

JUPITER-III 実験データ集

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動力炉・核燃料開発事業団
大洗工学センター

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動力炉・核燃料開発事業団 (Power Reactor and Nuclear Fuel Development Corporation)

JUPITER-III 実験データ集

技術開発部 プラント工学室

JUPITER サブワーキング Gr*

要 旨

本実験データ集は、動燃事業団と米国エネルギー省(DOE)との共同研究としてアルゴンヌ国立研究所(ANL-W)の大型臨界実験装置ZPPRで実施した大型高速炉臨界実験(JUPITER-III)の実験データをまとめたものである。JUPITER-III実験は電気出力65万kW級の軸非均質炉心模擬実験と100万kW級の均質炉心模擬実験からなる。

本データ集は、実験内容を理解するのに必要なデータおよび実験を解析するのに必要なデータを一元的に集大成することを目的に、実験手法、実験精度、実験体系、測定値等についてまとめている。主な実験項目は、(i) 臨界性、(ii) 制御棒反応度、(iii) 反応率分布、(iv) Naボイド反応度、(v) ガンマ発熱分布、(vi) サンプル反応度、(vii) 湾曲、熱膨張反応度である。

なお、本データ集の作成にあたっては、ANLのZPRレポートを極力加工せず原データを集約し、また実験内容を容易に理解できる様努めた。

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JUPITER-III Experimental Data Book

Plant Engineering Office
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Abstract

This book has been compiled for experimental data of JUPITER-III program, which is the co-operative research program between PNC and DOE using ZPPR in ANL-W. The program is benchmark experiments for 650MWe-size, axially heterogeneous and 1000MWe-size, two-zone homogeneous cores.

This data book is to cover full experimental data pertinent to the following items : experimental techniques, experimental uncertainties, core configurations, measured data, and so on. The experiments performed in this program are criticality, control rod worth, reaction rate distribution, sodium void worth, and bowing, expansion, sample worth measurements, and so on.

This data book mainly includes the original experimental data written in the ANL ZPR-reports.

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1. まえがき

動燃事業団と米国エネルギー省(DOE)の共同研究である大型高速炉臨界実験(JUPITER-III)は、昭和62年1月より1年間の実験が終了し、すべての実験データを動燃事業団は入手している。また、実験解析も今年度完了し、その成果は別の報告書⁽¹⁾にまとめている。そこで、今後の実験データの有効活用(設計解析手法の改良時の精度評価等)時の便宜を考慮して、JUPITER-III実験の全データを本資料にまとめた。本資料には、JUPITER-III実験に引続いて実施した日米共同核的空間結合特性実験(JUPITER-Io)⁽²⁾⁽³⁾での関連データも含まれている。

本資料は、JUPITER実験解析担当者が、各実験項目ごとに実際の解析を通して必要と思われるすべての情報を収録しているが、さらに詳細にわたる事項については、添付の「参考文献」として記載した個々の関連資料を直接参照していただきたい。

2. JUPITER-III実験の概要⁽⁴⁾

JUPITER-III実験は、JUPITER-I,IIの後を受けて企画されたものであり、総合的な大型高速炉炉心ベンチマークとしてのJUPITER実験を完結するものである。JUPITER実験の概要をTable2-1に示す。

JUPITER-III実験は、大別するとZPPR-17とZPPR-18に分けることができる。ZPPR-17は均質および径非均質炉心とともに、大型炉の炉心概念としてその可能性が検討されている軸非均質炉心の模擬実験である。ZPPR-18は、²³⁵U燃料も利用した100万kWe級2領域均質炉心を対象としたフルサイズ模擬実験である。JUPITER-IIIの実験経過をTable2-2に示す。

なお、JUPITER-10実験(ZPPR-19)は大型高速炉の核的デカップリング特性の把握のための実験であるが、一部JUPITER-III実験を補足する測定も実施している。

以下に、ZPPR-17, 18, 19の概要について述べる。

(1) ZPPR-17

ZPPR-17は、650MWe級の軸非均質炉心を対象とした臨界実験であり、ZPPR-17A、-17B、-17C(以下、17A、17B、17C)の3種類の実験体系により、臨界性、制御棒反応度、Naボイド反応度、反応率、 γ 線発熱分布、動特性、反応度係数の実験が実施された。ZPPR-17体系の主要目と実験項目をTable2-3、2-4にまとめた。

ZPPR-17体系は、円筒状の1領域の炉心の中心部に厚さ約30cmの円盤状の内部ブランケットを配置した構成になっており、内部ブランケット及び制御棒、制御棒チャンネルを含む炉心体積は約5500lである。各実験体系の炉心構成をFig.2-1に示す。

17Aは制御棒チャンネルを設けないクリーン炉心であり、軸非均質炉心の基本核特性を把握することを目的とした。これは、炉心型式間の核特性比較において、JUPITER-I、-IIで実施された均質炉心(クリーン炉心:ZPPR-9)、径非均質炉心(クリーン炉心:ZPPR-13A)と直接比較できるものである。

17B、17Cはいわゆる工学的模擬実験体系であり、17Bは25本の制御棒

チャンネルを設けた運転サイクル末期(制御棒全引抜き)模擬炉心、17Cは運転サイクル初期(制御棒13本半挿入)模擬炉心である。17Cは17Bとの比較により、各核特性に対する制御棒半挿入の効果、特に中性子束分布に対する影響を把握することを目的としている。

(2) ZPPR-18

ZPPR-18は1000MWe級の2領域均質炉心を対象とした臨界実験であり、ZPPR-18A、-18B、-18C(以下、18A、18B、18C)の3種類の実験体系により、臨界性、制御棒反応度、反応率、 γ 線発熱分布、動特性の実験が実施された。ZPPR-18体系の主要目と実験項目をTable2-3、2-4にまとめた。

ZPPR-18体系は、ZPPR実験装置でのPu保有量の制限のため、外側炉心に ^{235}U 濃縮領域を設けたいわゆるセクタ型炉心であり、炉心体積約8500lは臨界実験史上最大である。各実験体系の炉心構成をFig.2-2に示す。

各炉心とも工学的模擬実験体系であり、18Aは運転サイクル末期(24本の制御棒全引抜き)模擬炉心、18Bは運転サイクル初期(18本制御棒半挿入)模擬炉心、18Cは大型炉心で厳しくなる制御棒1本誤引抜き時の出力ピーキング特性の把握を目的とした、運転サイクル初期におけるオフセンタ制御棒1本誤引抜き(17本制御棒半挿入)模擬炉心である。

(3) ZPPR-19

JUPITER-Io実験(ZPPR-19)は次の2つを目的としている。

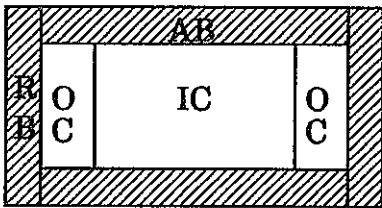
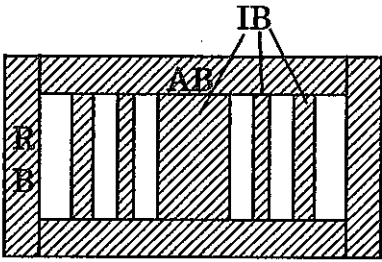
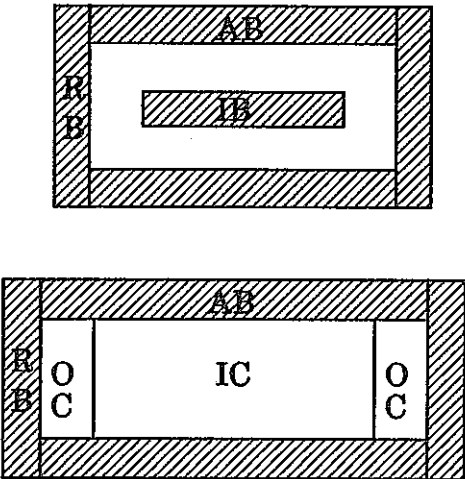
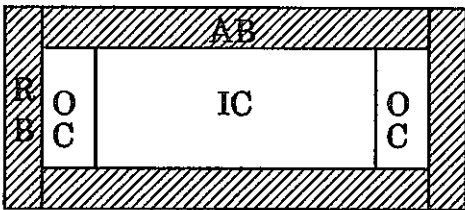
- ① 大型炉における核的ディカップリング実験データの取得
- ② ZPPR-18体系の ^{235}U 濃縮領域のセクタ効果に対するデータの取得

ZPPR-19体系はZPPR-19A、-19B(以下、19A、19B)の2種類の実験体系からなり、19Aは①の目的のため大型炉心における核的ディカップリングを強調した炉心配置である。

19Bは、上記①と②を実験目的とする炉心である。ZPPR-19体系の主要目と実験項目をTable2-3、2-4に、その炉心構成をFig.2-3に示す。19Bは、18Aとほぼ同じ炉心配置であるが、外側炉心に ^{235}U 濃縮燃料ドロワを均等に配置した炉心であり、ZPPR-18体系の ^{235}U 濃縮領域のセクタ効果に対する

データを取得するために、臨界性、制御棒反応度、反応率、Naボイド反応度、 γ 線発熱分布、動特性の実験が実施された。

Table2-1 JUPITER実験の概要

	炉心構成	模擬対象	実施期間
JUPITER-I		60万~80万 kWe級 2領域均質炉心	1978年8月~ 1981年8月 (3年)
JUPITER-II		65万kWe級 径方向 非均質炉心	1982年5月~ 1985年5月 (3年)
JUPITER-III		65万kWe級 軸方向 非均質炉心 100万kWe級 2領域均質炉心	1986年11月~ 1988年11月 (2年)
JUPITER-1o		100万kWe級 2領域均質炉心	1988年1月~ 1989年2月 (1年2カ月)



炉心

IC:内側炉心

OC:外側炉心



ブランケット

IB:内部ブランケット

AB:軸方向ブランケット

RB:径方向ブランケット

Table 2-2 J U P I T E R - III の実験経過

年 月	S62/1	2	3	4	5	6	7	8	9	10	11	12
実験体系	← ZPPR-17A → * 17B * → 17C → * ZPPR-18A → * 18B → * 18C →											
臨 界 性	□			□	□			□			□	□
特 性 試 験		□								□		□
制 御 棒 価 値		□			□	□				□		□
N a ボ イ ド 反 応 度			□									
反 応 率 と γ 線 発 熱			□		□		□			□		□ □
動 特 性			□							□		□
反 応 度 係 数			□									

Table 2-3 J U P I T E R - III 実験体系の主要目

体系名	ZPPR-17A	ZPPR-17B	ZPPR-17C	ZPPR-18A	ZPPR-18B	ZPPR-18C	ZPPR-19B
炉型	軸非均質炉心			2領域均質炉心(セクタ型)			2領域均質炉心
体系の特徴	制御棒領域を設けないクリーン体系	運転サイクル末期の制御棒全引抜き模擬体系	運転サイクル初期の調整棒半挿入模擬体系	運転サイクル末期の制御棒全引抜き模擬体系(外側炉心にセクタ状濃縮U領域有り)	運転サイクル初期の調整棒半挿入模擬体系(同左)	運転サイクル初期の調整棒半挿入状態におけるオフセンター調整棒1本誤引抜き模擬体系(同左)	運転サイクル末期の制御棒全引抜き模擬体系(外側炉心に濃縮Uドローを均等に配置)
炉心等価直径*1 (cm)	263.0	263.0	263.0	327.0	327.0	327.0	327.0
炉心高さ*2 (cm)	101.8	101.8	101.8	101.8	101.8	101.8	101.8
炉心体積*3 (ℓ)	4794	4794	4794	8549	8549	8549	8549
制御棒チャンネル数(本)	0	25	12	24	6	7	24
制御棒本数(本)	0	0	13(半挿入)	0	18(半挿入)	17(半挿入)	0
内部ブランケット厚(cm)	30.6	30.6	30.6	—	—	—	—
内部ブランケット径(cm)	87.5	87.5	87.5	—	—	—	—

*1 制御棒チャンネル, 制御棒を含む炉心領域の等価直径。

*2 軸非均質炉心の場合、内部ブランケット厚も含む。

*3 制御棒チャンネル, 制御棒を含む。軸非均質炉心の場合、内部ブランケットを除く。

Table2-4 JUPITER-IIIの実験項目

実験項目*	軸方向非均質炉心			2領域均質炉心		
	17A	17B	17C	18A	18B	18C
実効増倍率	○	○	○	○	○	○
反応率、反応率比	○	○	○	○	○	○
制御棒反応度	○	○	○	○	○	
Naボイド反応度	○					
物質反応度	○					
ガンマ線発熱	○	○	○	○	○	○
湾曲、熱膨張反応度	○					
動特性	○			○		

* ○は実験実施項目

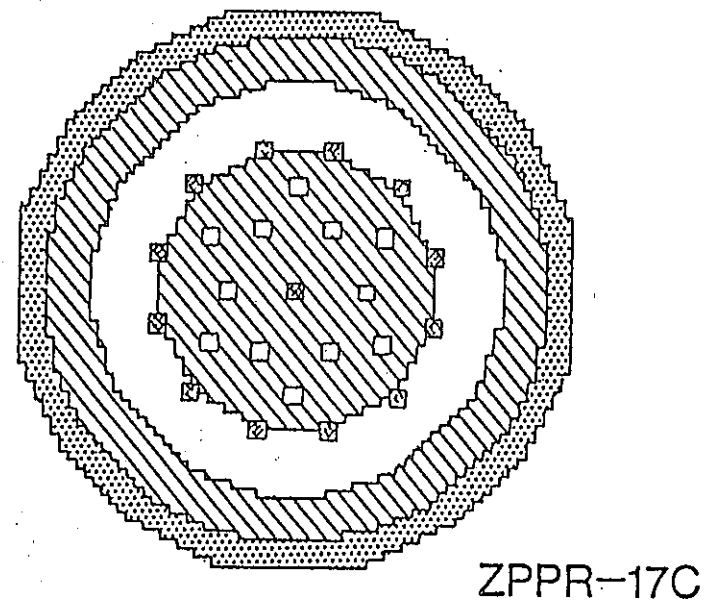
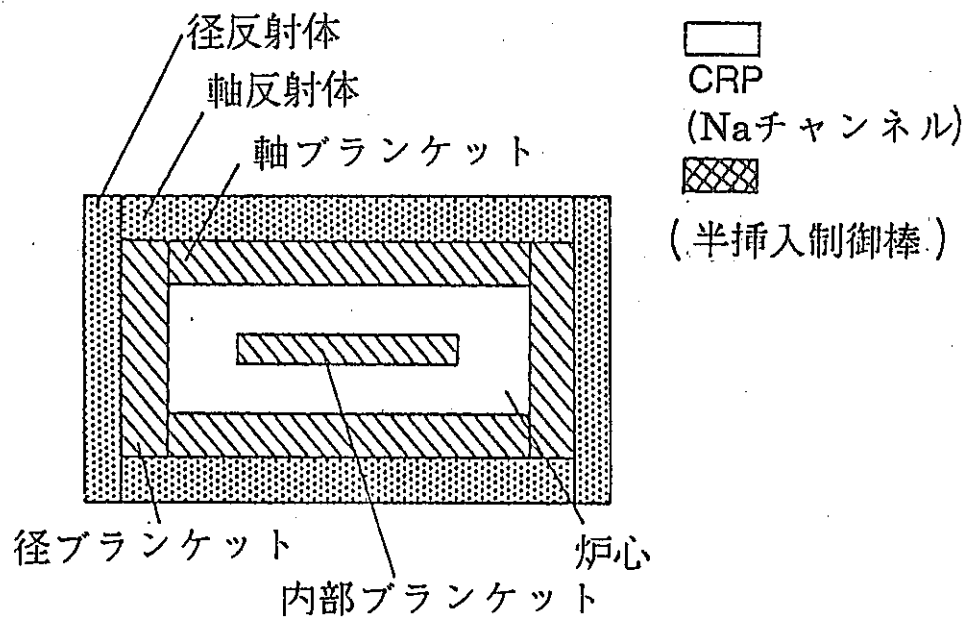
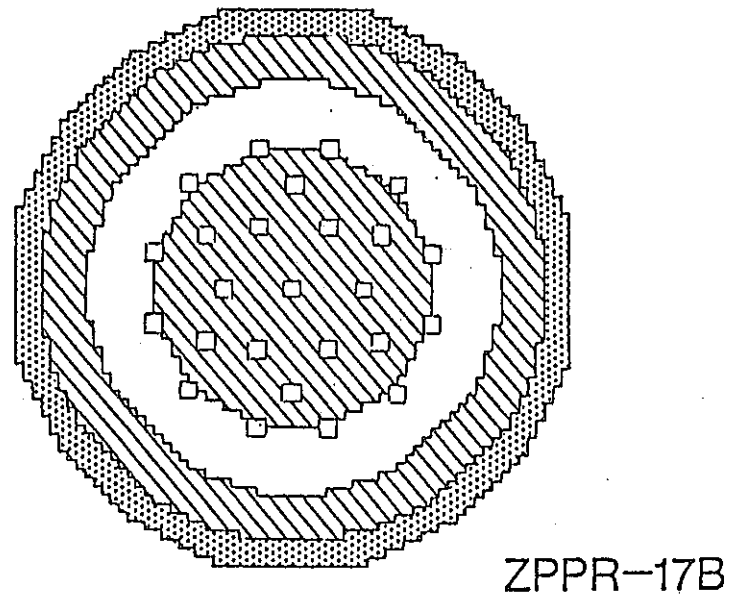
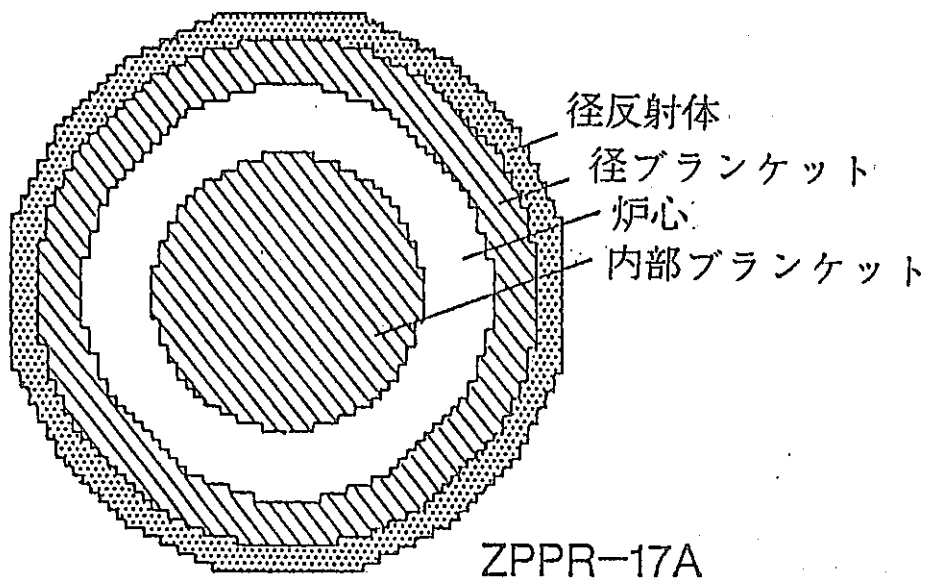


Fig.2-1 650MWe級軸非均質炉心模擬のZPPR-17の炉心構成

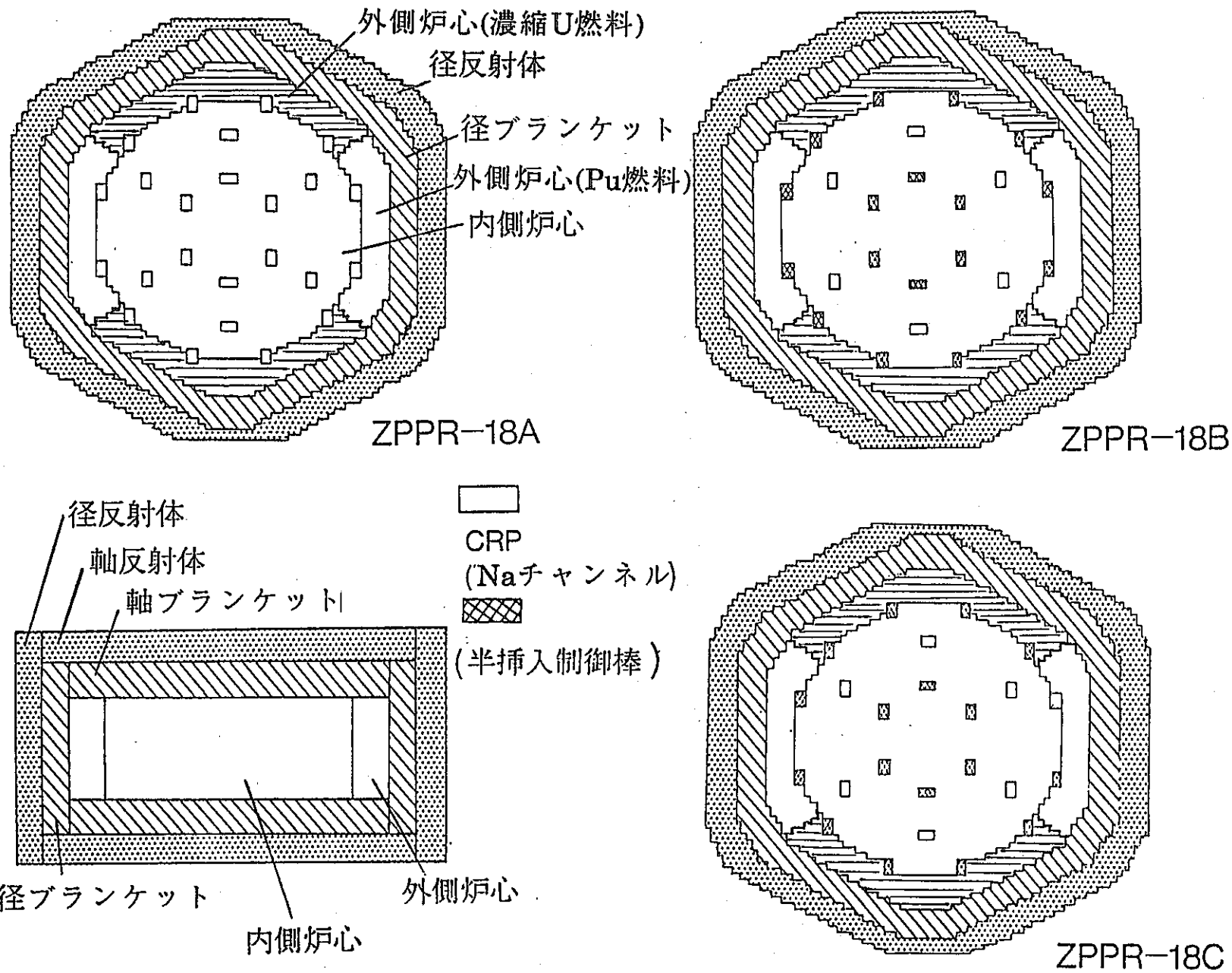
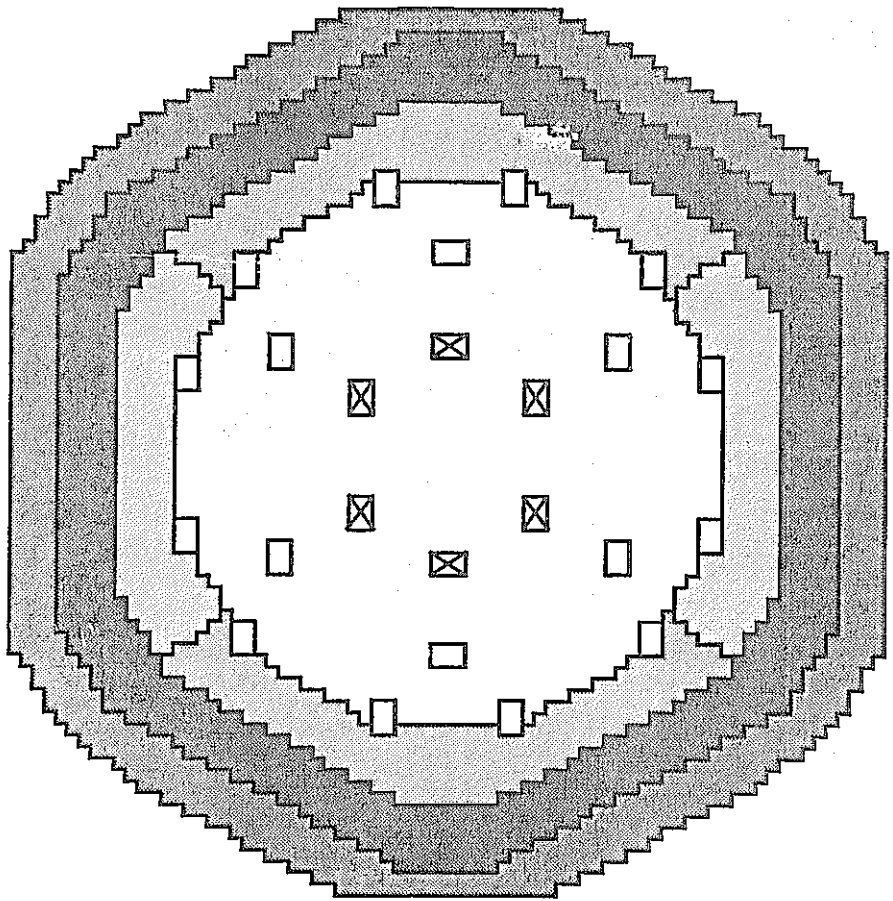


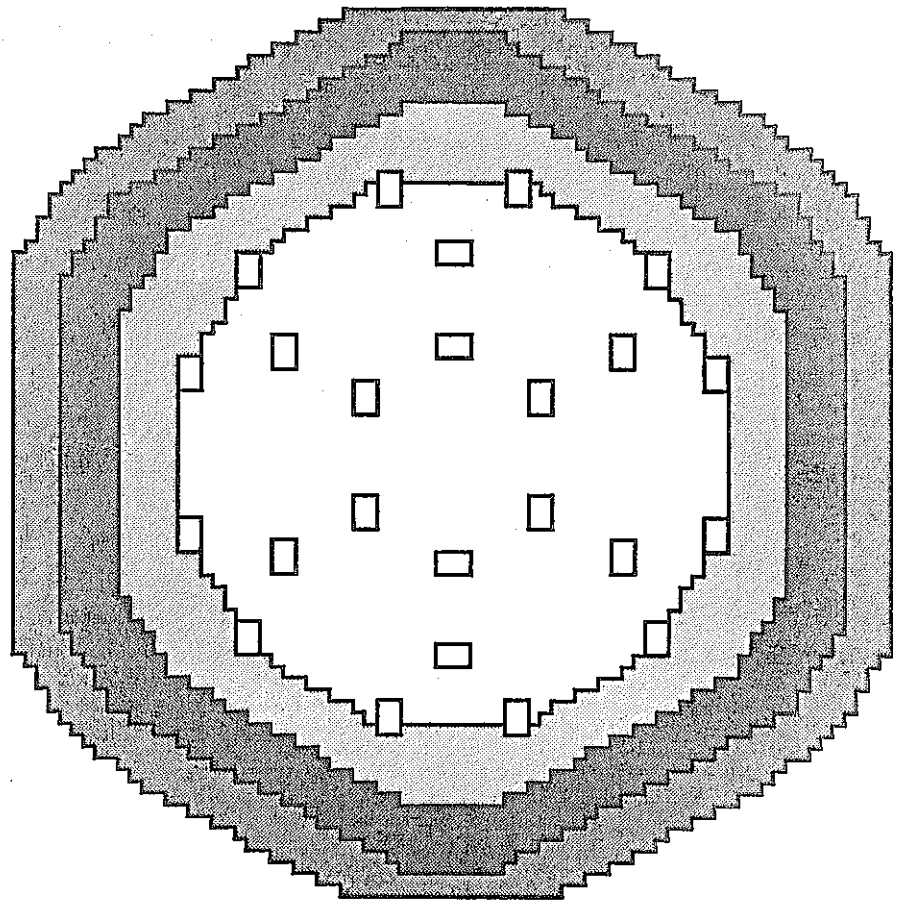
Fig.2-2 1000MWe級2領域均質炉心模擬のZPPR-18の炉心構成



CRP
 CR (FULL - INSERTED)

INNER CORE
 OUTER CORE
 U - DRIVER
 BLANKET
 REFLECTOR

ZPPR-19A



CRP

INNER CORE
 OUTER CORE (Pu - U MIXED)
 BLANKET
 REFLECTOR

ZPPR-19B

Fig.2-3 ZPPR-19の炉心構成

3. 測定方法

JUPITER-III実験における各実験項目の測定方法および測定誤差はJUPITER- I , II とほぼ同様である⁽⁵⁾。これらの測定方法と測定誤差を実験項目ごとにTable3-1 に示す。測定誤差は、その実験項目に共通の系統誤差と各測定ケースごとに異なる偶発誤差から成っている。系統誤差はその測定自体の誤差であり、偶発誤差は計数の統計誤差等である。実験者としては、これらの測定誤差が現状の誤差評価技術レベルにおける実験誤差であると解釈している。

ZPPRにおける測定方法は基本的には下記のごとく分類できる。

- (1) 臨界法
- (2) 動特性手法
- (3) 修正中性子源増倍法
- (4) 放射化箔による反応率分布測定
- (5) TLDによる γ 線発熱測定
- (6) その他

上記の各測定法について以下に説明する。

3.1 臨界法

臨界性の評価についてのみZPPR運転用制御棒のS字反応度曲線を使用する臨界法を適用している。臨界性評価では主に、ZPPR運転用制御棒の挿入反応度と温度(293°K基準)を補正する。一例としてTable3.1-1にZPPR-13の臨界性評価の誤差の内訳を示すが、燃料の同位体組成誤差の寄与が最も大きい。

3.2 動特性手法

従来の物質反応度、ドップラー反応度、Naボイド反応度分布、基準体系の未臨界度等とJUPITER-IIIで新たに開発・実施された湾曲、熱膨張反応度が、動特性手法によって求められた。この方法では、系に測定すべき反応度を動的に加え、その時の中性子計数率の時間変化から動特性方程式を逆に解くことにより反応度を求めている(Inverse Kinetics法)。

まず、動特性手法による反応度測定の基本手法を説明し、次に、オシレーション法による微小反応度の測定法と、湾曲、熱膨張反応度等の新しい測定法について述べる。

(1) 基本手法

$$\frac{\rho(t)}{\beta_{eff}} = 1 - \frac{\epsilon \cdot Seff}{\beta_{eff}} \cdot \frac{1}{R(t)} - \frac{1}{R(t)} \sum_{i=1}^6 a_i \lambda_i e^{-\lambda_i t} \int_{-\infty}^t R(\tau) e^{\lambda_i \tau} d\tau \dots\dots\dots (3.2-1)$$

ここに $\rho = \frac{k_{eff}-1}{k_{eff}}$

ϵ : 検出器効率

$R(t)$: 時刻 t における係数率

a_i : $\beta_{eff,i} / \beta_{eff}$

λ_i : 遅発中性子先行核崩壊定数

$Seff$: 実効中性子源

$$R(t) = \frac{1}{1-\beta_2} \cdot \frac{\epsilon \cdot Seff,2}{\beta_{eff,2}} + \frac{1}{1-\beta_2} \cdot \frac{\epsilon_2 \cdot \beta_{eff,1}}{\epsilon_1 \cdot \beta_{eff,2}} \cdot R_1 \cdot \sum a_i e^{-\lambda_i t} + \frac{1}{1-\beta_2} \sum a_i \lambda_i e^{-\lambda_i t} \int_0^t R(\tau) e^{\lambda_i \tau} d\tau \dots\dots\dots (3.2-2)$$

但し β_2 : ロッド・ドロップ後の反応度

$$P = A + b \cdot f_1(t) + c f_2(t) \dots\dots\dots (3.2-3)$$

一点炉近似の動特性方程式より、臨界にある系に挿入された反応度は中性子検出器の計数率の時間変化から(3.2-1)式により求められる。(3.2-1)式を解くにあたりZPPRでは、必要となる定数のうち λ_i は計算値を用い、 $\epsilon \cdot Seff / \beta_{eff}$ 、 a_i は以下に述べるロッド・ドロップ法で求められる実験値を用いている。

同じく一点炉近似の動特性方程式よりロッド・ドロップ後の中性子計数率は(3.2-2)式で表わされる。ここに添字1,2はそれぞれロッド・ドロップ前及び後を示す。ロッド・ドロップ後の計数率の時間変化データに(3.2-2)式を最小

自乗法により $\epsilon \cdot \text{Seff} / \beta_{\text{eff}}$ 及び a_i が求められる。すなわち、ロッド・ドロップ時の出力変動に注目すると、出力 P は中性子源による定数項 A 、ロッド・ドロップ前の遅発中性子によるもの $f_1(t)$ 、ロッド・ドロップ後の遅発中性子によるもの $f_2(t)$ の和になっている (Fig3.2-1 参照)。そこで (3.2-3) 式とおき、最小自乗法により、 A, b, c を求める。中性子源、検出器効率及び a_i 等はその情報が A, b, c の中に含まれているので、これらの値から求めることができる。

ZPPRにおける反応度に関する実験の多くが (3.2-1) 式を基本にしており、(3.2-1) 式を解くにあたり必要となる実効中性子源項や a_i セットの精度が実験結果に微妙に影響してくる。そして ZPPR ではこれらの定数を単純に計算値を用いず、(3.2-2) 式から求められる実験値を使っていることに意義があると言える。

(2) オシレーション法による微小反応度の測定

ZPPR では物質反応度、ドップラー反応度及び Na ボイド反応度分布は、オシレーション法で測定される。測定原理は上述の動特性的手法である。すなわち、測定すべきサンプルを炉内へ出し入れした時の炉出力の変化を時々刻々記録しておき、その炉出力の変化から逆時間動特性方程式を解くことにより反応度の変化を求める。したがってサンプルの炉内における位置と時刻との対応がついていれば、サンプルがトラバース(オシレーション)の過程で通過した任意の位置での反応度が得られる。サンプルがある場合とない場合の反応度の差から、サンプルの反応度が得られる (Fig3.2-2 参照)。

測定装置はサンプルをオシレートさせるための特別のものを用いているが、駆動部の制御からデータ収集更に逆時間動特性方程式を解いてデータ整理するところまで、一貫して計算機で行っている。

ドップラー反応度測定では、サンプルの温度を変えた時、炉体系内への熱の流入が変化しないよう、二重ヒータ・システムという特別の手法を用いている。

物質反応度、ドップラー反応度、Na ボイド反応度分布の3つは測定対象及び測定装置に差異がある以外は、測定原理、測定手法とも本質的に同じであ

る。以下にJUPITER-IIIで新たに開発された3種の測定手法について述べる。

(i) Plate-Column Oscillator

物質反応度は従来、炉心内にTubeを装荷して、その中を測定すべきサンプルを炉内に出し入れして反応度を測定していた。この方法の他に、JUPITER-IIIでは、プレート単位の物質反応度測定も実施した。

(目的)

軸方向のプレート単位の物質反応度の測定 (Fuel, U_3O_8 , Fe_2O_3 Na等)

(特徴)

1. Axial Tube Oscillator (ATO)と異なりプレートによる物質反応度測定
2. 駆動機構がドロウ内に内蔵されているため、任意のマトリックス(格子)位置で測定できる。
3. プレートをMylar Tapeにより軸方向に連結し、一体として移動

(機構)

特殊ドロウとして、通常の2本のドロウを溶接により連結した1.84mのドロウを用いる。本測定では、この特殊ドロウを固定側集合体に装荷する。移動側はすべて通常のドロウである。一般に、ZPPRではこうした特殊ドロウは固定側に装荷するが、これは固定側集合体の方が後方に充分空間があるためである。

特殊ドロウ内では、51cmの炉心部と15cmの軸ブラケット部合計66cmが装填され、後方には、モータ、位置検出用エンコーダがあり、被試験プレートとの結合はAlブロックとSS rodsが用いられた。被試験プレート同志の結合はMylar Tape ($C_{10}H_8O_4$)が用いられた。さらに、被試験プレートのすべりをよくするため、3.18mm(1/8")幅のプレート(Fe_2O_3 等)がとり除かれ、被試験プレートのガイドとして0.127mm厚さのステンレス製のtray(0.503g/cm)が設けられた。

ドロウ内でのプレートとモータの位置関係をFig.3.2-3に示す。

特殊ドロウ内のプレートの装填図をFig.3.2-4,5に示す。通常はFig.3.2-4のパターンで、最大ストロークは66cmである。一部実験はFig.3.2-5のごと

く被試験プレート長さ(102cm)を延長して実施し、この場合には最大ストロークは30cm(66×2-102)となる。

(測定法)

測定法はこれまでのオシレーション法と同様に被試験プレートを3~4サイクル前後に移動させ、その時の炉外中性子検出器信号、炉内温度(温度補正のため)、軸方向位置(エンコーダ)を記録する。これを、温度補正を含むInverse Kinetics法で各時間ごとの反応度を求め、エンコーダの読みから各位置での反応度に換算する。通常はプレートを連続的に移動させるが、精度確認のため、数点でモータを停めた位置でも測定し、両者の測定値がよく一致することを確認している。

測定される量は、各ストロークに対する積分された反応度である。誤差評価としては、6~8点の測定点の平均値のバラツキ、Inverse Kinetics法の誤差と位置の誤差が考慮された。実際の測定では、位置の誤差(±0.04cm)が以外と大きかったようである。これは、1サイクル後に0点に戻ったときエンコーダにヒステリシスがあり、0点のずれが大きかったためである。しかし、各ストローク間の反応度差は、この位置の差の精度(±0.004cm)はよいため位置の誤差が小さいと言える。

(ii) Axial Expansion Oscillator

(目的)

炉心の軸方向伸びによる反応度測定(軸方向熱膨張模擬)

(特徴)

1. 短いドロワをテープ(Mylar Tape)で結合し、後方から引っばることでより炉心領域にギャップを発生させる。
2. 駆動機構は格子内に設置するので、任意の格子位置で測定できる。

(機構)

短いドロワを複数本用い(ZPPR-17では4本)、一番前(密着面)のドロワは格子に固定し、あとの3本はそれぞれMylar Tapeで結合し、後方から引っばることによりそれぞれ6.35mmのギャップが生じる。全ギャップ(最大軸方向伸び)は、1.905cmである。ZPPR-17Aの場合、接続点は密着面からそれ

ぞれ、15.2cm、30.5cm、45.7cmの点である。なお、このドロワの後方にはスチールブロックは装荷されていない。

駆動機構は、Double-acting air cylinderであり、一番後ろのドロワとロッドで結合されている。位置はlinear potentiometerで測定されている。

(測定法)

測定法はこれまでのオシレーション法と同一である。Double-acting air cylinderで前後運動を数回くりかえし、ギャップ有無での反応度差をInverse Kinetics法で測定する。測定対象は駆動の途中は対象外で、ギャップ=0とギャップ=1.905cmのときの反応度差である。測定反応度は非常に小さく -0.1ϕ 程度で、誤差は再現性も含めて3%と見積っている。

(iii) Bowing Oscillator

(目的)

径方向の湾曲(1ドロワ)時の反応度測定(径方向湾曲模擬)

(特徴)

1. 格子とドロワの1.4mmの空気冷却用のギャップを利用して湾曲反応度測定
2. 任意の格子位置で測定できる(通常 radial flux gradientの大きい場所)

(機構)

ドロワの4コーナーの下端にair driver camsを取りつけ、これを回転させることにより、ドロワを約1.4mmもち上げる。この移動量はlinear potentiometerで測定する。

Fig.3.2-6に、プレート装填図を示すが、2つのドロワからなり、前方部分(21"=53.3cm)が動作部で、後方部分は固定されている。

Fig.3.2-6で④の部分は、 $1/4$ "の U_3O_8 板を $1/8$ " U_3O_8 板に置換しギャップを作り、ケーブルを通すとともに、Clamping barが設置されている。これは53.5cmのドロワを単にもち上げると、プレートの重みでドロワがたわむため、プレートの重みをドロワの横板と、このclamping barでもたせている。このため、ドロワの横板とclamping bar間を3カ所(◎点)ネジ止

めして締めつけ、プレートを固定している。図中のボイド部と①部にポテンシオメータ(3ヶ)を置き、上下移動量を測定している。さらに、上下の移動量をかせぐために、通常ドロワは底板の厚さ0.079cmに対して、このドロワでは0.025cmまで薄くしている。このドロワの長さは53.54cmである。

軸ブランケットのプレート装填はほぼ通常と同じであるが、ケーブルとワイヤを通すため片方の1/4"を2.54cm高さのSUS板に置換している。

(測定法)

測定法はこれまでのオシレーション法と同一である。air cylinderでcamsを動かし、ドロワの上下をくりかえし、この反応度差をInverse Kinetics法で測定する。まったく独立に2回測定し、この再現性の誤差は5%以下であることを確認している。特殊ドロワはradial core worth gradientのピークとなる径ブランケットから1ドロワの炉心部に装荷している。また上下の移動量はポテンシオメータとSitu feeler gaugeでも4点測定し、これらの平均値として最終値0.133cmを得ている。ZPPR-17Aで測定された湾曲反応度はわずかに -0.014ϕ である。その誤差は3.5%であり、内訳はInverse Kinetics法処理1.9%、位置の誤差2.9%(0.004cm)である。

以上のように、この装置は今回述べた装置の中で一番の労作と言える。このような小さな反応度差($\sim 0.01\phi$)は予備解析である程度予想できており、十分測定可能と判断し、装置の製作、実験実施をしたのはZPPRの測定技術の高さを示すものと言える。

3.3 修正中性子源増倍法

制御棒反応度、広領域Naボイド反応度、プレート・ピン置換反応度(広領域)、ZPPR-17Aで実施されたセルパターン変更による模擬湾曲反応度等の測定は、修正中性子源増倍法に基づいて行われた。修正中性子増倍法の原理は次式で表される。

$$\$2 = \$1 \cdot \frac{R1 \cdot \epsilon_2 \cdot \beta_{eff,1} \cdot Seff,2}{R2 \cdot \epsilon_1 \cdot \beta_{eff,2} \cdot Seff,1} \dots\dots\dots (3.3-1)$$

ここに、添字1,2はそれぞれ基準系、被測定系を示し、記号は(3.2-1)式と同様である。

この方法の特徴は、制御棒のような大きな負の反応度が局所的に挿入された場合に変化する検出器効率(Fig.3.3-1参照)や実効中性子源強度の効果を考慮していることである。その結果この方法は、炉内にほぼ均等に配置された64個のIn-core Fission Chamber (IFC)を用いることにより、精度のよい反応度測定を行うことができる。

(3.3-1)式の各項の求め方を制御棒反応度測定を例にとって説明する。

$\$1$: 基準系(浅い未臨界系)の未臨界度で、3.1で述べたロッド・ドロップ法により求められる。

ϵ_2/ϵ_1 : 基準系及び被測定系について64個のIFC位置での核分裂率を計算し、両者の比をとることにより求める。現在ZPPRでは計算値を使用しているが、実験値を用いることも可能である。

$\beta_{eff,1}/\beta_{eff,2}$: 通常 β_{eff} の変化は小さいこと、及び得られた反応度を計算値と比較する際に $\beta_{eff,1}/\beta_{eff,2}=1.0$ としておけば計算値に同種の補正をする必要のないことから1.0としている。

$Seff,2/Seff,1$: 検出器効率比(ϵ_2/ϵ_1)を求めた時と同様の計算により求める。通常
の制御棒反応度測定においては0.9~1.05の範囲である。

上記のごとく求めた64個の $\$2$ を検出器効率比に対して直線に最小自乗フィットし(Fig.3.3-2)、検出器効率比が1.0の点の $\$2$ をもって最終的な未臨界度としている。こうすることにより検出器効率比計算で生じる誤差を最小にしている。

ZPPRでの修正中性子源増倍法の特徴は炉内に64個のIFCをほぼ均等に配置していることで、これにより制御棒挿入による中性子束の歪みを的確にとらえている。更に検出器効率比や実効中性子源比の補正は計算値を用いているが、上述のように64個の $\$2$ を検出器効率比に対して最小自乗フィットすることにより、これらの補正で生じる誤差を無視し得る程度にしている。

ZPPRでの修正中性子源増倍法の測定誤差は、数10\$の未臨界度まで1%程度である。その大部分は、ロッド・ドロップ法で得られる基準系の未臨界度の測定誤差によるものである。

3.4 放射化箔による反応率分布測定

ZPPRでの反応率分布の測定は箔とMicro Fission Chamber (MFC) によるものの2つの方法がある。両者の関係はMFCによるものが補助的(箔で測定できない核種に対して行う)であり、箔によるものが主体となっている。JUPITER-IIIでは箔による測定のみ実施された。

ZPPRが保有する箔は ^{239}Pu 、 ^{235}U 、 ^{238}U 、 ^{232}Th の4種類であるがJUPITER実験で測定された反応は $^{239}\text{Pu}(n,f)$ 、 $^{235}\text{U}(n,f)$ 、 $^{238}\text{U}(n,f)$ 、 $^{238}\text{U}(n,\gamma)$ である。ドロワ内への箔の装荷は、箔ホルダ(厚さ0.02in. 縦・横2.0in. のSUS板に直径0.5in. の穴を開けたもの)を用いて、ドロワ内のプレートとプレートの間に挿入することにより行われる。

箔での測定はドロワ内の点での測定であるが、計算との比較のためにはセル(ドロワ)の平均の反応率が必要となる。そのためZPPRではセル内測定と呼ばれる測定でセル平均係数なるものを求め、これを各セル内の一点で測定された反応率に乗ずることによりセル平均の反応率を実験値として求めている。

セル内測定とは、そのセル内の異なる位置に何枚かの箔を置いてセル内の反応率分布を求めることである。この分布よりセル内の平均反応率とセル内の一点で測定された反応率との比(セル平均係数)を求めている。

3.5 TLDによるガンマ線発熱測定

ZPPRで使用しているTLDは ^7LiF と $\text{CaF}_2:\text{Mn}$ の2種類であるが、JUPITER-IIIでは ^7LiF が使用された。1×1×6mmのTLDは肉厚約0.9mmのSUU304のカプセル内に入れて照射される。このTLD入りのカプセルはNaプレートの先端に特別に作られた凹みに装着され、炉内に装荷される。したがって、TLDを照射するために特別にボイド部を作る必要はない。個々のTLDは照射される前に標準ガンマ線源を用いて較正される。この較正では、個々のTLDのガンマ線に対する感度及びTLDの発光量とガンマ線照射量の関係が求められる。照射されたTLDはまず発

光量が測定され、次に上記の較正曲線からガンマ線照射量に変換される。更に、中性子感度補正(TLDがガンマ線だけでなく中性子の影響も受けることに対する補正)及びステンレス鋼中でのガンマ線発熱への変換が施されて最終的な実験値となる。

3.6 その他

ZPPRでは上記以外にMicro Fission Chamberによる反応率分布、Back-to-Back Chamberによる反応率比、プロトン・リコイル・カウンタによる中性子スペクトル等の測定も実施する場合があるが、JUPITER-IIIでは実施しなかった。

また、動特性試験として、ロッド・ドロップ法、10Bオシレーション法、原子炉中性子雑音法も実施したが、本データ集に実験データは記載せず、別報告書(3)に測定法とともにまとめている。

Table3-1 JUPITER-III実験の測定法と測定誤差

実験項目	測定法	測定誤差 (%)		
		偶発誤差 ⁽¹⁾	系統誤差 ⁽²⁾	全誤差
実効増倍率	臨界法	0.01	0.04	0.04
反応率	箔照射	F9, F5, C8 ⁽⁴⁾		
		炉心 0.8	2	2
		ブランケット 1~2	2	2~3
		F8		
		炉心 1.5	2	3
		ブランケット 2~30	2	3~30
反応率比 ⁽³⁾		F5/F9, C8/F9(炉心) 1	2	2
		F8/F9(炉心) 1.5	2	3
制御棒反応度	修正中性子源増倍法	0.1~0.5	1	1
Naボイド反応度	修正中性子源増倍法 動特性手法	2.5	1	2.5 ⁽⁵⁾
広領域 サンプル		2	2	3 ⁽⁵⁾
物質反応度	動特性手法	0.2~0.6	1~2	1~2 ⁽⁶⁾
ガンマ線発熱	TLD(LiF) 照射	2	— ⁽⁷⁾	—
湾曲、熱膨張反応度	動特性手法	3	2	4
	修正中性子源増倍法	3	1	3
動特性	ロッドドロップ法 ¹⁰ Bオシレーション法 原子炉中性子雑音法	—	—	—

(1) 検出器の計数の統計誤差、再現性誤差等

(2) 同位体組成の誤差(臨界法)、セル・ファクタ、絶対較正の誤差(箔照射)、基準反応度の誤差(修正中性子源増倍法)、サンプル位置の誤差(動特性手法) 等

(3) 反応率のデータより導出

(4) F9: ²³⁹Pu核分裂率, F5: ²³⁵U核分裂率, F8: ²³⁸U核分裂率, C8: ²³⁸U捕獲率

(5) 炉心中心付近

(6) 炉心中心付近の²³⁹Pu, ¹⁰Bサンプル等

(7) —は未評価

Table 3.1-1 Estimated Uncertainties for Experimental k_{eff} Values in ZPPR-13

	Estimated 1 σ Uncertainty, % Δk				
	13A	13B/1	13B/3	13B/4	13C
a. Measured excess:					
period measurement	0.0008	0.0007	0.0009	0.0003	0.0008
b. Calculated β_{eff}	0.0025	0.0030	0.0033	0.0018	0.0033
c. Configuration reproducibility	0.0005	0.0005	0.0005	0.0005	0.0005
d. Material location	0.0066	0.0033	0.0033	0.0033	0.0033
e. Interface gap	0.0149	0.0133	0.0133	0.0133	0.0133
f. Core temperature adjustment:					
thermocouple calibration	0.0017	0.0018	0.0019	0.0019	0.0019
average temperature	0.0033	0.0036	0.0038	0.0039	0.0038
temperature coefficient	0.0024	0.0022	0.0017	0.0016	0.0023
g. ^{241}Pu decay of fuel ^a	0.0100	0.0106	0.0107	0.0109	0.0110
h. Void slots:					
shim/PSR drawers	0.0066	0.0066	0.0066	0.0066	0.0066
fission chambers	0.0090	0.0090	0.0090	0.0090	0.0090
i. Isotopic composition	0.0320	0.0320	0.0320	0.0320	0.0320
j. Humidity	0.0002	0.0002	0.0002	0.0002	0.0002
k. PSR blades parked in plenum	0.0040	0.0040	0.0040	0.0040	0.0040
Statistical sum	0.0395	0.0387	0.0387	0.0387	0.0389

^aUncertainty in calculated decay from fabrication date

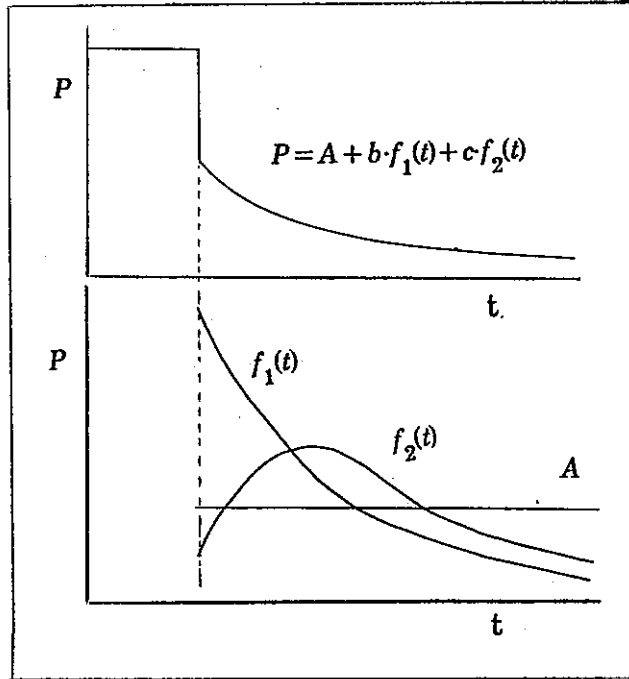


Fig.3.2-1 ロッド・ドロップ後の出力変動

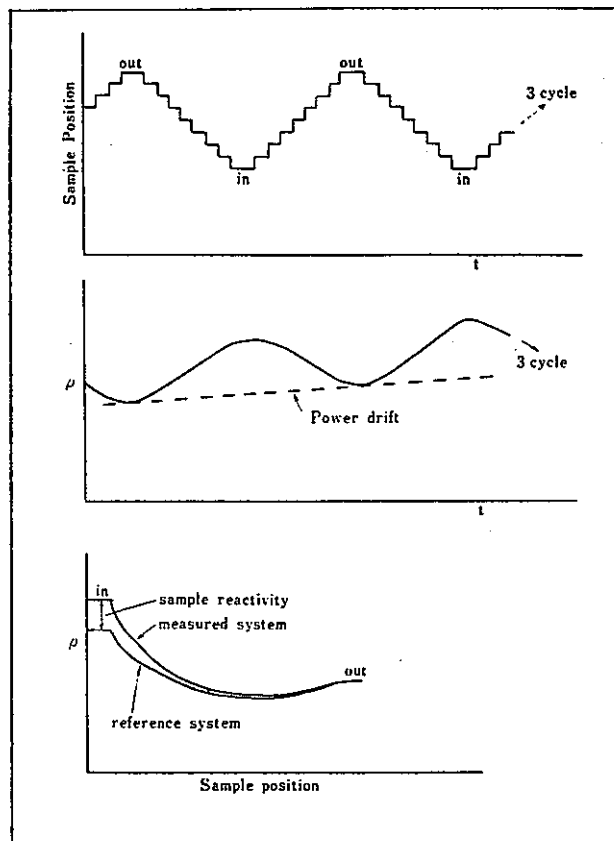


Fig.3.2-2 オシレーション法による微小反応度測定

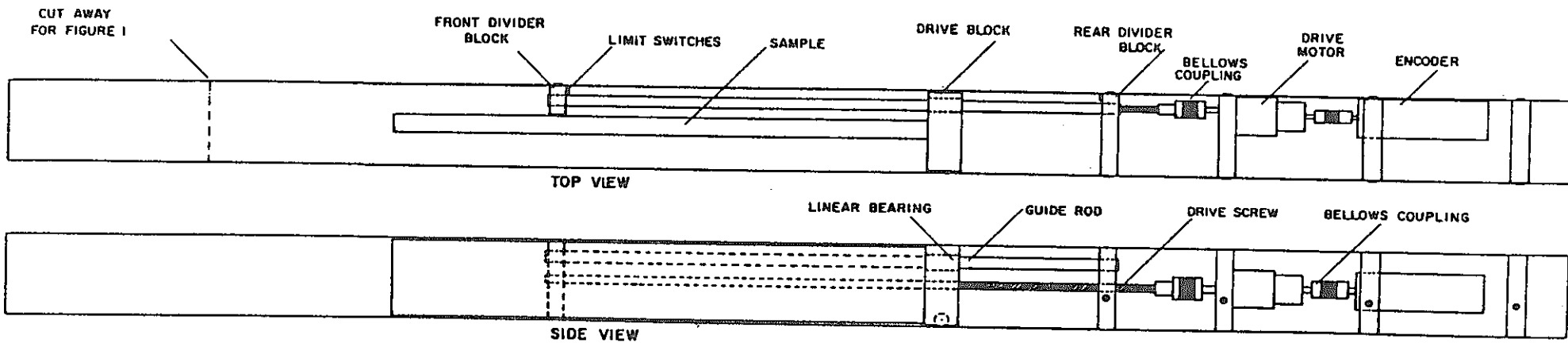


Fig.3.2-3 Plate Column Oscillator Drive Mechanism

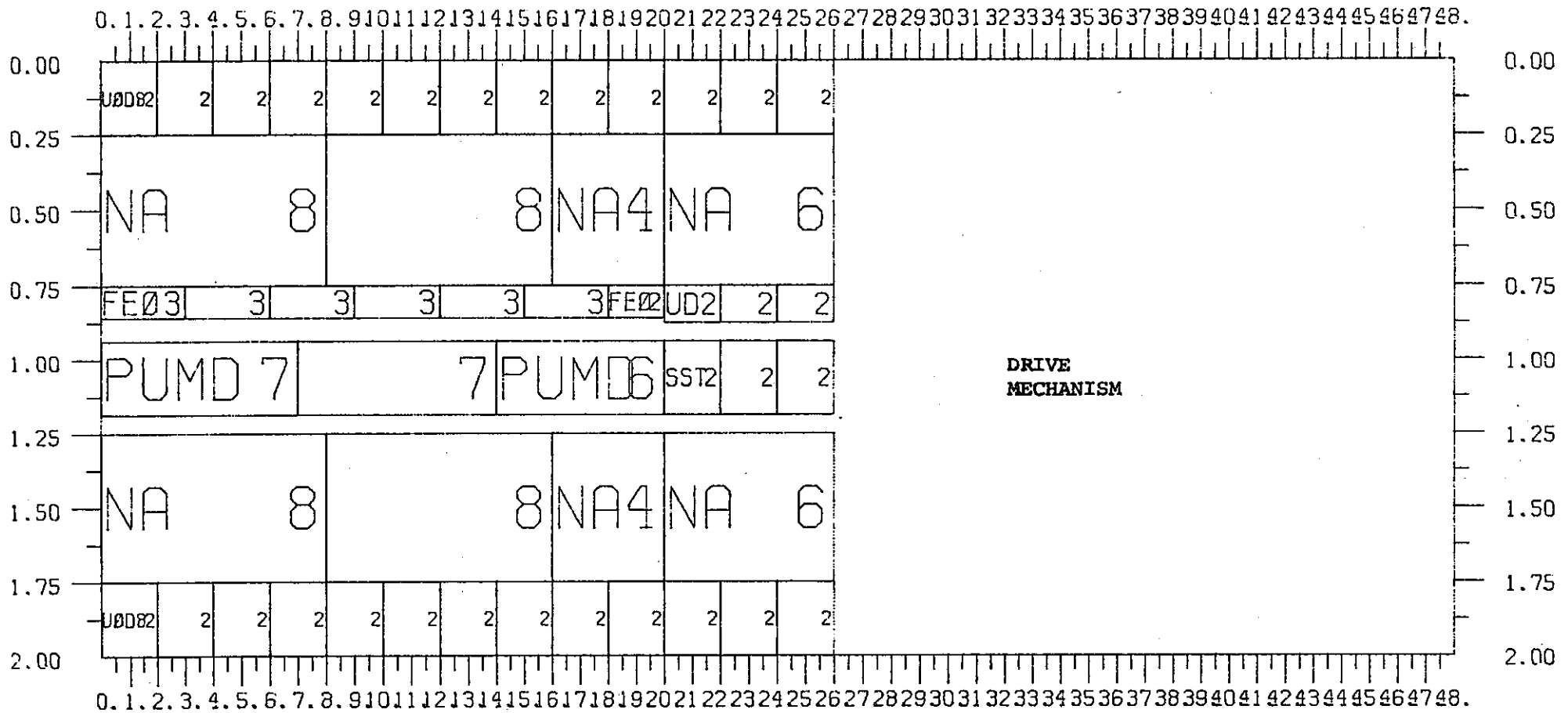


Fig.3.2-4 Oscillator Plate Loading in PCO-1

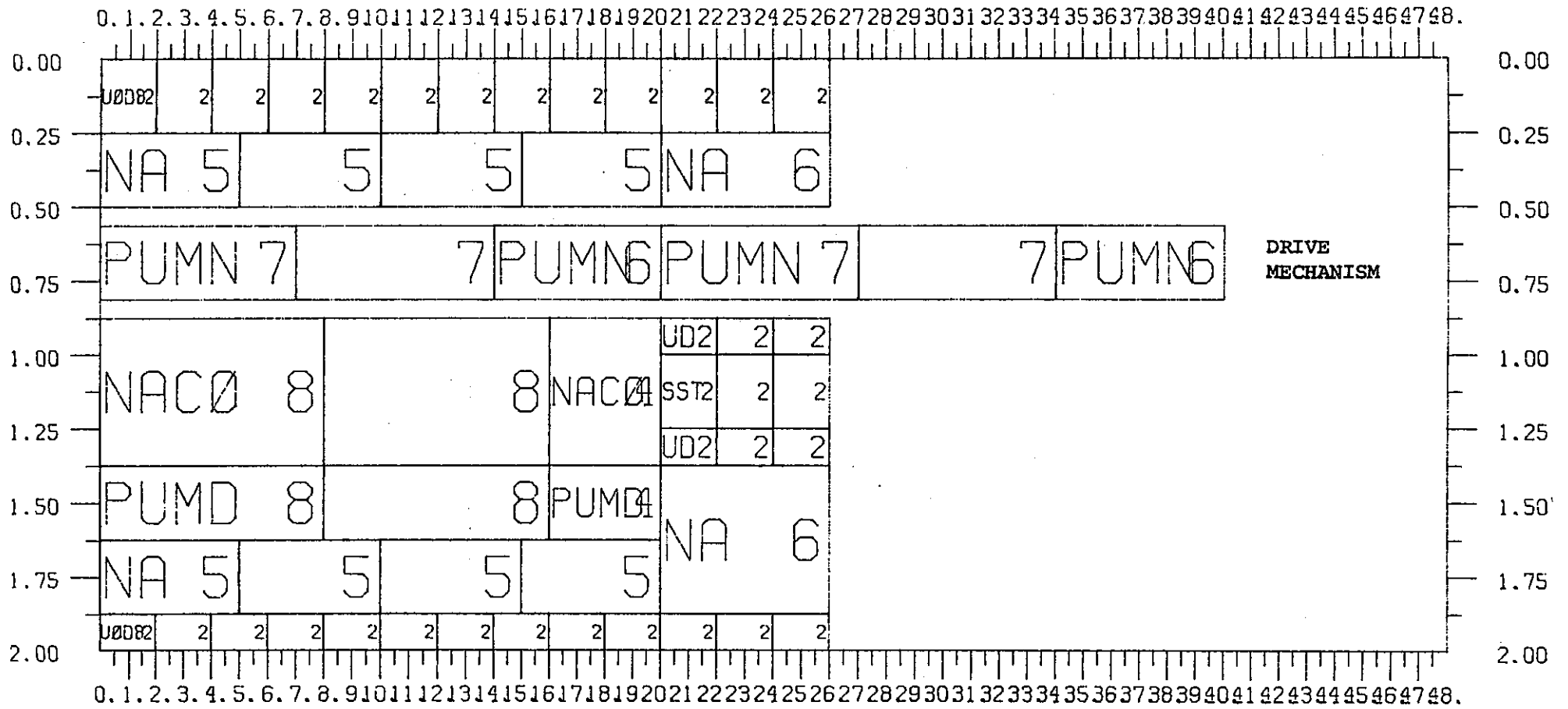
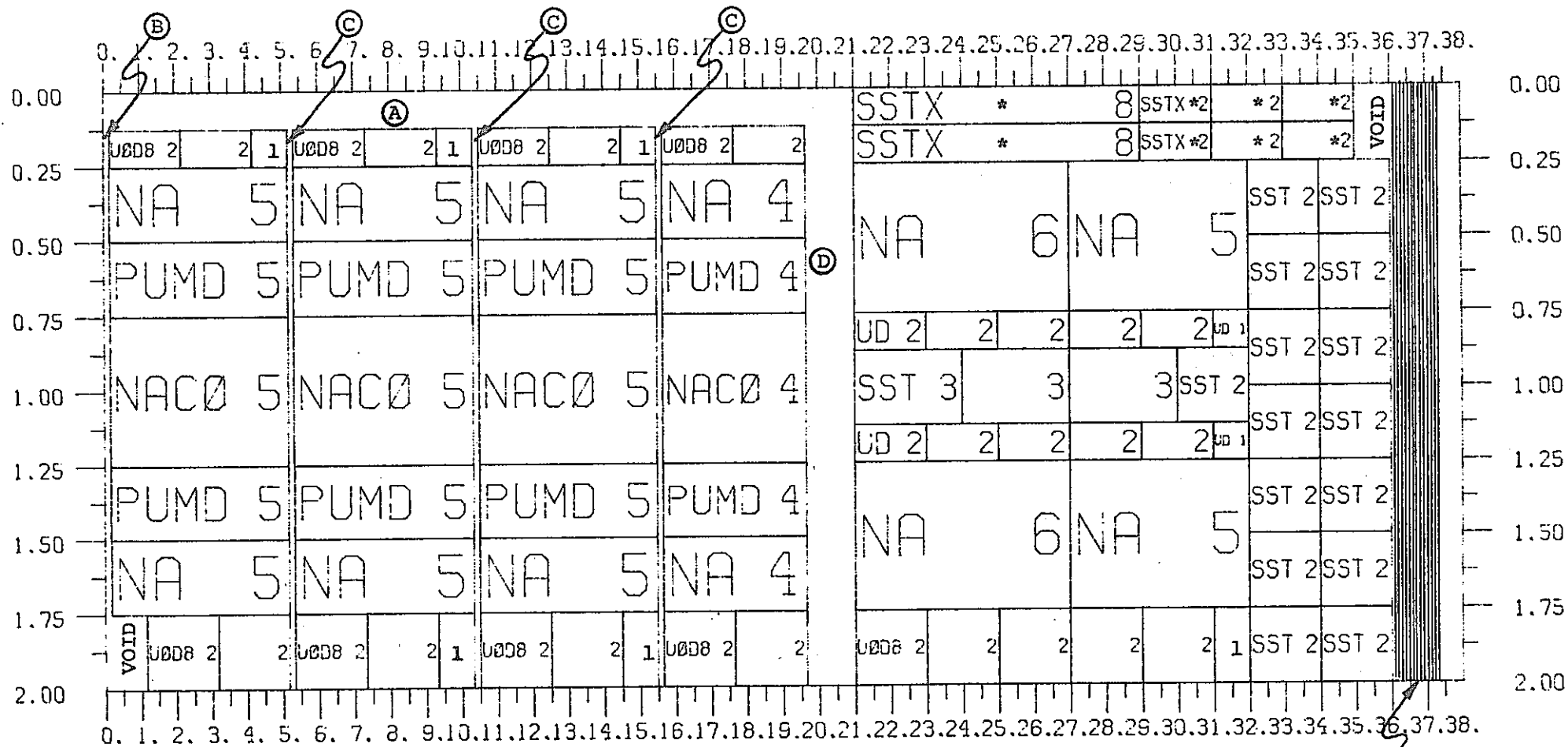


Fig.3.2-5 Oscillator Plate Loading in PCO-5



- * 1 Inch high for cables. 12 pieces 1/16 x 1 x 2 SSTX
1" High
- (A) Contains 477 g stainless steel, 3 g copper wire, and 2 g teflon insulation.
- (B) 0.46 cm wide gap contains 8 g stainless steel and 1.7 g plastic.
- (C) Each gap 0.41 cm wide. Gap contains 2 screws of 4 g steel.
- (D) 3.3 cm wide gap contains 36 g aluminum, 9 g stainless steel, 40 g mild steel, and 5 g plastic.

Fig.3.2-6 Plate Loading in Bowing Oscillator

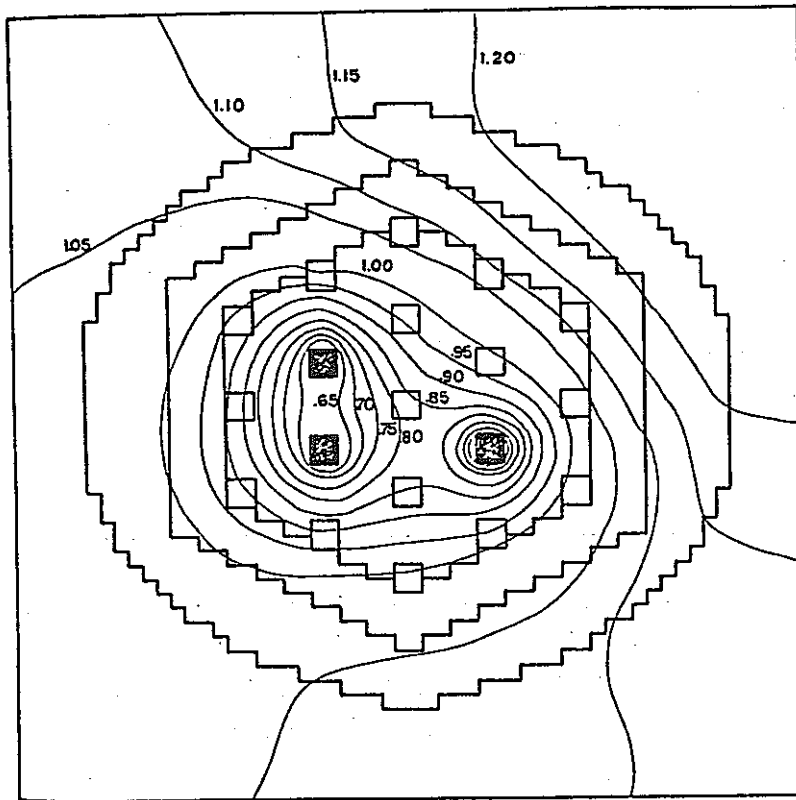


Fig.3.3-1 ZPPR-10Aの制御棒3本挿入時の検出器効率比分布

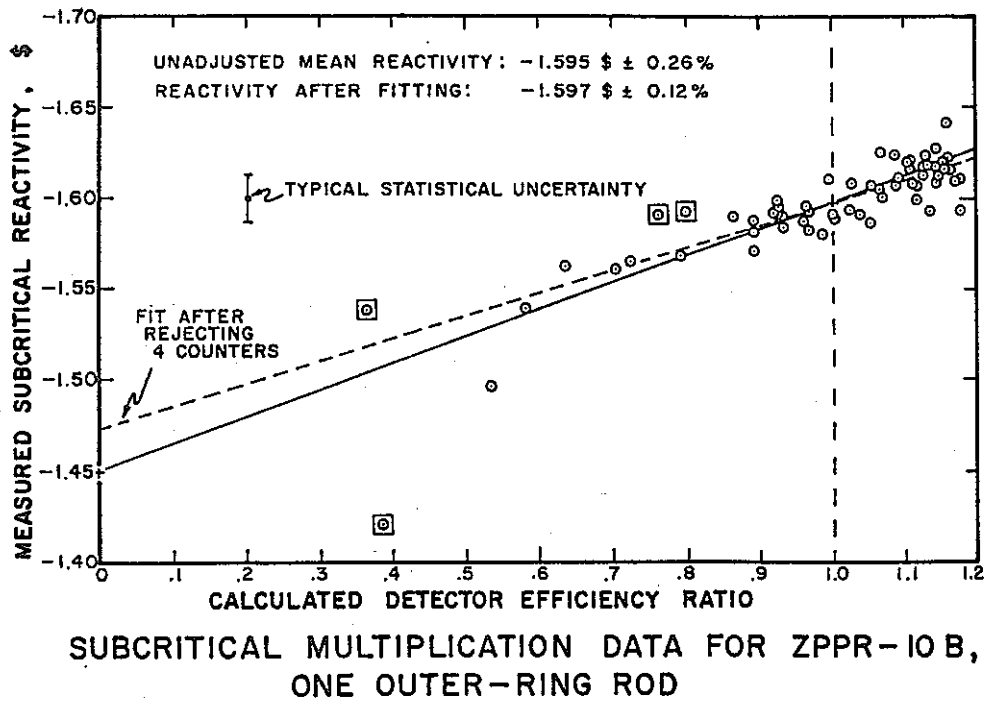


Fig.3.3-2 検出器効率比に対する未臨界度測定値の分布

4 実験データ

4.1 ZPPR-17炉心

4.1.1 臨界性

ZPPR-17A, B, C炉心の臨界性に関して、以下のデータをまとめた。
いずれも、ANLのデータは参考文献(16)によっている。

項 目	ZPPR-17A	-17B	-17C
a ドロワ装填図	Fig. 4.1.1-1~5	同 左	同 左
b 炉心構成図			
①基準体系	Fig. 4.1.1-6,-7	-10,-11	-14,-15
②AMM体系	Fig. 4.1.1-8,-9	-12,-13	-16,-17
c 基準体系モデルデータ			
①ドロワ本数	Table 4.1.1-1	-9	-16
②領域別炉心装荷重金属重量			
ANLデータ	Table 4.1.1-2	-10	-17
日本側データ	Table 4.1.1-3	-11	-18
③領域別原子数密度			
ANLデータ	Table 4.1.1-4	-12	-19
日本側データ	Table 4.1.1-5	-13	-20
④ドロワ別原子数密度			
AMMモデル用	Table 4.1.1-6	同 左	同 左
d ドロワマスタの種類	Table 4.1.1-7	-14	-21
e k_{eff} 実験値	Table 4.1.1-8	-15	-22
f 解析モデル			
①RZモデル	Fig. 4.1.1-18	-19	-20
②XYZモデル	Fig. 4.1.1-21,24	-22	-23

以下に記載したデータについて説明する。なお、この内容は 4.2節で説明する ZPPR-18, 19 炉心についても共通である。

a. ドロワ装填図

17 炉心で用いられる基本的なドロワについてドロワ内のプレートを説明した図である。

b. 炉心構成図

①基準体系

炉心内の同一のドロワを同じ記号で表した基準炉心体系図である。この図に基づき基準体系の解析モデルを作成することができる。

②AMM体系

ZPPRで用いられた各ドロワの中には重金属の重量等がわずかに異なるものがあり、詳細な検討には、これらのドロワごとにマクロ断面積を用意し、AMM (ALL Master Model) による解析を行う。本図はそのためのドロワ配置である。

c. 基準体系モデルデータ

①ドロワ本数

この炉心で用いられた各ドロワの種類ごとに本数をまとめて示したものである。

②領域別炉心装荷重金属重量

内側炉心、外側炉心、内部ブランケット、径ブランケット、軸ブランケットの各領域について領域別の重金属重量をまとめたものである。この表は入力した物質データのチェック用として用いることができる。Table 4.1.1-2 にはANLのデータを、Table 4.1.1-3 には日本側のデータを示す。両者は、ほぼ一致していることがわかる。

③領域別原子数密度

解析に用いる各領域別の原子数密度を示す。このデータについても、ANLのデータと日本側のデータを併記した。

④ドロワ別原子数密度

上記の領域別原子数密度を用いれば、基準解析を行うことができる。ここに示したドロワ別原子数密度は、AMM解析のために必要なものである。同表にはADENライブラリの番号とプレート数を併せて示した。

ここで、ADENライブラリとはZPPRで用いられた全プレートに関して、そのプレートの寸法、及び各プレート内の元素重量についてまとめられたライブラリである。1977年1月1日時点のADENライブラリを付録として Table A.1 に示した。これらのデータは、通常、磁気テープ等の媒体に格納されている。

d. ドロワマスタの種類

AMM体系モデルに用いられたドロワ番号は、それぞれ異なるドロワマスタの種類を表している。本表は、そのドロワ番号と種類を対応付けたものである。

e. 実験値

k_{eff} の実験値をここにまとめた。本表には臨界に達した日付、このシリーズの炉心番号、炉心温度が記載されている他、各種の誤差に由来する k_{eff} の補正量が示されている。また、参考値としてANLにおいて行われた解析結果も合わせて同表に示されている。

f. 解析モデル

本来の実験データではないが、日本側のJUPITER W/Gで用いた炉心体系の解析モデルをここにまとめて示した。RZモデルは断面積縮約用に用い、基準解析はXYZモデルを用いた。XYZモデルに関してはXY断面と、Z方向のメッシュ分割を別々の図に示している。解析の際にはこれらの図からXYZモデルを組み立てることができる。

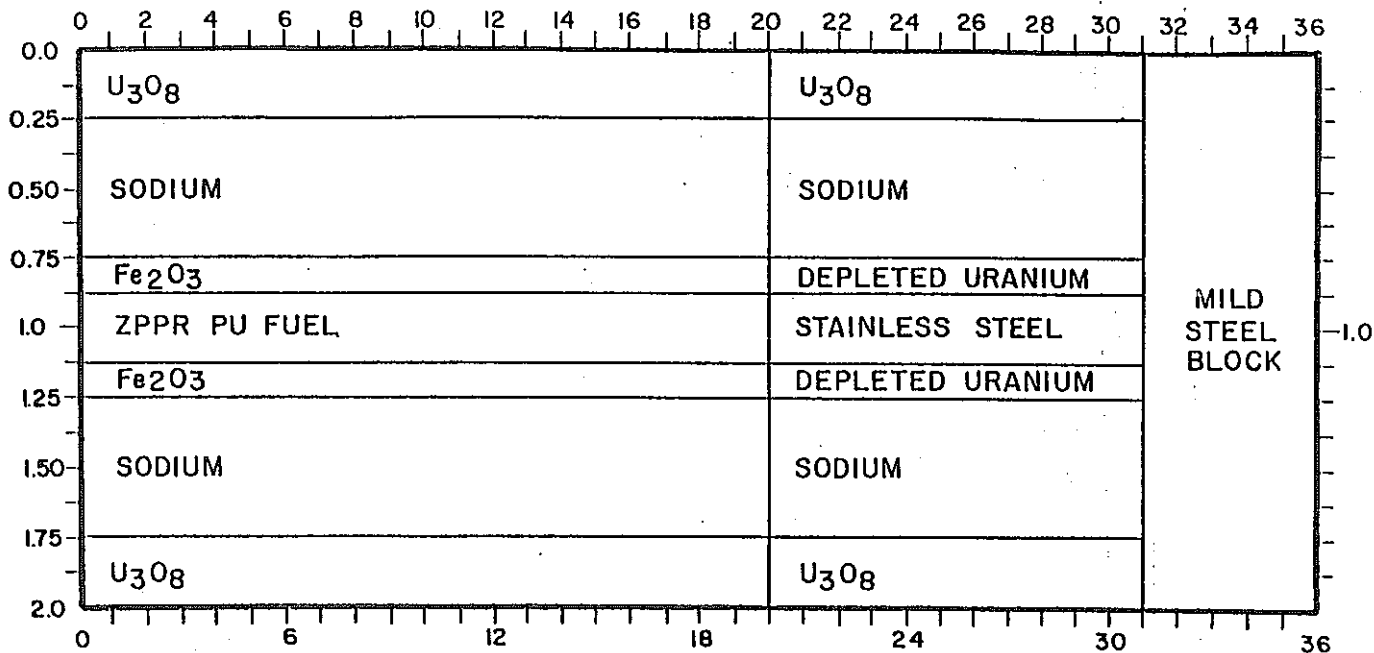


Fig. 4.1.1-1 Loading Pattern for Single-Fuel-Column Drawers in ZPPR-17.

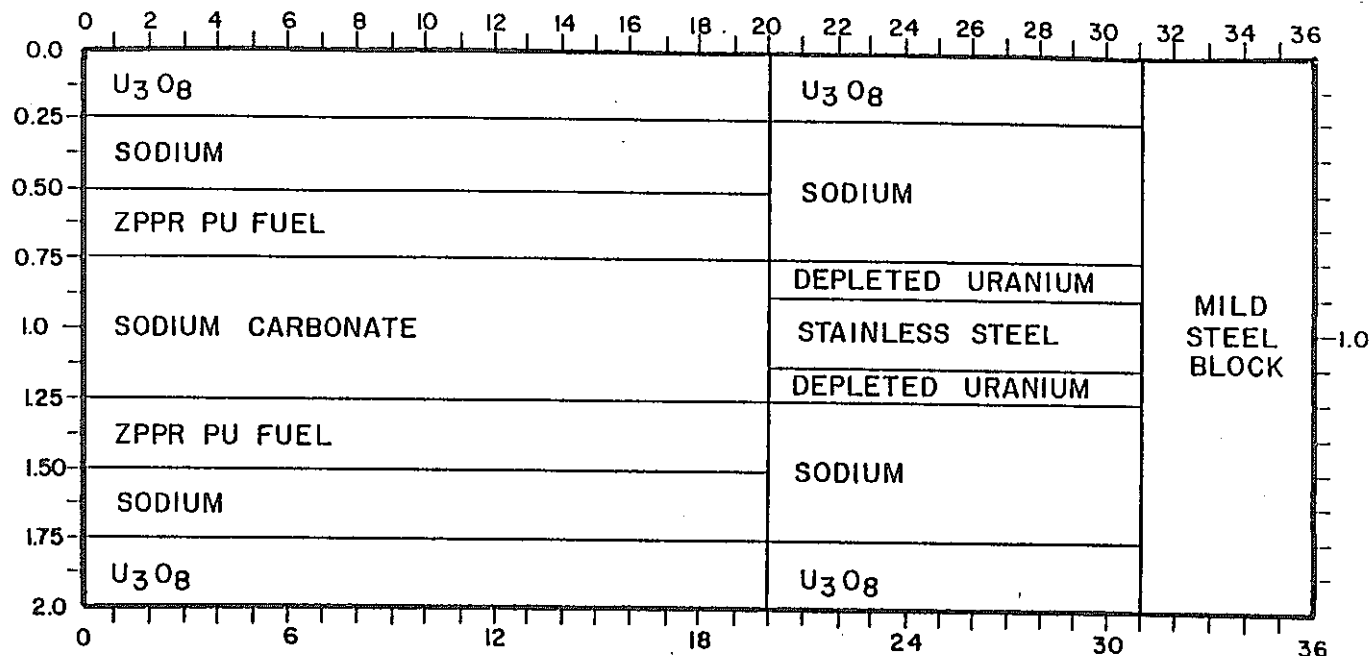


Fig. 4.1.1-2 Loading Pattern for Double-Fuel-Column Drawers in ZPPR-17.

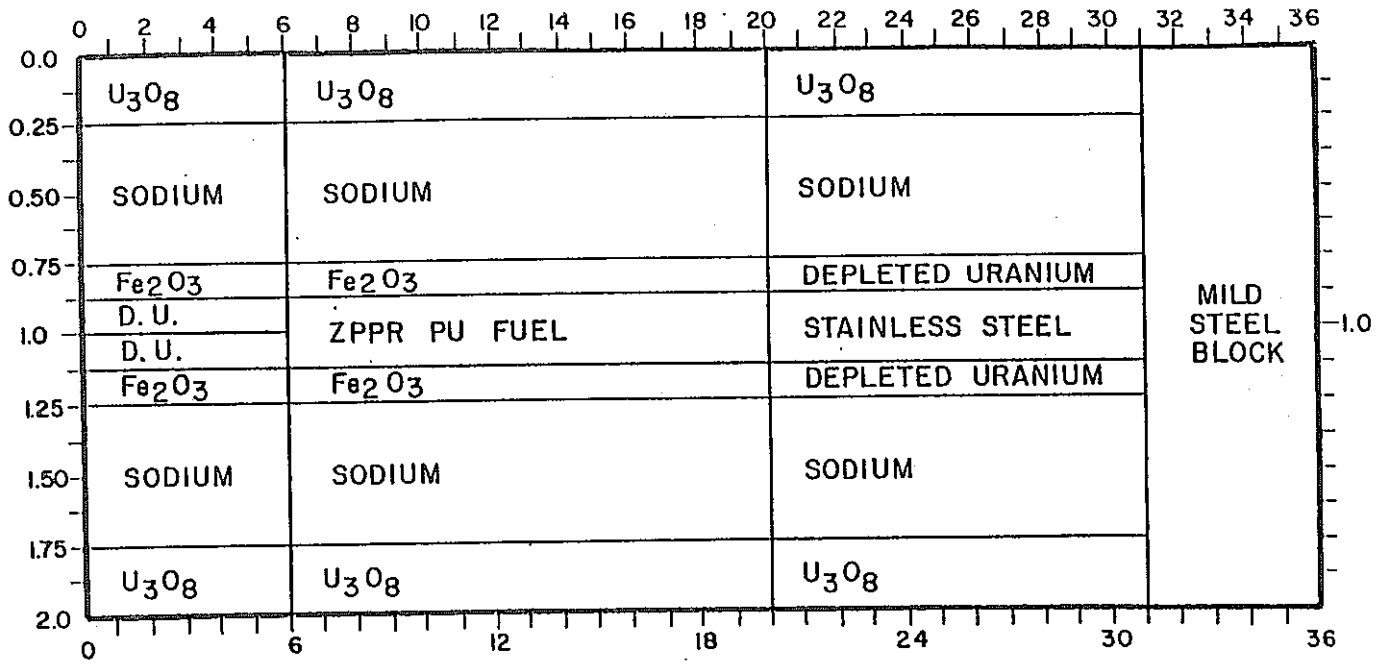


Fig. 4.1.1-3 Loading Pattern for Single-Fuel-Column Drawers with Internal Blanket Segment in ZPPR-17.

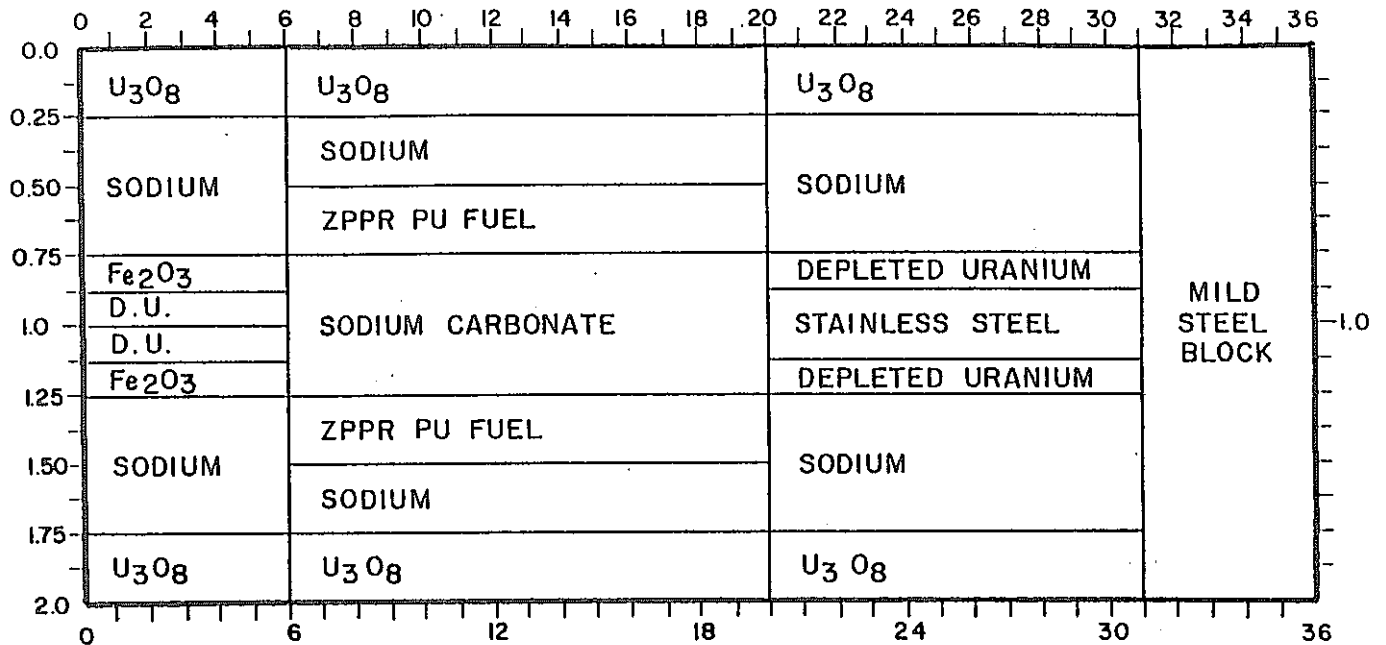


Fig. 4.1.1-4 Loading Pattern for Double-Fuel-Column Drawers with Internal Blanket Segment in ZPPR-17.

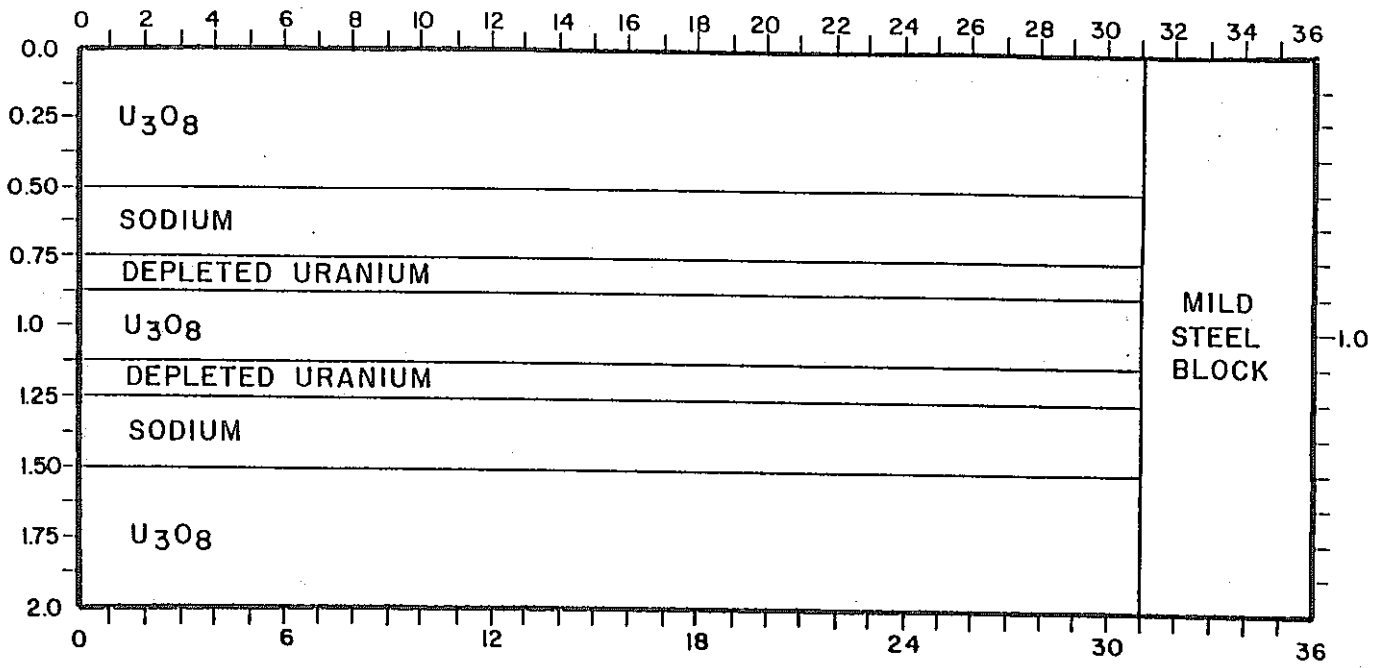
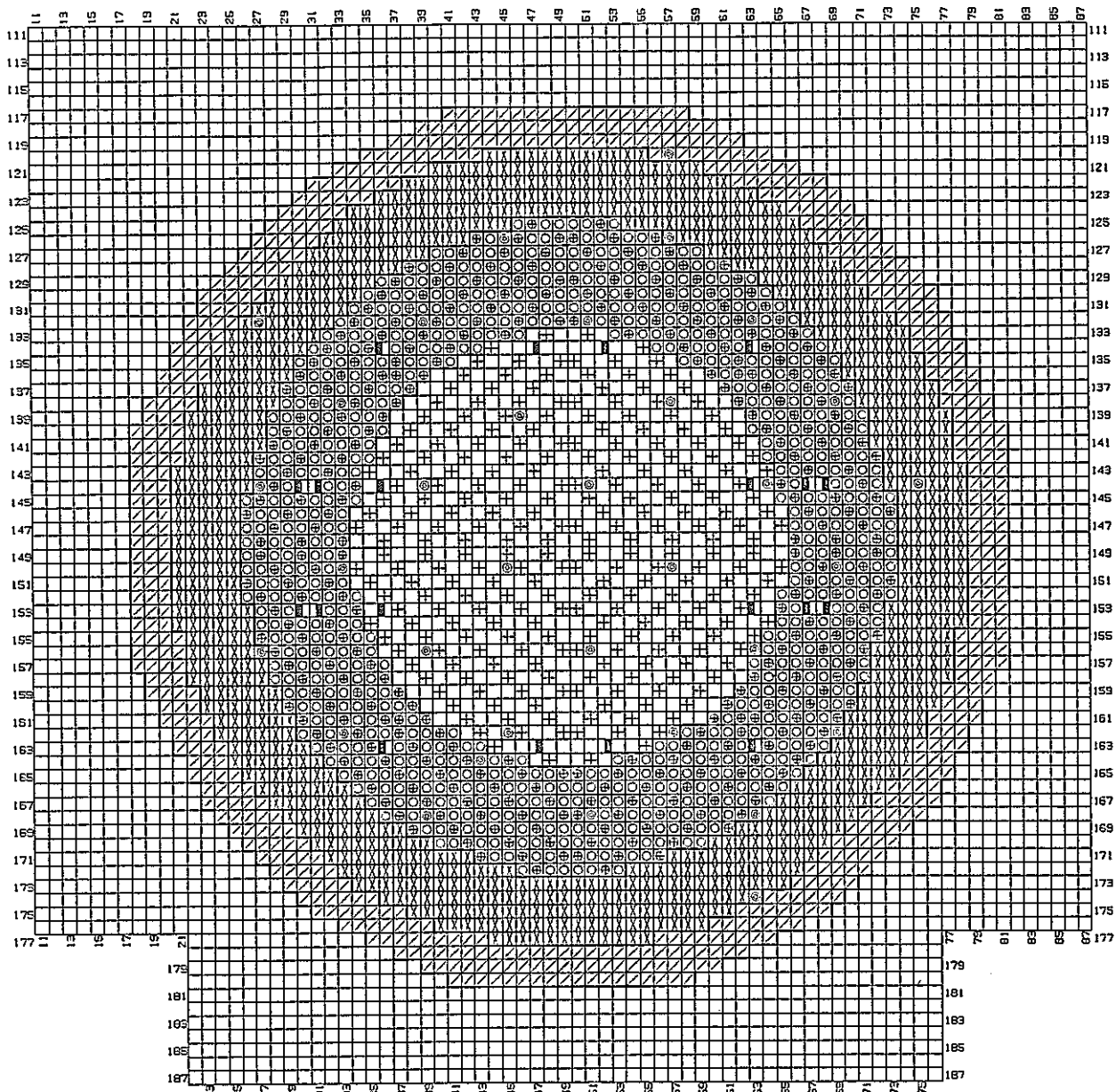


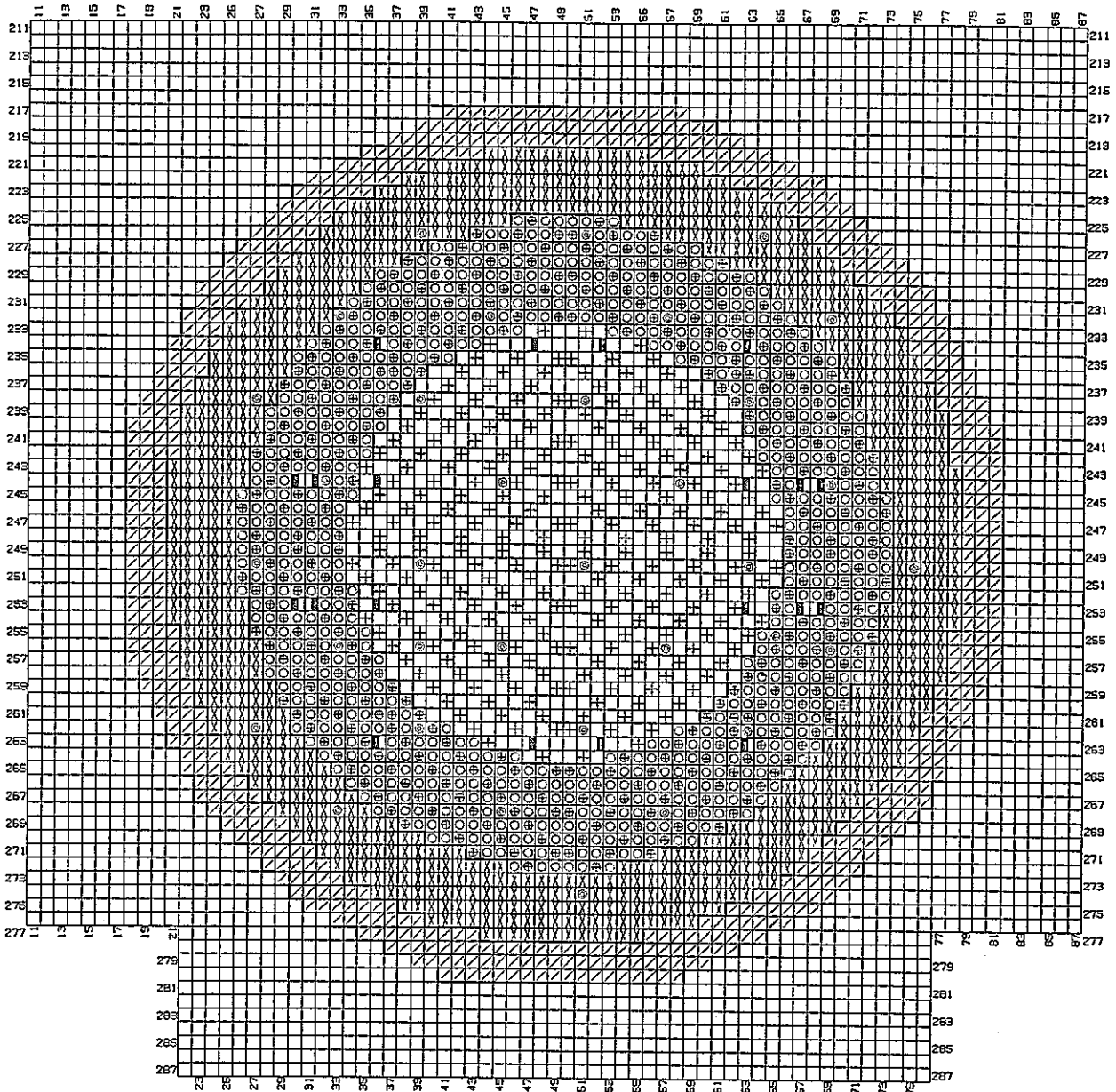
Fig. 4.1.1-5 Loading Pattern for Radial Blanket Drawers in ZPPR-17.



- | | |
|--------------------------------------|----------------------------------|
| SINGLE COLUMN FUEL DRAWER WITHOUT IB | DOUBLE COLUMN FUEL NARROW DRAWER |
| SINGLE COLUMN FUEL DRAWER WITH IB | RADIAL BLANKET |
| SINGLE COLUMN FUEL NARROW DRAWER | RADIAL REFLECTOR |
| DOUBLE COLUMN FUEL DRAWER WITHOUT IB | COUNTER |
| DOUBLE COLUMN FUEL DRAWER WITH IB | SODIUM FOLLOWER |
| | CONTROL RODS |

ZPPR-17A HALF-1

Fig. 4.1.1-6 CRITICAL REFERENCE CONFIGURATION



- | | | | |
|--|--------------------------------------|--|----------------------------------|
| | SINGLE COLUMN FUEL DRAWER WITHOUT IB | | DOUBLE COLUMN FUEL NARROW DRAWER |
| | SINGLE COLUMN FUEL DRAWER WITH IB | | RADIAL BLANKET |
| | SINGLE COLUMN FUEL NARROW DRAWER | | RADIAL REFLECTOR |
| | DOUBLE COLUMN FUEL DRAWER WITHOUT IB | | COUNTER |
| | DOUBLE COLUMN FUEL DRAWER WITH IB | | SODIUM FOLLOWER |
| | | | CONTROL RODS |

ZPPR-17A HALF-2

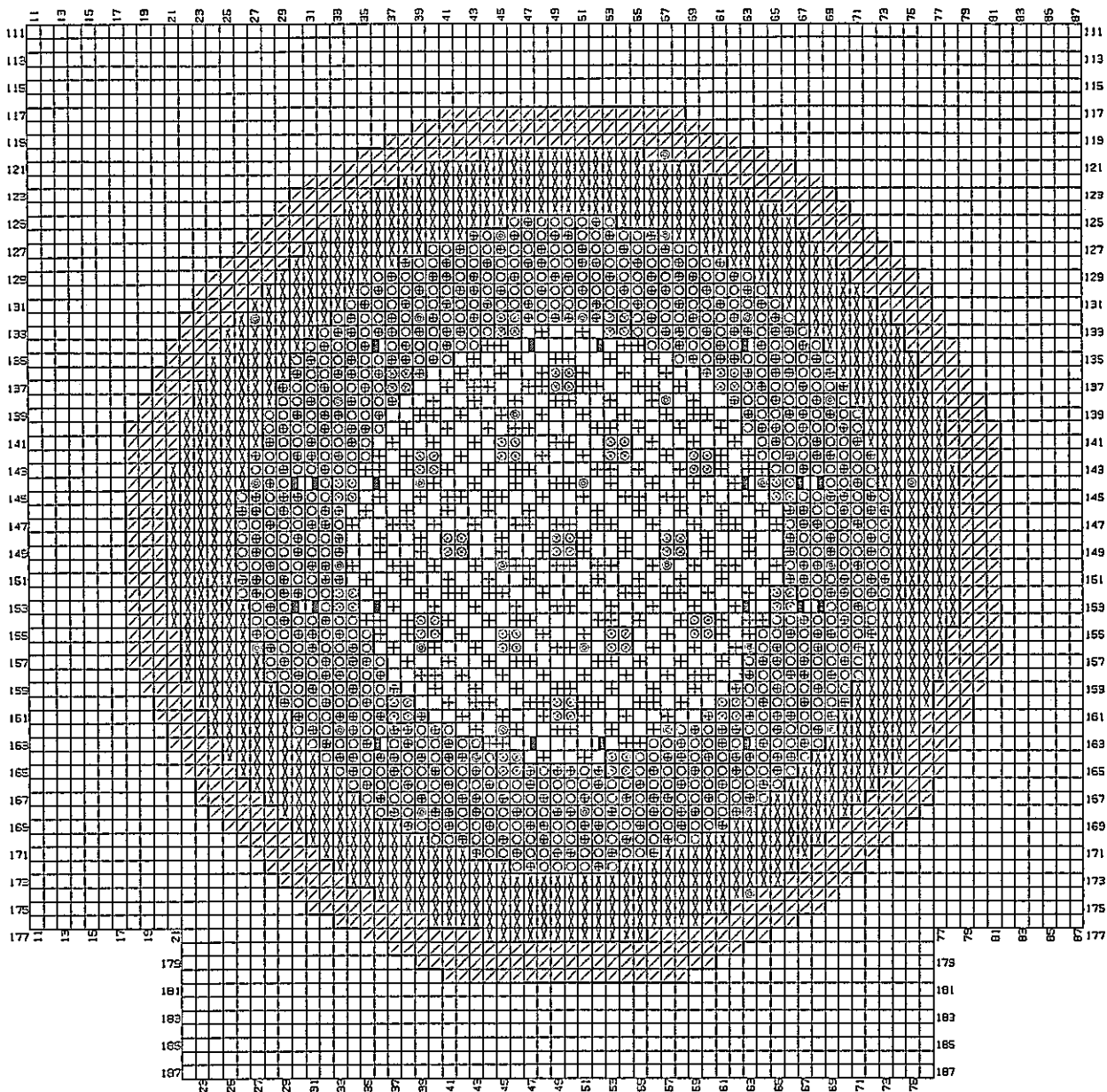
Fig. 4.1.1-7 CRITICAL REFERENCE CONFIGURATION

Table with 60 columns and 60 rows, containing numerical data for the XYZ Calculation Model for ZPPR-17A (Half D). The data is organized in a grid format with row and column indices on the left and right sides.

Fig. 4.1.1-8 The XYZ Calculation Model for ZPPR-17A (Half D)

Table with 32 columns and 32 rows. Each cell contains a numerical value. The values are arranged in a grid pattern, with some cells containing multiple lines of text or symbols. The table represents data for the XYZ Calculation Model for ZPPR-17A (Half 2).

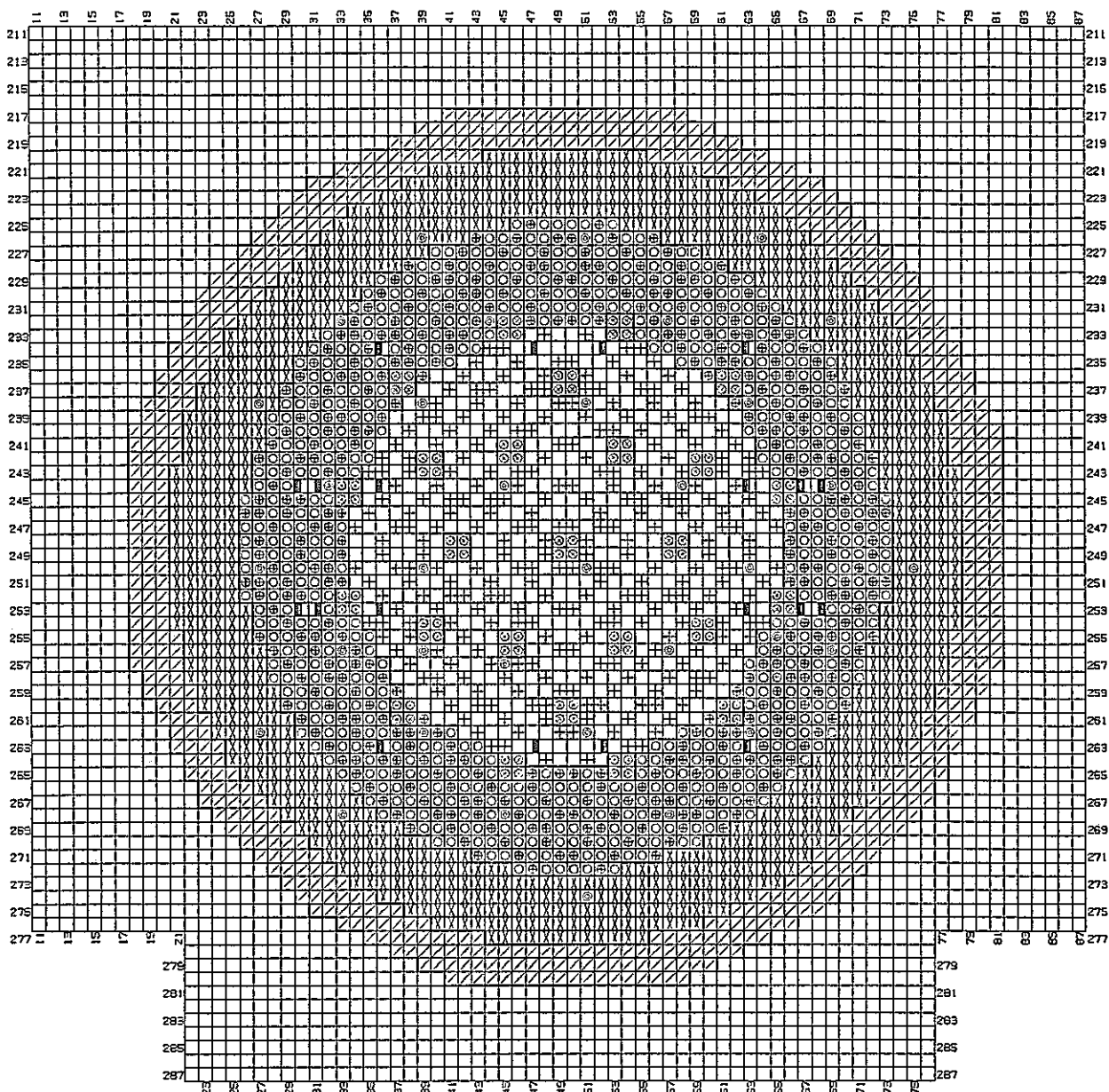
Fig. 4.1.1-9 The XYZ Calculation Model for ZPPR-17A (Half 2)














- | | | | |
|--|--------------------------------------|--|----------------------------------|
| | SINGLE COLUMN FUEL DRAWER WITHOUT IB | | DOUBLE COLUMN FUEL NARROW DRAWER |
| | SINGLE COLUMN FUEL DRAWER WITH IB | | RADIAL BLANKET |
| | SINGLE COLUMN FUEL NARROW DRAWER | | RADIAL REFLECTOR |
| | DOUBLE COLUMN FUEL DRAWER WITHOUT IB | | COUNTER |
| | DOUBLE COLUMN FUEL DRAWER WITH IB | | SODIUM FOLLOWER |
| | | | CONTROL RODS |

ZPPR-178 HALF-1

Fig. 4.1.1-10 CRITICAL REFERENCE CONFIGURATION



- | | | | |
|---|--------------------------------------|---|----------------------------------|
|  | SINGLE COLUMN FUEL DRAWER WITHOUT IB |  | DOUBLE COLUMN FUEL NARROW DRAWER |
|  | SINGLE COLUMN FUEL DRAWER WITH IB |  | RADIAL BLANKET |
|  | SINGLE COLUMN FUEL NARROW DRAWER |  | RADIAL REFLECTOR |
|  | DOUBLE COLUMN FUEL DRAWER WITHOUT IB |  | COUNTER |
|  | DOUBLE COLUMN FUEL DRAWER WITH IB |  | SODIUM FOLLOWER |
| | |  | CONTROL RODS |

ZPPR-17B HALF-2

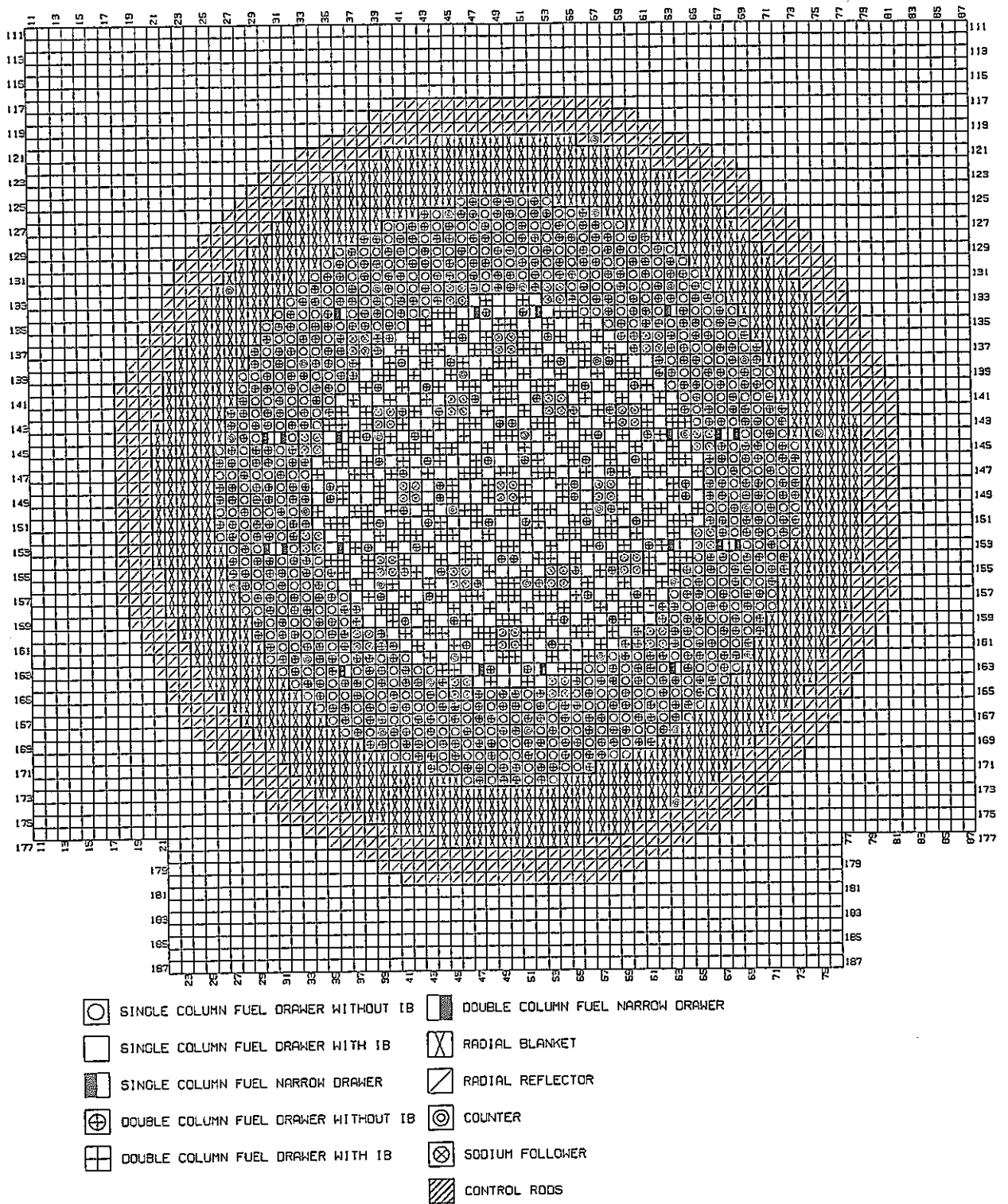
Fig. 4.1.1-11 CRITICAL REFERENCE CONFIGURATION

110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

Fig. 4.1.1-12 The XYZ Calculation Model for ZPPR-17B (Half 1)

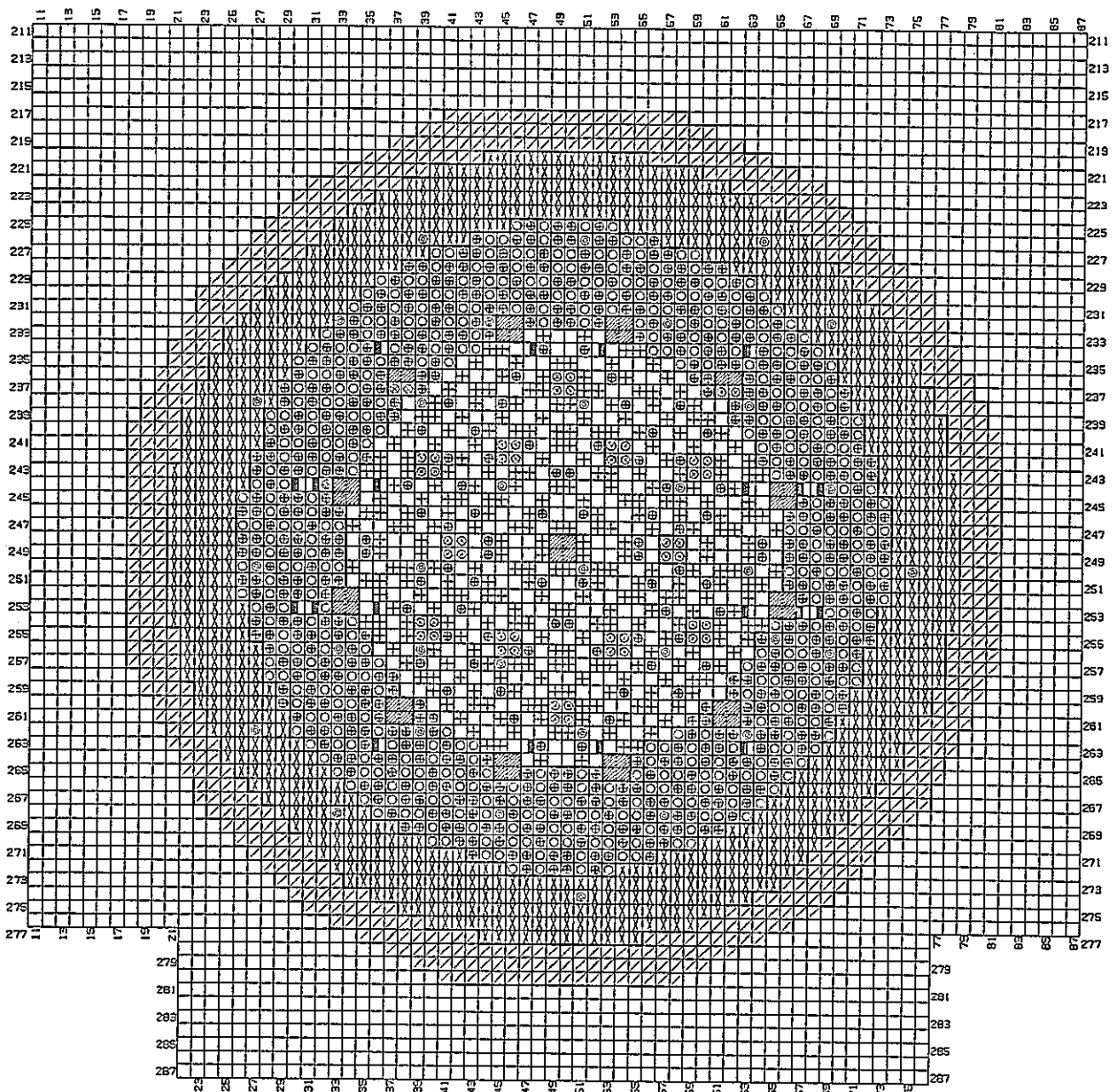
A large grid of numerical data representing the XYZ Calculation Model for ZPPR-17B (Half 2). The grid has 82 columns and 82 rows, with numerical values ranging from 0 to 1000. The data is organized into a structured layout with some blank spaces and specific values like 1000, 500, 100, 50, 25, 10, 5, 2, 1, 0.5, and 0.25. The grid is mostly empty, with data points scattered across the rows and columns, particularly in the lower half of the document.

Fig. 4.11-13 The XYZ Calculation Model for ZPPR-17B (Half 2)



ZPPR-17C HALF-1

Fig. 4.1.1-14 CRITICAL REFERENCE CONFIGURATION



- | | |
|--------------------------------------|----------------------------------|
| SINGLE COLUMN FUEL DRAWER WITHOUT IB | DOUBLE COLUMN FUEL NARROW DRAWER |
| SINGLE COLUMN FUEL DRAWER WITH IB | RADIAL BLANKET |
| SINGLE COLUMN FUEL NARROW DRAWER | RADIAL REFLECTOR |
| DOUBLE COLUMN FUEL DRAWER WITHOUT IB | COUNTER |
| DOUBLE COLUMN FUEL DRAWER WITH IB | SODIUM FOLLOWER |
| | CONTROL RODS |

ZPPR-17C HALF-2

Fig. 4.1.1-15 CRITICAL REFERENCE CONFIGURATION

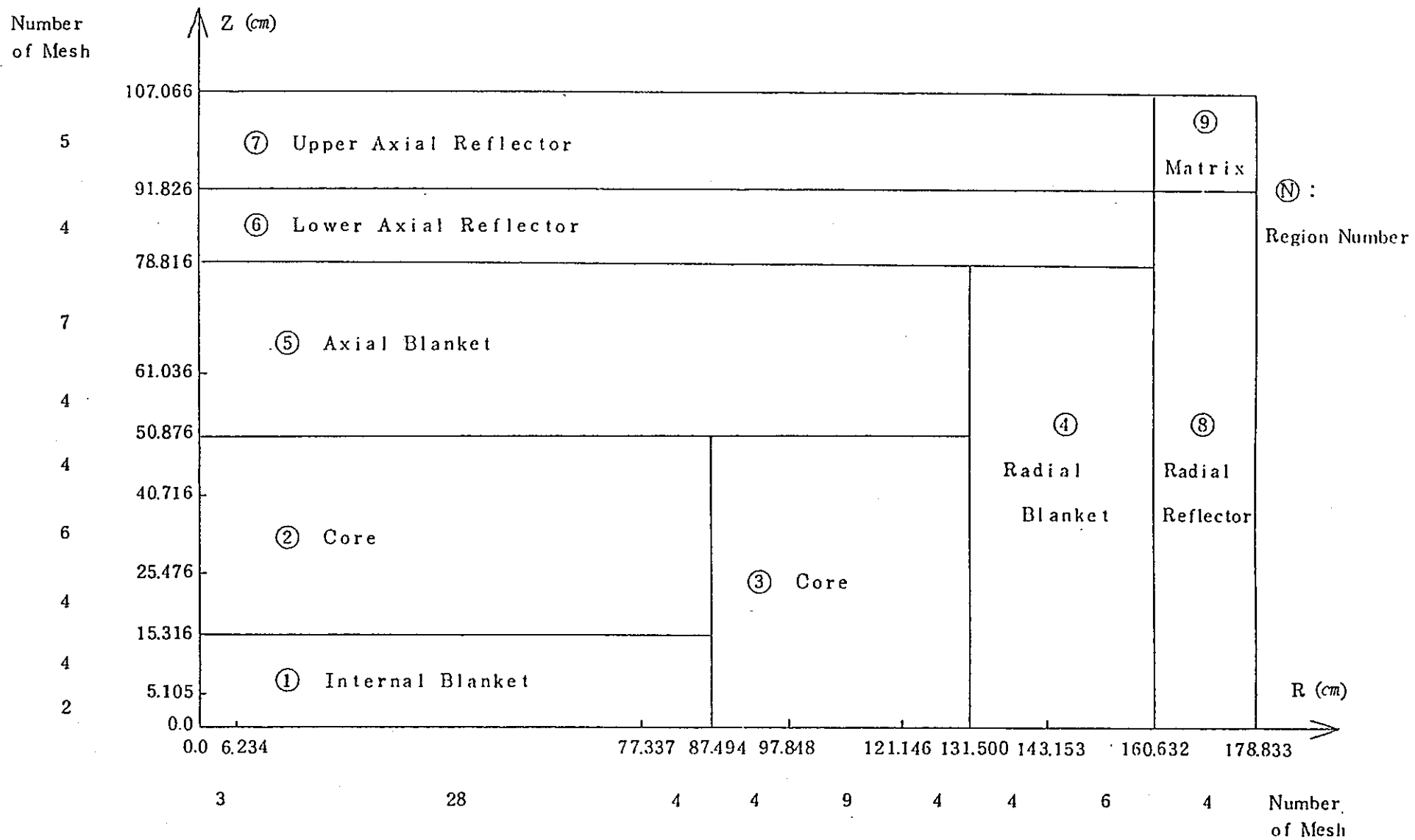


Fig. 4.1.1-18 RZ Calculational Model for ZPPR-17A

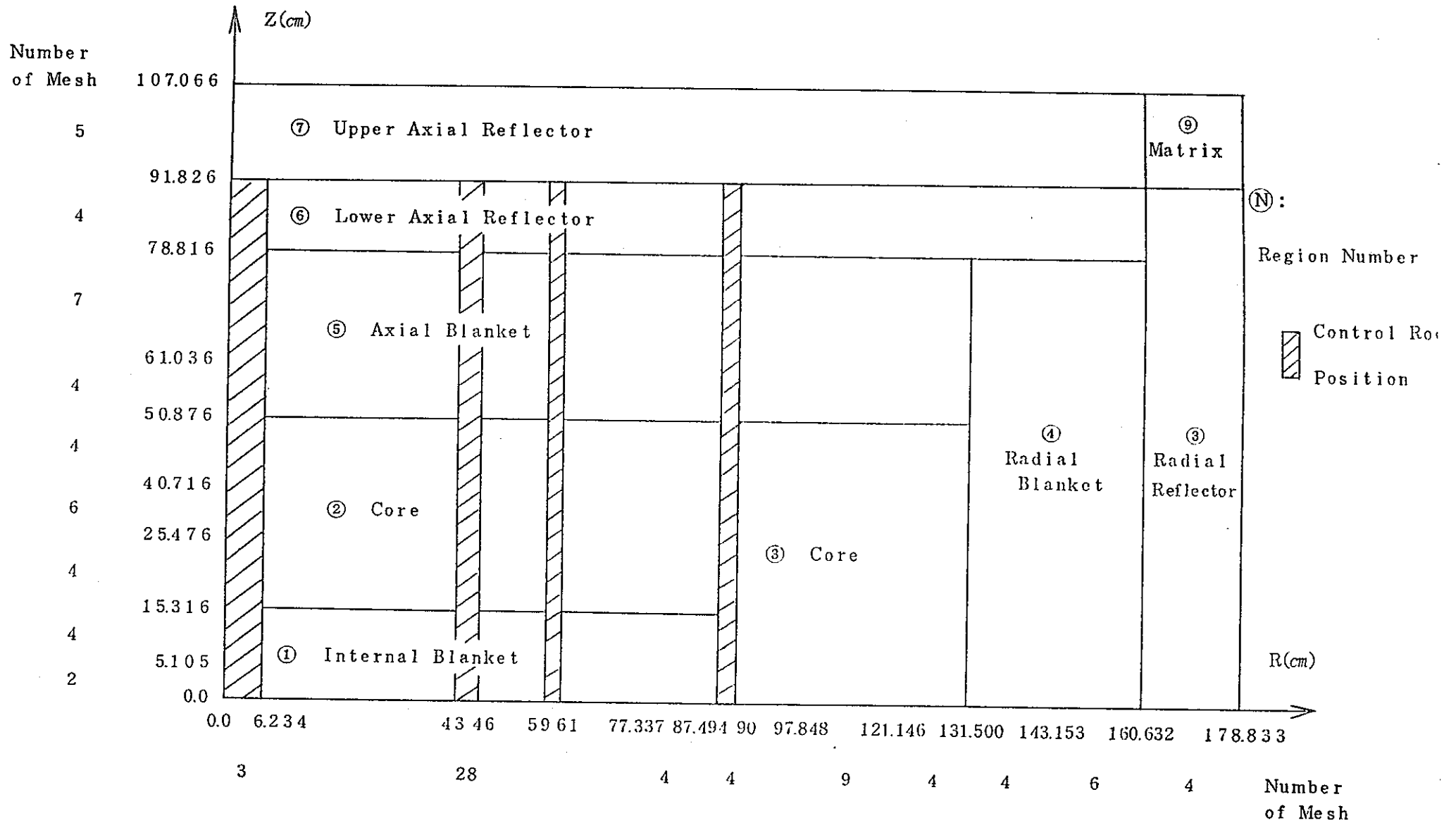


Fig. 4.1.1-19 RZ Calculation Model for ZPPR-17B Subcritical Core

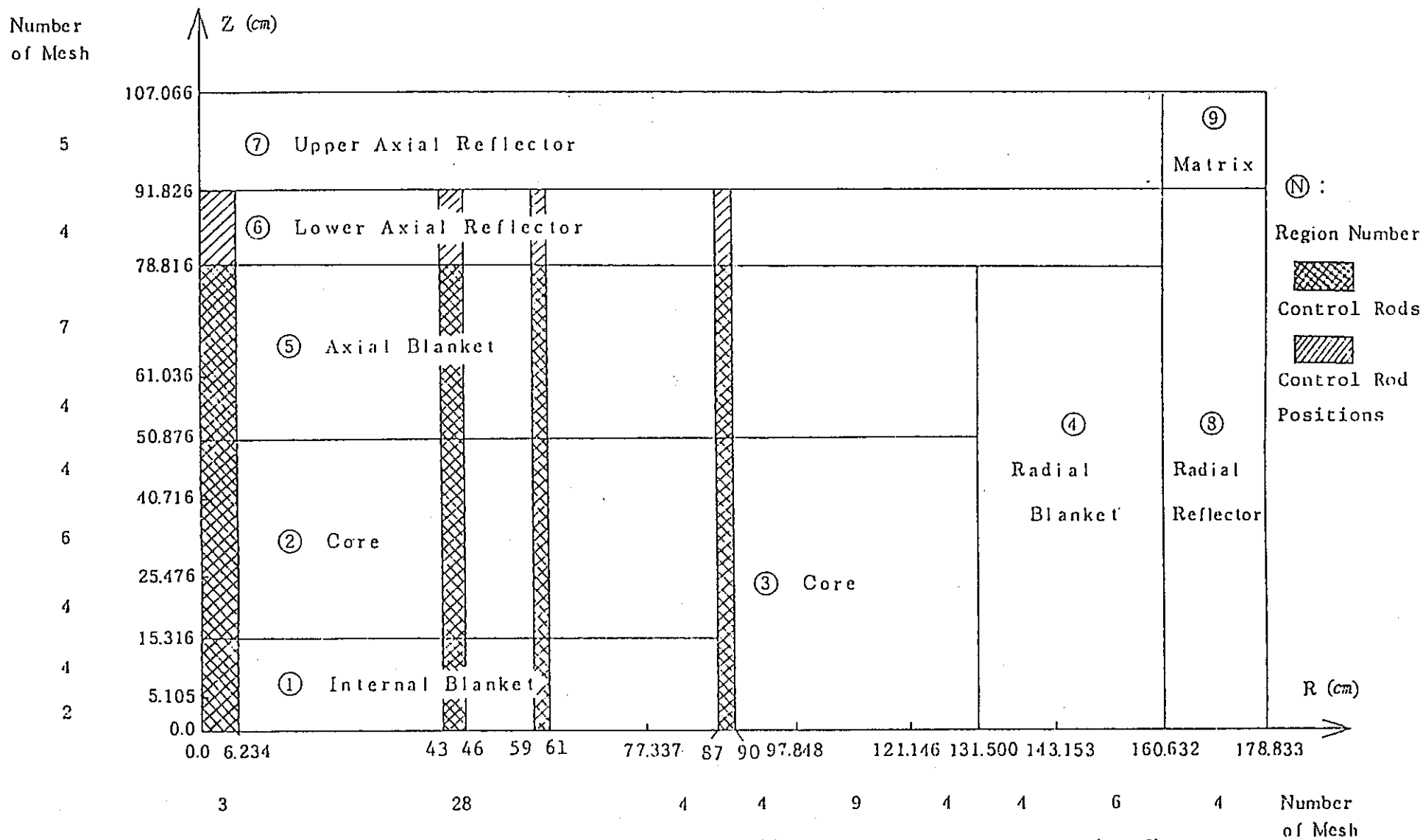
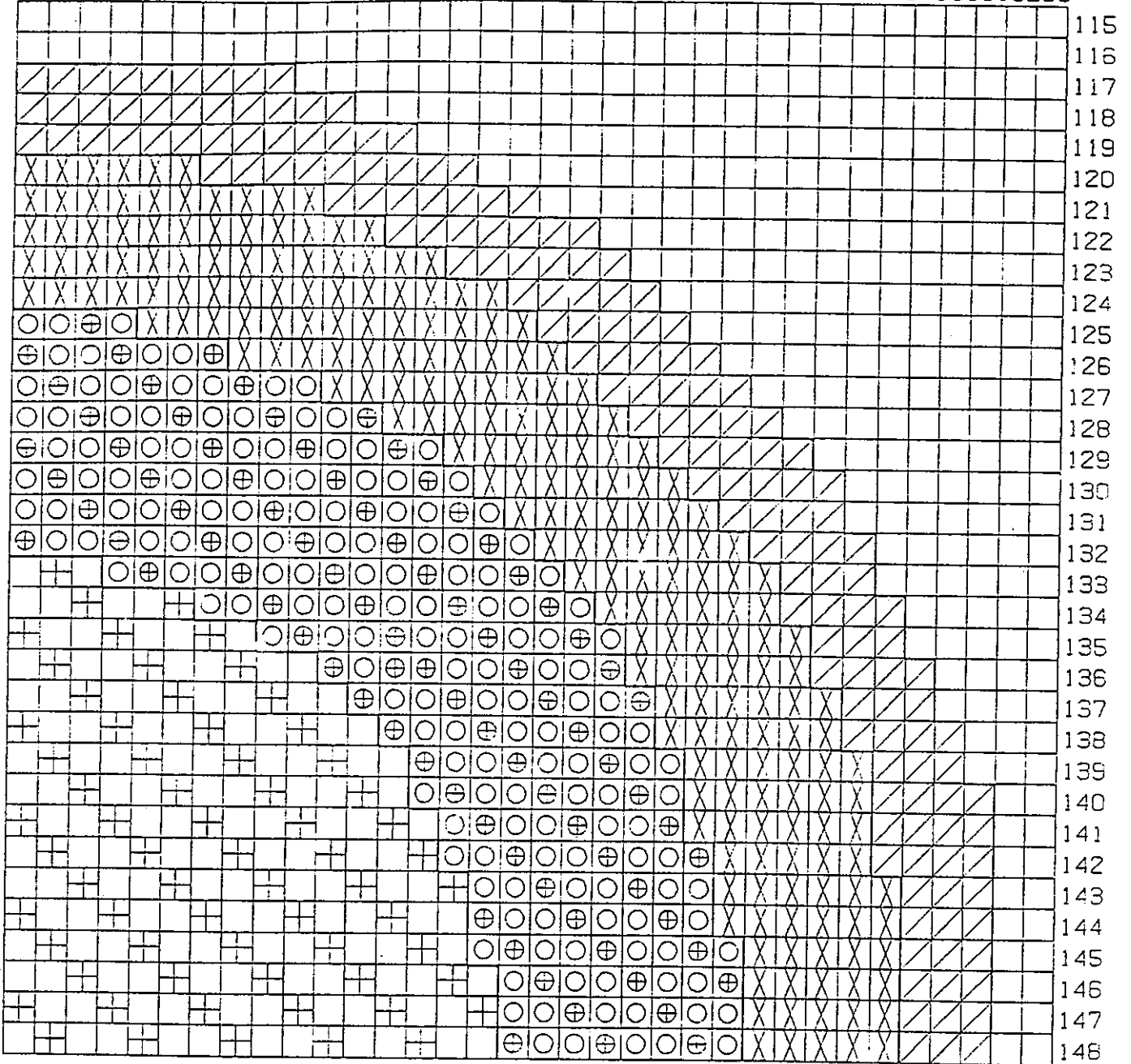


Fig. 4.1.1-20 RZ Calculation Model for ZPPR-17C Subcritical Reference Core (Half 2)
 (for the half 1, the same model as 17B was used)

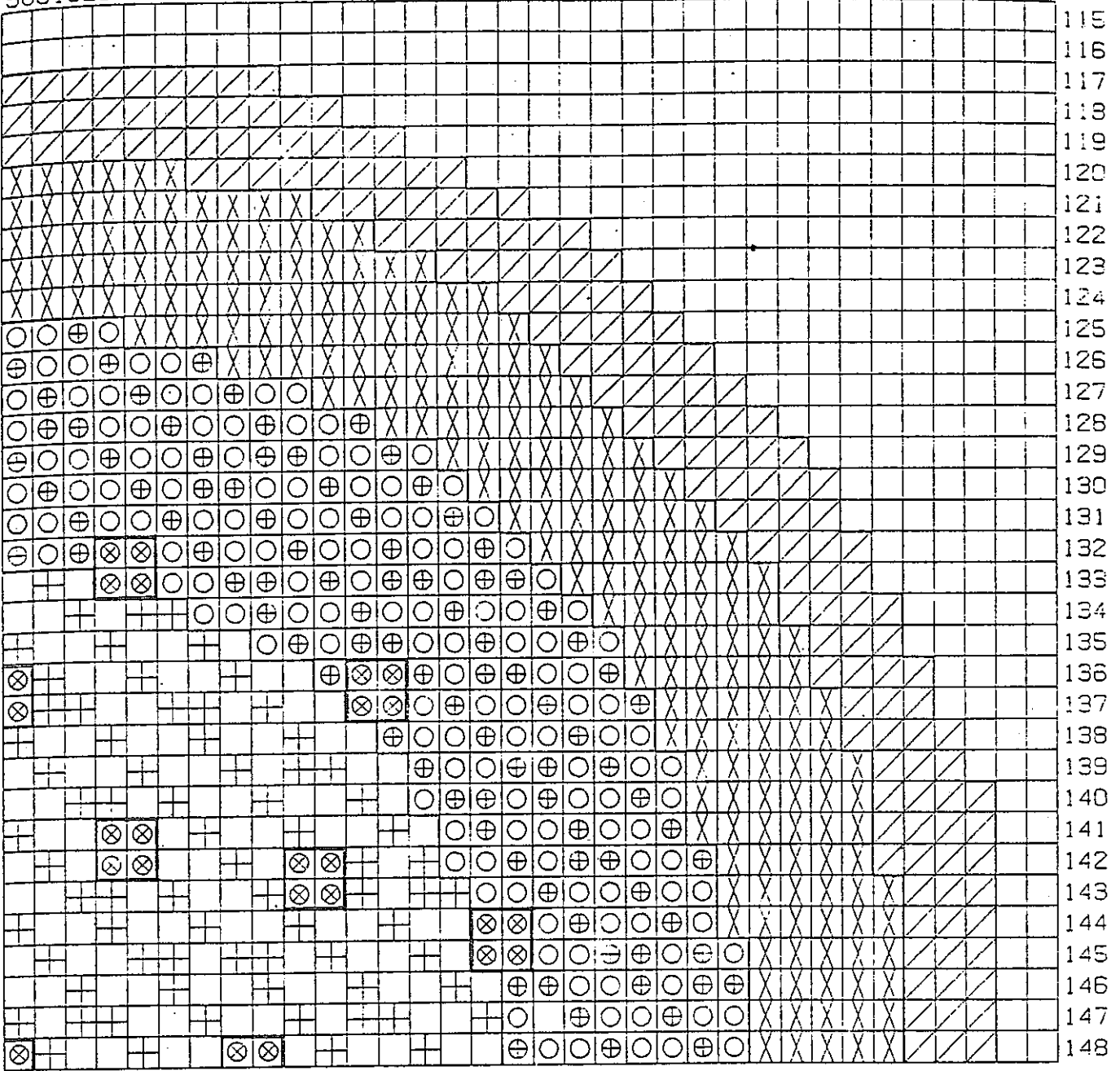
50515253545556575859606162636465666768697071727374757677787980918283



- SINGLE COLUMN FUEL DRAWER WITHOUT IB
 + DOUBLE COLUMN FUEL DRAWER WITH IB
- SINGLE COLUMN FUEL DRAWER WITH IB
 X RADIAL BLANKET
- ⊕ DOUBLE COLUMN FUEL DRAWER WITHOUT IB
 / RADIAL REFLECTOR

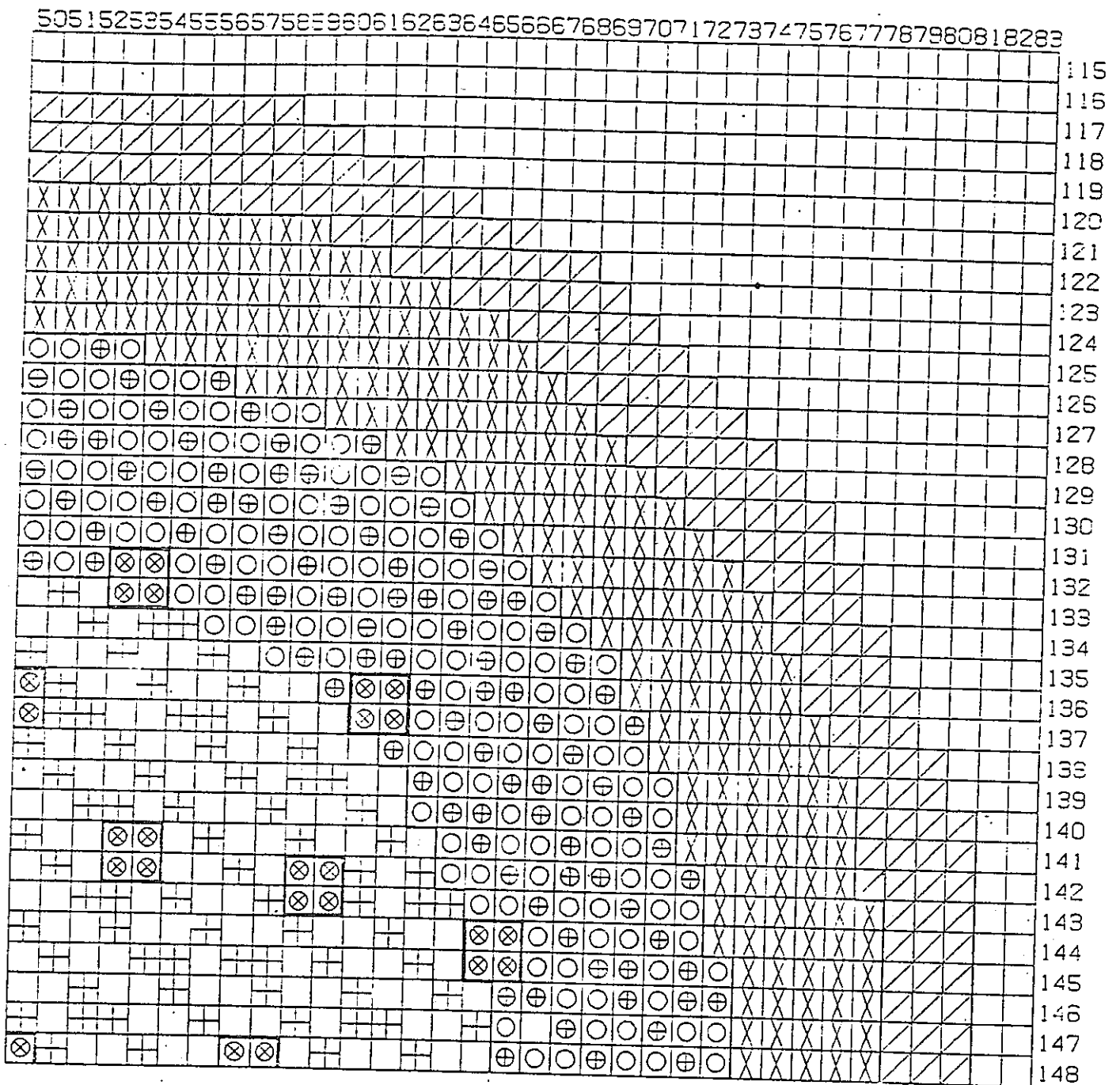
Fig. 4.1.1-21 XYZ CALCULATIONAL MODEL (XY CROSS SECTION) FOR ZPPR-17A

50515253545556575859606162636465666768697071727374757677787980818293



- SINGLE COLUMN FUEL DRAWER WITHOUT IB
- SINGLE COLUMN FUEL DRAWER WITH IB
- ⊕ DOUBLE COLUMN FUEL DRAWER WITHOUT IB
- ⊞ DOUBLE COLUMN FUEL DRAWER WITH IB
- ⌘ RADIAL BLANKET
- ⌚ RADIAL REFLECTOR
- ⊗ CONTROL ROD POSITION DRAWER

Fig. 4.1.1-22 XYZ CALCULATIONAL MODEL (XY CROSS SECTION) FOR SZPPR-17B



- SINGLE COLUMN FUEL DRAWER WITHOUT IB
- SINGLE COLUMN FUEL DRAWER WITH IB
- ⊖ DOUBLE COLUMN FUEL DRAWER WITHOUT IB
- ⊕ DOUBLE COLUMN FUEL DRAWER WITH IB
- ⊗ RADIAL BLANKET
- ⊘ RADIAL REFLECTOR
- ⊗ CONTROL ROD POSITION DRAWER

Fig. 4.1.1-23 XYZ CALCULATIONAL MODEL (XY CROSS SECTION) FOR ZPPR-17C

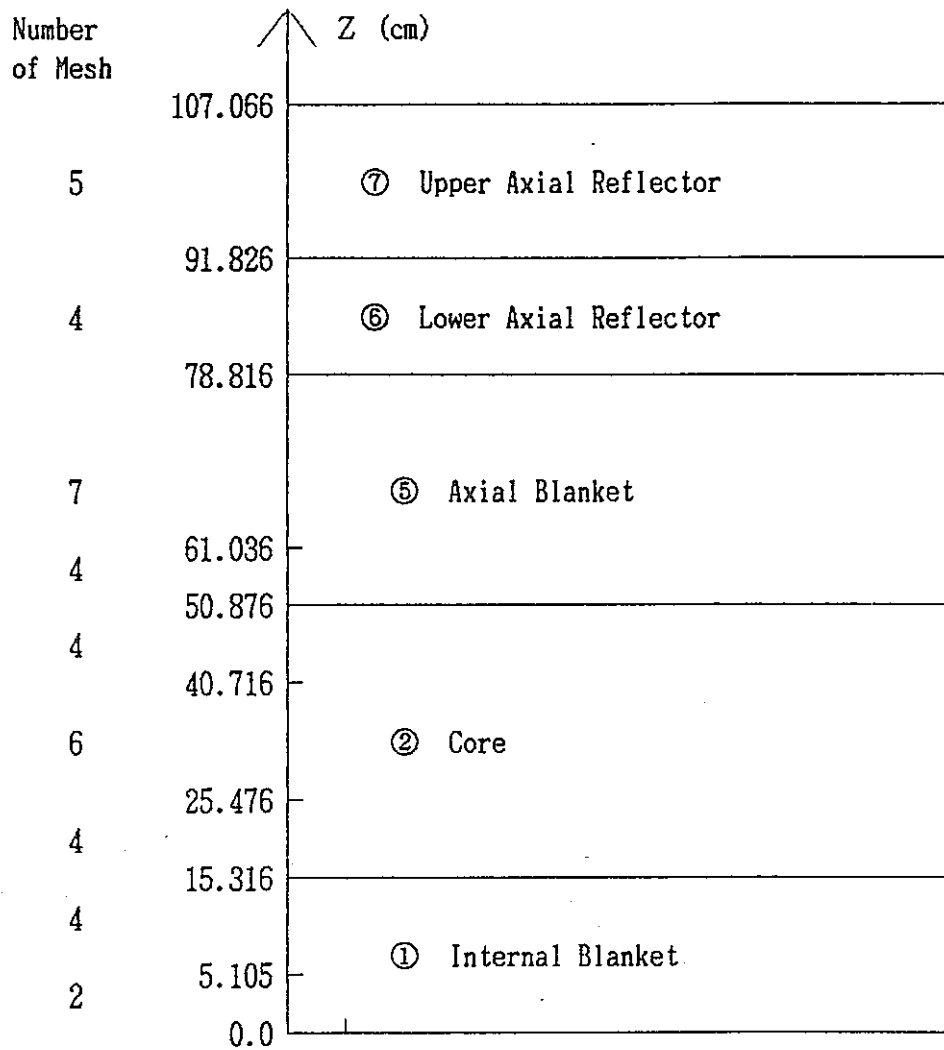


Fig. 4.1.1-24 Mesh Point Distribution Along Z-axis

Table 4.1.1-1 Drawer Loading Summary for the
ZPPR-17A Critical Reference

<u>Inner Core - Drawers with Internal Blanket</u>	
Drawers with one column of fuel (Includes 23 drawers with fission chambers and 8 narrow drawers adjacent to PSRs)	1056
Drawers with two columns of fuel (Includes 8 narrow drawers adjacent to PSRs)	520
<u>Outer Core</u>	
Drawers with one column of fuel (Includes 28 drawers with fission chambers, two drawers with thermocouples, and 16 narrow drawers adjacent to PSRs)	1304
Drawers with two columns of fuel (Includes 8 narrow drawers adjacent to PSRs)	680
<u>Radial Blanket</u>	
Radial blanket drawers (Includes 13 drawers with fission chambers)	1752
<u>Radial Reflector</u>	
Stainless-steel-filled reflector drawers (Includes one drawer with fission chamber)	1272

Table 4.1.1-2 Mass Summary for Various Regions in the ZPPR-17A Critical Reference

Material	Mass, kg ^b				
	Inner Core	Outer Core	Internal Blanket	Radial Blanket	Axial Blanket
Total Pu	911.090	1666.738	---	---	---
Fissile Pu	803.161	1469.219	---	---	---
Total Fissile	812.846	1486.758	5.112	47.500	21.260
²³⁸ Pu	0.449	0.713	---	---	---
²³⁹ Pu	796.474	1457.609	---	---	---
²⁴⁰ Pu	105.733	193.817	---	---	---
²⁴¹ Pu ^a	6.687	11.610	---	---	---
²⁴² Pu	1.747	2.988	---	---	---
Americium ^a	9.619	17.464	---	---	---
²³⁵ U	9.684	17.539	5.112	47.500	21.260
²³⁸ U	4495.945	8135.879	2369.604	22109.920	9787.461
Total Heavy Metal	<u>5426.336</u>	<u>9837.617</u>	2374.716	22157.420	9808.723
O	652.692	1176.432	268.122	2515.876	711.462
Na	591.425	1060.325	256.722	678.242	1061.658
Mo	85.398	156.285	1.595	8.932	16.913
Steel ^c	2619.347	4698.207	1049.908	4557.519	5883.968

^aMasses for all isotopes decayed to the date 2/25/87.

^bMasses are based on the average masses for plate types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe and Ni.

Table 4.1.1-3 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 17A CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE	INNER BLANKET	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	911.352	1667.167	---	---	---
FISSILE PU	803.095	1469.062	---	---	---
TOTAL FISSILE	813.009	1487.021	5.112	47.496	21.259
PU-239	796.414	1457.462	---	---	---
PU-240	105.770	193.879	---	---	---
PU-241	6.681	11.600	---	---	---
PU-242	2.487	4.225	---	---	---
AM-241	9.623	17.470	---	---	---
U-235	9.914	17.958	5.112	47.496	21.259
U-238	4495.590	8135.031	2369.271	22107.937	9786.648
TOTAL HEAVY METAL	5416.855	9820.152	2374.383	22155.434	9807.906
O	652.645	1176.324	268.085	2515.682	711.408
NA	591.384	1060.225	256.688	678.188	1061.576
MO	85.391	156.270	1.594	8.931	16.912
STEEL	2619.013	4697.465	1049.964	4557.543	5879.027

Table 4.1.1-4 (1) ZPPR Assembly 17A: Atom Densities by Zone

Isotope	Central Blanket SFC 0-6	Central Blanket DFC 0-6	Inner Core SFC 6-20	Inner Core DFC 6-20	Axial Blanket 20-31	Reflector Iron Block 31-36
C	0.0000333	0.0000331	0.0000331	0.0022784	0.0000532	0.0005889
O	0.0136987	0.0136964	0.0137650	0.0155776	0.0088214	--
Na	0.0092061	0.0091685	0.0092879	0.0087252	0.0092111	--
Si	0.0001433	0.0001458	0.0001570	0.0001822	0.0001925	0.0001231
Al	0.0000029	0.0000029	0.0000040	0.0000062	0.0000029	--
Mn	0.0002046	0.0002019	0.0002282	0.0002671	0.0003416	0.0006795
Cr	0.0023927	0.0023712	0.0026610	0.0031593	0.0041613	0.0020617
Fe	0.0118901	0.0117862	0.0128337	0.0111569	0.0147819	0.0758126
Ni	0.0010320	0.0010430	0.0011633	0.0014326	0.0017657	0.0008384
Cu	0.0000274	0.0000319	0.0000294	0.0000365	0.0000446	0.0000276
Mo	0.0000129	0.0000150	0.0002395	0.0004633	0.0000348	0.0000138
U5	0.0000178	0.0000178	0.0000127	0.0000182	0.0000179	--
U8	0.0081368	0.0081355	0.0058393	0.0082951	0.0081563	--
P8	--	--	0.0000005	0.0000010	--	--
P9	--	--	0.0008875	0.0017529	--	--
P0	--	--	0.0001175	0.0002314	--	--
P1	--	--	0.0000074	0.0000142	--	--
P2	--	--	0.0000019	0.0000037	--	--
A1	--	--	0.0000109	0.0000210	--	--
P	0.0000053	0.0000047	0.0000053	0.0000047	0.0000101	0.0000236
S	0.0000010	0.0000013	0.0000010	0.0000016	0.0000081	0.0000313
Cl	0.0000003	0.0000003	0.0000003	0.0000060	0.0000003	--
Ca	0.0000021	0.0000021	0.0000021	0.0000010	0.0000021	--
Co	0.0000008	0.0000047	0.0000008	0.0000043	0.0000020	0.0000014

Table 4.1.1-4 (2) (contd)

Isotope	Reflector Stainless 36-42	Outer Core SFC 0-6	Outer Core DFC 0-6	Outer Core SFC 6-20	Outer Core DFC 6-20	Axial Blanket 20-31
C	0.0002143	0.0000332	0.0022752	0.0000331	0.0022870	0.0000532
O	--	0.0136987	0.0155223	0.0137650	0.0156026	0.0088213
Na	--	0.0092447	0.0087164	0.0092246	0.0087434	0.0091835
Si	0.0008629	0.0001553	0.0001800	0.0001575	0.0001817	0.0001925
Al	--	0.0000038	0.0000057	0.0000041	0.0000062	0.0000029
Mn	0.0015241	0.0002267	0.0002609	0.0002294	0.0002654	0.0003415
Cr	0.0150441	0.0026487	0.0030954	0.0026741	0.0031422	0.0041605
Fe	0.0531084	0.0127704	0.0109304	0.0128793	0.0110970	0.0147790
Ni	0.0066621	0.0011599	0.0014039	0.0011699	0.0014240	0.0017656
Cu	0.0000172	0.0000289	0.0000360	0.0000294	0.0000363	0.0000446
Mo	0.0000083	0.0002402	0.0004697	0.0002398	0.0004685	0.0000349
U5	--	0.0000126	0.0000183	0.0000127	0.0000183	0.0000179
U8	--	0.0057976	0.0083514	0.0058140	0.0083529	0.0081562
P8	--	0.0000003	0.0000010	0.0000004	0.0000010	--
P9	--	0.0008888	0.0017783	0.0008879	0.0017727	--
P0	--	0.0001178	0.0002354	0.0001176	0.0002346	--
P1	--	0.0000064	0.0000145	0.0000066	0.0000145	--
P2	--	0.0000016	0.0000039	0.0000017	0.0000038	--
A1	--	0.0000103	0.0000216	0.0000106	0.0000215	--
P	--	0.0000053	0.0000047	0.0000053	0.0000047	0.0000101
S	--	0.0000010	0.0000016	0.0000010	0.0000016	0.0000081
Cl	--	0.0000003	0.0000060	0.0000003	0.0000061	0.0000003
Ca	--	0.0000021	0.0000010	0.0000021	0.0000010	0.0000021
Co	--	0.0000008	0.0000046	0.0000008	0.0000044	0.0000020

Table 4.1.1-4 (3) (contd)

Isotope	Reflector Iron Block 31-36	Reflector Stainless 36-42	Radial Blanket 0-6	Radial Blanket 6-20	Axial Blanket 20-31	Reflector Iron Block 31-36
C	0.0005882	0.0002143	0.0000322	0.0000323	0.0000323	0.0005928
O	--	--	0.0223887	0.0225016	0.0224943	--
Na	--	--	0.0042238	0.0042451	0.0042293	--
Si	0.0001244	0.0008629	0.0001388	0.0001397	0.0001397	0.0001164
Al	--	--	0.0000024	0.0000024	0.0000025	--
Mn	0.0006804	0.0015241	0.0001976	0.0001990	0.0001990	0.0006745
Cr	0.0020814	0.0150441	0.0023029	0.0023123	0.0023124	0.0019581
Fe	0.0757474	0.0531084	0.0082260	0.0082639	0.0082641	0.0761486
Ni	0.0008475	0.0066621	0.0009924	0.0009938	0.0009938	0.0007910
Cu	0.0000276	0.0000172	0.0000282	0.0000285	0.0000285	0.0000273
Mo	0.0000139	0.0000083	0.0000133	0.0000132	0.0000132	0.0000137
U5	--	--	0.0000288	0.0000290	0.0000289	--
U8	--	--	0.0132208	0.0132875	0.0132871	--
P8	--	--	--	--	--	--
P9	--	--	--	--	--	--
P0	--	--	--	--	--	--
P1	--	--	--	--	--	--
P2	--	--	--	--	--	--
A1	--	--	--	--	--	--
P	0.0000236	--	0.0000050	0.0000051	0.0000051	0.0000234
S	0.0000313	--	0.0000011	0.0000011	0.0000011	0.0000314
Cl	--	--	0.0000001	0.0000001	0.0000001	--
Ca	--	--	0.0000010	0.0000010	0.0000010	--
Co	0.0000015	--	0.0000018	0.0000017	0.0000017	0.0000012

Table 4.1.1-4 (4) (contd)

Isotope	Reflector Stainless 36-42	Radial Reflector 0-36	Blanket Central (SFC+DFC) 0-6	Inner Core (SFC+DFC) 6-20	Outer Core (SFC+DFC) 0-6	Outer Core (SFC+DFC) 6-20
C	0.0002143	0.0002510	0.0000332	0.0007739	0.0008016	0.0008056
O	--	--	0.0136981	0.0143632	0.0143237	0.0143948
Na	--	--	0.0091938	0.0091023	0.0090636	0.0090597
Si	0.0008629	0.0008767	0.0001441	0.0001653	0.0001638	0.0001658
Al	--	--	0.0000029	0.0000047	0.0000045	0.0000048
Mn	0.0015241	0.0013973	0.0002037	0.0002410	0.0002384	0.0002417
Cr	0.0150441	0.0153821	0.0023857	0.0028254	0.0028018	0.0028346
Fe	0.0531084	0.0546625	0.0118560	0.0122806	0.0121398	0.0122684
Ni	0.0066621	0.0066801	0.0010357	0.0012522	0.0012436	0.0012570
Cu	0.0000172	0.0000400	0.0000289	0.0000317	0.0000313	0.0000318
Mo	0.0000083	0.0000368	0.0000136	0.0003133	0.0003189	0.0003182
U5	--	--	0.0000178	0.0000145	0.0000146	0.0000146
U8	--	--	0.0081365	0.0066497	0.0066729	0.0066842
P8	--	--	--	0.0000007	0.0000006	0.0000006
P9	--	--	--	0.0011731	0.0011937	0.0011912
P0	--	--	--	0.0001551	0.0001581	0.0001577
P1	--	--	--	0.0000096	0.0000092	0.0000094
P2	--	--	--	0.0000025	0.0000024	0.0000024
A1	--	--	--	0.0000142	0.0000142	0.0000143
P	--	0.0000458	0.0000051	0.0000051	0.0000051	0.0000051
S	--	0.0000352	0.0000011	0.0000012	0.0000012	0.0000012
Cl	--	--	0.0000003	0.0000022	0.0000023	0.0000023
Ca	--	--	0.0000021	0.0000017	0.0000017	0.0000017
Co	--	0.0000009	0.0000021	0.0000020	0.0000021	0.0000020

Table 4.1.1-4 (5) (contd)

<u>Isotope</u>	<u>Empty Matrix</u>
C	0.0000188
O	--
Na	--
Si	0.0000683
Al	--
Mn	0.0001059
Cr	0.0011891
Fe	0.0042791
Ni	0.0004802
Cu	0.0000172
Mo	0.0000083
U5	--
U8	--
P8	--
P9	--
P0	--
P1	--
P2	--
A1	--
P	0.0000028
S	0.0000007
Cl	--
Ca	--
Co	--

Table 4.1.1-5 ZPPR ASSEMBLY 17A:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER BLANKET IB	INNER CORE SCF(IB)	INNER CORE DCF(IB)	INNER-RZ AVERAGE SCF&DCF	OUTER CORE SCF	OUTER CORE DCF	OUTER-RZ AVERAGE SCF&DCF	RADIAL BLANKET	AXIAL BLANKET	RADIAL REFLECTOR	AXIAL REFLECTOR
	0- 6(IN)	6-20(IN)	6-20(IN)	6-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	---	0.0008875	0.0017529	0.0011730	0.0008881	0.0017744	0.0011919	---	---	---	---
PU-240	---	0.0001175	0.0002315	0.0001551	0.0001177	0.0002348	0.0001578	---	---	---	---
PU-241	---	0.0000075	0.0000144	0.0000098	0.0000066	0.0000148	0.0000094	---	---	---	---
PU-242	---	0.0000028	0.0000053	0.0000036	0.0000023	0.0000055	0.0000034	---	---	---	---
AM-241	---	0.0000107	0.0000208	0.0000141	0.0000105	0.0000213	0.0000142	---	---	---	---
U-235	0.0000178	0.0000130	0.0000187	0.0000149	0.0000129	0.0000188	0.0000149	0.0000289	0.0000179	---	---
U-238	0.0081363	0.0058393	0.0082950	0.0066495	0.0058090	0.0083524	0.0066807	0.0132715	0.0081560	---	---
H-1	---	---	0.0000217	0.0000072	---	0.0000190	0.0000065	---	---	---	---
C	0.0000348	0.0000349	0.0022798	0.0007756	0.0000348	0.0022848	0.0008060	0.0000337	0.0000550	0.0002449	0.0005854
O	0.0136981	0.0137652	0.0155780	0.0143633	0.0137452	0.0155786	0.0143736	0.0224699	0.0088214	---	---
NA	0.0091274	0.0092209	0.0087251	0.0090573	0.0091618	0.0087351	0.0090155	0.0042155	0.0091606	---	---
AL	0.0000031	0.0000047	0.0000061	0.0000052	0.0000040	0.0000061	0.0000047	0.0000024	0.0000029	0.0000000	0.0000000
SI	0.0001441	0.0001575	0.0001822	0.0001657	0.0001572	0.0001812	0.0001654	0.0001396	0.0001929	0.0008972	0.0001289
CR	0.0023857	0.0026755	0.0031593	0.0028351	0.0026760	0.0031281	0.0028309	0.0023132	0.0041716	0.0156828	0.0021888
MN	0.0002037	0.0002295	0.0002671	0.0002419	0.0002294	0.0002640	0.0002413	0.0001990	0.0003425	0.0014285	0.0006856
FE	0.0118561	0.0128853	0.0111568	0.0123150	0.0128799	0.0110467	0.0122516	0.0082658	0.0148183	0.0554793	0.0756021
NI	0.0010357	0.0011694	0.0014326	0.0012562	0.0011709	0.0014180	0.0012556	0.0009948	0.0017702	0.0068192	0.0008924
CU	0.0000406	0.0000408	0.0000549	0.0000455	0.0000404	0.0000550	0.0000454	0.0000387	0.0000691	0.0001220	0.0000848
MO	0.0000136	0.0002396	0.0004632	0.0003134	0.0002400	0.0004689	0.0003184	0.0000133	0.0000350	0.0000358	0.0000146

Table 4.1.1-6 (I) ZPPR 17 : ATOM DENSITIES BY DRAWER

(1.0E24/CM**3)

	101 SCF		101 SCF		102 SCF		102 SCF		103 SCF		103 SCF		104 SCF		104 SCF		105 SCF		105 SCF		106 SCF		106 SCF	
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
ADEN NO.	15	1.5000	11	2.0000	4	0.8572	3	1.0000	5	0.7500	3	2.0000	5	0.7500	1	1.0000	5	0.7500	1	3.0000	2	1.2000	2	2.8000
& NUMBER	18	6.0000	15	2.5000	15	1.5000	4	1.1429	15	1.5000	5	0.2500	15	1.5000	5	1.2500	15	1.5000	5	0.2500	15	1.5000	11	2.0000
OF PLATE	52	4.0000	18	14.0000	18	6.0000	11	2.0000	18	6.0000	11	2.0000	18	6.0000	11	2.0000	18	6.0000	11	2.0000	18	6.0000	15	2.5000
	92	1.2000	51	2.0000	52	4.0000	15	2.5000	52	4.0000	15	2.5000	52	4.0000	15	2.5000	52	4.0000	15	2.5000	52	4.0000	18	14.0000
	226	1.0000	52	8.0000	226	1.0000	18	14.0000	226	1.0000	18	14.0000	226	1.0000	18	14.0000	226	1.0000	18	14.0000	226	1.0000	51	2.0000
	227	5.0300	92	2.8000	227	5.0300	51	2.0000	227	5.0300	51	2.0000	227	5.0300	51	2.0000	227	5.0300	51	2.0000	227	5.0300	52	8.0000
	228	1.0000	227	14.0000	228	1.0000	52	8.0000	228	1.0000	52	8.0000	228	1.0000	52	8.0000	228	1.0000	52	8.0000	228	1.0000	227	14.0000
	229	6.0300	229	14.0000	229	6.0300	227	14.0000	229	6.0300	227	14.0000	229	6.0300	227	14.0000	229	6.0300	227	14.0000	229	6.0300	229	14.0000
	-	--	-	--	-	--	229	14.0000	-	--	229	14.0000	-	--	-	--	-	--	229	14.0000	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001256	0.00001256	0.00001262	0.00001268	0.00001266	0.00001268	0.00001266	0.00001268	0.00001266	0.00001266	0.00001267	0.00001266	0.00001266	0.00001266	0.00001265	0.00001258	0.00001256	0.00001258	0.00001256	0.00001258	0.00001256	0.00001262	0.00001262	0.00001262
U-238	0.00578477	0.00581370	0.00579890	0.00582541	0.00581493	0.00582531	0.00581493	0.00582531	0.00581493	0.00581493	0.00582381	0.00581493	0.00581493	0.00581493	0.00581493	0.00578341	0.00577026	0.00578341	0.00577026	0.00578341	0.00577026	0.00579911	0.00579911	0.00579911
PU-239	0.00087520	0.00087958	0.00089114	0.00089319	0.00089678	0.00089162	0.00089678	0.00089162	0.00089678	0.00089678	0.00089404	0.00089678	0.00089678	0.00089678	0.00089404	0.00087959	0.00088265	0.00089678	0.00087959	0.00088265	0.00088265	0.00088706	0.00088706	0.00088706
PU-240	0.00011554	0.00011612	0.00011808	0.00011845	0.00011899	0.00011837	0.00011899	0.00011837	0.00011899	0.00011899	0.00011862	0.00011899	0.00011899	0.00011899	0.00011862	0.00011899	0.00011669	0.00011899	0.00011669	0.00011899	0.00011669	0.00011755	0.00011755	0.00011755
PU-241	0.00000718	0.00000722	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000692	0.00000640	0.00000640	0.00000647	0.00000640	0.00000640	0.00000640	0.00000647	0.00000655	0.00000604	0.00000640	0.00000655	0.00000604	0.00000604	0.00000607	0.00000607	0.00000607
PU-242	0.00000236	0.00000237	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000218	0.00000193	0.00000193	0.00000198	0.00000193	0.00000193	0.00000193	0.00000198	0.00000193	0.00000203	0.00000193	0.00000203	0.00000193	0.00000193	0.00000169	0.00000169	0.00000169
AM-241	0.00001037	0.00001042	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001106	0.00001034	0.00001034	0.00001045	0.00001034	0.00001034	0.00001034	0.00001045	0.00001034	0.00001056	0.00001034	0.00001056	0.00001034	0.00001034	0.00001011	0.00001011	0.00001011
NI	0.00116569	0.00117230	0.00115912	0.00116776	0.00115845	0.00116975	0.00115845	0.00116975	0.00115845	0.00115845	0.00117012	0.00115845	0.00115845	0.00115845	0.00117012	0.00115845	0.00118033	0.00115845	0.00118033	0.00115845	0.00116701	0.00117362	0.00117362	0.00117362
CR	0.00266008	0.00267861	0.00264693	0.00266967	0.00264577	0.00267378	0.00264577	0.00267378	0.00264577	0.00264577	0.00267442	0.00264577	0.00264577	0.00264577	0.00267442	0.00264577	0.00269480	0.00264577	0.00269480	0.00264577	0.00266276	0.00268130	0.00268130	0.00268130
FE	0.01281009	0.01289530	0.01276472	0.01286412	0.01276006	0.01287791	0.01276006	0.01287791	0.01276006	0.01276006	0.01288019	0.01276006	0.01276006	0.01276006	0.01288019	0.01276006	0.01295054	0.01276006	0.01295054	0.01276006	0.01281840	0.01290365	0.01290365	0.01290365
MO	0.00023638	0.00023725	0.00023936	0.00024085	0.00024412	0.00024215	0.00024412	0.00024215	0.00024412	0.00024412	0.00024270	0.00024412	0.00024412	0.00024412	0.00024270	0.00024412	0.00023805	0.00024412	0.00023805	0.00024412	0.00023691	0.00023779	0.00023779	0.00023779
CU	0.00003958	0.00004005	0.00003944	0.00003993	0.00003940	0.00003995	0.00003940	0.00003995	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003940	0.00003958	0.00004005	0.00004005
MN	0.00022754	0.00022970	0.00022645	0.00022896	0.00022638	0.00022929	0.00022638	0.00022929	0.00022638	0.00022638	0.00022638	0.00022638	0.00022638	0.00022638	0.00022638	0.00022638	0.00023111	0.00022638	0.00023111	0.00022638	0.00022782	0.00022998	0.00022998	0.00022998
SI	0.00015601	0.00015788	0.00015523	0.00015723	0.00015533	0.00015739	0.00015533	0.00015739	0.00015533	0.00015533	0.00015758	0.00015533	0.00015533	0.00015533	0.00015758	0.00015533	0.00015837	0.00015533	0.00015837	0.00015533	0.00015601	0.00015788	0.00015788	0.00015788
AL	0.00000387	0.00000397	0.00000395	0.00000414	0.00000380	0.00000421	0.00000380	0.00000421	0.00000380	0.00000380	0.00000380	0.00000380	0.00000380	0.00000380	0.00000380	0.00000380	0.00000420	0.00000380	0.00000420	0.00000380	0.00000387	0.00000397	0.00000397	0.00000397
NA	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00931016	0.00933051	0.00933051
C	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471	0.00003471
O	0.01369883	0.01376501	0.01369883	0.01376501	0.01369883	0.01376501	0.01369883	0.01376501	0.01369883	0.01369883	0.01376501	0.01369883	0.01369883	0.01369883	0.01376501	0.01369883	0.01376501	0.01369883	0.01376501	0.01369883	0.01376501	0.01369883	0.01376501	0.01376501

Table 4.1.1-6 (2) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	113 SCF 0.0 - 6.03	113 SCF 6.03-20.03	114 SCF 0.0 - 6.03	114 SCF 6.03-20.03	115 SCF 0.0 - 6.03	115 SCF 6.03-20.03	116 SCF 0.0 - 6.03	116 SCF 6.03-20.03	117 SCF 0.0 - 6.03	117 SCF 6.03-20.03	118 SCF 0.0 - 6.03	118 SCF 6.03-20.03
ADEN NO. & NUMBER OF PLATE	18 6.0000	11 2.0000	4 0.8572	3 1.0000	5 0.7500	3 2.0000	5 0.7500	1 3.0000	2 1.2000	2 2.8000	18 6.0000	11 2.0000
	52 4.0000	15 2.0000	18 6.0000	4 1.1429	18 6.0000	5 0.2500	18 6.0000	5 0.2500	18 6.0000	11 2.0000	52 4.0000	18 14.0000
	92 1.2000	18 14.0000	52 4.0000	11 2.0000	52 4.0000	11 2.0000	52 4.0000	11 2.0000	52 4.0000	15 2.0000	92 1.2000	51 2.0000
	189 1.5000	51 2.0000	189 1.5000	15 2.0000	189 1.5000	15 2.0000	189 1.5000	15 2.0000	189 1.5000	18 14.0000	189 1.5000	52 8.0000
	226 1.0000	52 8.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	51 2.0000	226 1.0000	92 2.8000
	227 5.0300	92 2.8000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	52 8.0000	227 5.0300	189 2.5000
	228 1.0000	189 0.5000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	189 0.5000	228 1.0000	227 14.0000
	229 6.0300	227 14.0000	229 6.0300	189 0.5000	229 6.0300	189 0.5000	229 6.0300	189 0.5000	229 6.0300	227 14.0000	229 6.0300	229 14.0000
	-	229 14.0000	-	227 14.0000	-	227 14.0000	-	227 14.0000	-	229 14.0000	-	-
	-	-	-	229 14.0000	-	229 14.0000	-	229 14.0000	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
U-235	0.00001256	0.00001262	0.00001262	0.00001268	0.00001266	0.00001268	0.00001266	0.00001258	0.00001256	0.00001262	0.00001256	0.00001262
U-238	0.00578477	0.00581370	0.00579890	0.00582541	0.00581493	0.00582531	0.00581493	0.00578341	0.00577026	0.00579911	0.00578477	0.00581370
PU-239	0.00087520	0.00087958	0.00089114	0.00089319	0.00089678	0.00089162	0.00089678	0.00087959	0.00088265	0.00088706	0.00087520	0.00087958
PU-240	0.00011554	0.00011612	0.00011808	0.00011845	0.00011899	0.00011837	0.00011899	0.00011669	0.00011696	0.00011755	0.00011554	0.00011612
PU-241	0.00000718	0.00000722	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000655	0.00000604	0.00000607	0.00000718	0.00000722
PU-242	0.00000236	0.00000237	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000203	0.00000169	0.00000169	0.00000236	0.00000237
AM-241	0.00001037	0.00001042	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001056	0.00001006	0.00001011	0.00001037	0.00001042
NI	0.00116836	0.00117268	0.00116179	0.00116815	0.00116112	0.00117013	0.00116112	0.00118071	0.00116968	0.00117400	0.00116836	0.00117421
CR	0.00266525	0.00267935	0.00265210	0.00267041	0.00265094	0.00267452	0.00265094	0.00269554	0.00266792	0.00268204	0.00266525	0.00268232
FE	0.01282809	0.01289789	0.01278271	0.01286671	0.01277805	0.01288049	0.01277805	0.01295312	0.01283639	0.01290623	0.01282809	0.01290822
MO	0.00023638	0.00023725	0.00023936	0.00024085	0.00024412	0.00024215	0.00024412	0.00023805	0.00023691	0.00023779	0.00023638	0.00023725
CU	0.00003715	0.00003969	0.00003701	0.00003958	0.00003697	0.00003960	0.00003697	0.00003977	0.00003715	0.00003969	0.00003715	0.00003830
MN	0.00022792	0.00022976	0.00022684	0.00022901	0.00022676	0.00022935	0.00022676	0.00023117	0.00022820	0.00023004	0.00022792	0.00022998
SI	0.00015636	0.00015793	0.00015557	0.00015728	0.00015567	0.00015744	0.00015567	0.00015842	0.00015636	0.00015793	0.00015636	0.00015813
AL	0.00000387	0.00000397	0.00000395	0.00000414	0.00000380	0.00000421	0.00000380	0.00000420	0.00000387	0.00000397	0.00000387	0.00000397
NA	--	0.00797057	--	0.00797057	--	0.00797057	--	0.00797057	--	0.00797057	--	0.00261219
C	0.00003385	0.00003459	0.00003385	0.00003459	0.00003385	0.00003459	0.00003385	0.00003459	0.00003385	0.00003459	0.00003385	0.00003409
O	0.01369816	0.01376491	0.01369816	0.01376491	0.01369816	0.01376491	0.01369816	0.01376491	0.01369816	0.01376491	0.01369816	0.01376452

Table 4.1.1-6 (3) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	119		119		120		120		121		121		122		122		123		123		124		124		
	SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	
ADEN NO. & NUMBER OF PLATE	4 0.8572 18 6.0000 52 4.0000 189 1.5000 226 1.0000 227 5.0300 228 1.0000 229 6.0300	3 1.0000 4 1.1429 11 2.0000 18 14.0000 51 2.0000 52 8.0000 189 2.5000 227 14.0000 229 14.0000	5 0.7500 18 6.0000 52 4.0000 189 1.5000 226 1.0000 227 5.0300 228 1.0000 229 6.0300	3 2.0000 5 0.2500 11 2.0000 18 14.0000 51 2.0000 52 8.0000 189 2.5000 227 14.0000 229 14.0000	5 0.7500 18 6.0000 52 4.0000 189 1.5000 226 1.0000 227 5.0300 228 1.0000 229 6.0300	1 3.0000 5 0.2500 11 2.0000 18 14.0000 51 2.0000 52 8.0000 189 2.5000 227 14.0000 229 14.0000	2 1.2000 18 6.0000 52 4.0000 189 1.5000 226 1.0000 227 5.0300 228 1.0000 229 6.0300	2 2.8000 11 2.0000 18 14.0000 51 2.0000 52 8.0000 189 2.5000 227 14.0000 229 14.0000	18 6.0000 52 4.0000 92 1.2000 189 1.5000 226 1.0000 227 5.0300 228 1.0000 229 6.0300	18 14.0000 51 2.0000 52 8.0000 92 2.8000 185 2.0000 189 2.5000 227 14.0000 229 14.0000	4 0.8572 18 6.0000 52 4.0000 189 1.5000 226 1.0000 227 5.0300 228 1.0000 229 6.0300	3 1.0000 4 1.1429 18 14.0000 51 2.0000 52 8.0000 185 2.0000 189 2.5000 227 14.0000 229 14.0000	3 1.0000 4 1.1429 18 14.0000 51 2.0000 52 8.0000 185 2.0000 189 2.5000 227 14.0000 229 14.0000												
U-235	0.00001262	0.00001268	0.00001266	0.00001268	0.00001266	0.00001268	0.00001258	0.00001256	0.00001262	0.00001256	0.00001262	0.00001262	0.00001262	0.00001256	0.00001256	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001268
U-238	0.00579890	0.00582541	0.00581493	0.00582531	0.00581493	0.00582531	0.00578341	0.00577026	0.00579911	0.00578477	0.00581370	0.00579890	0.00579890	0.00578477	0.00579911	0.00581370	0.00579890	0.00579890	0.00579890	0.00579890	0.00579890	0.00579890	0.00579890	0.00579890	0.00582541
PU-239	0.00089114	0.00089319	0.00089678	0.00089162	0.00089678	0.00089162	0.00087959	0.00088265	0.00087959	0.00088265	0.00087958	0.00089319	0.00089319	0.00088265	0.00087959	0.00088265	0.00087958	0.00087958	0.00087958	0.00087958	0.00087958	0.00087958	0.00087958	0.00087958	0.00089319
PU-240	0.00011808	0.00011845	0.00011899	0.00011837	0.00011899	0.00011837	0.00011669	0.00011696	0.00011755	0.00011554	0.00011612	0.00011808	0.00011845	0.00011755	0.00011554	0.00011612	0.00011612	0.00011612	0.00011612	0.00011612	0.00011612	0.00011612	0.00011612	0.00011612	0.00011845
PU-241	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000692	0.00000655	0.00000604	0.00000607	0.00000718	0.00000722	0.00000623	0.00000658	0.00000607	0.00000718	0.00000722	0.00000718	0.00000718	0.00000718	0.00000718	0.00000718	0.00000718	0.00000718	0.00000718	0.00000658
PU-242	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000218	0.00000203	0.00000169	0.00000169	0.00000236	0.00000237	0.00000181	0.00000199	0.00000169	0.00000236	0.00000237	0.00000236	0.00000236	0.00000236	0.00000236	0.00000236	0.00000236	0.00000236	0.00000236	0.00000199
AM-241	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001106	0.00001056	0.00001006	0.00001011	0.00001037	0.00001042	0.00001026	0.00001068	0.00001011	0.00001037	0.00001042	0.00001042	0.00001042	0.00001042	0.00001042	0.00001042	0.00001042	0.00001042	0.00001042	0.00001068
NI	0.00116179	0.00116968	0.00116112	0.00117166	0.00116112	0.00117166	0.00118225	0.00116968	0.00117553	0.00116836	0.00117434	0.00116179	0.00116968	0.00116968	0.00117553	0.00116836	0.00117434	0.00116836	0.00116836	0.00116836	0.00116836	0.00116836	0.00116836	0.00116836	0.00116968
CR	0.00265210	0.00267337	0.00265094	0.00267749	0.00265094	0.00267749	0.00269851	0.00266792	0.00268501	0.00266525	0.00268257	0.00265210	0.00267337	0.00266792	0.00268501	0.00266525	0.00268257	0.00266525	0.00266525	0.00266525	0.00266525	0.00266525	0.00266525	0.00266525	0.00267337
FE	0.01278271	0.01287704	0.01277805	0.01289082	0.01277805	0.01289082	0.01296345	0.01283639	0.01291657	0.01282809	0.01290913	0.01278271	0.01287704	0.01289082	0.01291657	0.01282809	0.01290913	0.01282809	0.01282809	0.01282809	0.01282809	0.01282809	0.01282809	0.01282809	0.01287704
MO	0.00023936	0.00024085	0.00024412	0.00024215	0.00024412	0.00024215	0.00023805	0.00023691	0.00023779	0.00023638	0.00023725	0.00023936	0.00024085	0.00023691	0.00023779	0.00023638	0.00023725	0.00023638	0.00023638	0.00023638	0.00023638	0.00023638	0.00023638	0.00023638	0.00024085
CU	0.00003701	0.00003818	0.00003697	0.00003820	0.00003697	0.00003820	0.00003838	0.00003715	0.00003830	0.00003715	0.00003762	0.00003701	0.00003818	0.00003715	0.00003830	0.00003715	0.00003762	0.00003762	0.00003762	0.00003762	0.00003762	0.00003762	0.00003762	0.00003762	0.00003818
MN	0.00022684	0.00022923	0.00022676	0.00022957	0.00022676	0.00022957	0.00023139	0.00022820	0.00023026	0.00022792	0.00023000	0.00022684	0.00022923	0.00022820	0.00023026	0.00022792	0.00023000	0.00022792	0.00022792	0.00022792	0.00022792	0.00022792	0.00022792	0.00022792	0.00022923
SI	0.00015557	0.00015748	0.00015567	0.00015763	0.00015567	0.00015763	0.00015862	0.00015636	0.00015813	0.00015636	0.00015817	0.00015557	0.00015748	0.00015636	0.00015813	0.00015636	0.00015817	0.00015636	0.00015636	0.00015636	0.00015636	0.00015636	0.00015636	0.00015636	0.00015748
AL	0.00000395	0.00000414	0.00000380	0.00000421	0.00000380	0.00000421	0.00000420	0.00000387	0.00000397	0.00000387	0.00000397	0.00000395	0.00000414	0.00000387	0.00000397	0.00000387	0.00000397	0.00000387	0.00000387	0.00000387	0.00000387	0.00000387	0.00000387	0.00000387	0.00000414
NA	--	0.00261219	--	0.00261219	--	0.00261219	--	0.00261219	--	0.00261219	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.00003385	0.00003409	0.00003385	0.00003409	0.00003385	0.00003409	0.00003409	0.00003385	0.00003409	0.00003385	0.00003409	0.00003385	0.00003409	0.00003385	0.00003409	0.00003385	0.00003384	0.00003384	0.00003384	0.00003384	0.00003384	0.00003384	0.00003384	0.00003384	0.00003409
O	0.01369816	0.01376452	0.01369816	0.01376452	0.01369816	0.01376452	0.01369816	0.01376452	0.01369816	0.01376452	0.01369816	0.01369816	0.01376452	0.01369816	0.01376452	0.01369816	0.01376434	0.01376434	0.01376434	0.01376434	0.01376434	0.01376434	0.01376434	0.01376434	0.01376452

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Table 4.1.1-6 (4) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	125		125		126		126		127		127		128		128		129		129		130		130	
	SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF		SCF	
	0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03	
ADEN NO.	5	0.7500	3	2.0000	5	0.7500	1	3.0000	2	1.2000	2	2.8000	18	6.0000	18	14.0000	4	0.8572	3	1.0000	5	0.7500	3	2.0000
& NUMBER	18	6.0000	5	0.2500	18	6.0000	5	0.2500	18	6.0000	18	14.0000	52	4.0000	51	2.0000	18	6.0000	4	1.1429	18	6.0000	5	0.2500
OF PLATE	52	4.0000	18	14.0000	52	4.0000	18	14.0000	52	4.0000	51	2.0000	92	1.2000	52	8.0000	52	4.0000	18	14.0000	52	4.0000	18	14.0000
	189	1.5000	51	2.0000	189	1.5000	51	2.0000	189	1.5000	52	8.0000	189	1.5000	92	2.8000	189	1.5000	51	2.0000	189	1.5000	51	2.0000
	226	1.0000	52	8.0000	226	1.0000	52	8.0000	226	1.0000	185	2.0000	226	1.0000	185	2.0000	226	1.0000	52	8.0000	226	1.0000	52	8.0000
	227	5.0300	185	2.0000	227	5.0300	185	2.0000	227	5.0300	189	2.5000	227	5.0300	189	2.5000	227	5.0300	185	2.0000	227	5.0300	185	2.0000
	228	1.0000	189	2.5000	228	1.0000	189	2.5000	228	1.0000	227	14.0000	228	1.0000	227	14.0000	228	1.0000	189	2.5000	228	1.0000	189	2.5000
	229	6.0300	227	14.0000	229	6.0300	227	14.0000	229	6.0300	229	14.0000	229	6.0300	229	14.0000	229	6.0300	227	14.0000	229	6.0300	227	14.0000
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-	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001266	0.00001268	0.00001266	0.00001258	0.00001256	0.00001262	0.00001256	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001256	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001262	0.00001268	0.00001266	0.00001266	0.00001268	
U-238	0.00581493	0.00582531	0.00581493	0.00578341	0.00577026	0.00579911	0.00578477	0.00581370	0.00579890	0.00582541	0.00581493	0.00582531	0.00581493	0.00581370	0.00579890	0.00582541	0.00581493	0.00582541	0.00581493	0.00581493	0.00581493	0.00581493	0.00582531	
PU-239	0.00089678	0.00089162	0.00089678	0.00087959	0.00088265	0.00088706	0.00087520	0.00087958	0.00089114	0.00089319	0.00089678	0.00089162	0.00089678	0.00087958	0.00089114	0.00089319	0.00089678	0.00089319	0.00089678	0.00089678	0.00089678	0.00089678	0.00089162	
PU-240	0.00011899	0.00011837	0.00011899	0.00011669	0.00011696	0.00011755	0.00011554	0.00011612	0.00011808	0.00011845	0.00011899	0.00011837	0.00011899	0.00011554	0.00011612	0.00011808	0.00011845	0.00011899	0.00011845	0.00011899	0.00011899	0.00011837		
PU-241	0.00000640	0.00000692	0.00000640	0.00000655	0.00000604	0.00000607	0.00000718	0.00000722	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000718	0.00000722	0.00000623	0.00000658	0.00000692	0.00000658	0.00000640	0.00000640	0.00000692		
PU-242	0.00000193	0.00000218	0.00000193	0.00000203	0.00000169	0.00000169	0.00000236	0.00000237	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000236	0.00000237	0.00000181	0.00000199	0.00000218	0.00000199	0.00000193	0.00000193	0.00000218		
AM-241	0.00001034	0.00001106	0.00001034	0.00001056	0.00001006	0.00001011	0.00001037	0.00001042	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001037	0.00001042	0.00001026	0.00001068	0.00001106	0.00001068	0.00001034	0.00001034	0.00001106		
NI	0.00116112	0.00117179	0.00116112	0.00118238	0.00116968	0.00117567	0.00116836	0.00117434	0.00116179	0.00116981	0.00116112	0.00117179	0.00116112	0.00116836	0.00117434	0.00116179	0.00116981	0.00116112	0.00116981	0.00116112	0.00116112	0.00117179		
CR	0.00265094	0.00267774	0.00265094	0.00269877	0.00266792	0.00268526	0.00266525	0.00268257	0.00265210	0.00267363	0.00265094	0.00267774	0.00265094	0.00268526	0.00268257	0.00265210	0.00267363	0.00267774	0.00267363	0.00265094	0.00265094	0.00267774		
FE	0.01277805	0.01289174	0.01277805	0.01296437	0.01283639	0.01291748	0.01282809	0.01290913	0.01278271	0.01287795	0.01277805	0.01289174	0.01277805	0.01291748	0.01290913	0.01278271	0.01287795	0.01289174	0.01287795	0.01277805	0.01277805	0.01289174		
MO	0.00024412	0.00024215	0.00024412	0.00023805	0.00023691	0.00023779	0.00023638	0.00023725	0.00023936	0.00024085	0.00024412	0.00024215	0.00024412	0.00023638	0.00023725	0.00023936	0.00024085	0.00024085	0.00024085	0.00024412	0.00024412	0.00024215		
CU	0.00003697	0.00003752	0.00003697	0.00003770	0.00003715	0.00003762	0.00003715	0.00003762	0.00003701	0.00003750	0.00003697	0.00003752	0.00003697	0.00003715	0.00003762	0.00003701	0.00003750	0.00003750	0.00003750	0.00003697	0.00003697	0.00003752		
MN	0.00022676	0.00022959	0.00022676	0.00023141	0.00022820	0.00023028	0.00022792	0.00023000	0.00022684	0.00022925	0.00022676	0.00022959	0.00022676	0.00022792	0.00023000	0.00022684	0.00022925	0.00022925	0.00022925	0.00022676	0.00022676	0.00022959		
SI	0.00015567	0.00015767	0.00015567	0.00015866	0.00015636	0.00015817	0.00015636	0.00015817	0.00015557	0.00015752	0.00015567	0.00015767	0.00015567	0.00015636	0.00015817	0.00015557	0.00015752	0.00015752	0.00015752	0.00015567	0.00015567	0.00015767		
AL	0.00000380	0.00000421	0.00000380	0.00000420	0.00000387	0.00000397	0.00000387	0.00000397	0.00000395	0.00000414	0.00000380	0.00000421	0.00000380	0.00000397	0.00000397	0.00000395	0.00000414	0.00000414	0.00000414	0.00000380	0.00000380	0.00000421		
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
C	0.00003385	0.00003384	0.00003385	0.00003384	0.00003385	0.00003384	0.00003385	0.00003384	0.00003385	0.00003384	0.00003385	0.00003384	0.00003385	0.00003385	0.00003384	0.00003385	0.00003384	0.00003384	0.00003384	0.00003385	0.00003385	0.00003384		
O	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01369816	0.01376434	0.01369816	0.01376434	0.01376434	0.01376434	0.01369816	0.01369816	0.01376434		

Table 4.1.1-6 (5) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

ADEN NO. & NUMBER OF PLATE	131 SCF		131 SCF		132 SCF		132 SCF		133 IB		133 SCF		134 IB		134 SCF		135 IB		135 SCF		136 IB		136 SCF			
	0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03			
5	0.7500	1	3.0000	2	1.2000	2	2.8000	13	2.0000	14	2.0000	13	2.0000	18	14.0000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	18	14.0000	
18	6.0000	5	0.2500	18	6.0000	18	14.0000	18	6.0000	18	14.0000	18	6.0000	18	6.0000	51	2.0000	38	4.0000	51	2.0000	38	4.0000	51	2.0000	
52	4.0000	18	14.0000	52	4.0000	51	2.0000	38	4.0000	51	2.0000	38	4.0000	52	8.0000	52	4.0000	52	8.0000	52	4.0000	52	8.0000	52	8.0000	
189	1.5000	51	2.0000	189	1.5000	52	8.0000	52	4.0000	52	8.0000	52	4.0000	94	2.0000	187	2.0000	94	2.0000	187	2.0000	187	2.0000	94	2.0000	
226	1.0000	52	8.0000	226	1.0000	185	2.0000	226	1.0000	94	2.0000	226	1.0000	188	4.0000	226	1.0000	188	4.0000	226	1.0000	188	4.0000	188	4.0000	
227	5.0300	185	2.0000	227	5.0300	189	2.5000	227	5.0300	188	2.0000	227	5.0300	227	14.0000	227	5.0300	227	14.0000	227	5.0300	227	14.0000	227	14.0000	
228	1.0000	189	2.5000	228	1.0000	227	14.0000	228	1.0000	228	1.0000	228	1.0000	229	14.0000	228	1.0000	229	14.0000	228	1.0000	229	14.0000	229	14.0000	
229	6.0300	227	14.0000	229	6.0300	229	14.0000	229	6.0300	229	14.0000	229	6.0300	-	--	229	6.0300	-	--	229	6.0300	-	--	-	--	
-	--	229	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
U-235	0.00001266	0.00001258	0.00001256	0.00001262	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	
U-238	0.00581493	0.00578341	0.00577026	0.00579911	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	
PU-239	0.00089678	0.00087959	0.00088265	0.00088706	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	
PU-240	0.00011899	0.00011669	0.00011696	0.00011755	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	
PU-241	0.00000640	0.00000655	0.00000604	0.00000607	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	
PU-242	0.00000193	0.00000203	0.00000169	0.00000169	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	
AM-241	0.00001034	0.00001056	0.00001006	0.00001011	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	
NI	0.00116112	0.00118238	0.00116968	0.00117567	0.00103300	0.00116531	0.00103300	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	0.00116645	0.00103344	
CR	0.00265094	0.00269877	0.00266792	0.00268526	0.00239461	0.00266478	0.00239461	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	0.00266700	0.00239550	
FE	0.01277805	0.01296437	0.01283639	0.01291748	0.01189658	0.01284713	0.01189658	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	0.01285480	0.01189971	
MO	0.00024412	0.00023805	0.00023691	0.00023779	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	
CU	0.00003697	0.00003770	0.00003715	0.00003762	0.00003801	0.00003874	0.00003801	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	0.00003755	0.00003559	
MN	0.00022676	0.00023141	0.00022820	0.00023028	0.00020471	0.00022850	0.00020471	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	0.00022867	0.00020480	
SI	0.00015567	0.00015866	0.00015636	0.00015817	0.00014342	0.00015718	0.00014342	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	0.00015730	0.00014351	
AL	0.00000380	0.00000420	0.00000387	0.00000397	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	
NA	--	--	--	--	0.00924119	0.00466162	0.00924119	--	--	0.00924119	--	--	0.00924119	--	--	0.00924119	--	--	0.00924119	--	--	0.00924119	--	--	0.00924119	--
C	0.00003385	0.00003384	0.00003385	0.00003384	0.00003490	0.00003431	0.00003490	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	0.00003387	0.00003398	
O	0.01369816	0.01376434	0.01369816	0.01376434	0.01369881	0.01376467	0.01369881	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	0.01376434	0.01369816	

Table 4.1.1-6 (7) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

ADEN NO. & NUMBER OF PLATE	143 SCF		144 SCF		145 SCF		146 SCF		147 SCF		148 SCF	
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
9	3.4286	8 4.0000	4 0.8571	3 1.0000	5 0.7500	3 2.0000	5 0.7500	1 1.0000	5 0.7500	1 3.0000	9 3.4286	8 4.0000
18	6.0000	9 4.5714	9 3.4286	4 1.1429	9 3.4286	5 0.2500	9 3.4286	5 1.2500	9 3.4286	5 0.2500	18 6.0000	9 4.5714
52	4.0000	18 14.0000	18 6.0000	8 4.0000	18 6.0000	8 4.0000	18 6.0000	8 4.0000	18 6.0000	8 4.0000	52 4.0000	18 14.0000
92	1.2000	51 2.0000	52 4.0000	9 4.5714	52 4.0000	9 4.5714	52 4.0000	9 4.5714	52 4.0000	9 4.5714	92 1.2000	51 2.0000
226	1.0000	52 8.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	52 8.0000
227	5.0300	92 2.8000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	92 2.8000
228	1.0000	227 14.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	227 14.0000
229	6.0300	229 14.0000	229 6.0300	227 14.0000	229 6.0300	227 14.0000	229 6.0300	227 14.0000	229 6.0300	227 14.0000	229 6.0300	229 14.0000
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U-235	0.00001256	0.00001262	0.00001262	0.00001268	0.00001266	0.00001268	0.00001266	0.00001267	0.00001266	0.00001258	0.00001256	0.00001262
U-238	0.00578477	0.00581370	0.00579860	0.00582541	0.00581493	0.00582531	0.00581493	0.00582381	0.00581493	0.00578341	0.00578477	0.00581370
PU-239	0.00087520	0.00087958	0.00089103	0.00089319	0.00089678	0.00089162	0.00089678	0.00089404	0.00089678	0.00087959	0.00087520	0.00087958
PU-240	0.00011554	0.00011612	0.00011806	0.00011845	0.00011899	0.00011837	0.00011899	0.00011862	0.00011899	0.00011669	0.00011554	0.00011612
PU-241	0.00000718	0.00000722	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000647	0.00000640	0.00000655	0.00000718	0.00000722
PU-242	0.00000236	0.00000237	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000198	0.00000193	0.00000203	0.00000236	0.00000237
AM-241	0.00001037	0.00001042	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001045	0.00001034	0.00001056	0.00001037	0.00001042
NI	0.00137732	0.00137933	0.00137073	0.00137480	0.00137008	0.00137678	0.00137008	0.00137716	0.00137008	0.00138736	0.00137732	0.00137933
CR	0.00307312	0.00308266	0.00305994	0.00307371	0.00305881	0.00307783	0.00305881	0.00307847	0.00305881	0.00309885	0.00307312	0.00308266
FE	0.01424460	0.01429857	0.01419911	0.01426739	0.01419456	0.01428117	0.01419456	0.01428345	0.01419456	0.01435380	0.01424460	0.01429857
MO	0.00023661	0.00023748	0.00023956	0.00024108	0.00024435	0.00024237	0.00024435	0.00024293	0.00024435	0.00023827	0.00023661	0.00023748
CU	0.00004343	0.00004385	0.00004329	0.00004374	0.00004324	0.00004375	0.00004324	0.00004375	0.00004324	0.00004393	0.00004343	0.00004385
MN	0.00025835	0.00025985	0.00025727	0.00025911	0.00025719	0.00025944	0.00025719	0.00025954	0.00025719	0.00026126	0.00025835	0.00025985
SI	0.00018184	0.00018314	0.00018105	0.00018249	0.00018115	0.00018265	0.00018115	0.00018285	0.00018115	0.00018364	0.00018184	0.00018314
AL	0.00000606	0.00000605	0.00000614	0.00000622	0.00000599	0.00000629	0.00000599	0.00000608	0.00000599	0.00000629	0.00000606	0.00000605
NA	0.00839872	0.00831348	0.00839872	0.00831348	0.00839872	0.00831348	0.00839872	0.00831348	0.00839872	0.00831348	0.00839872	0.00831348
C	0.00003829	0.00003818	0.00003829	0.00003818	0.00003829	0.00003818	0.00003829	0.00003818	0.00003829	0.00003818	0.00003829	0.00003818
O	0.01369876	0.01376493	0.01369876	0.01376493	0.01369876	0.01376493	0.01369876	0.01376493	0.01369876	0.01376493	0.01369876	0.01376493

Table 4.1.1-6 (8)

ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	149 SCF 0.0 - 6.03	149 SCF 6.03-20.03	150 SCF 0.0 - 6.03	150 SCF 6.03-20.03	151 SCF 0.0 - 6.03	151 SCF 6.03-20.03	152 SCF 0.0 - 6.03	152 SCF 6.03-20.03	201 IB 0.0 - 6.03	201 IB 6.03-20.03	202 DCF 0.0 - 6.03	202 DCF 6.03-20.03
ADEN NO. & NUMBER OF PLATE	4 0.8571	3 1.0000	5 0.7500	3 2.0000	5 0.7500	1 1.0000	5 0.7500	1 3.0000	10 1.5000	6 2.0000	10 1.5000	6 2.0000
	9 3.4286	4 1.1429	9 3.4286	5 0.2500	9 3.4286	5 1.2500	9 3.4286	5 0.2500	18 6.0000	10 2.5000	18 6.0000	10 2.5000
	18 6.0000	8 4.0000	18 6.0000	8 4.0000	18 6.0000	8 4.0000	18 6.0000	8 4.0000	35 0.7500	18 14.0000	35 0.7500	18 14.0000
	52 4.0000	9 4.5714	52 4.0000	9 4.5714	52 4.0000	9 4.5714	52 4.0000	9 4.5714	97 6.0310	31 1.0000	95 1.5000	31 1.0000
	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	35 1.2500	97 6.0310	35 1.2500
	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0310	97 14.0000	226 1.0000	91 2.0000
	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	273 1.0000	227 14.0000	227 5.0310	95 2.5000
	229 6.0300	227 14.0000	229 6.0300	227 14.0000	229 6.0300	227 14.0000	229 6.0300	227 14.0000	- --	- --	273 1.0000	97 14.0000
	- --	229 14.0000	- --	229 14.0000	- --	229 14.0000	- --	229 14.0000	- --	- --	- --	227 14.0000
	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --
	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --
U-235	0.00001262	0.00001268	0.00001266	0.00001268	0.00001266	0.00001267	0.00001266	0.00001258	0.00000704	0.00000707	0.00001832	0.00001833
U-238	0.00579860	0.00582541	0.00581493	0.00582531	0.00581493	0.00582381	0.00581493	0.00578341	0.00329802	0.00331506	0.00835146	0.00835383
PU-239	0.00089103	0.00089319	0.00089678	0.00089162	0.00089678	0.00089404	0.00089678	0.00087959	--	--	0.00177833	0.00177319
PU-240	0.00011806	0.00011845	0.00011899	0.00011837	0.00011899	0.00011862	0.00011899	0.00011669	--	--	0.00023540	0.00023459
PU-241	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000647	0.00000640	0.00000655	--	--	0.00001485	0.00001476
PU-242	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000198	0.00000193	0.00000203	--	--	0.00000490	0.00000486
AM-241	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001045	0.00001034	0.00001056	--	--	0.00002133	0.00002120
NI	0.00137073	0.00137480	0.00137008	0.00137678	0.00137008	0.00137716	0.00137008	0.00138736	0.00113851	0.00114884	0.00140507	0.00142737
CR	0.00305994	0.00307371	0.00305881	0.00307783	0.00305881	0.00307847	0.00305881	0.00309885	0.00256431	0.00259197	0.00309716	0.00314828
FE	0.01419911	0.01426739	0.01419456	0.01428117	0.01419456	0.01428345	0.01419456	0.01435380	0.00910271	0.00920242	0.01093597	0.01111778
MO	0.00023956	0.00024108	0.00024435	0.00024237	0.00024435	0.00024293	0.00024435	0.00023827	0.00001571	0.00001559	0.00046974	0.00046844
CU	0.00004329	0.00004374	0.00004324	0.00004375	0.00004324	0.00004375	0.00004324	0.00004393	0.00005201	0.00005193	0.00005505	0.00005516
MN	0.00025727	0.00025911	0.00025719	0.00025944	0.00025719	0.00025954	0.00025719	0.00026126	0.00021562	0.00021840	0.00026099	0.00026593
SI	0.00018105	0.00018249	0.00018115	0.00018265	0.00018115	0.00018285	0.00018115	0.00018364	0.00015399	0.00015499	0.00018014	0.00018206
AL	0.00000614	0.00000622	0.00000599	0.00000629	0.00000599	0.00000608	0.00000599	0.00000629	0.00000351	0.00000367	0.00000566	0.00000603
NA	0.00839872	0.00831348	0.00839872	0.00831348	0.00839872	0.00831348	0.00839872	0.00831348	0.00876824	0.00878853	0.00876824	0.00878853
C	0.00003829	0.00003818	0.00003829	0.00003818	0.00003829	0.00003818	0.00003829	0.00003818	0.00230325	0.00231516	0.00230325	0.00231516
O	0.01369876	0.01376493	0.01369876	0.01376493	0.01369876	0.01376493	0.01369876	0.01376493	0.01560259	0.01568319	0.01560259	0.01568319

Table 4.1.1-6 (9) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	203		203		204		204		205		205		206		206		207		207		208		208	
	DCF		DCF		IB		IB		IB		DCF		IB		IB		DCF		DCF		DCF		DCF	
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
ADEN NO.	10	1.5000	6	2.0000	13	2.0000	9	4.0000	13	2.0000	9	4.0000	7	2.4000	7	5.6000	7	2.4000	7	5.6000	18	6.0000	6	2.0000
& NUMBER	18	6.0000	10	2.5000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	35	0.7500	10	2.0000
OF PLATE	35	0.7500	18	14.0000	38	4.0000	34	2.0000	38	4.0000	34	2.0000	35	0.7500	31	1.0000	35	0.7500	31	1.0000	95	1.5000	18	14.0000
	95	1.5000	31	1.0000	52	4.0000	97	14.0000	52	4.0000	91	2.0000	97	6.0310	35	1.2500	95	1.5000	35	1.2500	97	6.0310	31	1.0000
	97	6.0310	35	1.2500	97	6.0310	227	14.0000	97	6.0310	92	4.0000	226	1.0000	97	14.0000	97	6.0310	91	2.0000	184	1.5000	35	1.2500
	226	1.0000	93	4.0000	226	1.0000	-	--	226	1.0000	97	14.0000	227	5.0310	227	14.0000	226	1.0000	95	2.5000	226	1.0000	91	2.0000
	227	5.0310	95	0.5000	227	5.0310	-	--	227	5.0310	227	14.0000	273	1.0000	-	--	227	5.0310	97	14.0000	227	5.0310	95	2.5000
	273	1.0000	97	14.0000	273	1.0000	-	--	273	1.0000	-	--	-	--	-	--	273	1.0000	227	14.0000	273	1.0000	97	14.0000
	-	--	227	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	184	0.5000
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	227	14.0000
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001832	0.00001832	0.00001778	0.00000707	0.00001778	0.00001816	0.00000704	0.00000707	0.00001832	0.00001833	0.00001832	0.00001833	0.00001832	0.00001833	0.00001832	0.00001833	0.00001832	0.00001833	0.00001832	0.00001833	0.00001832	0.00001833	0.00001832	0.00001833
U-238	0.00835146	0.00835204	0.00813558	0.00331506	0.00813558	0.00829507	0.00329802	0.00331506	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383
PU-239	0.00177833	0.00177218	--	--	--	0.00175294	--	--	0.00177833	0.00177319	--	--	0.00177833	0.00177319	--	--	0.00177833	0.00177319	--	--	0.00177833	0.00177319	--	--
PU-240	0.00023540	0.00023448	--	--	--	0.00023146	--	--	0.00023540	0.00023459	--	--	0.00023540	0.00023459	--	--	0.00023540	0.00023459	--	--	0.00023540	0.00023459	--	--
PU-241	0.00001485	0.00001481	--	--	--	0.00001441	--	--	0.00001485	0.00001476	--	--	0.00001485	0.00001476	--	--	0.00001485	0.00001476	--	--	0.00001485	0.00001476	--	--
PU-242	0.00000490	0.00000487	--	--	--	0.00000473	--	--	0.00000490	0.00000486	--	--	0.00000490	0.00000486	--	--	0.00000490	0.00000486	--	--	0.00000490	0.00000486	--	--
AM-241	0.00002133	0.00002125	--	--	--	0.00002077	--	--	0.00002133	0.00002120	--	--	0.00002133	0.00002120	--	--	0.00002133	0.00002120	--	--	0.00002133	0.00002120	--	--
NI	0.00140507	0.00142491	0.00104520	0.00114518	0.00104520	0.00143647	0.00114440	0.00115186	0.00140507	0.00143039	0.00140507	0.00143039	0.00140507	0.00143039	0.00140507	0.00143039	0.00140507	0.00143039	0.00140507	0.00143039	0.00140507	0.00143039	0.00140507	0.00143039
CR	0.00309716	0.00314358	0.00237473	0.00258483	0.00237473	0.00316622	0.00257578	0.00259782	0.00309716	0.00315413	0.00309716	0.00315413	0.00309716	0.00315413	0.00309716	0.00315413	0.00309716	0.00315413	0.00309716	0.00315413	0.00309716	0.00315413	0.00309716	0.00315413
FE	0.01093597	0.01110069	0.01179788	0.00917749	0.01179788	0.01118033	0.00914262	0.00922280	0.01093597	0.01113816	0.01093597	0.01113816	0.01093597	0.01113816	0.01093597	0.01113816	0.01093597	0.01113816	0.01093597	0.01113816	0.01093597	0.01113816	0.01093597	0.01113816
MO	0.00046974	0.00046862	0.00001504	0.00001554	0.00001504	0.00046328	0.00001572	0.00001560	0.00046974	0.00046845	0.00046974	0.00046845	0.00046974	0.00046845	0.00046974	0.00046845	0.00046974	0.00046845	0.00046974	0.00046845	0.00046974	0.00046845	0.00046974	0.00046845
CU	0.00005505	0.00005516	0.00004627	0.00005167	0.00004627	0.00005516	0.00005211	0.00005204	0.00005505	0.00005527	0.00005505	0.00005527	0.00005505	0.00005527	0.00005505	0.00005527	0.00005505	0.00005527	0.00005505	0.00005527	0.00005505	0.00005527	0.00005505	0.00005527
MN	0.00026099	0.00026532	0.00020211	0.00021790	0.00020211	0.00026759	0.00021649	0.00021886	0.00026099	0.00026638	0.00026099	0.00026638	0.00026099	0.00026638	0.00026099	0.00026638	0.00026099	0.00026638	0.00026099	0.00026638	0.00026099	0.00026638	0.00026099	0.00026638
SI	0.00018014	0.00018166	0.00014608	0.00015457	0.00014608	0.00018262	0.00015470	0.00015536	0.00018014	0.00018243	0.00018014	0.00018243	0.00018014	0.00018243	0.00018014	0.00018243	0.00018014	0.00018243	0.00018014	0.00018243	0.00018014	0.00018243	0.00018014	0.00018243
AL	0.00000566	0.00000645	0.00000286	0.00000370	0.00000286	0.00000617	0.00000359	0.00000371	0.00000566	0.00000608	0.00000566	0.00000608	0.00000566	0.00000608	0.00000566	0.00000608	0.00000566	0.00000608	0.00000566	0.00000608	0.00000566	0.00000608	0.00000566	0.00000608
NA	0.00876824	0.00878853	0.00923966	0.00878877	0.00923966	0.00878877	0.00875580	0.00880104	0.00876824	0.00875580	0.00876824	0.00875580	0.00876824	0.00875580	0.00876824	0.00875580	0.00876824	0.00875580	0.00876824	0.00875580	0.00876824	0.00875580	0.00876824	0.00875580
C	0.00230325	0.00231516	0.00003469	0.00231490	0.00003469	0.00231490	0.00230339	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524	0.00230325	0.00231524
O	0.01560259	0.01568319	0.01369654	0.01568320	0.01369654	0.01568320	0.01560260	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321	0.01560259	0.01568321

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Table 4.1.1-6 (II) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	215		215		216		216		217		217		218		218		219		219		220		220	
	DCF		DCF		IB		DCF		IB		DCF		IB		DCF		IB		DCF		DCF		DCF	
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
ADEN NO.	18	6.0000	18	14.0000	13	2.0000	9	2.0000	13	2.0000	18	14.0000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	10	1.5000	6	2.0000
& NUMBER	35	0.7500	31	1.0000	18	6.0000	18	14.0000	18	6.0000	34	2.0000	38	4.0000	34	2.0000	38	4.0000	34	2.0000	18	6.0000	10	2.5000
OF PLATE	95	1.5000	35	1.2500	38	4.0000	34	2.0000	38	4.0000	91	2.0000	52	4.0000	91	2.0000	52	4.0000	91	2.0000	35	0.7500	18	14.0000
	97	6.0310	93	4.0000	52	4.0000	91	2.0000	52	4.0000	92	4.0000	97	6.0310	92	4.0000	97	6.0310	92	4.0000	95	1.5000	31	1.0000
	184	1.5000	95	0.5000	97	6.0310	92	4.0000	97	6.0310	97	14.0000	187	2.0000	97	14.0000	187	2.0000	97	14.0000	97	6.0310	35	1.2500
	226	1.0000	97	14.0000	226	1.0000	97	14.0000	226	1.0000	183	4.0000	226	1.0000	183	4.0000	226	1.0000	183	4.0000	226	1.0000	93	4.0000
	227	5.0310	180	2.0000	227	5.0310	183	2.0000	227	5.0310	227	14.0000	227	5.0310	227	14.0000	227	5.0310	227	14.0000	227	5.0310	95	0.5000
	273	1.0000	184	2.5000	273	1.0000	227	14.0000	-	--	273	1.0000	-	--	273	1.0000	-	--	273	1.0000	-	--	97	14.0000
	-	--	227	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001832	0.00001832	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001778	0.00001816	0.00001832	0.00001832	0.00001832	0.00001832
U-238	0.00835146	0.00835204	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00813558	0.00829507	0.00835146	0.00835204	0.00835204	0.00835204
PU-239	0.00177833	0.00177218	--	0.00175294	--	0.00175294	--	0.00175294	--	0.00175294	--	0.00175294	--	0.00175294	--	0.00175294	--	0.00175294	--	0.00175294	0.00177833	0.00177218	0.00177218	0.00177218
PU-240	0.00023540	0.00023448	--	0.00023146	--	0.00023146	--	0.00023146	--	0.00023146	--	0.00023146	--	0.00023146	--	0.00023146	--	0.00023146	--	0.00023146	0.00023540	0.00023448	0.00023448	0.00023448
PU-241	0.00001485	0.00001481	--	0.00001441	--	0.00001441	--	0.00001441	--	0.00001441	--	0.00001441	--	0.00001441	--	0.00001441	--	0.00001441	--	0.00001441	0.00001485	0.00001481	0.00001481	0.00001481
PU-242	0.00000490	0.00000487	--	0.00000473	--	0.00000473	--	0.00000473	--	0.00000473	--	0.00000473	--	0.00000473	--	0.00000473	--	0.00000473	--	0.00000473	0.00000490	0.00000487	0.00000487	0.00000487
AM-241	0.00002133	0.00002125	--	0.00002077	--	0.00002077	--	0.00002077	--	0.00002077	--	0.00002077	--	0.00002077	--	0.00002077	--	0.00002077	--	0.00002077	0.00002133	0.00002125	0.00002125	0.00002125
NI	0.00140813	0.00142960	0.00104520	0.00144335	0.00104520	0.00145023	0.00104520	0.00145023	0.00104520	0.00145023	0.00104520	0.00145023	0.00104520	0.00145023	0.00104520	0.00145023	0.00104520	0.00145023	0.00104520	0.00145023	0.00140813	0.00142960	0.00142960	0.00142960
CR	0.00310315	0.00315266	0.00237473	0.00317964	0.00237473	0.00319307	0.00237473	0.00319307	0.00237473	0.00319307	0.00237473	0.00319307	0.00237473	0.00319307	0.00237473	0.00319307	0.00237473	0.00319307	0.00237473	0.00319307	0.00310315	0.00315266	0.00315266	0.00315266
FE	0.01095680	0.01113251	0.01179788	0.01122697	0.01179788	0.01127361	0.01179788	0.01127361	0.01179788	0.01127361	0.01180102	0.01127361	0.01180102	0.01127361	0.01180102	0.01127361	0.01180102	0.01127361	0.01180102	0.01127361	0.01095680	0.01113251	0.01113251	0.01113251
MO	0.00046974	0.00046862	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00001504	0.00046328	0.00046974	0.00046862	0.00046862	0.00046862
CU	0.00005399	0.00005423	0.00004627	0.00005472	0.00004627	0.00005427	0.00004627	0.00005427	0.00004627	0.00005427	0.00004386	0.00005427	0.00004386	0.00005427	0.00004386	0.00005427	0.00004386	0.00005427	0.00004386	0.00005427	0.00005399	0.00005423	0.00005423	0.00005423
MN	0.00026144	0.00026611	0.00020211	0.00026860	0.00020211	0.00026961	0.00020211	0.00026961	0.00020211	0.00026961	0.00020221	0.00026961	0.00020221	0.00026961	0.00020221	0.00026961	0.00020221	0.00026961	0.00020221	0.00026961	0.00026144	0.00026611	0.00026611	0.00026611
SI	0.00018048	0.00018171	0.00014608	0.00018345	0.00014608	0.00018428	0.00014608	0.00018428	0.00014608	0.00018428	0.00014618	0.00018428	0.00014618	0.00018428	0.00014618	0.00018428	0.00014618	0.00018428	0.00014618	0.00018428	0.00018048	0.00018171	0.00018171	0.00018171
AL	0.00000566	0.00000653	0.00000286	0.00000621	0.00000286	0.00000625	0.00000286	0.00000625	0.00000286	0.00000625	0.00000286	0.00000625	0.00000286	0.00000625	0.00000286	0.00000625	0.00000286	0.00000625	0.00000286	0.00000625	0.00000566	0.00000653	0.00000653	0.00000653
NA	0.00454498	0.00456846	0.00923966	0.00667861	0.00923966	0.00456845	--	0.00456845	--	0.00456845	--	0.00456845	--	0.00456845	--	0.00456845	--	0.00456845	--	0.00456845	0.00454498	0.00456846	0.00456846	0.00456846
C	0.00230290	0.00231482	0.00003469	0.00231473	0.00003469	0.00231456	0.00003377	0.00231456	0.00003377	0.00231456	0.00003377	0.00231456	0.00003377	0.00231456	0.00003377	0.00231456	0.00003377	0.00231456	0.00003377	0.00231456	0.00230290	0.00231482	0.00231482	0.00231482
O	0.01560229	0.01568289	0.01369654	0.01568305	0.01369654	0.01568289	0.01369588	0.01568289	0.01369588	0.01568289	0.01369588	0.01568289	0.01369588	0.01568289	0.01369588	0.01568289	0.01369588	0.01568289	0.01369588	0.01568289	0.01560229	0.01568289	0.01568289	0.01568289

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Table 4.1.1-6 (12) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	221 DCF 0.0 - 6.03		221 DCF 6.03-20.03		222 DCF 0.0 - 6.03		222 DCF 6.03-20.03		223 DCF 0.0 - 6.03		223 DCF 6.03-20.03		224 DCF 0.0 - 6.03		224 DCF 6.03-20.03		225 DCF 0.0 - 6.03		225 DCF 6.03-20.03		402 RDR 0.0 -36.15		403 RDR 0.0 -36.16	
ADEN NO.	7	2.4000	7	5.6000	10	1.5000	6	2.0000	7	2.4000	7	5.6000	10	1.5000	6	2.0000	7	2.4000	7	5.6000	78	12.0000	97	36.1555
& NUMBER	18	6.0000	18	14.0000	18	6.0000	10	2.5000	18	6.0000	18	14.0000	18	6.0000	10	2.5000	18	6.0000	18	14.0000	108	1.0000	99	1.0000
OF PLATE	35	0.7500	31	1.0000	35	0.7500	18	14.0000	35	0.7500	31	1.0000	35	0.7500	18	14.0000	35	0.7500	31	1.0000	226	1.0000	108	1.0000
	95	1.5000	35	1.2500	95	1.5000	31	1.0000	95	1.5000	35	1.2500	95	1.5000	31	1.0000	95	1.5000	35	1.2500	227	35.1525	203	24.0000
	97	6.0310	91	2.0000	97	6.0310	35	1.2500	97	6.0310	91	2.0000	97	6.0310	35	1.2500	97	6.0310	91	2.0000	228	1.0000	226	1.0000
	226	1.0000	95	2.5000	226	1.0000	93	4.0000	226	1.0000	95	2.5000	226	1.0000	93	4.0000	226	1.0000	95	2.5000	229	36.1525	227	35.1555
	227	5.0310	97	14.0000	227	5.0310	95	0.5000	227	5.0310	97	14.0000	227	5.0310	95	0.5000	227	5.0310	97	14.0000	230	1.0000	273	1.0000
	273	1.0000	227	14.0000	273	1.0000	97	14.0000	273	1.0000	227	14.0000	273	1.0000	97	14.0000	273	1.0000	227	14.0000	-	--	-	--
	-	--	-	--	-	--	227	14.0000	-	--	-	--	-	--	227	14.0000	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001832	0.00001833	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001833	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	0.00001832	--	--	
U-238	0.00835146	0.00835383	0.00835146	0.00835204	0.00835146	0.00835204	0.00835146	0.00835383	0.00835146	0.00835204	0.00835146	0.00835383	0.00835146	0.00835204	0.00835146	0.00835383	0.00835146	0.00835383	0.00835146	0.00835383	--	--		
PU-239	0.00177833	0.00177319	0.00177833	0.00177218	0.00177833	0.00177319	0.00177833	0.00177319	0.00177833	0.00177319	0.00177833	0.00177319	0.00177833	0.00177319	0.00177833	0.00177319	0.00177833	0.00177319	0.00177833	0.00177319	--	--		
PU-240	0.00023540	0.00023459	0.00023540	0.00023448	0.00023540	0.00023459	0.00023540	0.00023459	0.00023540	0.00023459	0.00023540	0.00023448	0.00023540	0.00023459	0.00023540	0.00023459	0.00023540	0.00023459	0.00023540	0.00023459	--	--		
PU-241	0.00001485	0.00001476	0.00001485	0.00001481	0.00001485	0.00001485	0.00001476	0.00001485	0.00001485	0.00001481	0.00001485	0.00001481	0.00001485	0.00001476	0.00001485	0.00001476	0.00001485	0.00001476	0.00001485	0.00001476	--	--		
PU-242	0.00000490	0.00000486	0.00000490	0.00000487	0.00000490	0.00000486	0.00000490	0.00000486	0.00000490	0.00000486	0.00000490	0.00000487	0.00000490	0.00000486	0.00000490	0.00000486	0.00000490	0.00000486	0.00000490	0.00000486	--	--		
AM-241	0.00002133	0.00002120	0.00002133	0.00002125	0.00002133	0.00002120	0.00002133	0.00002120	0.00002133	0.00002125	0.00002133	0.00002120	0.00002133	0.00002125	0.00002133	0.00002120	0.00002133	0.00002125	0.00002133	0.00002120	--	--		
NI	0.00141096	0.00143039	0.00140507	0.00142491	0.00141096	0.00143039	0.00140507	0.00142491	0.00141096	0.00143039	0.00140507	0.00142491	0.00141096	0.00143039	0.00140507	0.00142491	0.00141096	0.00143039	0.00140507	0.00142491	0.00688886	0.00681346		
CR	0.00310864	0.00315413	0.00309716	0.00314358	0.00310864	0.00315413	0.00309716	0.00314358	0.00310864	0.00315413	0.00309716	0.00314358	0.00310864	0.00315413	0.00309716	0.00314358	0.00310864	0.00315413	0.00309716	0.00314358	0.01571316	0.01549457		
FE	0.01097588	0.01113816	0.01093597	0.01110069	0.01097588	0.01113816	0.01093597	0.01110069	0.01097588	0.01113816	0.01093597	0.01110069	0.01097588	0.01113816	0.01093597	0.01110069	0.01097588	0.01113816	0.01093597	0.01110069	0.05522985	0.05539863		
MO	0.00046975	0.00046845	0.00046974	0.00046862	0.00046975	0.00046845	0.00046974	0.00046862	0.00046975	0.00046845	0.00046974	0.00046862	0.00046975	0.00046845	0.00046974	0.00046862	0.00046975	0.00046845	0.00046974	0.00046862	0.00001244	0.00001474		
CU	0.00005515	0.00005527	0.00005505	0.00005516	0.00005515	0.00005527	0.00005505	0.00005516	0.00005515	0.00005527	0.00005505	0.00005516	0.00005515	0.00005527	0.00005505	0.00005516	0.00005515	0.00005527	0.00005505	0.00005516	0.00010967	0.00011489		
MN	0.00026186	0.00026638	0.00026099	0.00026532	0.00026186	0.00026638	0.00026099	0.00026532	0.00026186	0.00026638	0.00026099	0.00026532	0.00026186	0.00026638	0.00026099	0.00026532	0.00026186	0.00026638	0.00026099	0.00026532	0.00151248	0.00142854		
SI	0.00018084	0.00018243	0.00018014	0.00018166	0.00018084	0.00018243	0.00018014	0.00018166	0.00018084	0.00018243	0.00018014	0.00018166	0.00018084	0.00018243	0.00018014	0.00018166	0.00018084	0.00018243	0.00018014	0.00018166	0.00103952	0.00085903		
AL	0.00000574	0.00000608	0.00000566	0.00000645	0.00000574	0.00000608	0.00000566	0.00000645	0.00000574	0.00000608	0.00000566	0.00000645	0.00000574	0.00000608	0.00000566	0.00000645	0.00000574	0.00000608	0.00000566	0.00000645	--	--		
NA	0.00875580	0.00880104	0.00876824	0.00878853	0.00875580	0.00880104	0.00876824	0.00878853	0.00875580	0.00880104	0.00876824	0.00878853	0.00875580	0.00880104	0.00876824	0.00878853	0.00875580	0.00880104	0.00876824	0.00878853	--	--		
C	0.00230339	0.00231524	0.00230325	0.00231516	0.00230339	0.00231524	0.00230325	0.00231516	0.00230339	0.00231524	0.00230325	0.00231516	0.00230339	0.00231524	0.00230325	0.00231516	0.00230339	0.00231524	0.00230325	0.00231516	0.00025177	0.00025730		
O	0.01560260	0.01568321	0.01560259	0.01568319	0.01560260	0.01568321	0.01560259	0.01568319	0.01560260	0.01568321	0.01560259	0.01568319	0.01560260	0.01568321	0.01560259	0.01568319	0.01560260	0.01568321	0.01560259	0.01568319	--	--		

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Table 4.1.1-6 (13) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	404 RDR		405 RDR		501 RDB		501 RDB		502 RDB		502 RDB		601 CRP		601 CRP		602 CRP		602 CRP		603 CRP		603 CRP						
	0.0	-36.15	0.0	-36.15	0.0	- 6.03	6.03	-20.03	0.0	- 6.03	6.03	-20.03	0.0	- 6.03	6.03	-20.03	0.0	- 6.03	6.03	-20.03	0.0	- 6.03	6.03	-20.03	0.0	- 6.03	6.03	-20.03	
ADEN NO.	108	1.0000	108	1.0000	10	1.5000	10	3.5000	10	1.5000	10	3.5000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	
& NUMBER	226	1.0000	119	4.0000	18	3.0000	18	7.0000	18	15.0000	18	35.0000	226	1.0000	227	14.0000	143	1.5000	140	2.0000	143	1.5000	140	2.0000	143	1.5000	140	2.0000	
OF PLATE	227	35.1525	201	7.0000	20	6.0000	20	14.0000	37	6.0000	37	14.0000	227	5.0310	266	6.8572	226	1.0000	142	2.0000	164	4.0000	141	2.0000	226	1.0000	142	2.0000	
	228	1.0000	226	1.0000	37	6.0000	37	14.0000	97	6.0310	97	14.0000	267	3.0000	267	1.0000	227	5.0310	143	0.5000	226	1.0000	142	2.0000					
	229	36.1525	227	35.1525	226	1.0000	227	14.0000	226	1.0000	227	14.0000	273	1.0000	-	--	267	0.7500	227	14.0000	227	5.0310	143	0.5000					
	230	1.0000	228	1.0000	227	5.0300	229	14.0000	227	5.0310	-	--	-	--	-	--	271	1.5000	265	1.0000	273	1.0000	164	2.0000					
	274	3.0000	229	36.1525	228	1.0000	-	--	255	1.0000	-	--	-	--	-	--	273	1.0000	267	1.2500	-	--	165	4.0000					
	-	--	230	1.0000	229	6.0300	-	--	-	--	-	--	-	--	-	--	-	--	269	2.0000	-	--	166	2.0000					
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	271	2.5000	-	--	227	14.0000					
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--					
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--					
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--					
U-235	--	--	--	--	0.00002891	0.00002905	0.00002844	0.00002859	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
U-238	--	--	--	--	0.01328089	0.01334730	0.01306162	0.01312910	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-239	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
AM-241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
NI	0.00659166	0.00695041	0.00099056	0.00098923	0.00099703	0.00100604	0.00131839	0.00132743	0.00143209	0.00144359	0.00103274	0.00116206																	
CR	0.01576342	0.01576111	0.00231181	0.00231484	0.00227933	0.00230557	0.00293924	0.00296437	0.00315235	0.00318233	0.00235065	0.00261046																	
FE	0.05607350	0.05574385	0.00826497	0.00828106	0.00812253	0.00821818	0.01037357	0.01046491	0.01115303	0.01126108	0.00846490	0.00936813																	
MO	0.00012559	0.00001387	0.00001284	0.00001259	0.00001484	0.00001486	0.00001754	0.00001736	0.00001784	0.00001786	0.00001573	0.00001622																	
CU	0.00016690	0.00010699	0.00003592	0.00003628	0.00004393	0.00004388	0.00004966	0.00004905	0.00004755	0.00004730	0.00004229	0.00004877																	
MN	0.00114622	0.00158469	0.00019852	0.00019952	0.00019534	0.00019768	0.00024122	0.00024416	0.00025828	0.00026091	0.00020043	0.00022038																	
SI	0.00057873	0.00090071	0.00013826	0.00013919	0.00014010	0.00014112	0.00016479	0.00016495	0.00020229	0.00020369	0.00025216	0.00022350																	
AL	--	--	0.00000243	0.00000245	0.00000243	0.00000245	0.00000430	0.00000485	0.00000537	0.00000509	0.00000215	0.00000278																	
NA	--	--	0.00422396	0.00424508	0.00422326	0.00424508	0.01804308	0.01839714	0.00828281	0.00837684	--	--																	
C	0.00022322	0.00022767	0.00003371	0.00003362	0.00003328	0.00003362	0.00003072	0.00003086	0.00938544	0.00941357	0.02037487	0.01978541																	
O	--	--	0.02255250	0.02266526	0.02195461	0.02206802	0.00000130	0.00000133	0.00000059	0.00000060	0.00013525	0.00005341																	

Table 4.1.1-6 (14) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	604		604		605		605		606		606		607		607		608		608		609		609					
	CRP	0.0 - 6.03	CRP	6.03-20.03	CRP	0.0 - 6.03	CRP	6.03-20.03	CRP	0.0 - 6.03	CRP	6.03-20.03	CRP	0.0 - 6.03	CRP	6.03-20.03	CRP	0.0 - 6.03	CRP	6.03-20.03	CRP	0.0 - 6.03	CRP	6.03-20.03				
ADEN NO. & NUMBER OF PLATE	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000				
	143	1.5000	140	2.0000	156	51.0002	119	1.0000	156	51.0002	119	1.0000	158	8.0001	119	1.0000	158	8.0001	119	1.0000	156	51.0002	119	1.0000	156	51.0002		
	164	4.0000	141	2.0000	158	8.0001	156	119.0002	158	8.0001	156	119.0002	226	1.0000	157	16.0001	226	1.0000	157	16.0001	158	8.0001	156	119.0002	158	8.0001	156	119.0002
	226	1.0000	142	2.0000	226	1.0000	157	16.0001	226	1.0000	157	16.0001	227	5.0310	158	8.0001	227	5.0310	158	8.0001	226	1.0000	157	16.0001	158	8.0001	157	16.0001
	227	5.0310	143	0.5000	227	5.0310	158	8.0001	227	5.0310	158	8.0001	245	102.0002	227	14.0000	245	102.0002	227	14.0000	227	5.0310	158	8.0001	157	16.0001	158	8.0001
	273	1.0000	164	2.0000	273	1.0000	227	14.0000	273	1.0000	227	14.0000	273	1.0000	245	238.0002	273	1.0000	245	238.0002	273	1.0000	227	5.0310	158	8.0001	227	5.0310
	-	--	165	2.0000	432	1.0000	432	2.0000	432	1.0000	432	2.0000	432	1.0000	432	2.0000	432	1.0000	432	2.0000	432	1.0000	432	1.0000	432	2.0000	432	2.0000
	-	--	166	6.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000
	-	--	227	14.0000	-	--	472	2.0000	-	--	472	2.0000	-	--	472	2.0000	-	--	472	2.0000	-	--	-	--	472	2.0000	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
U-238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-239	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
PU-242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
AM-241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
NI	0.00103274	0.00116206	0.00268193	0.00271216	0.00268193	0.00271216	0.00268193	0.00271216	0.00268193	0.00271216	0.00268193	0.00271216	0.00268283	0.00271306	0.00268283	0.00271306	0.00268283	0.00271306	0.00268283	0.00271306	0.00268193	0.00271216	0.00268193	0.00271216	0.00268193	0.00271216		
CR	0.00235065	0.00261046	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199		
FE	0.00846490	0.00936813	0.02367466	0.02401767	0.02367466	0.02401767	0.02367466	0.02401767	0.02367466	0.02401767	0.02367466	0.02401767	0.02363948	0.02398231	0.02363948	0.02398231	0.02363948	0.02398231	0.02363948	0.02398231	0.02367466	0.02401767	0.02367466	0.02401767	0.02367466	0.02401767		
MO	0.00001573	0.00001622	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834		
CU	0.00004229	0.00004877	0.00010954	0.00011108	0.00010954	0.00011108	0.00010954	0.00011108	0.00010954	0.00011108	0.00010954	0.00011108	0.00011098	0.00011255	0.00011098	0.00011255	0.00011098	0.00011255	0.00011098	0.00011255	0.00010954	0.00011108	0.00010954	0.00011108	0.00010954	0.00011108		
MN	0.00020043	0.00022038	0.00045904	0.00046368	0.00045904	0.00046368	0.00045904	0.00046368	0.00045904	0.00046368	0.00045904	0.00046368	0.00045821	0.00046285	0.00045821	0.00046285	0.00045821	0.00046285	0.00045821	0.00046285	0.00045904	0.00046368	0.00045904	0.00046368	0.00045904	0.00046368		
SI	0.00025216	0.00022350	0.00032396	0.00031663	0.00032396	0.00031663	0.00032396	0.00031663	0.00032396	0.00031663	0.00032396	0.00031663	0.00032469	0.00031736	0.00032469	0.00031736	0.00032469	0.00031736	0.00032469	0.00031736	0.00032396	0.00031663	0.00032396	0.00031663	0.00032396	0.00031663		
AL	0.00000215	0.00000278	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000141	0.00000142	0.00000141	0.00000142	0.00000141	0.00000142	0.00000141	0.00000142	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071	0.00000071		
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
C	0.02037487	0.01976459	0.00819052	0.00823299	0.00819052	0.00823299	0.00819052	0.00823299	0.00819052	0.00823299	0.00819052	0.00823299	0.00914472	0.00919212	0.00914472	0.00919212	0.00914472	0.00919212	0.00914472	0.00919212	0.00819052	0.00823299	0.00819052	0.00823299	0.00819052	0.00823299		
O	0.00013525	0.00005341	--	--	--	--	--	--	--	--	--	--	0.00003038	0.00003054	0.00003038	0.00003054	0.00003038	0.00003054	0.00003038	0.00003054	--	--	--	--	--	--		

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Table 4.1.1-6 (15) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	610 CRP 0.0 - 6.03		610 CRP 6.03-20.03		611 CRP 0.0 - 6.03		611 CRP 6.03-20.03		612 CRP 0.0 - 6.03		612 CRP 6.03-20.03		613 CRP 0.03- 6.03		613 CRP 6.03-20.03		614 CRP 0.0 - 7.03		615 CRP 0.0 - 6.03		615 CRP 6.03-20.03		616 CRP 0.0 - 6.03			
ADEN NO. & NUMBER OF PLATE	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	6.0310	97	14.0000	97	--	97	--	226	1.0000	97	6.0310	97	14.0000	97	6.0310	97	6.0310
	156	51.0002	119	1.0000	158	8.0001	119	1.0000	158	8.0001	119	1.0000	121	0.5000	121	1.1667	227	6.0310	161	16.0001	160	48.0002	160	4.0001	160	4.0001
	158	8.0001	156	119.0002	226	1.0000	157	16.0001	226	1.0000	157	16.0001	226	1.0000	227	14.0000	258	7.0310	162	3.0000	161	24.0001	162	4.0000	162	4.0000
	226	1.0000	157	16.0001	227	5.0310	158	8.0001	227	5.0310	158	8.0001	227	5.0310	245	224.0000	259	1.0000	167	48.0001	162	5.0000	167	24.0000	167	24.0000
	227	5.0310	158	8.0001	245	102.0002	227	14.0000	245	102.0002	227	14.0000	245	96.0000	--	--	266	4.0000	170	6.0000	167	120.0001	170	2.0000	170	2.0000
	273	1.0000	227	14.0000	273	1.0000	245	238.0002	273	1.0000	245	238.0002	--	--	--	--	--	--	226	1.0000	227	14.0000	226	1.0000	226	1.0000
	432	1.0000	432	2.0000	432	1.0000	432	2.0000	432	1.0000	432	2.0000	--	--	--	--	--	--	227	5.0310	--	--	227	5.0310	227	5.0310
	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	471	1.0000	--	--	--	--	--	--	273	1.0000	--	--	267	0.7500	271	1.5000
	--	--	472	2.0000	--	--	472	2.0000	--	--	472	2.0000	--	--	--	--	--	--	--	--	--	--	271	1.5000	273	1.0000
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U-235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U-238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU-239	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU-240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU-241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU-242	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AM-241	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	0.00268193	0.00271216	0.00268283	0.00271306	0.00268283	0.00271306	0.00268283	0.00271306	0.00268283	0.00271306	0.00111241	0.00114071	0.00130119	0.00075827	0.00076029	0.00115763										
CR	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00661397	0.00670199	0.00252008	0.00259014	0.00296801	0.00181482	0.00182599	0.00261652										
FE	0.02367466	0.02401767	0.02363948	0.02398231	0.02363948	0.02398231	0.02363948	0.02398231	0.02363948	0.02398231	0.00886805	0.00912016	0.01046023	0.00650986	0.00655259	0.00926442										
MO	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00002682	0.00002834	0.00000985	0.00001034	0.00001451	0.00001472	0.00001457	0.00001684										
CU	0.00010954	0.00011108	0.00011098	0.00011255	0.00011098	0.00011255	0.00011098	0.00011255	0.00011098	0.00011255	0.00003768	0.00003888	0.00004046	0.00005688	0.00005796	0.00005443										
MN	0.00045904	0.00046368	0.00045821	0.00046285	0.00045821	0.00046285	0.00045821	0.00046285	0.00045821	0.00046285	0.00019144	0.00019768	0.00024395	0.00016033	0.00016190	0.00021819										
SI	0.00032396	0.00031663	0.00032469	0.00031736	0.00032469	0.00031736	0.00032469	0.00031736	0.00032469	0.00031736	0.00014109	0.00014512	0.00012245	0.00011114	0.00011118	0.00014932										
AL	0.00000071	0.00000071	0.00000141	0.00000142	0.00000141	0.00000142	0.00000141	0.00000142	0.00000141	0.00000142	0.00000424	0.00000424	0.00000491	--	--	0.00000322										
NA	--	--	--	--	--	--	--	--	--	--	0.00929374	0.00929400	0.01835917	--	--	0.00828281										
C	0.00819052	0.00823299	0.00914472	0.00919212	0.00914472	0.00919212	0.00914472	0.00919212	0.00855299	0.00855407	0.00855299	0.00855407	0.000003075	0.02192200	0.02167569	0.01089460										
O	--	--	0.00003038	0.00003054	0.00003038	0.00003054	0.00003038	0.00003054	0.00002874	0.00002874	0.00002874	0.00002874	0.00000132	0.00004247	0.00004574	0.00002182										

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Table 4.1.1-6 (16) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	616	701	701	702	702	703	703	705	705	706	706	707
	CRP	SCF	SCF	SCF	SCF	SCF	SCF	SCF	SCF	SCF	SCF	IB
	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03
ADEN NO.	97 14.0000	15 0.7500	8 2.0000	4 0.8572	3 1.0000	5 0.7500	3 2.0000	5 0.7500	1 3.0000	2 1.2000	2 2.8000	13 1.0000
& NUMBER	160 28.0001	18 6.0000	11 1.0000	15 0.7500	4 1.1429	15 0.7500	5 0.2500	15 0.7500	5 0.2500	15 0.7500	8 2.0000	18 6.0000
OF PLATE	161 16.0001	52 4.0000	15 1.2500	18 6.0000	8 2.0000	18 6.0000	8 2.0000	18 6.0000	8 2.0000	18 6.0000	11 1.0000	38 4.0000
	167 60.0001	92 1.2000	18 14.0000	52 4.0000	11 1.0000	52 4.0000	11 1.0000	52 4.0000	11 1.0000	52 4.0000	15 1.2500	52 4.0000
	227 14.0000	187 1.0000	51 2.0000	187 1.0000	15 1.2500	187 1.0000	15 1.2500	187 1.0000	15 1.2500	187 1.0000	18 14.0000	187 1.0000
	265 1.0000	226 1.0000	52 8.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	226 1.0000	51 2.0000	226 1.0000
	267 1.2500	227 5.0300	92 2.8000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	51 2.0000	227 5.0300	52 8.0000	227 5.0300
	269 2.0000	228 1.0000	110 2.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	52 8.0000	228 1.0000	110 2.0000	228 1.0000
	271 2.5000	229 6.0300	205 2.0000	229 6.0300	110 2.0000	229 6.0300	110 2.0000	229 6.0300	110 2.0000	229 6.0300	205 2.0000	229 6.0300
	- --	- --	227 14.0000	- --	205 2.0000	- --	205 2.0000	- --	205 2.0000	- --	227 14.0000	- --
	- --	- --	229 14.0000	- --	227 14.0000	- --	227 14.0000	- --	227 14.0000	- --	229 14.0000	- --
U-235	--	0.00001256	0.00001262	0.00001262	0.00001268	0.00001266	0.00001268	0.00001266	0.00001258	0.00001256	0.00001262	0.00001778
U-238	--	0.00578477	0.00581370	0.00579890	0.00582541	0.00581493	0.00582531	0.00581493	0.00578341	0.00577026	0.00579911	0.00813693
PU-239	--	0.00087520	0.00087958	0.00089114	0.00089319	0.00089678	0.00089162	0.00089678	0.00087959	0.00088265	0.00088706	--
PU-240	--	0.00011554	0.00011612	0.00011808	0.00011845	0.00011899	0.00011837	0.00011899	0.00011669	0.00011696	0.00011755	--
PU-241	--	0.00000718	0.00000722	0.00000623	0.00000658	0.00000640	0.00000692	0.00000640	0.00000655	0.00000604	0.00000607	--
PU-242	--	0.00000236	0.00000237	0.00000181	0.00000199	0.00000193	0.00000218	0.00000193	0.00000203	0.00000169	0.00000169	--
AM-241	--	0.00001037	0.00001042	0.00001026	0.00001068	0.00001034	0.00001106	0.00001034	0.00001056	0.00001006	0.00001011	--
NI	0.00116223	0.00117066	0.00145288	0.00116409	0.00144834	0.00116342	0.00145033	0.00116342	0.00146091	0.00117198	0.00145420	0.00103322
CR	0.00263284	0.00266976	0.00335152	0.00265661	0.00334258	0.00265545	0.00334669	0.00265545	0.00336772	0.00267244	0.00335421	0.00239506
FE	0.00932466	0.01284376	0.01528367	0.01279839	0.01525249	0.01279373	0.01526627	0.01279373	0.01533890	0.01285207	0.01529201	0.01189815
MO	0.00001667	0.00023638	0.00024268	0.00023936	0.00024628	0.00024412	0.00024757	0.00024412	0.00024347	0.00023691	0.00024322	0.00001288
CU	0.00005489	0.00003843	0.00008247	0.00003829	0.00008236	0.00003824	0.00008237	0.00003824	0.00008255	0.00003843	0.00008247	0.00003680
MN	0.00022001	0.00022827	0.00028822	0.00022719	0.00028747	0.00022711	0.00028781	0.00022711	0.00028962	0.00022855	0.00028850	0.00020476
SI	0.00014946	0.00015664	0.00018354	0.00015586	0.00018290	0.00015596	0.00018305	0.00015596	0.00018404	0.00015664	0.00018354	0.00014347
AL	0.00000314	0.00000394	0.00000360	0.00000402	0.00000377	0.00000387	0.00000384	0.00000387	0.00000384	0.00000394	0.00000360	0.00000286
NA	0.00837684	0.00466526	0.00640022	0.00466526	0.00640022	0.00466526	0.00640022	0.00466526	0.00640022	0.00466526	0.00640022	0.00462060
C	0.01086474	0.00003434	0.00004483	0.00003434	0.00004483	0.00003434	0.00004483	0.00003434	0.00004483	0.00003434	0.00004483	0.00003444
O	0.00002347	0.01369850	0.01376480	0.01369850	0.01376480	0.01369850	0.01376480	0.01369850	0.01376480	0.01369850	0.01376480	0.01369849

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Table 4.1.1-6 (17) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

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	707 SCF 6.03-20.03		708 IB 0.0 - 6.03		708 SCF 6.03-20.03		709 IB 0.0 - 6.03		709 IB 6.03-20.03		710 RDR 0.0 -36.15		711 SCF 0.0 - 6.03		711 SCF 6.03-20.03		712 IB 0.0 - 6.03		712 SCF 6.03-20.03		713 IB 0.0 - 6.03		713 SCF 6.03-20.03	
ADEN NO. & NUMBER OF PLATE	8	2.0000	13	1.0000	8	2.0000	16	6.0000	10	1.5000	84	3.0000	15	1.5000	1	1.0000	8	1.0000	14	2.0000	13	1.0000	14	2.0000
	14	2.0000	18	6.0000	14	2.0000	18	12.0000	16	14.0000	108	1.0000	18	6.0000	5	1.0000	13	1.0000	18	14.0000	18	6.0000	18	14.0000
	18	14.0000	38	4.0000	18	14.0000	37	6.0000	18	28.0000	110	3.0000	52	4.0000	11	2.0000	18	6.0000	51	2.0000	38	4.0000	51	2.0000
	51	2.0000	52	4.0000	51	2.0000	97	6.0310	37	14.0000	111	2.0000	218	0.7500	15	2.5000	38	4.0000	52	8.0000	52	4.0000	52	8.0000
	52	8.0000	187	1.0000	52	8.0000	187	1.0000	97	14.0000	113	1.0000	226	1.0000	18	14.0000	52	4.0000	94	2.0000	187	1.0000	94	2.0000
	94	2.0000	226	1.0000	91	1.0000	226	1.0000	205	2.0000	119	1.0000	227	5.0300	51	2.0000	181	1.0000	110	2.0000	226	1.0000	110	2.0000
	110	2.0000	227	5.0300	92	2.0000	227	5.0310	227	14.0000	187	1.0000	228	1.0000	52	8.0000	226	1.0000	181	2.0000	227	5.0300	181	2.0000
	205	2.0000	228	1.0000	110	2.0000	255	1.0000	242	3.0000	203	17.0000	229	6.0300	218	0.2500	227	5.0300	205	1.0000	228	1.0000	205	1.0000
	227	14.0000	229	6.0300	205	2.0000	-	--	-	--	226	1.0000	-	--	227	14.0000	228	1.0000	227	14.0000	229	6.0300	229	14.0000
	229	14.0000	-	--	227	14.0000	-	--	-	--	227	35.1525	-	--	229	14.0000	229	6.0300	229	14.0000	-	--	-	--
	242	2.0000	-	--	229	14.0000	-	--	-	--	228	1.0000	-	--	-	--	334	2.0000	242	2.0000	-	--	-	--
U-235	0.00001271		0.00001778		0.00001262		0.00002841		0.00002855	--		0.00001244		0.00001264		0.00001778		0.00001271		0.00001778		0.00001271		
U-238	0.00583985		0.00813693		0.00580507		0.01300695		0.01307414	--		0.00577747		0.00581843		0.00813693		0.00583985		0.00813693		0.00583985		
PU-239	0.00088769		--		0.00087647		--		--	--		0.00087193		0.00089047		--		0.00088769		--		0.00088769		
PU-240	0.00011749		--		0.00011573		--		--	--		0.00011494		0.00011804		--		0.00011749		--		0.00011749		
PU-241	0.00000748		--		0.00000720		--		--	--		0.00000722		0.00000659		--		0.00000748		--		0.00000748		
PU-242	0.00000246		--		0.00000236		--		--	--		0.00000246		0.00000205		--		0.00000246		--		0.00000246		
AM-241	0.00001075		--		0.00001039		--		--	--		0.00001036		0.00001045		--		0.00001075		--		0.00001075		
NI	0.00144504		0.00103322		0.00145534		0.00089623		0.00117952	0.00631570		0.00116273		0.00117074		0.00111662		0.00142079		0.00103322		0.00142079		
CR	0.00333603		0.00239506		0.00335631		0.00208261		0.00275680	0.01452597		0.00265413		0.00267562		0.00255775		0.00328660		0.00239506		0.00328660		
FE	0.01522973		0.01189815		0.01530057		0.00743939		0.00983911	0.05180793		0.01278895		0.01288434		0.01246310		0.01505597		0.01189815		0.01505597		
MO	0.00024496		0.00001288		0.00024193		0.00001472		0.00001839	0.00003244		0.00023419		0.00024128		0.00001298		0.00024495		0.00001288		0.00024495		
CU	0.00008234		0.00003680		0.00008252		0.00004078		0.00010020	0.00013808		0.00003788		0.00003973		0.00003893		0.00008144		0.00003680		0.00008144		
MN	0.00028689		0.00020476		0.00028871		0.00018068		0.00024229	0.00132140		0.00022708		0.00022949		0.00021698		0.00028288		0.00020476		0.00028288		
SI	0.00018274		0.00014347		0.00018373		0.00012783		0.00015819	0.00078472		0.00014225		0.00015571		0.00015378		0.00017992		0.00014347		0.00017992		
AL	0.00000367		0.00000286		0.00000367		0.00000143		0.00000105	0.00000024		0.00000272		0.00000384		0.00032541		0.00028067		0.00000286		0.00041928		
NA	0.00640677		0.00462060		0.00640677		--		0.00181932	--		0.00933051		0.00931016		0.00664647		0.00466162		0.00462060		0.00466162		
C	0.00004484		0.00003444		0.00004484		0.00003116		0.00004309	0.00023359		0.00003471		0.00003471		0.00003604		0.00004413		0.00003444		0.00004413		
O	0.01376479		0.01369849		0.01376479		0.02179152		0.02190423	--		0.01369883		0.01376501		0.01369863		0.01376467		0.01369849		0.01376467		

Table 4.1.1-6 (19) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	804 DCF 6.03-20.04	805 SCF 0.0 - 6.03	805 SCF 6.03-20.04	806 SCF 0.0 - 6.03	806 SCF 6.03-20.04	807 DCF 0.0 - 6.03	807 DCF 6.03-20.04	808 DCF 0.0 - 6.03	808 DCF 6.03-20.04	809 SCF 0.0 - 6.03	809 SCF 6.03-20.04	810 SCF 0.0 - 6.03
ADEN NO.	14 2.0000	4 0.8572	3 1.0000	4 0.8572	3 1.0000	15 0.7500	11 1.0000	15 0.7500	11 1.0000	2 1.2000	2 2.8000	2 1.2000
& NUMBER	18 14.0000	15 0.7500	4 1.1429	15 0.7500	4 1.1429	18 6.0000	15 1.2500	18 6.0000	15 1.2500	15 0.7500	11 1.0000	15 0.7500
OF PLATE	91 2.0000	18 6.0000	11 1.0000	18 6.0000	11 1.0000	95 1.5000	18 14.0000	95 1.5000	18 14.0000	18 6.0000	15 1.2500	18 6.0000
	92 4.0000	52 4.0000	15 1.2500	52 4.0000	15 1.2500	226 1.0000	91 2.0000	226 1.0000	91 2.0000	52 4.0000	18 14.0000	52 4.0000
	227 14.0000	226 1.0000	18 14.0000	226 1.0000	18 14.0000	227 5.0350	95 2.5000	227 5.0350	95 2.5000	226 1.0000	51 2.0000	226 1.0000
	231 15.5556	227 5.0350	51 2.0000	227 5.0350	51 2.0000	231 6.7056	227 14.0000	231 6.7056	227 14.0000	227 5.0350	52 8.0000	227 5.0350
	- --	231 6.7056	52 8.0000	231 6.7056	52 8.0000	232 1.5807	231 15.5556	232 1.5807	231 15.5556	231 6.7056	227 14.0000	231 6.7056
	- --	232 1.5807	227 14.0000	232 1.5807	227 14.0000	- --	- --	- --	- --	232 1.5807	231 15.5556	232 1.5807
	- --	- --	231 15.5556	- --	231 15.5556	- --	- --	- --	- --	- --	- --	- --
	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --
	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --
	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --	- --
U-235	0.00001816	0.00001261	0.00001268	0.00001261	0.00001268	0.00001831	0.00001833	0.00001831	0.00001833	0.00001255	0.00001262	0.00001255
U-238	0.00829507	0.00579409	0.00582541	0.00579409	0.00582541	0.00834592	0.00835384	0.00834592	0.00835384	0.00576547	0.00579911	0.00576547
PU-239	0.00175294	0.00089040	0.00089319	0.00089040	0.00089319	0.00177715	0.00177319	0.00177715	0.00177319	0.00088192	0.00088706	0.00088192
PU-240	0.00023146	0.00011798	0.00011845	0.00011798	0.00011845	0.00023525	0.00023459	0.00023525	0.00023459	0.00011686	0.00011755	0.00011686
PU-241	0.00001441	0.00000623	0.00000658	0.00000623	0.00000658	0.00001484	0.00001476	0.00001484	0.00001476	0.00000603	0.00000607	0.00000603
PU-242	0.00000473	0.00000181	0.00000199	0.00000181	0.00000199	0.00000490	0.00000486	0.00000490	0.00000486	0.00000169	0.00000169	0.00000169
AM-241	0.00002077	0.00001025	0.00001068	0.00001025	0.00001068	0.00002131	0.00002120	0.00002131	0.00002120	0.00001005	0.00001011	0.00001005
NI	0.00118583	0.00103395	0.00103319	0.00103395	0.00103319	0.00116483	0.00117335	0.00116483	0.00117335	0.00104183	0.00103905	0.00104183
CR	0.00271593	0.00240932	0.00241150	0.00240932	0.00241150	0.00267126	0.00269140	0.00267126	0.00269140	0.00242513	0.00242314	0.00242513
FE	0.00966044	0.01194046	0.01197020	0.01194046	0.01197020	0.00949976	0.00957487	0.00949976	0.00957487	0.01199409	0.01200973	0.01199409
MO	0.00046030	0.00023917	0.00024077	0.00023917	0.00024077	0.00046662	0.00046541	0.00046662	0.00046541	0.00023673	0.00023771	0.00023673
CU	0.00003819	0.00003591	0.00003630	0.00003591	0.00003630	0.00003738	0.00003793	0.00003738	0.00003793	0.00003604	0.00003641	0.00003604
MN	0.00023703	0.00021061	0.00021095	0.00021061	0.00021095	0.00023285	0.00023489	0.00023285	0.00023489	0.00021198	0.00021198	0.00021198
SI	0.00015586	0.00013982	0.00014100	0.00013982	0.00014100	0.00015298	0.00015488	0.00015298	0.00015488	0.00014060	0.00014165	0.00014060
AL	0.00000386	0.00000259	0.00000273	0.00000259	0.00000273	0.00000351	0.00000377	0.00000351	0.00000377	0.00000250	0.00000256	0.00000250
NA	0.00466162	0.00466139	0.00465508	0.00466139	0.00465508	0.00466139	0.00465508	0.00466139	0.00465508	0.00466139	0.00465508	0.00466139
C	0.00003235	0.00003246	0.00003234	0.00003246	0.00003234	0.00003246	0.00003234	0.00003246	0.00003234	0.00003246	0.00003234	0.00003246
O	0.00882743	0.01368714	0.01376467	0.01368714	0.01376467	0.00877624	0.00882743	0.00877624	0.00882743	0.01368714	0.01376467	0.01368714

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Table 4.1.1-6 (20) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

— 83 —

ADEN NO. & NUMBER OF PLATE	810	811	811	812	812	813	813	814	814	815	815	816	
	SCF 6.03-20.04	IB 0.0 - 6.03	SCF 6.03-20.03	IB 0.0 - 6.03	SCF 6.03-20.03	IB 0.0 - 6.03	SCF 6.03-20.03	IB 0.0 - 6.03	SCF 6.03-20.03	IB 0.0 - 6.03	SCF 6.03-20.03	IB 0.0 - 6.03	SCF 6.03-20.03
2	2.8000	13	2.0000	14	4.0000	13	1.0000	14	2.0000	18	6.0000	18	14.0000
11	1.0000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	38	4.0000	51	1.0000
15	1.2500	38	4.0000	51	1.0000	38	4.0000	51	1.0000	52	2.0000	52	4.0000
18	14.0000	52	2.0000	52	4.0000	52	2.0000	52	4.0000	187	2.0000	94	2.0000
51	2.0000	226	1.0000	94	2.0000	187	1.0000	94	2.0000	188	4.0000	187	1.0000
52	8.0000	227	5.0300	227	14.0000	226	1.0000	188	2.0000	227	5.0300	227	14.0000
227	14.0000	228	1.0000	229	14.0000	227	5.0300	227	14.0000	228	1.0000	229	14.0000
231	15.5556	229	6.0300	-	--	228	1.0000	229	14.0000	227	5.0300	227	14.0000
-	--	-	--	-	--	229	6.0300	-	--	228	1.0000	229	14.0000
-	--	-	--	-	--	-	--	-	--	229	6.0300	-	--
-	--	-	--	-	--	-	--	-	--	-	--	-	--
-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001262	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001271	0.00001778	0.00001266	0.00001258	0.00001266
U-238	0.00579911	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00583985	0.00813693	0.00581493	0.00578341	0.00581493
PU-239	0.00088706	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00088769	--	0.00089678	0.00089678	0.00089678
PU-240	0.00011755	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011749	--	0.00011899	0.00011899	0.00011899
PU-241	0.00000607	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000748	--	0.00000640	0.00000655	0.00000640
PU-242	0.00000169	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000246	--	0.00000193	0.00000203	0.00000193
AM-241	0.00001011	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001075	--	0.00001034	0.00001056	0.00001034
NI	0.00103905	0.00103300	0.00116418	0.00103322	0.00116531	0.00103344	0.00116645	0.00103322	0.00116531	0.00115845	0.00118033	0.00115979	0.00115979
CR	0.00242314	0.00239461	0.00266256	0.00239506	0.00266478	0.00239550	0.00266700	0.00239506	0.00266478	0.00264577	0.00269480	0.00264836	0.00264836
FE	0.01200973	0.01022460	0.01115982	0.01022617	0.01116749	0.01022774	0.01117516	0.01022617	0.01116749	0.01108809	0.01127090	0.01109708	0.01109708
MO	0.00023771	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00023953	0.00001288	0.00024412	0.00023805	0.00024412
CU	0.00003641	0.00003801	0.00003994	0.00003680	0.00003874	0.00003559	0.00003755	0.00003680	0.00003874	0.00003940	0.00004013	0.00003818	0.00003818
MN	0.00021198	0.00020471	0.00022834	0.00020476	0.00022850	0.00020480	0.00022867	0.00020476	0.00022850	0.00022638	0.00023111	0.00022657	0.00022657
SI	0.00014165	0.00014342	0.00015706	0.00014347	0.00015718	0.00014351	0.00015730	0.00014347	0.00015718	0.00015533	0.00015837	0.00015550	0.00015550
AL	0.00000256	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000286	0.00000403	0.00000380	0.00000420	0.00000380	0.00000380
NA	0.00465508	0.00924119	0.00932325	0.00462060	0.00466162	--	--	0.00462060	0.00466162	0.00933051	0.00931016	0.00466526	0.00466526
C	0.00003234	0.00003490	0.00003473	0.00003444	0.00003431	0.00003398	0.00003387	0.00003444	0.00003431	0.00003471	0.00003471	0.00003428	0.00003428
O	0.01376467	0.01124133	0.01129638	0.01124100	0.01129605	0.01124067	0.01129572	0.01124100	0.01129605	0.01124135	0.01129639	0.01124101	0.01124101

Table 4.1.1-6 (21) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	816 SCF 6.03-20.03	817 SCF 0.0 - 6.03	817 SCF 6.03-20.03	818 SCF 0.0 - 6.03	818 SCF 6.03-20.03	819 SCF 0.0 - 6.03	819 SCF 6.03-20.03	820 SCF 0.0 - 6.03	820 SCF 6.03-20.03	821 IB 0.0 - 6.03	821 IB 6.03-20.03	822 IB 0.0 - 6.03
ADEN NO. & NUMBER OF PLATE	1 3.0000	5 0.7500	3 2.0000	5 0.7500	3 2.0000	15 1.5000	11 2.0000	15 0.7500	11 1.0000	15 0.7500	11 1.0000	16 3.0000
	5 0.2500	15 1.5000	5 0.2500	15 0.7500	5 0.2500	18 6.0000	15 2.5000	18 6.0000	15 1.2500	16 3.0000	15 1.2500	20 6.0000
	11 1.0000	18 6.0000	11 2.0000	18 6.0000	11 1.0000	52 2.0000	18 14.0000	52 2.0000	18 14.0000	20 6.0000	16 7.0000	37 6.0000
	15 1.2500	52 2.0000	15 2.5000	52 2.0000	15 1.2500	92 1.2000	51 1.0000	92 1.2000	51 1.0000	37 6.0000	20 14.0000	189 0.7500
	18 14.0000	226 1.0000	18 14.0000	189 0.7500	18 14.0000	226 1.0000	52 4.0000	189 0.7500	52 4.0000	226 1.0000	37 14.0000	226 1.0000
	51 1.0000	227 5.0300	51 1.0000	226 1.0000	51 1.0000	227 5.0300	92 2.8000	226 1.0000	92 2.8000	227 5.0300	227 14.0000	227 5.0300
	52 4.0000	228 1.0000	52 4.0000	227 5.0300	52 4.0000	228 1.0000	227 14.0000	227 5.0300	185 1.0000	228 1.0000	229 14.0000	228 1.0000
	185 1.0000	229 6.0300	227 14.0000	228 1.0000	185 1.0000	229 6.0300	229 14.0000	228 1.0000	189 1.2500	229 6.0300	- --	229 6.0300
	189 1.2500	- --	229 14.0000	229 6.0300	189 1.2500	- --	- --	229 6.0300	227 14.0000	- --	- --	- --
	227 14.0000	- --	- --	- --	227 14.0000	- --	- --	- --	229 14.0000	- --	- --	- --
	229 14.0000	- --	- --	- --	229 14.0000	- --	- --	- --	- --	- --	- --	- --
U-235	0.00001258	0.00001266	0.00001268	0.00001266	0.00001268	0.00001256	0.00001262	0.00001256	0.00001262	0.00002713	0.00002727	0.00002713
U-238	0.00578341	0.00581493	0.00582531	0.00581493	0.00582531	0.00578477	0.00581370	0.00578477	0.00581370	0.01242891	0.01249105	0.01242891
PU-239	0.00087959	0.00089678	0.00089162	0.00089678	0.00089162	0.00087520	0.00087958	0.00087520	0.00087958	--	--	--
PU-240	0.00011669	0.00011899	0.00011837	0.00011899	0.00011837	0.00011554	0.00011612	0.00011554	0.00011612	--	--	--
PU-241	0.00000655	0.00000640	0.00000692	0.00000640	0.00000692	0.00000718	0.00000722	0.00000718	0.00000722	--	--	--
PU-242	0.00000203	0.00000193	0.00000218	0.00000193	0.00000218	0.00000236	0.00000237	0.00000236	0.00000237	--	--	--
AM-241	0.00001056	0.00001034	0.00001106	0.00001034	0.00001106	0.00001037	0.00001042	0.00001037	0.00001042	--	--	--
NI	0.00118135	0.00115845	0.00116975	0.00115979	0.00117077	0.00116569	0.00117230	0.00116703	0.00117332	0.00088477	0.00088644	0.00088610
CR	0.00269678	0.00264577	0.00267378	0.00264836	0.00267576	0.00266008	0.00267861	0.00266266	0.00268059	0.00210538	0.00211425	0.00210796
FE	0.01127782	0.01108809	0.01119827	0.01109708	0.01120519	0.01113812	0.01121567	0.01114712	0.01122258	0.00754805	0.00758445	0.00755705
MO	0.00023805	0.00024412	0.00024215	0.00024412	0.00024215	0.00023638	0.00023725	0.00023638	0.00023725	0.00001272	0.00001247	0.00001272
CU	0.00003891	0.00003940	0.00003995	0.00003818	0.00003873	0.00003958	0.00004005	0.00003837	0.00003883	0.00003390	0.00003432	0.00003270
MN	0.00023126	0.00022638	0.00022929	0.00022657	0.00022944	0.00022754	0.00022970	0.00022773	0.00022985	0.00018313	0.00018456	0.00018332
SI	0.00015852	0.00015533	0.00015739	0.00015550	0.00015753	0.00015601	0.00015788	0.00015619	0.00015802	0.00012536	0.00012665	0.00012553
AL	0.00000420	0.00000380	0.00000421	0.00000380	0.00000421	0.00000387	0.00000397	0.00000387	0.00000397	0.00000136	0.00000141	0.00000136
NA	0.00465508	0.00933051	0.00931016	0.00466526	0.00465508	0.00933051	0.00931016	0.00466526	0.00465508	0.00466526	0.00465508	--
C	0.00003428	0.00003471	0.00003471	0.00003428	0.00003428	0.00003471	0.00003471	0.00003428	0.00003428	0.00003195	0.00003190	0.00003153
O	0.01129605	0.01124135	0.01129639	0.01124101	0.01129605	0.01124135	0.01129639	0.01124101	0.01129605	0.02027534	0.02037671	0.02027500

Table 4.1.1-6 (22) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

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ADEN NO. & NUMBER OF PLATE	822 IB 6.03-20.03		823 IB 0.0 - 6.03		823 SCF 6.03-20.03		824 IB 0.0 - 6.03		824 SCF 6.03-20.03		825 SCF 0.0 - 6.03		825 SCF 6.03-20.03		826 IB 0.0 - 6.03		826 DCF 6.03-20.03		827 IB 0.0 - 6.03		827 DCF 6.03-20.03		828 DCF 0.0 - 6.03	
	16	7.0000	13	2.0000	14	4.0000	13	2.0000	14	4.0000	15	1.5000	5	1.0000	13	2.0000	9	4.0000	13	2.0000	9	4.0000	10	1.5000
20	14.0000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	18	6.0000	11	2.0000	18	6.0000	16	7.0000	18	6.0000	16	7.0000	16	3.0000	
37	14.0000	38	4.0000	51	8.0000	38	4.0000	51	2.0000	51	6.0000	15	2.5000	38	4.0000	18	7.0000	38	4.0000	18	7.0000	18	3.0000	
185	1.0000	52	4.0000	52	4.0000	52	4.0000	52	4.0000	155	2.0000	18	14.0000	52	4.0000	34	2.0000	52	4.0000	34	2.0000	35	0.7500	
189	1.2500	226	1.0000	95	1.0000	226	1.0000	95	1.0000	226	1.0000	51	2.0000	97	6.0310	91	3.0000	97	6.0310	91	3.0000	95	0.7500	
227	14.0000	227	5.0300	155	2.0000	227	5.0300	155	2.0000	227	5.0300	52	8.0000	226	1.0000	92	2.0000	226	1.0000	92	2.0000	97	6.0310	
229	14.0000	228	1.0000	227	14.0000	228	1.0000	227	14.0000	228	1.0000	93	1.0000	227	5.0310	97	14.0000	227	5.0310	97	14.0000	155	2.0000	
-	--	229	6.0300	229	14.0000	229	6.0300	229	14.0000	229	6.0300	227	14.0000	273	1.0000	155	2.0000	273	1.0000	155	2.0000	226	1.0000	
-	--	-	--	-	--	-	--	-	--	-	--	229	14.0000	-	--	227	14.0000	-	--	227	14.0000	227	5.0310	
-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	297	5.0000	-	--	297	5.0000	273	1.0000	
-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	368	4.0000	-	--	368	4.0000	297	2.0000	
U-235	0.00002727	0.00001778	0.00001265	0.00001778	0.00001265	0.00001246	0.00001271	0.00001778	0.00001820	0.00001778	0.00001820	0.00001778	0.00001820	0.00001778	0.00001820	0.00001778	0.00001820	0.00001778	0.00001820	0.00001778	0.00001820	0.00001806	0.00001806	
U-238	0.01249105	0.00813693	0.00580859	0.00813693	0.00580859	0.00571833	0.00583801	0.00813558	0.00827556	0.00813558	0.00827556	0.00813558	0.00827556	0.00813558	0.00827556	0.00813558	0.00827556	0.00813558	0.00827556	0.00813558	0.00827556	0.00820379	0.00820379	
PU-239	--	--	0.00088054	--	0.00088054	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00011657	0.00174269	0.00174269	
PU-240	--	--	0.00011657	--	0.00011657	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00011367	0.00023026	0.00023026	
PU-241	--	--	0.00000691	--	0.00000691	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	0.00000614	
PU-242	--	--	0.00000214	--	0.00000214	0.00000214	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	0.00000215	
AM-241	--	--	0.00001006	--	0.00001006	0.00001006	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	0.00000914	
NI	0.00088746	0.00103300	0.00119064	0.00103300	0.00119064	0.00122143	0.00116634	0.00104520	0.00152877	0.00104520	0.00152877	0.00104520	0.00152877	0.00104520	0.00152877	0.00104520	0.00152877	0.00104520	0.00152877	0.00104520	0.00152877	0.00154577	0.00154577	
CR	0.00211624	0.00239461	0.00271549	0.00239461	0.00271549	0.00277157	0.00266687	0.00237473	0.00334366	0.00237473	0.00334366	0.00237473	0.00334366	0.00237473	0.00334366	0.00237473	0.00334366	0.00237473	0.00334366	0.00237473	0.00334366	0.00337013	0.00337013	
FE	0.00759136	0.01189658	0.01301720	0.01189658	0.01301720	0.01318324	0.01285421	0.01179788	0.01180058	0.01179788	0.01180058	0.01179788	0.01180058	0.01179788	0.01180058	0.01179788	0.01180058	0.01179788	0.01180058	0.01179788	0.01180058	0.01188634	0.01188634	
MO	0.00001247	0.00001288	0.00023653	0.00001288	0.00023653	0.00022997	0.00024239	0.00001504	0.00045980	0.00001504	0.00045980	0.00001504	0.00045980	0.00001504	0.00045980	0.00001504	0.00045980	0.00001504	0.00045980	0.00001504	0.00045980	0.00045980	0.00045980	
CU	0.00003311	0.00003801	0.00003925	0.00003801	0.00003925	0.00003788	0.00003991	0.00004627	0.00005482	0.00004627	0.00005482	0.00004627	0.00005482	0.00004627	0.00005482	0.00004627	0.00005482	0.00004627	0.00005482	0.00004627	0.00005482	0.00005393	0.00005393	
MN	0.00018471	0.00020471	0.00023289	0.00020471	0.00023289	0.00023710	0.00022871	0.00020211	0.00028149	0.00020211	0.00028149	0.00020211	0.00028149	0.00020211	0.00028149	0.00020211	0.00028149	0.00020211	0.00028149	0.00020211	0.00028149	0.00028280	0.00028280	
SI	0.00012679	0.00014342	0.00015153	0.00014342	0.00015153	0.00014225	0.00015729	0.00014608	0.00017974	0.00014608	0.00017974	0.00014608	0.00017974	0.00014608	0.00017974	0.00014608	0.00017974	0.00014608	0.00017974	0.00014608	0.00017974	0.00017037	0.00017037	
AL	0.00000141	0.00000286	0.00000341	0.00000286	0.00000341	0.00000341	0.00000272	0.00000405	0.00000286	0.00000405	0.00000286	0.00000405	0.00000286	0.00000405	0.00000286	0.00000405	0.00000286	0.00000405	0.00000286	0.00000405	0.00000286	0.00000458	0.00000458	
NA	--	0.00924119	0.00932325	0.00924119	0.00932325	0.00933051	0.00931016	0.00923966	0.00878877	0.00923966	0.00878877	0.00923966	0.00878877	0.00923966	0.00878877	0.00923966	0.00878877	0.00923966	0.00878877	0.00923966	0.00878877	0.00876824	0.00876824	
C	0.00003146	0.00003490	0.00003473	0.00003490	0.00003473	0.00003471	0.00003471	0.00003471	0.00003469	0.00003471	0.00003469	0.00003471	0.00003469	0.00003471	0.00003469	0.00003471	0.00003469	0.00003471	0.00003469	0.00003471	0.00003469	0.00230389	0.00230389	
O	0.02037637	0.01369881	0.01375806	0.01369881	0.01375806	0.01376500	0.01368273	0.01376501	0.01339461	0.01376501	0.01339461	0.01376501	0.01339461	0.01376501	0.01339461	0.01376501	0.01339461	0.01376501	0.01339461	0.01376501	0.01339461	0.01332577	0.01332577	

Table 4.1.1-6 (23) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

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	828 DCF 6.03-20.03		829 IB 0.0 - 6.03		829 SCF 6.03-20.03		830 IB 0.0 - 6.03		830 DCF 6.03-20.03		832 DCF 0.0 - 6.03		832 DCF 6.03-20.03		833 IB 0.0 - 6.03		833 SCF 6.03-20.03		834 IB 0.0 - 6.03		834 DCF 6.03-20.03		834 DCF 6.03-20.03	
ADEN NO. & NUMBER OF PLATE	6	2.0000	13	2.0000	14	4.0000	13	2.0000	9	4.0000	10	1.0000	6	1.0000	226	1.0000	1	2.0000	8	2.0000	9	4.0000	9	4.0000
	10	2.5000	18	6.0000	18	14.0000	18	6.0000	18	14.0000	18	4.0000	10	3.0000	227	5.0300	15	1.0000	18	6.0000	18	14.0000	18	14.0000
	16	1.0000	37	6.0000	51	2.0000	37	6.0000	34	2.0000	95	1.0000	18	14.0000	228	1.0000	18	8.0000	38	4.0000	91	2.0000	91	2.0000
	18	13.0000	52	4.0000	52	8.0000	52	4.0000	91	2.0000	97	6.0310	29	1.7143	229	6.0300	51	2.0000	52	4.0000	92	4.0000	92	4.0000
	31	1.0000	226	1.0000	94	2.0000	97	6.0310	92	4.0000	119	1.0000	93	3.3333	-	--	52	4.0000	226	1.0000	227	14.0000	227	14.0000
	35	1.2500	227	5.0300	227	14.0000	226	1.0000	97	14.0000	226	1.0000	95	1.0000	-	--	227	14.0000	227	5.0300	229	14.0000	229	14.0000
	91	1.0000	228	1.0000	229	14.0000	227	5.0310	227	14.0000	227	5.0310	97	14.0000	-	--	229	14.0000	228	1.0000	-	--	-	--
	93	1.0000	229	6.0300	-	--	273	1.0000	-	--	273	1.0000	110	6.0000	-	--	242	4.0000	229	6.0300	-	--	-	--
	95	2.2500	-	--	-	--	-	--	-	--	-	--	227	14.0000	-	--	-	--	-	--	-	--	-	--
	97	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	227	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001847	0.00001789	0.00001271	0.00001789	0.00001816	0.00001221	0.00001834	--	0.00000718	0.00001778	0.00001816	0.00001816	0.00001847	0.00001789	0.00001271	0.00001789	0.00001816	0.00001221	0.00001834	--	0.00000718	0.00001778	0.00001816	0.00001816
U-238	0.00841605	0.00811593	0.00583985	0.00811458	0.00829507	0.00556764	0.00835910	--	0.00329904	0.00813693	0.00829507	0.00829507	0.00841605	0.00811593	0.00583985	0.00811458	0.00829507	0.00556764	0.00835910	--	0.00329904	0.00813693	0.00829507	0.00829507
PU-239	0.00177652	--	0.00088769	--	0.00175294	0.00118555	0.00177472	--	0.00050056	--	0.00175294	0.00175294	0.00177652	--	0.00088769	--	0.00175294	0.00118555	0.00177472	--	0.00050056	--	0.00175294	0.00175294
PU-240	0.00023507	--	0.00011749	--	0.00023146	0.00015694	0.00023484	--	0.00006641	--	0.00023146	0.00023146	0.00023507	--	0.00011749	--	0.00023146	0.00015694	0.00023484	--	0.00006641	--	0.00023146	0.00023146
PU-241	0.00001481	--	0.00000748	--	0.00001441	0.00000990	0.00001481	--	0.00000375	--	0.00001441	0.00001441	0.00001481	--	0.00000748	--	0.00001441	0.00000990	0.00001481	--	0.00000375	--	0.00001441	0.00001441
PU-242	0.00000488	--	0.00000246	--	0.00000473	0.00000327	0.00000487	--	0.00000117	--	0.00000473	0.00000473	0.00000488	--	0.00000246	--	0.00000473	0.00000327	0.00000487	--	0.00000117	--	0.00000473	0.00000473
AM-241	0.00002127	--	0.00001075	--	0.00002077	0.00001422	0.00002128	--	0.00000605	--	0.00002077	0.00002077	0.00002127	--	0.00001075	--	0.00002077	0.00001422	0.00002128	--	0.00000605	--	0.00002077	0.00002077
NI	0.00142410	0.00103300	0.00116418	0.00104520	0.00143647	0.00121569	0.00169495	0.00074603	0.00130858	0.00099221	0.00128054	0.00128054	0.00142410	0.00103300	0.00116418	0.00104520	0.00143647	0.00121569	0.00169495	0.00074603	0.00130858	0.00099221	0.00128054	0.00128054
CR	0.00314193	0.00239461	0.00266256	0.00237473	0.00316622	0.00277178	0.00381533	0.00183461	0.00308686	0.00231504	0.00289631	0.00289631	0.00314193	0.00239461	0.00266256	0.00237473	0.00316622	0.00277178	0.00381533	0.00183461	0.00308686	0.00231504	0.00289631	0.00289631
FE	0.01109535	0.01189658	0.01283945	0.01179788	0.01118033	0.00985292	0.01347836	0.00660767	0.01294209	0.01162017	0.01028422	0.01028422	0.01109535	0.01189658	0.01283945	0.01179788	0.01118033	0.00985292	0.01347836	0.00660767	0.01294209	0.01162017	0.01028422	0.01028422
MO	0.00046937	0.00001288	0.00023953	0.00001504	0.00046328	0.00031975	0.00047805	0.00001256	0.00014547	0.00001284	0.00046032	0.00046032	0.00046937	0.00001288	0.00023953	0.00001504	0.00046328	0.00031975	0.00047805	0.00001256	0.00014547	0.00001284	0.00046032	0.00046032
CU	0.00005512	0.00003801	0.00003994	0.00004627	0.00005516	0.00004769	0.00006284	0.00002995	0.00011303	0.00003585	0.00003972	0.00003972	0.00005512	0.00003801	0.00003994	0.00004627	0.00005516	0.00004769	0.00006284	0.00002995	0.00011303	0.00003585	0.00003972	0.00003972
MN	0.00026529	0.00020471	0.00022834	0.00020211	0.00026759	0.00023705	0.00031783	0.00016292	0.00027251	0.00019877	0.00024923	0.00024923	0.00026529	0.00020471	0.00022834	0.00020211	0.00026759	0.00023705	0.00031783	0.00016292	0.00027251	0.00019877	0.00024923	0.00024923
SI	0.00018176	0.00014342	0.00015706	0.00014608	0.00018262	0.00015393	0.00019787	0.00010847	0.00017024	0.00013846	0.00016726	0.00016726	0.00018176	0.00014342	0.00015706	0.00014608	0.00018262	0.00015393	0.00019787	0.00010847	0.00017024	0.00013846	0.00016726	0.00016726
AL	0.00000609	0.00000286	0.00000403	0.00000286	0.00000617	0.00000305	0.00000584	--	0.00000160	0.00000242	0.00000493	0.00000493	0.00000609	0.00000286	0.00000403	0.00000286	0.00000617	0.00000305	0.00000584	--	0.00000160	0.00000242	0.00000493	0.00000493
NA	0.00878853	0.00924119	0.00932325	0.00923966	0.00878877	0.00281551	0.00600555	--	0.00267919	0.00405174	0.00422032	0.00422032	0.00878853	0.00924119	0.00932325	0.00923966	0.00878877	0.00281551	0.00600555	--	0.00267919	0.00405174	0.00422032	0.00422032
C	0.00231516	0.00003490	0.00003473	0.00003469	0.00231490	0.00003628	0.00092739	0.00002920	0.00004602	0.00003370	0.00003366	0.00003366	0.00231516	0.00003490	0.00003473	0.00003469	0.00231490	0.00003628	0.00092739	0.00002920	0.00004602	0.00003370	0.00003366	0.00003366
O	0.01535625	0.01369881	0.01376500	0.01369654	0.01568320	0.00585468	0.01148797	--	0.00786454	0.01369845	0.00882740	0.00882740	0.01535625	0.01369881	0.01376500	0.01369654	0.01568320	0.00585468	0.01148797	--	0.00786454	0.01369845	0.00882740	0.00882740

Table 4.1.1-6 (24) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

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	835		835		836		836		837		837		838		838		839		839		840		840	
	DCF		DCF		SCF		SCF		SCF		SCF		IB		DCF		DCF		DCF		SCF		SCF	
	0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03	
ADEN NO.	7	2.4000	7	5.6000	13	2.0000	14	4.0000	4	0.8571	3	1.0000	13	2.0000	8	4.0000	5	0.7500	1	1.0000	4	0.8571	3	1.0000
& NUMBER	18	6.0000	18	14.0000	18	6.0000	18	14.0000	15	1.5000	4	1.1429	18	6.0000	18	14.0000	7	2.4000	5	1.2500	15	1.5000	4	1.1429
OF PLATE	95	1.5000	91	2.0000	52	2.0000	51	1.0000	18	6.0000	11	2.0000	38	4.0000	33	2.0000	16	3.0000	7	5.6000	18	6.0000	11	2.0000
	226	1.0000	95	2.5000	93	1.0000	52	4.0000	52	2.0000	15	2.5000	52	4.0000	93	4.0000	18	3.0000	16	7.0000	52	2.0000	15	2.5000
	227	5.0300	227	14.0000	226	1.0000	94	2.0000	226	1.0000	18	14.0000	97	6.0310	97	14.0000	35	0.7500	18	7.0000	226	1.0000	18	14.0000
	228	1.0000	229	14.0000	227	5.0300	227	14.0000	227	5.0300	51	1.0000	226	1.0000	227	14.0000	94	0.8571	31	1.0000	227	5.0300	51	1.0000
	229	6.0300	-	--	228	1.0000	229	14.0000	228	1.0000	52	4.0000	227	5.0310	355	2.0000	97	6.0310	35	1.2500	228	1.0000	52	4.0000
	-	--	-	--	229	6.0300	-	--	229	6.0300	227	14.0000	273	1.0000	-	--	226	1.0000	93	1.0000	229	6.0300	227	14.0000
	-	--	-	--	-	--	-	--	-	--	229	14.0000	-	--	-	--	227	5.0310	94	1.1429	-	--	229	14.0000
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	273	1.0000	97	14.0000	-	--	-	--
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	227	14.0000	-	--	-	--
U-235	0.00001832	0.00001833	0.00001263	0.00001271	0.00001262	0.00001268	0.00001778	0.00001670	0.00001649	0.00001652	0.00001262	0.00001268												
U-238	0.00835284	0.00835384	0.00580100	0.00583985	0.00579860	0.00582541	0.00813558	0.00762639	0.00747380	0.00748818	0.00579860	0.00582541												
PU-239	0.00177862	0.00177319	0.00088041	0.00088769	0.00089103	0.00089319	--	0.00151682	0.00177972	0.00178052	0.00089103	0.00089319												
PU-240	0.00023544	0.00023459	0.00011648	0.00011749	0.00011806	0.00011845	--	0.00020068	0.00023585	0.00023593	0.00011806	0.00011845												
PU-241	0.00001485	0.00001476	0.00000736	0.00000748	0.00000623	0.00000658	--	0.00001267	0.00001384	0.00001391	0.00000623	0.00000658												
PU-242	0.00000490	0.00000486	0.00000241	0.00000246	0.00000181	0.00000199	--	0.00000416	0.00000438	0.00000442	0.00000181	0.00000199												
AM-241	0.00002133	0.00002120	0.00001055	0.00001075	0.00001026	0.00001068	--	0.00001818	0.00002103	0.00002114	0.00001026	0.00001068												
NI	0.00126306	0.00127368	0.00117103	0.00116418	0.00115910	0.00116776	0.00104520	0.00137136	0.00141396	0.00142938	0.00115910	0.00116776												
CR	0.00285623	0.00288268	0.00267038	0.00266256	0.00264690	0.00266967	0.00237473	0.00303842	0.00311439	0.00315230	0.00264690	0.00266967												
FE	0.01013846	0.01023654	0.01117362	0.01115982	0.01109264	0.01118449	0.01179788	0.01073636	0.01099590	0.01113083	0.01109264	0.01118449												
MO	0.00046696	0.00046545	0.00023799	0.00023953	0.00023933	0.00024085	0.00001504	0.00040356	0.00047264	0.00047228	0.00023933	0.00024085												
CU	0.00003907	0.00003964	0.00003963	0.00003994	0.00003944	0.00003993	0.00004627	0.00005311	0.00005519	0.00005525	0.00003944	0.00003993												
MN	0.00024477	0.00024791	0.00022816	0.00022834	0.00022645	0.00022896	0.00020211	0.00025650	0.00026244	0.00026613	0.00022645	0.00022896												
SI	0.00016511	0.00016696	0.00015672	0.00015706	0.00015523	0.00015723	0.00014608	0.00017531	0.00018074	0.00018208	0.00015523	0.00015723												
AL	0.00000467	0.00000490	0.00000430	0.00000403	0.00000395	0.00000414	0.00000286	0.00000570	0.00000590	0.00000622	0.00000395	0.00000414												
NA	0.00421153	0.00423258	0.00924119	0.00932325	0.00933051	0.00931016	0.00923966	0.00793434	0.00875580	0.00880104	0.00933051	0.00931016												
C	0.00003385	0.00003377	0.00003490	0.00003473	0.00003471	0.00003471	0.00003469	0.00198902	0.00230339	0.00231524	0.00003471	0.00003471												
O	0.00878349	0.00882741	0.01124133	0.01129638	0.01124135	0.01129639	0.01369654	0.01470378	0.01332578	0.01339462	0.01124135	0.01129639												

Table 4.1.1-6 (25) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

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	841 DCF		841 DCF		842 SCF		842 SCF		843 18		843 SCF		844 SCF		844 SCF		845 DCF		845 DCF		846 SCF		846 SCF	
	0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03	
ADEN NO.	2	2.2640	1	2.0000	4	0.8571	3	1.0000	13	2.0000	14	4.0000	4	0.8571	3	1.0000	8	2.0000	8	4.0000	4	0.8571	3	1.0000
& NUMBER	7	2.2640	2	3.7360	15	1.5000	4	1.1429	18	6.0000	18	14.0000	15	1.5000	4	1.1429	18	6.0000	18	14.0000	15	1.5000	4	1.1429
OF PLATE	16	2.3300	6	2.0000	18	6.0000	11	2.0000	38	4.0000	51	1.0000	18	6.0000	11	2.0000	33	1.0000	33	2.0000	18	6.0000	11	2.0000
	18	2.3300	7	3.7360	52	2.0000	15	2.5000	52	2.0000	52	4.0000	52	2.0000	15	2.5000	93	2.0000	93	4.0000	52	2.0000	15	2.5000
	32	1.1320	16	5.6700	226	1.0000	18	14.0000	226	1.0000	94	2.0000	226	1.0000	18	14.0000	97	6.0310	97	14.0000	226	1.0000	18	14.0000
	226	1.0000	17	2.0000	227	5.0300	51	1.0000	227	5.0300	227	14.0000	227	5.0300	51	1.0000	226	1.0000	227	14.0000	227	5.0300	51	1.0000
	227	5.0300	18	5.6700	228	1.0000	52	4.0000	228	1.0000	229	14.0000	228	1.0000	52	4.0000	227	5.0310	355	2.0000	228	1.0000	52	4.0000
	228	1.0000	31	1.0000	229	6.0300	227	14.0000	229	6.0300	-	--	229	6.0300	227	14.0000	273	1.0000	-	--	229	6.0300	227	14.0000
	229	6.0300	32	1.8680	-	--	229	14.0000	-	--	-	--	-	--	229	14.0000	-	--	-	--	-	--	229	14.0000
	382	1.0000	227	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
	-	--	229	14.0000	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
U-235	0.00001480	0.00001558	0.00001262	0.00001268	0.00001778	0.00001271	0.00001262	0.00001262	0.00001821	0.00001670	0.00001262	0.00001268												
U-238	0.00669999	0.00706316	0.00579860	0.00582541	0.00813693	0.00583985	0.00579860	0.00582541	0.00830206	0.00762639	0.00579860	0.00582541												
PU-239	0.00166527	0.00168416	0.00089103	0.00089319	--	0.00088769	0.00089103	0.00089319	0.00176053	0.00151682	0.00089103	0.00089319												
PU-240	0.00022067	0.00022325	0.00011806	0.00011845	--	0.00011749	0.00011806	0.00011845	0.00023292	0.00020068	0.00011806	0.00011845												
PU-241	0.00001139	0.00001185	0.00000623	0.00000658	--	0.00000748	0.00000623	0.00000658	0.00001471	0.00001267	0.00000623	0.00000658												
PU-242	0.00000319	0.00000344	0.00000181	0.00000199	--	0.00000246	0.00000181	0.00000199	0.00000483	0.00000416	0.00000181	0.00000199												
AM-241	0.00001898	0.00001953	0.00001026	0.00001068	--	0.00001075	0.00001026	0.00001068	0.00002110	0.00001818	0.00001026	0.00001068												
NI	0.00138665	0.00140206	0.00115910	0.00116776	0.00103300	0.00116418	0.00115910	0.00116776	0.00141994	0.00137136	0.00115910	0.00116776												
CR	0.00310475	0.00314110	0.00264690	0.00266967	0.00239461	0.00266256	0.00264690	0.00266967	0.00312653	0.00303842	0.00264690	0.00266967												
FE	0.01099080	0.01112212	0.01109264	0.01118449	0.01022460	0.01115982	0.01109264	0.01118449	0.01103763	0.01073636	0.01109264	0.01118449												
MO	0.00043627	0.00044191	0.00023933	0.00024085	0.00001288	0.00023953	0.00023933	0.00024085	0.00046595	0.00040356	0.00023933	0.00024085												
CU	0.00004672	0.00004742	0.00003944	0.00003993	0.00003801	0.00003994	0.00003944	0.00003993	0.00005519	0.00005311	0.00003944	0.00003993												
MN	0.00026289	0.00026655	0.00022645	0.00022896	0.00020471	0.00022834	0.00022645	0.00022896	0.00026323	0.00025650	0.00022645	0.00022896												
SI	0.00017618	0.00017871	0.00015523	0.00015723	0.00014342	0.00015706	0.00015523	0.00015723	0.00018102	0.00017531	0.00015523	0.00015723												
AL	0.00000562	0.00000597	0.00000395	0.00000414	0.00000286	0.00000403	0.00000395	0.00000414	0.00000623	0.00000570	0.00000395	0.00000414												
NA	0.00826101	0.00836470	0.00933051	0.00931016	0.00924119	0.00932325	0.00933051	0.00931016	0.00859604	0.00793434	0.00933051	0.00931016												
C	0.00217537	0.00220769	0.00003471	0.00003471	0.00003490	0.00003473	0.00003471	0.00003471	0.00230376	0.00198902	0.00003471	0.00003471												
O	0.01184890	0.01276507	0.01124135	0.01129639	0.01124133	0.01129638	0.01124135	0.01129639	0.01560258	0.01470378	0.01124135	0.01129639												

Table 4.1.1-6 (26) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

68

ADEN NO. & NUMBER OF PLATE	847 SCF		848 SCF		849 SCF		850 DCF		901 SCF		902 IB	
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
2	1.2000	2 2.8000	2 1.2000	2 2.8000	2 1.2000	2 2.8000	10 1.5000	6 2.0000	5 0.7500	1 1.0000	6 1.0000	13 0.6667
15	1.5000	11 2.0000	15 0.7500	11 1.0000	15 1.5000	11 2.0000	18 6.0000	10 2.5000	6 1.0000	5 1.2500	13 1.3333	14 3.4286
18	6.0000	15 2.5000	18 6.0000	15 1.2500	16 3.0000	15 2.5000	95 1.5000	18 14.0000	15 1.0000	11 1.0000	18 6.0000	18 14.0000
52	2.0000	18 14.0000	52 2.0000	18 14.0000	18 3.0000	16 7.0000	97 6.0310	93 4.0000	18 6.0000	15 3.0000	38 4.0000	51 2.0000
226	1.0000	51 1.0000	189 0.7500	51 1.0000	51 3.0000	18 7.0000	226 1.0000	95 0.5000	52 4.0000	18 14.0000	52 4.0000	52 8.0000
227	5.0300	52 4.0000	226 1.0000	52 4.0000	52 2.0000	52 9.3333	227 5.0310	97 14.0000	226 1.0000	51 2.0000	226 1.0000	94 2.0000
228	1.0000	227 14.0000	227 5.0300	185 1.0000	226 1.0000	227 14.0000	273 1.0000	227 14.0000	227 5.0300	52 8.0000	227 5.0300	227 14.0000
229	6.0300	229 14.0000	228 1.0000	189 1.2500	227 5.0300	229 14.0000	-	-	228 1.0000	227 14.0000	228 1.0000	229 14.0000
-	--	-	229 6.0300	227 14.0000	228 1.0000	-	-	-	229 6.0300	229 14.0000	229 6.0300	-
-	--	-	--	229 14.0000	229 6.0300	-	-	-	357 1.0000	-	357 1.0000	-
-	--	-	--	--	--	-	-	-	--	-	--	-
U-235	0.00001256	0.00001262	0.00001256	0.00001262	0.00001078	0.00001084	0.00001832	0.00001832	0.00001266	0.00001267	0.00001778	0.00001271
U-238	0.00577026	0.00579911	0.00577026	0.00579911	0.00491827	0.00494286	0.00835146	0.00835204	0.00581493	0.00582381	0.00813693	0.00583985
PU-239	0.00088265	0.00088706	0.00088265	0.00088706	0.00088265	0.00088706	0.00177833	0.00177218	0.00089678	0.00089404	--	0.00088769
PU-240	0.00011696	0.00011755	0.00011696	0.00011755	0.00011696	0.00011755	0.00023540	0.00023448	0.00011899	0.00011862	--	0.00011749
PU-241	0.00000604	0.00000607	0.00000604	0.00000607	0.00000604	0.00000607	0.00001485	0.00001481	0.00000640	0.00000647	--	0.00000748
PU-242	0.00000169	0.00000169	0.00000169	0.00000169	0.00000169	0.00000169	0.00000490	0.00000487	0.00000193	0.00000198	--	0.00000246
AM-241	0.00001006	0.00001011	0.00001006	0.00001011	0.00001006	0.00001011	0.00002133	0.00002125	0.00001034	0.00001045	--	0.00001075
NI	0.00116701	0.00117362	0.00116834	0.00117464	0.00116701	0.00117362	0.00126932	0.00128501	0.00123556	0.00116660	0.00110694	0.00116462
CR	0.00266276	0.00268130	0.00266534	0.00268328	0.00266276	0.00268130	0.00282479	0.00286287	0.00279623	0.00266754	0.00253890	0.00266342
FE	0.01114643	0.01122401	0.01115542	0.01123093	0.01281355	0.01290503	0.01000014	0.01013618	0.01328264	0.01285630	0.01239773	0.01284242
MO	0.00023691	0.00023779	0.00023691	0.00023779	0.00023691	0.00023779	0.00046904	0.00046788	0.00024411	0.00024270	0.00001287	0.00023953
CU	0.00003958	0.00004005	0.00003837	0.00003883	0.00003958	0.00004005	0.00004724	0.00004712	0.00004056	0.00003991	0.00003912	0.00003994
MN	0.00022782	0.00022998	0.00022801	0.00023013	0.00022782	0.00022998	0.00024129	0.00024502	0.00023760	0.00022888	0.00021547	0.00022840
SI	0.00015601	0.00015788	0.00015619	0.00015802	0.00015601	0.00015788	0.00016706	0.00016813	0.00016471	0.00015716	0.00015241	0.00015711
AL	0.00000387	0.00000397	0.00000387	0.00000397	0.00000387	0.00000397	0.00000458	0.00000526	0.00000456	0.00000396	0.00000358	0.00000404
NA	0.00933051	0.00931016	0.00466526	0.00465508	0.00933051	0.00931016	0.00422326	0.00422008	0.00890424	0.00934367	0.00884454	0.00931826
C	0.00003471	0.00003471	0.00003428	0.00003428	0.00003471	0.00003471	0.00003350	0.00003368	0.00003541	0.00003468	0.00003554	0.00003474
O	0.01124135	0.01129639	0.01124101	0.01129605	0.01141358	0.01147872	0.00878202	0.00882739	0.01369880	0.01376501	0.01369879	0.01376500

Table 4.1.1-6 (27) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

-06-

	903		904		905		906		907		908	
	IB	DCF	SCF	SCF	IB	SCF	IB	DCF	SCF	SCF	SCF	SCF
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
ADEN NO.	8 1.0000	9 4.0000	5 0.7500	1 1.0000	6 1.5000	6 3.5000	8 1.0000	9 2.0000	4 0.8571	3 1.0000	5 0.7500	3 2.0000
& NUMBER	13 1.0000	18 14.0000	6 1.5000	5 1.2500	13 1.0000	14 2.0000	13 1.0000	18 14.0000	6 1.0000	4 1.1429	6 1.0000	5 0.2500
OF PLATE	18 6.0000	34 2.0000	15 0.7500	6 3.5000	18 6.0000	18 14.0000	18 6.0000	34 2.0000	11 0.5000	6 1.0000	11 0.5000	6 1.0000
	38 4.0000	91 2.0000	18 6.0000	11 1.0000	38 4.0000	51 2.0000	38 4.0000	91 2.0000	15 0.7500	11 1.5000	15 0.7500	11 1.5000
	52 4.0000	92 4.0000	52 4.0000	15 1.2500	52 4.0000	52 8.0000	52 4.0000	92 4.0000	18 6.0000	18 2.2500	18 6.0000	15 2.2500
	97 6.0310	97 14.0000	226 1.0000	18 14.0000	226 1.0000	94 2.0000	97 6.0310	97 14.0000	52 4.0000	18 14.0000	52 4.0000	18 14.0000
	226 1.0000	227 14.0000	227 5.0300	51 2.0000	227 5.0300	227 14.0000	226 1.0000	227 14.0000	226 1.0000	51 2.0000	226 1.0000	51 2.0000
	227 5.0310	- --	228 1.0000	52 8.0000	228 1.0000	229 14.0000	227 5.0310	357 3.5000	52 8.0000	227 5.0300	227 5.0300	52 8.0000
	273 1.0000	- --	229 6.0300	227 14.0000	229 6.0300	357 3.5000	273 1.0000	- --	228 1.0000	227 14.0000	228 1.0000	227 14.0000
	355 1.0000	- --	357 1.5000	229 14.0000	357 1.5000	- --	357 1.5000	- --	229 6.0300	229 14.0000	229 6.0300	229 14.0000
	357 1.0000	- --	- --	357 3.5000	- --	- --	- --	- --	357 1.0000	357 1.0000	357 1.0000	357 1.0000
U-235	0.00001778	0.00001816	0.00001266	0.00001267	0.00001778	0.00001271	0.00001778	0.00001816	0.00001262	0.00001268	0.00001266	0.00001268
U-238	0.00813558	0.00829507	0.00581493	0.00582381	0.00813693	0.00583985	0.00813558	0.00829507	0.00579860	0.00582541	0.00581493	0.00582531
PU-239	--	0.00175294	0.00089678	0.00089404	--	0.00088769	--	0.00175294	0.00089103	0.00089319	0.00089678	0.00089162
PU-240	--	0.00023146	0.00011899	0.00011862	--	0.00011749	--	0.00023146	0.00011806	0.00011845	0.00011899	0.00011837
PU-241	--	0.00001441	0.00000640	0.00000647	--	0.00000748	--	0.00001441	0.00000623	0.00000658	0.00000640	0.00000692
PU-242	--	0.00000473	0.00000193	0.00000198	--	0.00000246	--	0.00000473	0.00000181	0.00000199	0.00000193	0.00000218
AM-241	--	0.00002077	0.00001034	0.00001045	--	0.00001075	--	0.00002077	0.00001026	0.00001068	0.00001034	0.00001106
NI	0.00115710	0.00143647	0.00127412	0.00128284	0.00114392	0.00127717	0.00115186	0.00144130	0.00124031	0.00119921	0.00123965	0.00120119
CR	0.00259575	0.00316622	0.00287146	0.00289435	0.00261106	0.00288305	0.00258287	0.00317559	0.00280534	0.00273103	0.00280421	0.00273514
FE	0.01256197	0.01118033	0.01354393	0.01364409	0.01264835	0.01360527	0.01252080	0.01121293	0.01331493	0.01307726	0.013331038	0.01309104
MO	0.00001528	0.00046328	0.00024410	0.00024268	0.00001286	0.00023951	0.00001502	0.00046314	0.00023932	0.00024084	0.00024411	0.00024214
CU	0.00004772	0.00005516	0.00004115	0.00004167	0.00003970	0.00004166	0.00004790	0.00005490	0.00004065	0.00004042	0.00004060	0.00004043
MN	0.00021837	0.00026759	0.00024321	0.00024580	0.00022085	0.00024478	0.00021764	0.00026829	0.00023826	0.00023353	0.00023819	0.00023387
SI	0.00015846	0.00018262	0.00016940	0.00017130	0.00015691	0.00017079	0.00015908	0.00018321	0.00016510	0.00016106	0.00016520	0.00016121
AL	0.00000383	0.00000617	0.00000494	0.00000511	0.00000394	0.00000515	0.00000386	0.00000616	0.00000476	0.00000445	0.00000461	0.00000451
NA	0.00856319	0.00878877	0.00869110	0.00870106	0.00864644	0.00870760	0.00860244	0.00864580	0.00886535	0.00914331	0.00886535	0.00914331
C	0.00003510	0.00231490	0.00003575	0.00003572	0.00003585	0.00003573	0.00003553	0.00231407	0.00003545	0.00003499	0.00003545	0.00003499
O	0.01369649	0.01568320	0.01369879	0.01376496	0.01369878	0.01376496	0.01369650	0.01568319	0.01369880	0.01376500	0.01369880	0.01376500

Table 4.1.1-6 (28) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

-16-

ADEN NO. & NUMBER OF PLATE	909 SCF		909 SCF		910 SCF		910 SCF		911 IB		911 SCF		912 DCF		912 DCF		913 DCF		913 DCF		914 IB		914 DCF	
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
5	0.7500	1	3.0000	2	1.2000	2	2.8000	6	1.0000	6	1.0000	6	0.5000	6	1.5000	6	0.5000	6	1.5000	6	0.5000	6	2.5000	
6	1.0000	5	0.2500	6	1.0000	6	1.0000	11	0.5000	11	0.5000	10	0.7500	10	2.2500	10	0.7500	10	2.2500	8	1.0000	9	2.0000	
11	0.5000	6	1.0000	11	0.5000	11	1.5000	13	1.0000	14	3.1429	18	6.0000	18	14.0000	18	6.0000	18	14.0000	13	1.0000	18	14.0000	
15	0.7500	11	1.5000	15	0.7500	15	2.2500	18	6.0000	18	14.0000	35	0.7500	31	1.0000	35	0.7500	31	1.0000	18	6.0000	34	2.0000	
18	6.0000	15	2.2500	18	6.0000	18	14.0000	38	4.0000	51	2.0000	95	1.5000	35	1.2500	95	1.5000	35	1.2500	38	4.0000	91	2.0000	
52	4.0000	18	14.0000	52	4.0000	51	2.0000	52	4.0000	52	8.0000	97	6.0310	91	2.0000	97	6.0310	93	4.0000	52	4.0000	92	4.0000	
226	1.0000	51	2.0000	226	1.0000	52	8.0000	226	1.0000	94	2.0000	226	1.0000	95	2.5000	226	1.0000	95	0.5000	97	6.0310	97	14.0000	
227	5.0300	52	8.0000	227	5.0300	227	14.0000	227	5.0300	227	14.0000	227	5.0310	97	14.0000	227	5.0310	97	14.0000	226	1.0000	227	14.0000	
228	1.0000	227	14.0000	228	1.0000	229	14.0000	228	1.0000	229	14.0000	273	1.0000	227	14.0000	273	1.0000	227	14.0000	227	5.0310	357	1.0000	
229	6.0300	229	14.0000	229	6.0300	357	1.0000	229	6.0300	357	1.0000	357	1.0000	357	1.0000	357	1.0000	357	1.0000	273	1.0000	-	--	
357	1.0000	357	1.0000	357	1.0000	-	--	357	1.0000	-	--	-	--	-	--	-	--	-	--	-	--	357	1.0000	
U-235	0.00001266	0.00001258	0.00001256	0.00001262	0.00001778	0.00001271	0.00001832	0.00001833	0.00001832	0.00001832	0.00001832	0.00001778	0.00001816											
U-238	0.00581493	0.00578341	0.00577026	0.00579911	0.00813693	0.00583985	0.00835146	0.00835383	0.00835146	0.00835204	0.00813558	0.00829507												
PU-239	0.00089678	0.00087959	0.00088265	0.00088706	--	0.00088769	0.00177833	0.00177319	0.00177833	0.00177218	--	0.00175294												
PU-240	0.00011899	0.00011669	0.00011696	0.00011755	--	0.00011749	0.00023540	0.00023459	0.00023540	0.00023448	--	0.00023146												
PU-241	0.00000640	0.00000655	0.00000604	0.00000607	--	0.00000748	0.00001485	0.00001476	0.00001485	0.00001481	--	0.00001441												
PU-242	0.00000193	0.00000203	0.00000169	0.00000169	--	0.00000246	0.00000490	0.00000486	0.00000490	0.00000487	--	0.00000473												
AM-241	0.00001034	0.00001056	0.00001006	0.00001011	--	0.00001075	0.00002133	0.00002120	0.00002133	0.00002125	--	0.00002077												
NI	0.00123965	0.00121178	0.00124821	0.00120507	0.00110945	0.00119777	0.00140997	0.00142802	0.00140997	0.00142557	0.00115194	0.00144147												
CR	0.00280421	0.00275617	0.00282120	0.00274266	0.00254382	0.00272810	0.00310670	0.00314955	0.00310670	0.00314485	0.00258304	0.00317596												
FE	0.01331038	0.01316367	0.01336872	0.01311679	0.01241480	0.01306709	0.01096915	0.01112220	0.01096915	0.01110511	0.01252139	0.01121420												
MO	0.00024411	0.00023804	0.00023691	0.00023778	0.00001288	0.00023953	0.00046965	0.00046840	0.00046965	0.00046858	0.00001507	0.00046324												
CU	0.00004060	0.00004061	0.00004079	0.00004053	0.00003915	0.00004044	0.00005488	0.00005507	0.00005488	0.00005507	0.00004801	0.00005513												
MN	0.00023819	0.00023569	0.00023963	0.00023456	0.00021584	0.00023323	0.00026170	0.00026602	0.00026170	0.00026542	0.00021766	0.00026831												
SI	0.00016520	0.00016220	0.00016589	0.00016171	0.00015271	0.00016114	0.00018072	0.00018214	0.00018072	0.00018175	0.00015908	0.00018321												
AL	0.00000461	0.00000451	0.00000468	0.00000428	0.00000360	0.00000437	0.00000568	0.00000602	0.00000568	0.00000644	0.00000388	0.00000621												
NA	0.00886535	0.00914331	0.00886535	0.00914331	0.00882069	0.00913455	0.00865069	0.00875040	0.00865069	0.00875040	0.00863945	0.00872551												
C	0.00003545	0.00003499	0.00003545	0.00003499	0.00003554	0.00003503	0.00230274	0.00231491	0.00230274	0.00231491	0.00003584	0.00231473												
O	0.01369880	0.01376500	0.01369880	0.01376500	0.01369879	0.01376499	0.01560259	0.01568319	0.01560259	0.01568319	0.01369650	0.01568319												

Table 4.1.1-6 (29) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	915		916		917	
	IB	IB	SCF	SCF	IB	DCF
	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03	0.0 - 6.03	6.03-20.03
ADEN NO.	6	6	5	1	6	6
& NUMBER	0.5000	0.5000	0.7500	1.0000	5.0000	7.0000
OF PLATE	10	10	6	5	18	8
	0.7500	3.2500	4.0000	1.2500	6.0000	2.0000
	18	18	15	15	4.0000	18
	3.0000	7.0000	0.5000	3.5000	38	14.0000
	20	20	18	18	4.0000	35
	6.0000	14.0000	6.0000	14.0000	52	1.0000
	37	37	52	51	6.0310	91
	6.0000	14.0000	4.0000	2.0000	97	2.0000
	226	227	226	52	1.0000	92
	1.0000	14.0000	1.0000	8.0000	226	4.0000
	227	229	227	227	5.0310	97
	5.0300	14.0000	5.0300	14.0000	227	14.0000
	228	-	228	229	1.0000	227
	1.0000	--	1.0000	14.0000	273	14.0000
	229	-	229	-	2.0000	-
	6.0300	--	6.0300	--	-	--
	357	-	-	-	-	-
	1.0000	--	-	-	-	--
	-	-	-	-	-	-
	--	--	--	--	--	--

U-235	0.00002891	0.00002905	0.00001266	0.00001267	0.00001778	0.00001816
U-238	0.01328089	0.01334730	0.00581493	0.00582381	0.00813558	0.00829507
PU-239	--	--	0.00089678	0.00089404	--	0.00175294
PU-240	--	--	0.00011899	0.00011862	--	0.00023146
PU-241	--	--	0.00000640	0.00000647	--	0.00001441
PU-242	--	--	0.00000193	0.00000198	--	0.00000473
AM-241	--	--	0.00001034	0.00001045	--	0.00002077
NI	0.00099545	0.00098996	0.00131298	0.00116307	0.00127776	0.00149148
CR	0.00232135	0.00231626	0.00294738	0.00266066	0.00283401	0.00327020
FE	0.00829816	0.00828599	0.01380758	0.01283240	0.01338587	0.01154627
MO	0.00001275	0.00001259	0.00024428	0.00024269	0.00001570	0.00046312
CU	0.00003573	0.00003629	0.00004215	0.00003987	0.00004967	0.00005446
MN	0.00019923	0.00019962	0.00024886	0.00022837	0.00023590	0.00027561
SI	0.00013885	0.00013927	0.00017409	0.00015673	0.00017181	0.00019078
AL	0.00000246	0.00000246	0.00000542	0.00000392	0.00000506	0.00000671
NA	0.00410640	0.00423883	0.00862602	0.00937717	0.00811989	0.00851325
C	0.00003321	0.00003364	0.00003731	0.00003464	0.00003693	0.00133946
O	0.02255250	0.02266526	0.01369877	0.01376502	0.01369645	0.01274511

Table 4.1.1-6 (31) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

76-

	625 CRP	626 CRP	626 CRP	627 CRP	628 CRP	629 CRP	629 CRP	630 CRP	631 CRP	632 CRP	633 CRP	634 CRP
	0.0 -12.03	0.0 - 4.03	4.03-36.16	0.0 - 8.03	0.0 -36.16	0.0 - 4.03	4.03-36.16	0.0 -32.03	0.0 -28.03	0.0 -24.03	0.0 -20.03	0.0 - 4.03
ADEN NO.	97 12.0310	97 4.0310	97 32.1245	97 8.0310	97 36.1555	97 4.0310	97 32.1245	97 32.0310	97 28.0310	97 24.0310	97 20.0310	97 4.0310
& NUMBER	139 12.0000	226 1.0000	99 1.0000	139 8.0000	99 1.0000	139 4.0000	99 1.0000	139 32.0000	139 28.0000	139 24.0000	139 20.0000	139 4.0000
OF PLATE	226 1.0000	227 3.0310	108 1.0000	226 1.0000	108 1.0000	226 1.0000	108 1.0000	226 1.0000	226 1.0000	226 1.0000	226 1.0000	226 1.0000
	227 11.0310	265 4.0000	139 32.0000	227 7.0310	139 36.0000	227 3.0310	227 32.1245	227 31.0310	227 27.0310	227 23.0310	227 19.0310	227 3.0310
	263 1.0000	273 1.0000	227 32.1245	263 1.0000	226 1.0000	263 1.0000	265 32.0000	273 1.0000	273 1.0000	273 1.0000	273 1.0000	273 1.0000
	-	-	-	-	227 35.1555	-	-	-	-	-	-	-
	-	-	-	-	273 1.0000	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
U-235	--	--	--	--	--	--	--	--	--	--	--	--
U-238	--	--	--	--	--	--	--	--	--	--	--	--
PU-239	--	--	--	--	--	--	--	--	--	--	--	--
PU-240	--	--	--	--	--	--	--	--	--	--	--	--
PU-241	--	--	--	--	--	--	--	--	--	--	--	--
PU-242	--	--	--	--	--	--	--	--	--	--	--	--
AM-241	--	--	--	--	--	--	--	--	--	--	--	--
NI	0.00133988	0.00136256	0.00135125	0.00133660	0.00134988	0.00132682	0.00137498	0.00134551	0.00134537	0.00134519	0.00134494	0.00133893
CR	0.00295281	0.00302347	0.00298205	0.00294405	0.00297791	0.00291788	0.00306093	0.00296720	0.00296675	0.00296613	0.00296528	0.00294490
FE	0.01051718	0.01065856	0.01066540	0.01048542	0.01064540	0.01039064	0.01083860	0.01056899	0.01056729	0.01056502	0.01056184	0.01048602
MO	0.00001696	0.00001801	0.00001715	0.00001694	0.00001716	0.00001688	0.00001796	0.00001703	0.00001703	0.00001704	0.00001704	0.00001721
CU	0.00004273	0.00005044	0.00004320	0.00004271	0.00004320	0.00004263	0.00005041	0.00004283	0.00004284	0.00004285	0.00004286	0.00004325
MN	0.00024520	0.00024655	0.00024783	0.00024443	0.00024737	0.00024213	0.00025064	0.00024637	0.00024631	0.00024624	0.00024614	0.00024374
SI	0.00022091	0.00016875	0.00022248	0.00022046	0.00022231	0.00021911	0.00017013	0.00022170	0.00022169	0.00022166	0.00022163	0.00022090
AL	0.00000287	0.00000571	0.00000287	0.00000287	0.00000287	0.00000286	0.00000573	0.00000288	0.00000288	0.00000288	0.00000287	0.00000286
NA	--	0.01819600	--	--	--	--	0.01826595	--	--	--	--	--
C	0.01866586	0.00003066	0.01864402	0.01864177	0.01863580	0.01856988	0.00003305	0.01869611	0.01869352	0.01869008	0.01868526	0.01857036
O	--	0.00000130	--	--	--	--	0.00000131	--	--	--	--	--

Table 4.1.1-6 (32) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

- 96 -

	634 CRP 4.03-36.16	635 CRP 0.0 -36.16	636 CRP 0.0 - 8.03	637 CRP 0.0 -12.03	638 CRP 0.0 -16.03	851 SCF 0.0 - 6.03	851 SCF 6.03-20.03
ADEN NO. & NUMBER OF PLATE	97 32.1245	97 36.1555	97 8.0310	97 12.0310	97 16.0310	2 1.2000	2 2.8000
	99 1.0000	99 1.0000	139 8.0000	139 12.0000	139 16.0000	15 1.5000	11 2.0000
	108 1.0000	108 1.0000	226 1.0000	226 1.0000	226 1.0000	18 6.0000	15 2.5000
	227 32.1245	226 1.0000	227 7.0310	227 11.0310	227 15.0310	52 4.0000	18 14.0000
	265 32.0000	227 35.1555	273 1.0000	273 1.0000	273 1.0000	226 1.0000	51 2.0000
	- -	263 1.0000	- -	- -	- -	227 5.0300	52 8.0000
	- -	265 36.0000	- -	- -	- -	228 1.0000	227 14.0000
	- -	- -	- -	- -	- -	229 6.0300	229 14.0000
	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -
	- -	- -	- -	- -	- -	- -	- -
U-235	- -	- -	- -	- -	- -	0.00001256	0.00001262
U-238	- -	- -	- -	- -	- -	0.00577026	0.00579911
PU-239	- -	- -	- -	- -	- -	0.00088265	0.00088706
PU-240	- -	- -	- -	- -	- -	0.00011696	0.00011754
PU-241	- -	- -	- -	- -	- -	0.00000598	0.00000601
PU-242	- -	- -	- -	- -	- -	0.00000169	0.00000169
AM-241	- -	- -	- -	- -	- -	0.00001011	0.00001016
NI	0.00137498	0.00137224	0.00134268	0.00134393	0.00134456	0.00116701	0.00117362
CR	0.00306093	0.00305374	0.00295761	0.00296187	0.00296400	0.00266276	0.00268130
FE	0.01083860	0.01080789	0.01053330	0.01054914	0.01055707	0.01281840	0.01290365
MO	0.00001796	0.00001793	0.00001710	0.00001707	0.00001705	0.00023691	0.00023779
CU	0.00005041	0.00005033	0.00004301	0.00004293	0.00004290	0.00003958	0.00004005
MN	0.00025064	0.00025001	0.00024524	0.00024574	0.00024599	0.00022782	0.00022998
SI	0.00017013	0.00016978	0.00022136	0.00022151	0.00022159	0.00015601	0.00015788
AL	0.00000573	0.00000573	0.00000287	0.00000287	0.00000287	0.00000387	0.00000397
NA	0.01826595	0.01825815	- -	- -	- -	0.00933051	0.00931016
C	0.00003305	0.00003273	0.01864201	0.01866602	0.01867804	0.00003471	0.00003471
O	0.00000131	0.00000131	- -	- -	- -	0.01369883	0.01376501

Table 4.1.1-6 (35) ZPPR 17 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

-86-

	639		639		640		640	
	CRP		CRP		CRP		CRP	
	0.0 - 6.03		6.03-20.03		0.0 - 6.03		6.03-20.03	
ADEN NO.	97	6.0310	97	14.0000	97	6.0310	97	14.0000
& NUMBER	143	1.5000	140	2.0000	143	1.5000	140	2.0000
OF PLATE	164	4.0000	141	2.0000	164	4.0000	142	2.0000
	226	1.0000	142	2.0000	226	1.0000	143	0.5000
	227	5.0310	143	0.5000	227	5.0310	163	2.0000
	273	1.0000	164	2.0000	273	1.0000	164	2.0000
	-	--	165	4.0000	-	--	165	2.0000
	-	--	166	2.0000	-	--	166	6.0000
	-	--	227	14.0000	-	--	227	14.0000
	-	--	-	--	-	--	-	--
	-	--	-	--	-	--	-	--
U-235	--	--	--	--	--	--	--	--
U-238	--	--	--	--	--	--	--	--
PU-239	--	--	--	--	--	--	--	--
PU-240	--	--	--	--	--	--	--	--
PU-241	--	--	--	--	--	--	--	--
PU-242	--	--	--	--	--	--	--	--
AM-241	--	--	--	--	--	--	--	--
NI	0.00103274		0.00116206		0.00103274		0.00104165	
CR	0.00235065		0.00261046		0.00235065		0.00237547	
FE	0.00846490		0.00936813		0.00846490		0.00858380	
MO	0.00001573		0.00001622		0.00001573		0.00001576	
CU	0.00004229		0.00004877		0.00004229		0.00005601	
MN	0.00020043		0.00022038		0.00020043		0.00020281	
SI	0.00025216		0.00022350		0.00025216		0.00021876	
AL	0.00000215		0.00000278		0.00000215		0.00000195	
NA	--		--		--		--	
C	0.02037487		0.01978541		0.02037487		0.02047694	
O	0.00013525		0.00005341		0.00013525		0.00008254	

Table 4.1.1-7 Drawer Masters in ZPPR-17A

Zone	Master	Description ^a
Core Without	101	Fuel-SC
Internal Blanket (Outer Core)	102	Fuel-SC
	103	Fuel-SC
	104	Fuel-SC
	105	Fuel-SC
	106	Fuel-SC
	109	Fuel-SC-Symmetry retaining
	110	Fuel-SC-Symmetry retaining
	111	Fuel-SC-Symmetry retaining
	112	Fuel-SC-Symmetry retaining
	202	Fuel-DC
203	Fuel-DC	
207	Fuel-DC	
701	Fuel-SC-FC	
702	Fuel-SC-FC	
703	Fuel-SC-FC	
705	Fuel-SC-FC	
706	Fuel-SC-FC	
711	Fuel-SC-Thermocouple	
714	Fuel-SC-FC-Symmetry retaining	
715	Fuel-SC-FC-Symmetry retaining	
805	Fuel-SC-PSR	
806	Fuel-SC-PSR	
807	Fuel-DC-PSR	
808	Fuel-DC-PSR	
809	Fuel-SC-PSR	
810	Fuel-SC-PSR	

Table 4.1.1-7 (contd)

Zone	Master	Description ^a
Core With Internal Blanket (Inner Core)	107	Fuel-SC
	108	Fuel-SC
	205	Fuel-DC
	707	Fuel-SC-FC
	708	Fuel-SC-FC
	712	Fuel-SC-Axially distributed FC
	713	Fuel-SC-Axially distributed FC
	801	Fuel-SC-PSR
	802	Fuel-SC-PSR
	803	Fuel-DC-PSR
804	Fuel-DC-PSR	
Radial Blanket	501	DU
	502	DU
	709	DU-FC
Radial Reflector	402	Stainless Steel
	403	Stainless Steel
	404	Stainless Steel
	405	Stainless Steel
	710	Stainless Steel

^aSC is single fuel column, DC is double fuel column, FC is fission chamber, PSR is adjacent to poison safety rod, DU is depleted uranium.

Table 4.1.1-8 Experimental and Calculated k-effective Results for ZPPR-17A

	<u>Critical Reference</u>	<u>Subcritical Reference</u>
Date	02/23/87	02/26/87
Reactor Run Number	22	25
Temperature, K	300.3	300.47
Interface Gap, GIU ^a	-44.2	-44.3
Measured Excess Reactivity, ϕ	+7.1 ± 0.1	-25.86 ± 0.21
Adjustment to 293K, ϕ ^b	+7.88 ± 0.80	+8.07 ± 0.82
Adjustment to 44.2 GIU ^c , ϕ	---	+0.34 ± 0.04
Adjustment to 02/23/87, ϕ	---	+0.072 ± 0.007
Adjusted Reactivity, ϕ	+15.0 ± 0.8 ϕ	-17.38 ± 0.85
Experimental K-effective (E) ^d	1.000508 ± 0.000027	0.999412 ± 0.000029
Calculation, 21G XYZ NDT (C)	0.987075	0.985888
C/E for k-effective	0.986574	0.986468

^aGIU = Gap interface unit (approximately 1 mil) on a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.08 \pm 0.11\phi K^{-1}$.

^cUsing measured gap coefficient $-0.18 \pm 0.02\phi GIU^{-1}$.

^dUsing calculated ²⁴¹Pu decay coefficient $-0.02386\phi day^{-1}$.

^eUsing calculated β -effective 0.003385.

Table 4.1.1-9 Drawer Loading Summary for the
ZPPR-17B Critical Reference

<u>Inner Core - Drawers with Internal Blanket</u>	
Drawers with one column of fuel (Includes 23 drawers with fission chambers and 8 narrow drawers adjacent to PSRs)	888
Drawers with two columns of fuel (Includes 8 narrow drawers adjacent to PSRs)	584
<u>Outer Core</u>	
Drawers with one column of fuel (Includes 28 drawers with fission chambers, two drawers with thermocouples, and 16 narrow drawers adjacent to PSRs)	1128
Drawers with two columns of fuel (Includes 8 narrow drawers adjacent to PSRs)	760
<u>Control Rod Position Drawers</u>	
Drawers filled with sodium cans	200
<u>Radial Blanket</u>	
Radial blanket drawers (Includes 13 drawers with fission chambers)	1752
<u>Radial Reflector</u>	
Stainless-steel-filled reflector drawers (Includes one drawer with fission chamber)	1272

Table 4.1.1-10 Mass Summary for Various Regions in the
ZPPR-17B Critical Reference

Material	Mass, kg ^b					
	Inner Core	Outer Core	Internal Blanket	Radial Blanket	Axial Blanket	CRP
Total Pu	892.778	1656.825	---	---	---	---
Fissile Pu	787.030	1460.446	---	---	---	---
Total Fissile	796.303	1477.526	4.775	47.500	21.066	---
²³⁸ Pu	0.439	0.718	---	---	---	---
²³⁹ Pu	780.554	1448.947	---	---	---	---
²⁴⁰ Pu	103.600	192.665	---	---	---	---
²⁴¹ Pu ^a	6.477	11.499	---	---	---	---
²⁴² Pu	1.708	2.996	---	---	---	---
Americium ^a	9.473	17.498	---	---	---	---
²³⁵ U	9.272	17.080	4.775	47.500	20.066	---
²³⁸ U	4302.801	7918.418	2213.234	22109.920	9237.605	---
Total Heavy Metal	5214.320	9609.824	2218.009	22157.420	9257.672	---
O	614.954	1128.316	250.428	2515.876	671.492	0.020
Na	549.835	1004.801	239.571	678.242	1001.392	391.486
Mo	83.566	155.169	1.505	8.932	16.027	1.564
Steel ^c	2438.270	4453.914	980.128	4557.519	5552.960	776.287

^aMasses for all isotopes decayed to the date 5/11/87.

^bMasses are based on the average masses for plate types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe and Ni.

Table 4.1.1-11 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 178 CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE	INNER BLANKET	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	893.106	1657.369	---	---	---
FISSILE PU	787.035	1460.403	---	---	---
TOTAL FISSILE	796.532	1477.899	4.774	47.496	21.259
PU-239	780.499	1448.799	---	---	---
PU-240	103.638	192.729	---	---	---
PU-241	6.536	11.604	---	---	---
PU-242	2.433	4.238	---	---	---
AM-241	9.415	17.396	---	---	---
U-235	9.497	17.497	4.774	47.496	21.259
U-238	4302.461	7917.578	2212.899	22107.937	9786.648
TOTAL HEAVY METAL	5205.062	9592.441	2217.674	22155.434	9807.906
O	614.912	1128.213	250.392	2515.682	711.407
NA	549.797	1004.705	239.537	678.188	1060.915
MO	83.560	155.153	1.505	8.931	16.980
STEEL	2438.035	4453.359	980.211	4557.543	5878.715

Table 4.1.1-12 (1) ZPPR Assembly 17B: Atom Densities by Zone

Isotope	Central Blanket SFC 0-6	Central Blanket DFC 0-6	Inner Core SFC 6-20	Inner Core DFC 6-20	Axial Blanket 20-31	Reflector Iron Block 31-36
C	0.0000333	0.0000342	0.0000331	0.0022822	0.0000532	0.0005884
O	0.0136987	0.0136964	0.0137650	0.0155893	0.0088213	- -
Na	0.0091995	0.0091764	0.0092812	0.0087323	0.0092077	- -
Si	0.0001434	0.0001498	0.0001570	0.0001822	0.0001926	0.0001231
Al	0.0000029	0.0000029	0.0000040	0.0000062	0.0000029	- -
Mn	0.0002047	0.0002081	0.0002282	0.0002672	0.0003414	0.0006786
Cr	0.0023943	0.0024413	0.0026606	0.0031600	0.0041603	0.0020566
Fe	0.0118957	0.0120382	0.0128326	0.0111595	0.0147764	0.0757381
Ni	0.0010326	0.0010714	0.0011632	0.0014331	0.0017666	0.0008383
Cu	0.0000274	0.0000329	0.0000294	0.0000365	0.0000448	0.0000277
Mo	0.0000129	0.0000155	0.0002394	0.0004633	0.0000350	0.0000139
U5	0.0000178	0.0000178	0.0000127	0.0000182	0.0000179	- -
U8	0.0081368	0.0081355	0.0058392	0.0082951	0.0081562	- -
P8	- -	- -	0.0000005	0.0000010	- -	- -
P9	- -	- -	0.0008875	0.0017529	- -	- -
P0	- -	- -	0.0001175	0.0002314	- -	- -
P1	- -	- -	0.0000073	0.0000140	- -	- -
P2	- -	- -	0.0000019	0.0000037	- -	- -
A1	- -	- -	0.0000109	0.0000211	- -	- -
P	0.0000053	0.0000049	0.0000053	0.0000047	0.0000101	0.0000235
S	0.0000010	0.0000013	0.0000010	0.0000016	0.0000081	0.0000313
Cl	0.0000003	0.0000003	0.0000003	0.0000060	0.0000003	- -
Ca	0.0000021	0.0000021	0.0000021	0.0000010	0.0000021	- -
Co	0.0000008	0.0000047	0.0000008	0.0000043	0.0000022	0.0000017

Table 4.1.1-12 (2) (contd)

Isotope	Reflector	Outer Core	Outer Core	Outer Core	Outer Core	Axial
	Stainless 36-42	SFC 0-6	DFC 0-6	SFC 6-20	DFC 6-20	Blanket 20-31
C	0.0002143	0.0000343	0.0022792	0.0000331	0.0022898	0.0000532
O	- -	0.0136985	0.0155311	0.0137649	0.0156113	0.0088222
Na	- -	0.0092311	0.0087208	0.0092111	0.0087495	0.0091804
Si	0.0008629	0.0001593	0.0001840	0.0001574	0.0001817	0.0001926
Al	- -	0.0000038	0.0000057	0.0000041	0.0000062	0.0000029
Mn	0.0015241	0.0002328	0.0002673	0.0002294	0.0002654	0.0003414
Cr	0.0150441	0.0027175	0.0031671	0.0026738	0.0031426	0.0041601
Fe	0.0531084	0.0130179	0.0111884	0.0128780	0.0110985	0.0147759
Ni	0.0066621	0.0011875	0.0014329	0.0011697	0.0014240	0.0017666
Cu	0.0000172	0.0000299	0.0000370	0.0000294	0.0000363	0.0000448
Mo	0.0000083	0.0002411	0.0004699	0.0002400	0.0004685	0.0000350
U5	- -	0.0000126	0.0000183	0.0000127	0.0000183	0.0000179
U8	- -	0.0057991	0.0083488	0.0058138	0.0083534	0.0081570
P8	- -	0.0000003	0.0000010	0.0000003	0.0000010	- -
P9	- -	0.0008898	0.0017772	0.0008882	0.0017727	- -
P0	- -	0.0001179	0.0002353	0.0001177	0.0002346	- -
P1	- -	0.0000063	0.0000144	0.0000066	0.0000144	- -
P2	- -	0.0000016	0.0000039	0.0000017	0.0000039	- -
A1	- -	0.0000103	0.0000217	0.0000106	0.0000216	- -
P	- -	0.0000054	0.0000048	0.0000053	0.0000047	0.0000101
S	- -	0.0000010	0.0000016	0.0000010	0.0000016	0.0000081
Cl	- -	0.0000003	0.0000060	0.0000003	0.0000061	0.0000003
Ca	- -	0.0000021	0.0000010	0.0000021	0.0000010	0.0000021
Co	- -	0.0000008	0.0000046	0.0000008	0.0000043	0.0000023

Table 4.1.1-12 (3) (contd)

Isotope	Reflector Iron Block 31-36	Reflector Stainless 36-42	Radial Blanket 0-6	Radial Blanket 6-20	Axial Blanket 20-31	Reflector Iron Block 31-36
C	0.0005875	0.0002143	0.0000331	0.0000323	0.0000323	0.0005923
O	- -	- -	0.0224198	0.0225016	0.0224943	- -
Na	- -	- -	0.0042298	0.0042451	0.0042293	- -
Si	0.0001234	0.0008629	0.0001420	0.0001397	0.0001397	0.0001148
Al	- -	- -	0.0000024	0.0000024	0.0000025	- -
Mn	0.0006781	0.0015241	0.0002028	0.0001990	0.0001990	0.0006719
Cr	0.0020591	0.0150441	0.0023609	0.0023123	0.0023124	0.0019296
Fe	0.0756250	0.0531084	0.0084347	0.0082639	0.0082641	0.0760459
Ni	0.0008401	0.0066621	0.0010153	0.0009938	0.0009938	0.0007794
Cu	0.0000275	0.0000172	0.0000290	0.0000285	0.0000285	0.0000269
Mo	0.0000138	0.0000083	0.0000137	0.0000132	0.0000132	0.0000135
U5	- -	- -	0.0000288	0.0000290	0.0000289	- -
U8	- -	- -	0.0132393	0.0132875	0.0132871	- -
P8	- -	- -	- -	- -	- -	- -
P9	- -	- -	- -	- -	- -	- -
P0	- -	- -	- -	- -	- -	- -
P1	- -	- -	- -	- -	- -	- -
P2	- -	- -	- -	- -	- -	- -
A1	- -	- -	- -	- -	- -	- -
P	0.0000235	- -	0.0000052	0.0000051	0.0000051	0.0000233
S	0.0000313	- -	0.0000011	0.0000011	0.0000011	0.0000314
Cl	- -	- -	0.0000001	0.0000001	0.0000001	- -
Ca	- -	- -	0.0000010	0.0000010	0.0000010	- -
Co	0.0000017	- -	0.0000017	0.0000017	0.0000017	0.0000012

Table 4.1.1-12 (4) (contd)

Isotope	Reflector Stainless 36-42	Reflector Reflector 0-36	Central Blanket (SFC+DFC) 0-6	Inner Core (SFC+DFC) 6-20	Outer Core (SFC+DFC) 0-6	Outer Core (SFC+DFC) 6-20
C	0.0002143	0.0002506	0.0000337	0.0009254	0.0009380	0.0009416
O	--	--	0.0136978	0.0144887	0.0144375	0.0145095
Na	--	--	0.0091902	0.0090633	0.0090264	0.0090259
Si	0.0008629	0.0008751	0.0001459	0.0001670	0.0001693	0.0001672
Al	--	--	0.0000029	0.0000049	0.0000046	0.0000049
Mn	0.0015241	0.0013948	0.0002061	0.0002436	0.0002467	0.0002439
Cr	0.0150441	0.0153536	0.0024129	0.0028588	0.0028987	0.0028628
Fe	0.0531084	0.0545599	0.0119522	0.0121688	0.0122826	0.0121628
Ni	0.0066621	0.0066686	0.0010480	0.0012702	0.0012864	0.0012722
Cu	0.0000172	0.0000396	0.0000296	0.0000322	0.0000328	0.0000322
Mo	0.0000083	0.0000366	0.0000139	0.0003282	0.0003333	0.0003320
U5	--	--	0.0000178	0.0000149	0.0000149	0.0000149
U8	--	--	0.0081363	0.0068136	0.0068261	0.0068368
P8	--	--	--	0.0000007	0.0000006	0.0000006
P9	--	--	--	0.0012308	0.0012471	0.0012444
P0	--	--	--	0.0001627	0.0001652	0.0001648
P1	--	--	--	0.0000100	0.0000096	0.0000097
P2	--	--	--	0.0000026	0.0000025	0.0000026
A1	--	--	--	0.0000149	0.0000149	0.0000151
P	--	0.0000457	0.0000051	0.0000051	0.0000052	0.0000051
S	--	0.0000352	0.0000011	0.0000012	0.0000012	0.0000012
Cl	--	--	0.0000003	0.0000026	0.0000026	0.0000026
Ca	--	--	0.0000021	0.0000017	0.0000016	0.0000016
Co	--	0.0000009	0.0000024	0.0000022	0.0000023	0.0000022

Table 4.1.1-12 (5) (contd)

Isotope	Empty Matrix 0-60	Control Position 0-20	Control Position 20-31
C	0.0000188	0.0000314	0.0000369
O	- -	0.0000013	0.0000013
Na	- -	0.0182024	0.0182389
Si	0.0000683	0.0001670	0.0001667
Al	- -	0.0000045	0.0000049
Mn	0.0001059	0.0002460	0.0002462
Cr	0.0011891	0.0029889	0.0029856
Fe	0.0042791	0.0105526	0.0106624
Ni	0.0004802	0.0013379	0.0013366
Cu	0.0000172	0.0000361	0.0000358
Mo	0.0000083	0.0000177	0.0000177
U5	- -	- -	- -
U8	- -	- -	- -
P8	- -	- -	- -
P9	- -	- -	- -
P0	- -	- -	- -
P1	- -	- -	- -
P2	- -	- -	- -
A1	- -	- -	- -
P	0.0000028	0.0000041	0.0000040
S	0.0000007	0.0000013	0.0000012
Cl	- -	0.0000006	0.0000006
Ca	- -	0.0000041	0.0000042
Co	- -	0.0000039	0.0000040

Table 4.1.1-13 ZPPR ASSEMBLY 17B:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER	INNER	INNER	INNER-RZ	OUTER	OUTER	OUTER-RZ	RADIAL	AXIAL	RADIAL	AXIAL
	BLANKET	CORE	CORE	AVERAGE	CORE	CORE	AVERAGE	BLANKET	BLANKET	REFLECTOR	REFLECTOR
	ID	SCF (IB)	DCF (IB)	SCF&DCF	SCF	DCF	SCF&DCF				
	0-6(IN)	6-20(IN)	6-20(IN)	6-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	---	0.0008875	0.0017529	0.0012308	0.0008887	0.0017740	0.0012450	---	---	---	---
PU-240	---	0.0001175	0.0002315	0.0001627	0.0001178	0.0002348	0.0001649	---	---	---	---
PU-241	---	0.0000075	0.0000144	0.0000102	0.0000066	0.0000148	0.0000099	---	---	---	---
PU-242	---	0.0000028	0.0000053	0.0000038	0.0000023	0.0000055	0.0000036	---	---	---	---
AM-241	---	0.0000107	0.0000208	0.0000147	0.0000105	0.0000213	0.0000148	---	---	---	---
U-235	0.0000178	0.0000130	0.0000187	0.0000152	0.0000129	0.0000188	0.0000153	0.0000289	0.0000179	---	---
U-238	0.0081363	0.0058392	0.0082950	0.0068135	0.0058093	0.0083518	0.0068328	0.0132715	0.0081560	---	---
H-1	---	---	0.0000217	0.0000086	---	0.0000190	0.0000077	---	---	---	---
C	0.0000348	0.0000350	0.0022836	0.0009271	0.0000349	0.0022876	0.0009417	0.0000337	0.0000550	0.0002449	0.0005851
O	0.0136980	0.0137652	0.0155896	0.0144890	0.0137452	0.0155872	0.0144867	0.0224699	0.0088214	---	---
NA	0.0091193	0.0092016	0.0087321	0.0090153	0.0091377	0.0087406	0.0089778	0.0042155	0.0091549	---	---
AL	0.0000031	0.0000048	0.0000061	0.0000053	0.0000040	0.0000061	0.0000048	0.0000024	0.0000029	0.0000000	0.0000000
SI	0.0001443	0.0001576	0.0001823	0.0001674	0.0001572	0.0001812	0.0001668	0.0001396	0.0001931	0.0008972	0.0001295
CR	0.0023842	0.0026779	0.0031600	0.0028692	0.0026769	0.0031289	0.0028588	0.0023132	0.0041714	0.0156828	0.0021974
MN	0.0002035	0.0002297	0.0002672	0.0002446	0.0002295	0.0002641	0.0002434	0.0001990	0.0003424	0.0014285	0.0006860
FE	0.0118489	0.0128941	0.0111594	0.0122058	0.0128834	0.0110498	0.0121453	0.0082658	0.0148157	0.0554793	0.0755771
NI	0.0010364	0.0011704	0.0014330	0.0012746	0.0011712	0.0014182	0.0012706	0.0009948	0.0017714	0.0068192	0.0008971
CU	0.0000412	0.0000410	0.0000549	0.0000465	0.0000405	0.0000549	0.0000463	0.0000387	0.0000696	0.0001220	0.0000852
MO	0.0000137	0.0002396	0.0004632	0.0003283	0.0002402	0.0004688	0.0003322	0.0000133	0.0000351	0.0000358	0.0000148

Table 4.1.1-14 (1) Drawer Masters in ZPPR-17B

Zone	Master	Description ^a
Core Without	101	Fuel-SC
Internal Blanket (Outer Core)	102	Fuel-SC
	103	Fuel-SC
	104	Fuel-SC
	105	Fuel-SC
	106	Fuel-SC
	109	Fuel-SC-Symmetry retaining
	110	Fuel-SC-Symmetry retaining
	111	Fuel-SC-Symmetry retaining
	112	Fuel-SC-Symmetry retaining
	202	Fuel-DC
	203	Fuel-DC
	207	Fuel-DC
	226	Fuel-DC
	227	Fuel-DC
	701	Fuel-SC-FC
	702	Fuel-SC-FC
	703	Fuel-SC-FC
	705	Fuel-SC-FC
	706	Fuel-SC-FC
	711	Fuel-SC-Thermocouple
	714	Fuel-SC-FC-Symmetry retaining
	715	Fuel-SC-FC-Symmetry retaining
	805	Fuel-SC-PSR
	806	Fuel-SC-PSR
	807	Fuel-DC-PSR
	808	Fuel-DC-PSR
	809	Fuel-SC-PSR
	810	Fuel-SC-PSR

Table 4.1.1-14 (2) (contd)

Zone	Master	Description ^a
Core With Internal Blanket (Inner Core)	107	Fuel-SC
	108	Fuel-SC
	205	Fuel-DC
	707	Fuel-SC-FC
	708	Fuel-SC-FC
	712	Fuel-SC-Axially distributed FC
	713	Fuel-SC-Axially distributed FC
	801	Fuel-SC-PSR
	802	Fuel-SC-PSR
	803	Fuel-DC-PSR
804	Fuel-DC-PSR	
Control Rod Position	601	CRP
Radial Blanket	501	DU
	502	DU
	709	DU-FC
Radial Reflector	402	Stainless Steel
	403	Stainless Steel
	404	Stainless Steel
	405	Stainless Steel
	710	Stainless Steel

^aSC is single fuel column, DC is double fuel column, FC is fission chamber, PSR is adjacent to poison safety rod, DU is depleted uranium.

Table 4.1.1-15 Experimental and Calculated k-effective Results for ZPPR-17B

	<u>Critical Reference</u>	<u>Subcritical Reference</u>
Date	5/8/87	5/07/87
Reactor Run Number	96	95
Temperature, K	300.1	300.2
Interface Gap, mil ^a	42.1	42.0
Measured Excess Reactivity, ϕ	+11.7 \pm 0.1	-22.45 \pm 0.18
Adjustment to 293K, ϕ ^b	+7.67 \pm 0.78	+7.78 \pm 0.79
Adjustment to 42.1 mil ^c , ϕ	---	-0.02 \pm 0.00
Adjustment to 5/8/87, ϕ ^d	---	-0.02 \pm 0.00
Adjusted Reactivity, ϕ	+19.4 \pm 0.8 ϕ	-14.71 \pm 0.81
Experimental K-effective (E) ^e	1.000655 \pm 0.000027	0.999504 \pm 0.000029
Calculation, 21G XYZ NDT (C)	0.984989	---
C/E for k-effective	0.984344	---

^aOn a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.08 \pm 0.11 \phi \text{ K}^{-1}$.

^cUsing measured gap coefficient $-0.18 \pm 0.02 \phi \text{ mil}^{-1}$.

^dUsing calculated ^{241}Pu decay coefficient $-0.02386 \phi \text{ day}^{-1}$.

^eUsing calculated β -effective 0.003374.

Table 4.1.1-16 Drawer Loading Summary for the
ZPPR-17C Critical Reference

<u>Inner Core - Drawers with Internal Blanket</u>	
Drawers with one column of fuel (Includes 23 drawers with fission chambers and 8 narrow drawers adjacent to PSRs)	704
Drawers with two columns of fuel (Includes 8 narrow drawers adjacent to PSRs)	768
<u>Outer Core</u>	
Drawers with one column of fuel (Includes 28 drawers with fission chambers, two drawers with thermocouples and 16 narrow drawers adjacent to PSRs)	888
Drawers with two columns of fuel (Includes 8 narrow drawers adjacent to PSRs)	1000
<u>Control Rod Position</u>	
Sodium-filled drawers	148
<u>Control Rod</u>	
B ₄ C-filled drawers	52
<u>Radial Blanket</u>	
Radial blanket drawers (Includes 13 drawers with fission chambers)	1752
<u>Radial Reflector</u>	
Stainless-steel-filled drawers (Includes one drawer with fission chamber)	1272

Table 4.1.1-17 Mass Summary for Various Regions in the ZPPR-17C Critical Reference

Material	Mass, kg ^b					
	Inner Core	Outer Core	Internal Blanket	Radial Blanket	Axial Blanket	Control Rods
Total Pu	972.945	1806.354	---	---	---	---
Fissile Pu	857.722	1592.235	---	---	---	---
Total Fissile	867.424	1610.133	4.775	47.500	20.066	---
²³⁸ Pu	0.456	0.795	---	---	---	---
²³⁹ Pu	850.826	1579.677	---	---	---	---
²⁴⁰ Pu	112.953	210.031	---	---	---	---
²⁴¹ Pu ^a	6.896	12.558	---	---	---	---
²⁴² Pu	1.813	3.293	---	---	---	---
Americium ^a	10.308	19.157	---	---	---	---
²³⁵ U	9.702	17.898	4.775	47.500	20.066	---
²³⁸ U	4497.820	8289.254	2213.234	22109.920	9237.605	---
Total Heavy Metal	5490.777	10132.660	2218.009	22157.420	9257.672	---
O	625.131	1147.273	250.428	2515.876	671.492	0.281
Na	545.761	996.566	239.571	678.242	1001.405	303.896
Mo	90.817	168.764	1.535	8.932	16.154	1.523
Steel ^c	2420.712	4419.553	979.296	4557.519	5550.580	747.117
¹⁰ B	---	---	---	---	---	32.497
¹¹ B	---	---	---	---	---	144.897
C	38.575	71.901	0.455	2.716	3.048	50.910

^aMasses for all isotopes decayed to the date 6/15/87.

^bMasses are based on the average masses for plate types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe and Ni.

Table 4.1.1-18 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 17C CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE	INNER BLANKET	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	973.339	1807.016	---	---	---
FISSILE PU	857.764	1592.254	---	---	---
TOTAL FISSILE	867.711	1610.606	4.774	47.498	21.259
PU-239	850.772	1579.523	---	---	---
PU-240	112.996	210.102	---	---	---
PU-241	6.991	12.731	---	---	---
PU-242	2.580	4.660	---	---	---
AM-241	10.216	18.989	---	---	---
U-235	9.947	18.353	4.774	47.498	21.259
U-238	4497.465	8288.320	2212.850	22109.273	9786.687
TOTAL HEAVY METAL	5480.750	10113.687	2217.624	22156.770	9807.945
O	625.089	1147.161	250.387	2515.896	711.411
NA	545.601	996.061	239.414	678.922	1060.675
MO	90.811	168.746	1.535	8.921	17.116
STEEL	2420.981	4419.895	979.407	4556.328	5877.441

Table 4.1.1-19 (1) ZPPR Assembly 17C: Atom Densities by Zone

Isotope	Empty Matrix 0-36	Radial Reflector 0-36	Axial Reflector 36-42	Radial Blanket 31-36	Radial Blanket 20-31	Radial Blanket 6-20
B0	--	--	--	--	--	--
B1	--	--	--	--	--	--
C	0.0000188	0.0002440	0.0002143	0.0005923	0.0000323	0.0000323
O	--	--	--	--	0.0224943	0.0225016
Na	--	--	--	--	0.0042293	0.0042451
Si	0.0000683	0.0009017	0.0008629	0.0001148	0.0001397	0.0001397
Al	--	--	--	--	0.0000025	0.0000024
Mn	0.0001059	0.0014353	0.0015241	0.0006719	0.0001990	0.0001990
Cr	0.0011891	0.0157477	0.0150441	0.0019296	0.0023124	0.0023123
Fe	0.0042791	0.0556680	0.0531083	0.0760459	0.0082641	0.0082639
Ni	0.0004802	0.0068483	0.0066621	0.0007794	0.0009938	0.0009938
Cu	0.0000172	0.0000379	0.0000172	0.0000269	0.0000285	0.0000285
Mo	0.0000083	0.0000356	0.0000083	0.0000135	0.0000132	0.0000132
U5	--	--	--	--	0.0000289	0.0000290
U8	--	--	--	--	0.0132871	0.0132875
P8	--	--	--	--	--	--
P9	--	--	--	--	--	--
P0	--	--	--	--	--	--
P1	--	--	--	--	--	--
P2	--	--	--	--	--	--
A1	--	--	--	--	--	--
P	0.0000028	0.0000472	0.0000533	0.0000233	0.0000051	0.0000051
S	0.0000007	0.0000363	0.0000252	0.0000314	0.0000011	0.0000011
Cl	--	--	--	--	0.0000001	0.0000001
Ca	--	--	--	--	0.0000010	0.0000010
Co	--	0.0000007	--	0.0000012	0.0000017	0.0000017

Table 4.1.1-19 (2) (contd)

Isotope	Radial Blanket 0-6	Axial Refl Outer Core 31-36	Axial Blkt Outer Core 20-31	Outer Core 6-20	Outer Core 0-6	Axial Refl Inner Core 31-36
B0	--	--	--	--	--	--
B1	--	--	--	--	--	--
C	0.0000333	0.0005874	0.0000532	0.0012314	0.0012263	0.0005884
O	0.0223887	--	0.0088214	0.0147521	0.0146783	--
Na	0.0042238	--	0.0091799	0.0089549	0.0089446	--
Si	0.0001428	0.0001236	0.0001928	0.0001703	0.0001724	0.0001232
Al	0.0000024	--	0.0000029	0.0000052	0.0000049	--
Mn	0.0002038	0.0006777	0.0003411	0.0002486	0.0002513	0.0006779
Cr	0.0023727	0.0020570	0.0041582	0.0029237	0.0029578	0.0020511
Fe	0.0084772	0.0756063	0.0147653	0.0119410	0.0120566	0.0757124
Ni	0.0010206	0.0008422	0.0017683	0.0013052	0.0013186	0.0008390
Cu	0.0000292	0.0000281	0.0000454	0.0000331	0.0000337	0.0000283
Mo	0.0000138	0.0000141	0.0000353	0.0003610	0.0003624	0.0000142
U5	0.0000288	--	0.0000179	0.0000156	0.0000156	--
U8	0.0132208	--	0.0081563	0.0071563	0.0071450	--
P8	--	--	--	0.0000007	0.0000007	--
P9	--	--	--	0.0013565	0.0013596	--
P0	--	--	--	0.0001796	0.0001801	--
P1	--	--	--	0.0000108	0.0000106	--
P2	--	--	--	0.0000028	0.0000028	--
A1	--	--	--	0.0000164	0.0000162	--
P	0.0000052	0.0000234	0.0000100	0.0000050	0.0000051	0.0000234
S	0.0000011	0.0000313	0.0000082	0.0000013	0.0000013	0.0000314
Cl	0.0000001	--	0.0000003	0.0000034	0.0000033	--
Ca	0.0000010	--	0.0000021	0.0000015	0.0000015	--
Co	0.0000018	0.0000022	0.0000027	0.0000027	0.0000028	0.0000022

Table 4.1.1-19 (3) (contd)

Isotope	Axial Blkt	Inner Core	Inner Core	Axial Refl	Axial Blkt	Outer Core
	Inner Core			Outer Core	SCF		Outer Core
	20-31	6-20	0-6	31-36	20-31	6-20
B0	--	--	--	--	--	--
B1	--	--	--	--	--	--
C	0.0000532	0.0012105	0.0000338	0.0005855	0.0000532	0.0000331
O	0.0088212	0.0147284	0.0136973	--	0.0088213	0.0137650
Na	0.0092079	0.0089966	0.0091901	--	0.0091325	0.0091844
Si	0.0001928	0.0001701	0.0001468	0.0001260	0.0001918	0.0001574
Al	0.0000029	0.0000051	0.0000029	--	0.0000029	0.0000041
Mn	0.0003412	0.0002484	0.0002065	0.0006816	0.0003421	0.0002293
Cr	0.0041587	0.0029197	0.0024191	0.0021181	0.0041628	0.0026730
Fr	0.0147671	0.0119542	0.0119711	0.0754880	0.0147973	0.0128752
Ni	0.0017686	0.0013032	0.0010530	0.0008569	0.0017595	0.0011693
Cu	0.0000454	0.0000331	0.0000303	0.0000256	0.0000432	0.0000294
Mo	0.0000353	0.0003567	0.0000143	0.0000128	0.0000341	0.0002398
U5	0.0000179	0.0000156	0.0000178	--	0.0000179	0.0000127
U8	0.0081561	0.0071223	0.0081361	--	0.0081562	0.0058134
P8	--	0.0000007	--	--	--	0.0000004
P9	--	0.0013416	--	--	--	0.0008879
P0	--	0.0001774	--	--	--	0.0001177
P1	--	0.0000108	--	--	--	0.0000066
P2	--	0.0000028	--	--	--	0.0000017
A1	--	0.0000162	--	--	--	0.0000107
P	0.0000100	0.0000050	0.0000051	0.0000238	0.0000103	0.0000053
S	0.0000082	0.0000013	0.0000012	0.0000312	0.0000080	0.0000010
Cl	0.0000003	0.0000033	0.0000003	--	0.0000003	0.0000003
Ca	0.0000021	0.0000015	0.0000021	--	0.0000021	0.0000021
Co	0.0000027	0.0000027	0.0000029	--	0.0000008	0.0000008

Table 4.1.1-19 (4) (contd)

Isotope	Outer Core	Axial Refl	Axial Blkt	Outer Core	Outer Core	Axial Refl
	SCF 0-6	Outer Core DCF 31-36	Outer Core DCF 20-31	DCF 6-20	DCF 0-6	Inner Core SCF 31-36
B0	--	--	--	--	--	--
B1	--	--	--	--	--	--
C	0.0000343	0.0005891	0.0000532	0.0022955	0.0022849	0.0005885
O	0.0136986	--	0.0088213	0.0156284	0.0155480	--
Na	0.0092043	--	0.0092218	0.0087510	0.0087138	--
Si	0.0001592	0.0001216	0.0001937	0.0001818	0.0001842	0.0001232
Al	0.0000038	--	0.0000029	0.0000063	0.0000058	--
Mn	0.0002328	0.0006742	0.0003403	0.0002657	0.0002677	0.0006808
Cr	0.0027171	0.0020027	0.0041540	0.0031463	0.0031715	0.0020771
Fe	0.0130166	0.0757097	0.0147367	0.0111112	0.0112039	0.0758039
Ni	0.0011873	0.0008291	0.0017761	0.0014258	0.0014351	0.0008375
Cr	0.0000299	0.0000303	0.0000473	0.0000363	0.0000370	0.0000260
Mo	0.0002408	0.0000153	0.0000363	0.0004686	0.0004704	0.0000130
U5	0.0000126	--	0.0000179	0.0000183	0.0000183	--
U8	0.0057979	--	0.0081562	0.0083486	0.0083410	--
P8	0.0000003	--	--	0.0000010	0.0000009	--
P9	0.0008892	--	--	0.0017726	0.0017773	--
P0	0.0001178	--	--	0.0002346	0.0002353	--
P1	0.0000063	--	--	0.0000145	0.0000143	--
P2	0.0000016	--	--	0.0000038	0.0000038	--
A1	0.0000103	--	--	0.0000214	0.0000214	--
P	0.0000054	0.0000230	0.0000098	0.0000047	0.0000048	0.0000238
S	0.0000010	0.0000315	0.0000083	0.0000016	0.0000016	0.0000312
Cl	0.0000003	--	0.0000003	0.0000062	0.0000061	--
Ca	0.0000021	--	0.0000021	0.0000010	0.0000010	--
Co	0.0000008	0.0000042	0.0000044	0.0000043	0.0000046	--

Table 4.1.1-19 (5) (contd)

Isotope	Axial Blkt Inner Core SCF	Inner Core SCF	Inner Core SCF	Axial Refl Inner Core DCF	Axial Blkt Inner Core DCF	Inner Core DCF
	20-31	6-20	0-6	31-36	20-31	6-20
B0	--	--	--	--	--	--
B1	--	--	--	--	--	--
C	0.0000532	0.0000331	0.0000333	0.0005882	0.0000532	0.0022897
O	0.0088213	0.0137650	0.0136987	--	0.0088213	0.0156118
Na	0.0092050	0.0092702	0.0091887	--	0.0092107	0.0087458
Si	0.0001919	0.0001569	0.0001434	0.0001232	0.0001937	0.0001821
Al	0.0000029	0.0000040	0.0000029	--	0.0000029	0.0000062
Mn	0.0003422	0.0002281	0.0002047	0.0006753	0.0003402	0.0002669
Cr	0.0041646	0.0026601	0.0023942	0.0020274	0.0041534	0.0031576
Fe	0.0148035	0.0128309	0.0118954	0.0756294	0.0147340	0.0111507
Ni	0.0017604	0.0011629	0.0010325	0.0008404	0.0017760	0.0014319
Cu	0.0000432	0.0000294	0.0000274	0.0000304	0.0000473	0.0000365
Mo	0.0000341	0.0002394	0.0000129	0.0000154	0.0000364	0.0004643
U5	0.0000179	0.0000127	0.0000178	--	0.0000179	0.0000182
U8	0.0081562	0.0058390	0.0081368	--	0.0081562	0.0082988
P8	--	0.0000005	--	--	--	0.0000009
P9	--	0.0008874	--	--	--	0.0017580
P0	--	0.0001175	--	--	--	0.0002323
P1	--	0.0000074	--	--	--	0.0000139
P2	--	0.0000019	--	--	--	0.0000036
A1	--	0.0000109	--	--	--	0.0000210
P	0.0000103	0.0000053	0.0000053	0.0000231	0.0000098	0.0000047
S	0.0000080	0.0000010	0.0000010	0.0000315	0.0000083	0.0000016
C1	0.0000003	0.0000003	0.0000003	--	0.0000003	0.0000060
Ca	0.0000021	0.0000021	0.0000021	--	0.0000021	0.0000010
Co	0.0000008	0.0000008	0.0000008	0.0000043	0.0000045	0.0000044

Table 4.1.1-19 (6) (contd)

<u>Isotope</u>	<u>Inner Blkt</u> <u>0-6</u>	<u>Control</u> <u>Position</u> <u>31-36</u>	<u>Control</u> <u>Position</u> <u>20-31</u>	<u>Control</u> <u>Position</u> <u>6-20</u>	<u>Control</u> <u>Position</u> <u>0-6</u>	<u>Bank</u> <u>Control</u> <u>Rod</u> <u>31-36</u>
B0	--	--	--	--	--	--
B1	--	--	--	--	--	--
C	0.0000342	0.0000443	0.0000309	0.0000309	0.0000318	0.0000508
O	0.0136964	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013
Na	0.0091915	0.0179925	0.0184405	0.0183970	0.0180431	0.0180018
Si	0.0001499	0.0001688	0.0001649	0.0001649	0.0001688	0.0001863
Al	0.0000029	0.0000048	0.0000049	0.0000048	0.0000043	0.0000056
Mn	0.0002082	0.0002486	0.0002443	0.0002442	0.0002474	0.0002517
Cr	0.0024420	0.0030099	0.0029657	0.0029644	0.0030089	0.0030170
Fe	0.0120407	0.0108979	0.0104697	0.0104649	0.0106243	0.0109629
Ni	0.0010718	0.0013470	0.0013281	0.0013274	0.0013465	0.0013664
Cu	0.0000329	0.0000365	0.0000353	0.0000353	0.0000367	0.0000364
Mo	0.0000155	0.0000181	0.0000174	0.0000174	0.0000180	0.0000160
U5	0.0000178	--	--	--	--	--
U8	0.0081355	--	--	--	--	--
P8	--	--	--	--	--	--
P9	--	--	--	--	--	--
P0	--	--	--	--	--	--
P1	--	--	--	--	--	--
P2	--	--	--	--	--	--
A1	--	--	--	--	--	--
P	0.0000049	0.0000041	0.0000040	0.0000040	0.0000041	0.0000057
S	0.0000013	0.0000013	0.0000012	0.0000012	0.0000013	0.0000013
Cl	0.0000003	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006
Ca	0.0000021	0.0000041	0.0000042	0.0000042	0.0000041	0.0000041
Co	0.0000048	0.0000043	0.0000037	0.0000037	0.0000040	0.0000059

Table 4.1.1-19 (7) . (contd)

Isotope	Bank Control Rod 20-31	Bank Control Rod 6-20	Bank Control Rod 0-6	Central Control Rod 31-36	Central Control Rod 20-31	Central Control Rod 6-20
B0	0.0160061	0.0151769	0.0158703	--	0.0160061	0.0157321
B1	0.0649083	0.0615467	0.0643535	--	0.0649083	0.0637966
C	0.0208421	0.0197666	0.0203715	0.0000508	0.0208421	0.0204374
O	0.0000803	0.0000534	0.0001353	0.0000013	0.0000803	0.0000825
Na	--	--	--	0.0180018	--	--
Si	0.0002047	0.0002235	0.0002562	0.0001863	0.0002047	0.0002188
Al	0.0000010	0.0000028	0.0000021	0.0000056	0.0000010	0.0000020
Mn	0.0001928	0.0002204	0.0002066	0.0002517	0.0001928	0.0002028
Cr	0.0022421	0.0026105	0.0024203	0.0030170	0.0022421	0.0023755
Fe	0.0081410	0.0093681	0.0087156	0.0109629	0.0081410	0.0085838
Ni	0.0009734	0.0011621	0.0010609	0.0013664	0.0009734	0.0010417
Cu	0.0000307	0.0000325	0.0000325	0.0000364	0.0000307	0.0000314
Mo	0.0000155	0.0000162	0.0000162	0.0000160	0.0000155	0.0000158
U5	--	--	--	--	--	--
U8	--	--	--	--	--	--
P8	--	--	--	--	--	--
P9	--	--	--	--	--	--
P0	--	--	--	--	--	--
P1	--	--	--	--	--	--
P2	--	--	--	--	--	--
A1	--	--	--	--	--	--
P	0.0000040	0.0000040	0.0000041	0.0000057	0.0000040	0.0000040
S	0.0000012	0.0000012	0.0000013	0.0000013	0.0000012	0.0000012
C1	--	--	--	0.0000006	--	--
Ca	--	--	--	0.0000041	--	--
Co	0.0000037	0.0000037	0.0000040	0.0000059	0.0000037	0.0000037

Table 4.1.1-19 (8) (contd)

<u>Isotope</u>	<u>Central Control Rod 0-6</u>
B0	0.0158703
B1	0.0643535
C	0.0203715
O	0.0001353
Na	--
Si	0.0002562
Al	0.0000021
Mn	0.0002066
Cr	0.0024203
Fe	0.0087156
Ni	0.0010609
Cu	0.0000325
Mo	0.0000162
U5	--
U8	--
P8	--
P9	--
P0	--
P1	--
P2	--
A1	--
P	0.0000041
S	0.0000013
Cl	--
Ca	--
Co	0.0000040

Table 4.1.1-20 ZPPR ASSEMBLY 17C:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER	INNER	INNER	INNER-RZ	OUTER	OUTER	OUTER-RZ	RADIAL	AXIAL	RADIAL	AXIAL
	BLANKET	CORE	CORE	AVERAGE	CORE	CORE	AVERAGE	BLANKET	BLANKET	REFLECTOR	REFLECTOR
	IB	SCF(1B)	DCF(1B)	SCF&DCF	SCF	DCF	SCF&DCF				
	0-6(IN)	6-20(IN)	6-20(IN)	6-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	---	0.0008874	0.0017580	0.0013417	0.0008883	0.0017740	0.0013574	---	---	---	---
PU-240	---	0.0001175	0.0002323	0.0001774	0.0001177	0.0002348	0.0001797	---	---	---	---
PU-241	---	0.0000075	0.0000141	0.0000109	0.0000066	0.0000146	0.0000108	---	---	---	---
PU-242	---	0.0000028	0.0000052	0.0000040	0.0000023	0.0000054	0.0000040	---	---	---	---
AM-241	---	0.0000107	0.0000208	0.0000160	0.0000105	0.0000212	0.0000162	---	---	---	---
U-235	0.0000178	0.0000130	0.0000187	0.0000160	0.0000129	0.0000188	0.0000160	0.0000289	0.0000179	---	---
U-238	0.0081361	0.0058390	0.0082987	0.0071223	0.0058087	0.0083463	0.0071527	0.0132723	0.0081561	---	---
H-1	---	---	0.0000218	0.0000114	---	0.0000191	0.0000101	---	---	---	---
C	0.0000348	0.0000351	0.0022911	0.0012121	0.0000349	0.0022934	0.0012311	0.0000337	0.0000550	0.0002448	0.0005852
O	0.0136977	0.0137652	0.0156121	0.0147288	0.0137452	0.0156044	0.0147300	0.0224718	0.0088214	---	---
NA	0.0091146	0.0091657	0.0087456	0.0089465	0.0090818	0.0087397	0.0089006	0.0042201	0.0091528	---	---
AL	0.0000028	0.0000052	0.0000061	0.0000057	0.0000040	0.0000061	0.0000051	0.0000024	0.0000029	0.0000000	---
SI	0.0001446	0.0001578	0.0001821	0.0001705	0.0001573	0.0001813	0.0001700	0.0001396	0.0001933	0.0008970	0.0001294
CR	0.0023817	0.0026829	0.0031576	0.0029306	0.0026801	0.0031329	0.0029199	0.0023125	0.0041705	0.0156819	0.0021923
MN	0.0002032	0.0002302	0.0002669	0.0002493	0.0002298	0.0002644	0.0002481	0.0001989	0.0003422	0.0014284	0.0006856
FE	0.0118363	0.0129118	0.0111506	0.0119929	0.0128949	0.0110636	0.0119249	0.0082636	0.0148088	0.0554766	0.0755817
NI	0.0010379	0.0011724	0.0014319	0.0013078	0.0011725	0.0014201	0.0013036	0.0009945	0.0017735	0.0068188	0.0008967
CU	0.0000422	0.0000414	0.0000549	0.0000484	0.0000407	0.0000549	0.0000482	0.0000386	0.0000706	0.0001220	0.0000859
MO	0.0000140	0.0002396	0.0004642	0.0003568	0.0002401	0.0004690	0.0003613	0.0000133	0.0000354	0.0000358	0.0000150

Table 4.1.1-21 (1) Drawer Masters in ZPPR-17C

Zone	Master	Description ^a
Core Without Internal Blanket (Outer Core)	101	Fuel-SC
	102	Fuel-SC
	103	Fuel-SC
	104	Fuel-SC
	105	Fuel-SC
	106	Fuel-SC
	109	Fuel-SC-Symmetry retaining
	110	Fuel-SC-Symmetry retaining
	111	Fuel-SC-Symmetry retaining
	112	Fuel-SC-Symmetry retaining
	202	Fuel-DC
	203	Fuel-DC
	207	Fuel-DC
	226	Fuel-DC
	227	Fuel-DC
230	Fuel-DC	
231	Fuel-DC	
232	Fuel-DC	
233	Fuel-DC	
235	Fuel-DC	
236	Fuel-DC	
237	Fuel-DC	
701	Fuel-SC-FC	
702	Fuel-SC-FC	
703	Fuel-SC-FC	
705	Fuel-SC-FC	
706	Fuel-SC-FC	
711	Fuel-SC-Thermocouple	
714	Fuel-SC-FC-Symmetry retaining	
715	Fuel-SC-FC-Symmetry retaining	
805	Fuel-SC-PSR	
806	Fuel-SC-PSR	
807	Fuel-DC-PSR	
808	Fuel-DC-PSR	
809	Fuel-SC-PSR	
810	Fuel-SC-PSR	

Table 4.1.1-21 (2) (contd)

Zone	Master	Description ^a
Core With Internal Blanket (Inner Core)	107	Fuel-SC
	108	Fuel-SC
	205	Fuel-DC
	228	Fuel-DC
	229	Fuel-DC
	234	Fuel-DC
	707	Fuel-SC-FC
	708	Fuel-SC-FC
	712	Fuel-SC-Axially distributed FC
	713	Fuel-SC-Axially distributed FC
	801	Fuel-SC-PSR
	802	Fuel-SC-PSR
803	Fuel-DC-PSR	
804	Fuel-DC-PSR	
Control Rod Position	601	CRP
Control Rod	639	CR
	640	CR
Radial Blanket	501	DU
	502	DU
	709	DU-FC
Radial Reflector	402	Stainless Steel
	403	Stainless Steel
	404	Stainless Steel
	405	Stainless Steel
	710	Stainless Steel

^aSC is single fuel column, DC is double fuel column, FC is fission chamber, PSR is adjacent to poison safety rod, DU is depleted uranium.

Table 4.1.1-22 Experimental and Calculated k-effective Results for ZPPR-17C

	<u>Critical Reference</u>	<u>Subcritical Reference</u>
Date	6/16/87	6/12/87
Reactor Run Number	152	150
Temperature, K	298.93	300.4
Interface Gap, mil ^a	40.1	42.3
Measured Excess Reactivity, ϕ	+6.7 \pm 0.1	-25.2 \pm 0.2
Adjustment to 293K, ϕ ^b	+6.40 \pm 0.6	+7.99 \pm 0.8
Adjustment to 40.1 mil ^c , ϕ	---	+0.40 \pm 0.04
Adjustment to 6/16/87, ϕ ^d	---	-0.10 \pm 0.01
Adjusted Reactivity, ϕ	+13.1 \pm 0.7	-16.9 \pm 0.8
Experimental K-effective (E) ^e	1.000440 \pm 0.000023	0.999432 \pm 0.000027
Calculation, 21G XYZ NDT (C)	0.984640	---
C/E for k-effective	0.984207	---

^aOn a scale with arbitrary zero.

^bUsing temperature coefficient $-1.08 \pm 0.11 \phi \text{ K}^{-1}$, measured in ZPPR-17A.

^cUsing gap coefficient $-0.18 \pm 0.02 \phi \text{ mil}^{-1}$, measured in ZPPR-17A.

^dUsing ^{241}Pu decay coefficient $-0.02386 \phi \text{ day}^{-1}$, calculated for ZPPR-17A.

^eUsing calculated β -effective 0.003357.

4.1.2 制御棒反応度

(1) ZPPR-17A

ZPPR-17A体系では、炉心中心制御棒について燃料に対する制御棒価値が、制御棒の¹⁰B濃度、サイズ、位置および構成を変えて測定された。さらに、ZPPR-17Bへの移行時に、燃料に対する4本のバンク制御棒およびバンクCRPの反応度価値も測定された。

a 炉心体系と制御棒位置

ZPPR-17A体系は、制御棒ポジションを持たないクリーン炉心であり、実験は、未臨界基準体系において、Fig. 4.1.2-1 に示す制御棒位置の燃料ドロワと制御棒を置換した体系で実施された。

なお、制御棒価値の制御棒サイズ依存性の実験においては、以下に示す制御棒挿入位置で測定が実施された。

Central 2×2 control rod : 148-49,148-50,149-49,149-50

Central 2×3 control rod : 148-48,148-49,148-50,149-48,
149-49,149-50

Central 3×3 control rod : 148-48,148-49,148-50,149-48,
149-49,149-50,150-48,150-49
150-50

Off central 2×2 control rod : 148-48,148-49,149-48,149-49

b 制御棒の構成

以下の3種のタイプの模擬制御棒を使用した。

(a)プレートタイプ制御棒

ドロワ(0~20inch領域) : 天然B₄C及び92%濃縮B₄Cプレート

ドロワ(20~36inch領域) : Na

(b)ピンタイプ制御棒 (カランドリア内B₄Cピン型)

ドロワ(0~20inch領域) : ピン内92%濃縮B₄Cペレット、カランドリア内Na

ドロワ(20~24inch領域) : ステンレス鋼

ドロワ(24~31inch領域) : Na

ドロワ(31~36inch領域) : mild steel ブロック

(c) ピンタイプ制御棒 (密充填 B_4C ピン型)

ドロワ(0~20inch領域) : Fig. 4.1.2-2 に装填パターンを示す。

- ①天然 B_4C 及び92%濃縮 B_4C ペレット (中心)
- ②ステンレス鋼ペレット (直径9.52mm)(周囲)
- ③ステンレス鋼プレート (ドロワエッジ、厚さ3.18mm)(周囲)

ドロワ(20~36inch領域) : Na

測定に用いた制御棒タイプと制御棒に用いたドロワマスタ番号を Table 4.1.2-1 に、各ドロワマスタの原子数密度を Table 4.1.2-2 示す。

c 測定結果

中心制御棒の反応度値の測定結果を Table 4.1.2-3 に、バンク制御棒及びバンクCRPの反応度値の測定結果を Table 4.1.2-4 に示す。

制御棒値は、第3.3節で述べたごとく、64個のIFCを用いて修正中性子源増倍法で求めている。解析値と比較すべき最終値は、これらのデータを最小自乗フィットして求めているが、上記の2表には参考までに各IFCから得られる制御棒値を加算平均した値も記載している。同表でAllの欄はすべてのデータを用いたケースで、 3.6σ の欄は、平均値とのずれが 3.6σ 以内のデータのみを用いたケースである。LSFITの欄が最小自乗フィットによる最終値で、解析値と比較すべき値である。同表では、これらの値をアンダーラインで示す。

(2) ZPPR-17B

ZPPR-17B体系での制御棒値の測定は、各種のバンク制御棒値と制御棒値の軸方向分布の測定が実施された。

a バンク制御棒値

(a) 炉心体系と制御棒位置

実験は、ZPPR-17Bの未臨界基準体系において、そのNa装填ドロワを制御棒ドロワで置換した体系で実施された。Fig. 4.1.2-3に制御棒の挿入位置を示す。

(b) 制御棒の構成

ドロウマスタ番号 603と604 の2種類の模擬制御棒を使用した。603タイプは炉心中心に、604タイプはその他の制御棒位置で用いられた(Table 4.1.2-2)

(c) 測定結果

測定結果を、Table 4.1.2-5 に示す。解析値と比較すべき測定値をアンダーラインで示す。

b 制御棒価値の軸方向分布

実験は、ZPPR-17B体系において、2つの測定方法で実施された。第1の方法は未臨界体系での中性子源増倍法、第2の方法は臨界体系でのドロウオシレーション法である。

(a) 未臨界体系での測定

i 炉心体系と制御棒位置

実験は、ZPPR-17Bの未臨界体系において、Fig. 4.1.2-4 の中心制御棒ポジションのNa装填ドロウ(2×2)を制御棒ドロウで置換した体系で実施された。

ii 制御棒の構成

制御棒は、軸方向に36inch長さのドロウを3本連ねて構成される(half-one側:36inch長、half-two側:72inch長)。Fig.4.1.2-3に、各測定ケースのB₄C領域(軸方向長さ40inch)の軸方向位置を示す。測定の11ステップは、制御棒が炉心と軸方向ブランケットとの境界位置(①)から4inch長間隔で挿入された位置に対応する。

実験では、天然B₄Cのプレートタイプの模擬制御棒が用いられた。各測定で用いたドロウタイプを Table 4.1.2-6 に示す。

Table 4.1.2-7 に各模擬制御棒の軸方向位置の原子数密度を示す。

iii 測定結果

測定結果を、Table 4.1.2-6 に示す。

(b) 臨界体系での測定

i 炉心体系と制御棒位置

実験は、ZPPR-17Bの臨界体系において、Fig. 4.1.2-4の中心制御棒ポジションの149-49と249-49位置のNa装填ドロワを制御棒ドロワで置換した体系で実施された。

ii 制御棒の構成

制御棒ドロワには、40in.長さの天然B₄CカンとNaが装填されている。各領域の原子数密度は、

天然B₄Cカン：Table 4.1.2-7のドロワマスタ 638(0-16in.)

Na ：Table 4.1.2-7のドロワマスタ 638(16-36in.)

である。

iii 測定結果

測定結果をTable 4.1.2-8に示す。

(3) ZPPR-17C

ZPPR-17C体系での制御棒価値の測定は、各種のバンク制御棒価値の測定と制御棒価値の軸方向分布の測定が実施された。

a バンク制御棒価値

(a) 炉心体系と制御棒位置

実験は、ZPPR-17Cの未臨界基準体系において、そのNaドロワを制御棒ドロワで置換した体系で実施された。制御棒の挿入位置をFig. 4.1.2-5に示す。

(b) 制御棒の構成

ZPPR-17Bと同じ。

(c) 測定結果

測定結果を、Table 4.1.2-9に示す。解析値と比較すべき測定値をアンダーラインで示す。

b 制御棒価値の軸方向分布

制御棒価値の軸方向分布の実験が、ZPPR-17C体系においても実施された。
測定方法は、臨界体系でのドロワオシレーション法である。

(a) 炉心体系と制御棒位置

実験は、Fig. 4.1.2-9 に示す ZPPR-17C の臨界体系において、Fig. 4.1.2-8 の中心制御棒ポジションの 149-49 と 249-49 及び 165-49 と 265-49 位置の装荷ドロワを制御棒ドロワで置換した2つの体系で実施した。

(b) 制御棒の構成

ZPPR-18Bに同じ。

(c) 測定結果

測定結果を Table 4.1.2-10 及び Table 4.1.2-11 に示す。

(4) 測定結果のまとめ

以上の測定結果を解析結果とともにまとめて以下の表に示す。

Table 4.1.2-12は、ZPPR-17Aにおける各種の構成による中心制御棒価値、
Table 4.1.2-13は、ZPPR-17Bにおける各種の制御棒パターンでの制御棒価値、
Table 4.1.2-14は、(2×2)サイズの制御棒ドロワによる制御棒価値の軸方向分布、
Table 4.1.2-15は、ZPPR-17Cの各種制御棒パターンでの制御棒価値である。

Table 4.1.2-1 Control Rod Worth Measurements in ZPPR-17A

Reactor Run Number	Reactor Loading Number	Data File Number	Rod Descriptions	Drawer Masters Used
25	27	45	Subcritical Reference	---
26	28	46	CRP	601
27	29	47	50% Natural B C Plate	602
28	30	48	100% Natural B C Plate	604
29	31	49	Half Inserted 100% Natural B C Plate	604
30	32	50	Tight-packed Natural B C Pellets	605, 606, 609, 610
31	33	51	Enriched B C Pellets in Calandria	613
32	34	52	Tight-packed Enriched B C Pellets	607, 608, 611, 612
33	35	53	Half Inserted 100% Enriched B C Plates	615
34	36	54	50% Enriched B C Plates	616
35	37	55	2 x 3 100% Natural B C Plates	604
36	38	56	2 x 2 100% Natural B C Plates Off Center	604
37	39	57	3 x 3 CRP	601
38	40	58	3 x 3 100% Natural B C Plates	604
39	41	59	Subcritical Reference	---

Table 4.1.2-2 Control Rod Compositions for ZPPR-17A (atoms/barn-cm)

Isotopes	Master 601 0-6	Master 601 6-20	Master 601 20-31	Master 601 31-36	Master 602 0-6	Master 602 6-20
B-10	---	---	---	---	0.0071434	0.0071648
B-11	---	---	---	---	0.0289640	0.0290522
C	0.0000307	0.0000309	0.0000309	0.0000447	0.0093854	0.0094136
O	0.0000013	0.0000013	0.0000013	0.0000013	0.0000006	0.0000006
Na	0.0180431	0.0183971	0.0184407	0.0179928	0.0082828	0.0083768
Si	0.0001648	0.0001649	0.0001649	0.0001705	0.0002023	0.0002037
Al	0.0000043	0.0000048	0.0000049	0.0000048	0.0000054	0.0000051
Mn	0.0002412	0.0002442	0.0002443	0.0002512	0.0002583	0.0002609
Cr	0.0029392	0.0029644	0.0029657	0.0030388	0.0031523	0.0031823
Fe	0.0103736	0.0104649	0.0104697	0.0110019	0.0111530	0.0112611
Ni	0.0013184	0.0013274	0.0013281	0.0013586	0.0014321	0.0014436
Cu	0.0000357	0.0000353	0.0000353	0.0000370	0.0000362	0.0000362
Mo	0.0000175	0.0000174	0.0000173	0.0000183	0.0000178	0.0000179
P	0.0000040	0.0000040	0.0000040	0.0000042	0.0000040	0.0000040
S	0.0000013	0.0000012	0.0000012	0.0000013	0.0000013	0.0000012
Cl	0.0000006	0.0000006	0.0000006	0.0000006	0.0000003	0.0000003
Ca	0.0000041	0.0000042	0.0000042	0.0000041	0.0000019	0.0000019
Co	0.0000040	0.0000037	0.0000037	0.0000043	0.0000040	0.0000037

Table 4.1.2-2 (contd)

Isotope	Master 602 20-31	Master 602 31-36	Master 603 0-6	Master 603 6-20	Master 603 20-31	Master 603 31-36
B-10	---	---	0.0158704	0.0151769	---	---
B-11	---	---	0.0643536	0.0615467	---	---
C	0.0000308	0.0000447	0.0203704	0.0197666	0.0000308	0.0000447
O	0.0000013	0.0000013	0.0001353	0.0000534	0.0000013	0.0000013
Na	0.0181363	0.0176957	---	---	0.0181363	0.0176957
Si	0.0001651	0.0001707	0.0002522	0.0002235	0.0001651	0.0001707
Al	0.0000043	0.0000042	0.0000021	0.0000028	0.0000043	0.0000042
Mn	0.0002432	0.0002501	0.0002004	0.0002204	0.0002432	0.0002501
Cr	0.0029562	0.0030295	0.0023506	0.0026105	0.0029562	0.0030295
Fe	0.0104363	0.0109693	0.0084649	0.0093681	0.0104363	0.0109693
Ni	0.0013233	0.0013539	0.0010327	0.0011621	0.0013233	0.0013539
Cu	0.0000357	0.0000374	0.0000314	0.0000325	0.0000357	0.0000374
Mo	0.0000174	0.0000183	0.0000157	0.0000162	0.0000174	0.0000183
P	0.0000040	0.0000042	0.0000040	0.0000040	0.0000040	0.0000042
S	0.0000012	0.0000013	0.0000013	0.0000012	0.0000012	0.0000013
Cl	0.0000006	0.0000006	---	---	0.0000006	0.0000006
Ca	0.0000042	0.0000041	---	---	0.0000042	0.0000041
Co	0.0000037	0.0000043	0.0000040	0.0000037	0.0000037	0.0000043

Table 4.1.2-2 (contd)

Isotope	Master 604 0-6	Master 604 6-20	Master 604 20-31	Master 604 31-36	Master 605 0-6	Master 605 6-20
B-10	0.0158704	0.0151625	---	---	0.0064917	0.0065252
B-11	0.0643536	0.0614842	---	---	0.0265916	0.0267289
C	0.0203704	0.0197463	0.0000308	0.0000447	0.0081572	0.0081995
O	0.0001353	0.0000534	0.0000013	0.0000013	---	---
Na	---	---	0.0181363	0.0176957	---	---
Si	0.0002522	0.0002235	0.0001651	0.0001707	0.0003240	0.0003166
Al	0.0000021	0.0000028	0.0000043	0.0000042	0.0000007	0.0000007
Mn	0.0002004	0.0002204	0.0002432	0.0002501	0.0004590	0.0004637
Cr	0.0023506	0.0026105	0.0029562	0.0030295	0.0066140	0.0067020
Fe	0.0084649	0.0093681	0.0104363	0.0109693	0.0236747	0.0240177
Ni	0.0010327	0.0011621	0.0013233	0.0013539	0.0026819	0.0027122
Cu	0.0000314	0.0000325	0.0000357	0.0000374	0.0000634	0.0000651
Mo	0.0000157	0.0000162	0.0000174	0.0000183	0.0000268	0.0000283
P	0.0000040	0.0000040	0.0000040	0.0000042	0.0000154	0.0000155
S	0.0000013	0.0000012	0.0000012	0.0000013	0.0000114	0.0000114
Cl	---	---	0.0000006	0.0000006	---	---
Ca	---	---	0.0000042	0.0000041	---	---
Co	0.0000040	0.0000037	0.0000037	0.0000043	0.0000193	0.0000191

Table 4.1.2-2 (contd)

Isotope	Master 605 20-31	Master 605 31-36	Master 606 0-6	Master 606 6-20	Master 606 20-31	Master 606 31-36
B-10	---	---	0.0064917	0.0065252	---	---
B-11	---	---	0.0265916	0.0267289	---	---
C	0.0000308	0.0000447	0.0081572	0.0081995	0.0000308	0.0000447
O	0.0000013	0.0000013	---	---	0.0000013	0.0000013
Na	0.0181363	0.0176957	---	---	0.0181363	0.0176957
Si	0.0001651	0.0001707	0.0003240	0.0003166	0.0001651	0.0001707
Al	0.0000043	0.0000042	0.0000007	0.0000007	0.0000043	0.0000042
Mn	0.0002432	0.0002501	0.0004590	0.0004637	0.0002432	0.0002501
Cr	0.0029562	0.0030295	0.0066140	0.0067020	0.0029562	0.0030295
Fe	0.0104363	0.0109693	0.0236747	0.0240177	0.0104363	0.0109693
Ni	0.0013233	0.0013539	0.0026819	0.0027122	0.0013233	0.0013539
Cu	0.0000357	0.0000374	0.0000634	0.0000651	0.0000357	0.0000374
Mo	0.0000174	0.0000183	0.0000268	0.0000283	0.0000174	0.0000183
P	0.0000040	0.0000042	0.0000154	0.0000155	0.0000040	0.0000042
S	0.0000012	0.0000013	0.0000114	0.0000114	0.0000012	0.0000013
Cl	0.0000006	0.0000006	---	---	0.0000006	0.0000006
Ca	0.0000042	0.0000041	---	---	0.0000042	0.0000041
Co	0.0000037	0.0000043	0.0000193	0.0000191	0.0000037	0.0000043

Table 4.1.2-2 (contd)

Isotope	Master 607 0-6	Master 607 6-20	Master 607 20-31	Master 607 31-36	Master 608 0-6	Master 608 6-20
B-10	0.0320920	0.0322578	---	---	0.0320920	0.0322578
B-11	0.0027949	0.0028093	---	---	0.0027949	0.0028093
C	0.0091012	0.0091484	0.0000308	0.0000447	0.0091012	0.0091484
O	0.0000304	0.0000305	0.0000013	0.0000013	0.0000304	0.0000305
Na	---	---	0.0181363	0.0176957	---	---
Si	0.0003247	0.0003174	0.0001651	0.0001707	0.0003247	0.0003174
Al	0.0000014	0.0000014	0.0000043	0.0000042	0.0000014	0.0000014
Mn	0.0004582	0.0004629	0.0002432	0.0002501	0.0004582	0.0004629
Cr	0.0066140	0.0067020	0.0029562	0.0030295	0.0066140	0.0067020
Fe	0.0236395	0.0239823	0.0104363	0.0109693	0.0236395	0.0239823
Ni	0.0026828	0.0027131	0.0013233	0.0013539	0.0026828	0.0027131
Cu	0.0000624	0.0000641	0.0000357	0.0000374	0.0000624	0.0000641
Mo	0.0000268	0.0000283	0.0000174	0.0000183	0.0000268	0.0000283
P	0.0000154	0.0000155	0.0000040	0.0000042	0.0000154	0.0000155
S	0.0000114	0.0000114	0.0000012	0.0000013	0.0000114	0.0000114
Cl	---	---	0.0000006	0.0000006	---	---
Ca	0.0000036	0.0000036	0.0000042	0.0000041	0.0000036	0.0000036
Co	0.0000182	0.0000180	0.0000037	0.0000043	0.0000182	0.0000180

Table 4.1.2-2 (contd)

Isotope	Master 608 20-31	Master 608 31-36	Master 609 0-6	Master 609 6-20	Master 609 20-31	Master 609 31-36
B-10	---	---	0.0064917	0.0065252	---	---
B-11	---	---	0.0265916	0.0267289	---	---
C	0.0000308	0.0000447	0.0081572	0.0081995	0.0000308	0.0000447
O	0.0000013	0.0000013	---	---	0.0000013	0.0000013
Na	0.0181363	0.0176957	---	---	0.0181363	0.0176957
Si	0.0001651	0.0001707	0.0003240	0.0003166	0.0001651	0.0001707
Al	0.0000043	0.0000042	0.0000007	0.0000007	0.0000043	0.0000042
Mn	0.0002432	0.0002501	0.0004590	0.0004637	0.0002432	0.0002501
Cr	0.0029562	0.0030295	0.0066140	0.0067020	0.0029562	0.0030295
Fe	0.0104363	0.0109693	0.0236747	0.0240177	0.0104363	0.0109693
Ni	0.0013233	0.0013539	0.0026819	0.0027122	0.0013233	0.0013539
Cu	0.0000357	0.0000374	0.0000634	0.0000651	0.0000357	0.0000374
Mo	0.0000174	0.0000183	0.0000268	0.0000283	0.0000174	0.0000183
P	0.0000040	0.0000042	0.0000154	0.0000155	0.0000040	0.0000042
S	0.0000012	0.0000013	0.0000114	0.0000114	0.0000012	0.0000013
Cl	0.0000006	0.0000006	---	---	0.0000006	0.0000006
Ca	0.0000042	0.0000041	---	---	0.0000042	0.0000041
Co	0.0000037	0.0000043	0.0000193	0.0000191	0.0000037	0.0000043

Table 4.1.2-2 (contd)

Isotope	Master 610 0-6	Master 610 6-20	Master 610 20-31	Master 610 31-36	Master 611 0-6	Master 611 6-20
B-10	0.0064917	0.0065252	---	---	0.0320920	0.0322578
B-11	0.0265916	0.0267289	---	---	0.0027949	0.0028093
C	0.0081572	0.0081995	0.0000308	0.0000447	0.0091012	0.0091484
O	---	---	0.0000013	0.0000013	0.0000304	0.0000305
Na	---	---	0.0181363	0.0176957	---	---
Si	0.0003240	0.0003166	0.0001651	0.0001707	0.0003247	0.0003174
Al	0.0000007	0.0000007	0.0000043	0.0000042	0.0000014	0.0000014
Mn	0.0004590	0.0004637	0.0002432	0.0002501	0.0004582	0.0004629
Cr	0.0066140	0.0067020	0.0029562	0.0030295	0.0066140	0.0067020
Fe	0.0236747	0.0240177	0.0104363	0.0109693	0.0236395	0.0239823
Ni	0.0026819	0.0027122	0.0013233	0.0013539	0.0026828	0.0027131
Cu	0.0000634	0.0000651	0.0000357	0.0000374	0.0000624	0.0000641
Mo	0.0000268	0.0000283	0.0000174	0.0000183	0.0000268	0.0000283
P	0.0000154	0.0000155	0.0000040	0.0000042	0.0000154	0.0000155
S	0.0000114	0.0000114	0.0000012	0.0000013	0.0000114	0.0000114
Cl	---	---	0.0000006	0.0000006	---	---
Ca	---	---	0.0000042	0.0000041	0.0000036	0.0000036
Co	0.0000193	0.0000191	0.0000037	0.0000043	0.0000182	0.0000180

Table 4.1.2-2 (contd)

Isotope	Master 611 20-31	Master 611 31-36	Master 612 0-6	Master 612 6-20	Master 612 20-31	Master 612 31-36
B-10	---	---	0.0320920	0.0322578	---	---
B-11	---	---	0.0027949	0.0028093	---	---
C	0.0000308	0.0000447	0.0091012	0.0091484	0.0000308	0.0000447
O	0.0000013	0.0000013	0.0000304	0.0000305	0.0000013	0.0000013
Na	0.0181363	0.0176957	---	---	0.0181363	0.0176957
Si	0.0001651	0.0001707	0.0003247	0.0003174	0.0001651	0.0001707
Al	0.0000043	0.0000042	0.0000014	0.0000014	0.0000043	0.0000042
Mn	0.0002432	0.0002501	0.0004582	0.0004629	0.0002432	0.0002501
Cr	0.0029562	0.0030295	0.0066140	0.0067020	0.0029562	0.0030295
Fe	0.0104363	0.0109693	0.0236395	0.0239823	0.0104363	0.0109693
Ni	0.0013233	0.0013539	0.0026828	0.0027131	0.0013233	0.0013539
Cu	0.0000357	0.0000374	0.0000624	0.0000641	0.0000357	0.0000374
Mo	0.0000174	0.0000183	0.0000268	0.0000283	0.0000174	0.0000183
P	0.0000040	0.0000042	0.0000154	0.0000155	0.0000040	0.0000042
S	0.0000012	0.0000013	0.0000114	0.0000114	0.0000012	0.0000013
Cl	0.0000006	0.0000006	---	---	0.0000006	0.0000006
Ca	0.0000042	0.0000041	0.0000036	0.0000036	0.0000042	0.0000041
Co	0.0000037	0.0000043	0.0000182	0.0000180	0.0000037	0.0000043

Table 4.1.2-2 (contd)

Isotope	Master 613 0-6	Master 613 6-20	Master 613 20-31	Master 613 31-36	Master 614 0-7	Master 614 7-12
B-10	0.0303603	0.0303602	---	---	---	---
B-11	0.0026441	0.0026441	---	---	---	---
C	0.0085390	0.0085401	0.0000564	0.0000187	0.0000307	0.0005925
O	0.0000287	0.0000287	---	---	0.0000013	---
Na	0.0092937	0.0092940	0.0033792	---	0.0183592	---
Si	0.0001411	0.0001451	0.0001710	0.0000683	0.0001224	0.0000724
Al	0.0000042	0.0000042	0.0000011	---	0.0000049	---
Mn	0.0001914	0.0001977	0.0002470	0.0001059	0.0002440	0.0006778
Cr	0.0025201	0.0025901	0.0039716	0.0011891	0.0029680	0.0018719
Fe	0.0088680	0.0091202	0.0143059	0.0042791	0.0104602	0.0772265
Ni	0.0011124	0.0011407	0.0016121	0.0004802	0.0013012	0.0007425
Cu	0.0000219	0.0000230	0.0000386	0.0000172	0.0000300	0.0000242
Mo	0.0000099	0.0000103	0.0000110	0.0000083	0.0000145	0.0000119
P	0.0000041	0.0000043	0.0000077	0.0000028	0.0000045	0.0000237
S	0.0000020	0.0000021	0.0000048	0.0000007	0.0000011	0.0000322
Cl	---	---	---	---	0.0000006	---
Ca	0.0000034	0.0000034	---	---	0.0000042	---
Co	0.0000062	0.0000062	0.0000126	---	---	---

Table 4.1.2-2 (contd)

Isotope	Master 614 12-23	Master 615 0-6	Master 615 6-20	Master 615 20-31	Master 615 31-36	Master 616 0-6
B-10	---	0.0631433	0.0632983	---	---	0.0313728
B-11	---	0.0059024	0.0058759	---	---	0.0029308
C	0.0000354	0.0212450	0.0209466	0.0000308	0.0000447	0.0105561
O	---	0.0000425	0.0000457	0.0000013	0.0000013	0.0000218
Na	---	---	---	0.0181363	0.0176957	0.0082828
Si	0.0000726	0.0001111	0.0001112	0.0001651	0.0001707	0.0001493
Al	---	---	---	0.0000043	0.0000042	0.0000032
Mn	0.0001664	0.0001603	0.0001619	0.0002432	0.0002501	0.0002182
Cr	0.0018830	0.0018148	0.0018260	0.0029562	0.0030295	0.0026165
Fe	0.0068638	0.0065099	0.0065526	0.0104363	0.0109693	0.0092644
Ni	0.0007560	0.0007583	0.0007603	0.0013233	0.0013539	0.0011576
Cu	0.0000246	0.0000290	0.0000290	0.0000357	0.0000374	0.0000337
Mo	0.0000121	0.0000147	0.0000146	0.0000174	0.0000183	0.0000168
P	0.0000046	0.0000040	0.0000040	0.0000040	0.0000042	0.0000040
S	0.0000012	0.0000013	0.0000012	0.0000012	0.0000013	0.0000013
Cl	---	---	---	0.0000006	0.0000006	0.0000003
Ca	---	---	---	0.0000042	0.0000041	0.0000019
Co	---	0.0000040	0.0000037	0.0000037	0.0000043	0.0000040

Table 4.1.2-2 (contd)

Isotope	Master 616 6-20	Master 616 20-31	Master 616 31-36
B-10	0.0316774	---	---
B-11	0.0029410	---	---
C	0.0105002	0.0000308	0.0000447
O	0.0000235	0.0000213	0.0000013
Na	0.0083768	0.0181363	0.0176957
Si	0.0001495	0.0001651	0.0001707
Al	0.0000031	0.0000043	0.0000042
Mn	0.0002200	0.0002432	0.0002501
Cr	0.0026328	0.0029562	0.0030295
Fe	0.0093247	0.0104363	0.0109693
Ni	0.0011622	0.0013233	0.0013539
Cu	0.0000338	0.0000357	0.0000374
Mo	0.0000167	0.0000174	0.0000183
P	0.0000040	0.0000040	0.0000042
S	0.0000012	0.0000012	0.0000013
Cl	0.0000003	0.0000006	0.0000006
Ca	0.0000019	0.0000042	0.0000041
Co	0.0000037	0.0000037	0.0000043

Table 4.1.2-3 Data Processing for Central Control Rods in ZPPR-17A

Case	File	Method	FCs	χ^2	Ratio	Worth, \$ ^a	σ_s %	σ_t %	Difference from ZPR-476, %
2 x 2 CRP	46	All	61	1.090	0.9986	0.0838	0.12	0.90	
		3.6 σ	61	1.090	"	0.0837	0.11	0.90	
		LSFIT	61	0.971	0.9986	<u>0.0837</u>	0.11	1.45	+2
50/50 B ₄ C/Na 2 x 2	47	All	61	9.00	0.9965	0.779	0.15	0.82	
		3.6 σ	55	2.19	"	0.781	0.08	0.81	
		LSFIT	61	1.14	0.9972	<u>0.778</u>	0.06	0.89	-0.6
100% Nat. B ₄ C 2 x 2	48	All	61	3.94	0.9965	1.073	0.09	0.81	
		3.6 σ	57	1.36	"	1.071	0.06	0.81	
		LSFIT	61	0.74	0.9959	<u>1.073</u>	0.04	0.88	-0.7
100% Nat. B ₄ C 2 x 2 Half- inserted	49	All	61	28.6	0.9965	0.619	0.25	0.85	
		3.6 σ	47	1.74	"	0.623	0.08	0.82	
		LSFIT	58	1.24	0.9976	<u>0.619</u>	0.06	0.90	-0.2
Nat. B ₄ C Pins Tight Pack	50	All	61	19.6	0.9965	0.704	0.21	0.84	
		3.6 σ	54	2.22	"	0.708	0.08	0.81	
		LSFIT	61	0.79	0.9976	<u>0.703</u>	0.05	0.90	-0.5
Enr. B ₄ C Pins in Calandria	51	All	61	11.4	0.9965	1.187	0.19	0.83	
		3.6 σ	56	2.84	"	1.183	0.10	0.81	
		LSFIT	61	1.04	0.9951	<u>1.188</u>	0.06	0.88	-0.7
Enr. B ₄ C Pins Tight Pack	52	All	61	3.89	0.9965	1.083	0.11	0.82	
		3.6 σ	58	1.83	"	1.082	0.07	0.81	
		LSFIT	60	1.14	0.9959	<u>1.083</u>	0.06	0.88	-0.7
100% Enr. B ₄ C Half-inserted	53	All	61	4.79	0.9965	0.817	0.11	0.82	
		3.6 σ	57	1.34	0.9965	0.818	0.07	0.81	
		LSFIT	57	1.11	0.9966	<u>0.817</u>	0.06	0.89	-0.4

Ref. : PNC SA0765 ANL-ZPR-480

Table 4.1.2-3 (contd)

Case	File	Method	FCs	χ^2	Ratio	Worth, \$ ^a	σ_s %	σ_t %	Difference from ZPR-476, %
50% Enr. B ₄ C Plate	54	All	61	11.7	0.9965	1.194	0.19	0.83	
		3.6 σ	56	2.57	"	1.190	0.09	0.81	
		LSFIT	61	1.01	0.9951	<u>1.195</u>	0.05	0.88	-0.7
2 x 3 Nat. B ₄ C Plate	55	All	61	41.0	0.9965	1.387	0.40	0.90	
		3.6 σ	40	3.31	"	1.380	0.13	0.82	
		LSFIT	34	0.88	0.9919	<u>1.395</u>	0.12	0.89	-0.2
2 x 2 Nat. B ₄ C Plate Off-center	56	All	61	30.3	0.9965	1.117	0.31	0.87	
		3.6 σ	35	3.59	"	1.118	0.16	0.82	
		LSFIT	19	0.89	0.9954	<u>1.108</u>	0.09	0.89	-1.4
3 x 3 CRP	57	All	61	7.47	0.9986	0.305	0.16	0.83	
		3.6 σ	51	2.95	"	0.304	0.11	0.83	
		LSFIT	55	1.27	0.9981	<u>0.306</u>	0.07	0.97	+0.7
3 x 3 Nat. B ₄ C Plate	58	All	61	131.0	0.9965	1.710	0.65	1.04	
		3.6 σ	25	3.80	"	1.702	0.16	0.82	
		LSFIT	18	0.82	0.9917	<u>1.721</u>	0.11	0.88	0.0

^aDetector efficiencies and source ratios were calculated only for the case of the 2 x 2 CRP and for the 2 x 2 100% natural B₄C control rod.

^bWorths are derived relative to the subcritical reference reactivity of $-25.16\phi \pm 0.20\phi$ with data recorded on file 45.

Table 4.1.2-4 Data Processing for the Special Control Rod Bank and CRP Banks in ZPPR-17A

Case	File	Method	No. of FCs	χ^2 ^a	Source Ratio	Worth, \$ ^a	σ_s %	σ_t %	E_f	C_s	C_E
4 CRPs	83	All	63	1.26	0.9913	0.587	0.12	0.82	---	---	---
		3.6 σ	63	1.26	0.9913	0.587	0.11	0.82	---	---	---
		LSFIT	63	0.99	0.9927	<u>0.588</u>	0.11	0.92	1.0082	0.9971	1.0076
4 CRs	84	All	60	2.86	0.9778	3.350	0.14	0.85	---	---	---
		3.6 σ	57	1.71	0.9778	3.345	0.11	0.84	---	---	---
		LSFIT	60	1.05	0.9742	<u>3.347</u>	0.08	0.87	1.0050	0.9971	1.0076
Central CRP	85	All	61	0.81	0.9986	0.0756	0.40	1.02	---	---	---
		3.6 σ	61	0.81	0.9986	0.0756	0.39	1.01	---	---	---
		LSFIT	61	0.76	0.9986	<u>0.0756</u> ^b	0.39	1.71	1.0014	0.9986	1.0013
Center, 6 Inner CRPs	86	All	61	1.90	0.9860	1.048	0.08	0.82	---	---	---
		3.6 σ	61	1.90	0.9860	1.048	0.07	0.82	---	---	---
		LSFIT	61	1.20	0.9860	<u>1.046</u>	0.07	0.89	1.0139	0.9861	1.0133
Center, 6 Inner, 6 middle, CRPs	87	All	59	3.24	0.9770	1.778	0.12	0.85	---	---	---
		3.6 σ	57	2.40	0.9770	1.779	0.10	0.85	---	---	---
		LSFIT	57	0.94	0.9768	<u>1.768</u>	0.08	0.88	1.0239	0.9765	1.0236
All 25 CRPs	88	All	64	3.13	0.9504	6.684	0.14	0.96	---	---	---
		3.6 σ	62	2.64	0.9504	6.689	0.13	0.96	---	---	---
		LSFIT	57	1.23	0.9473	<u>6.630</u>	0.12	0.87	1.0595	0.0439	1.0640

^aWorths are derived relative to the subcritical reference reactivity of $-29.27\phi \pm 0.23\phi$ with data recorded on file 82.

^bRecommended worth for the central CRP is taken from Table 6.2, see text.

Ref. : PNC SA0765 ANL-ZPR-480

Table 4.1.2-5 Data Processing for ZPPR-17B Control Rods

Step	Rods	File	Method	Number of FC's	χ^2	Source Ratio	Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
1	CR1 (1,0,0,0)	95	All	63	3.21	0.9971	1.001	0.133	0.890
			3.6 σ	60	1.86	0.9971	0.999	0.142	0.892
			LSFIT	63	1.34	0.9961	<u>1.001</u>	0.087	0.885
2	2-7 Half In (0, 6H, 0, 0)	96	All	62	7.29	0.9910	3.183	0.284	0.908
			3.6 σ	53	1.73	0.9910	3.165	0.190	0.883
			LSFIT	62	1.15	0.9872	<u>3.171</u>	0.123	0.874
3	2-7 (0, 6, 0, 0)	97	All	62	17.85	0.9794	5.870	0.456	0.972
			3.6 σ	49	3.07	0.9794	5.796	0.314	0.915
			LSFIT	62	1.42	0.9705	<u>5.822</u>	0.116	0.874
4	1-7 (1,6,0,0)	98	All	61	19.98	0.9724	6.205	0.530	1.009
			3.6 σ	47	2.72	0.9724	6.113	0.285	0.905
			LSFIT	61	1.46	0.9593	<u>6.137</u>	0.117	0.877
5	1-13 (1,6,6,0)	99	All	56	21.28	0.9510	12.329	0.693	1.170
			3.6 σ	40	3.82	0.9510	12.136	0.493	1.064
			LSFIT	56	1.37	0.9303	<u>12.169</u>	0.158	0.888
6	2-13 (0,6,6,0)	100	All	57	28.96	0.9587	12.099	0.651	1.114
			3.6 σ	32	3.05	0.9587	11.944	0.538	1.052
			LSFIT	50	1.12	0.9428	<u>11.952</u>	0.163	0.885
7	1-7, 9-13 (1,6,5,0)	101	All	55	23.97	0.9410	11.010	0.709	1.227
			3.6 σ	32	3.05	0.9410	10.842	0.432	1.091
			LSFIT	50	1.36	0.9208	<u>10.804</u>	0.180	0.898
8	1, 3-13 (1,5,6,0)	102	All	55	18.79	0.9562	11.822	0.635	1.115
			3.6 σ	38	3.44	0.9562	11.667	0.466	1.028
			LSFIT	54	1.45	0.9378	<u>11.718</u>	0.161	0.887

Table 4.1.2-5 (contd)

Step	Rods	File	Method	Number of FC's	χ^2	Source Ratio	Worth,\$	Statistical Uncertainty, %	Total Uncertainty, %
9	1, 8-13 (1,0,6,0)	103	All	58	9.05	0.9877	9.010	0.332	0.920
			3.6 σ	47	2.69	0.9877	8.926	0.320	0.915
			LSFIT	58	1.44	0.9832	<u>9.017</u>	0.126	0.870
10	8-13 (0,0,6,0)	104	All	59	5.71	0.9953	8.304	0.259	0.896
			3.6 σ	52	3.59	0.9953	8.273	0.409	0.950
			LSFIT	59	1.25	0.9937	<u>8.318</u>	0.121	0.867
11	9-13 (0,0,5,0)	105	All	58	6.64	0.9782	6.571	0.256	0.896
			3.6 σ	49	2.65	0.9782	6.549	0.298	0.907
			LSFIT	50	0.99	0.9729	<u>6.537</u>	0.134	0.873
12	1, 3-7, 15, 17,19,21,23,25 (1,5,0,6 \emptyset)	106	All	56	16.28	0.9848	17.413	0.487	0.985
			3.6 σ	42	3.19	0.9848	17.229	0.392	0.942
			LSFIT	51	1.46	0.9848	<u>17.321</u>	0.131	0.870
13	2-7, 15, 17 19,21,23,25 (0,6,0,6 \emptyset)	107	All	57	17.52	0.9904	17.938	0.478	0.960
			3.6 σ	36	4.39	0.9904	17.770	0.570	1.028
			LSFIT	48	1.07	0.9869	<u>17.856</u>	0.147	0.871
14	1-7, 15, 17 19,21,23,25 (1,6,0,6 \emptyset)	108	All	56	18.53	0.9830	18.411	0.523	1.003
			3.6 σ	37	3.21	0.9830	18.194	0.420	0.954
			LSFIT	54	1.36	0.9772	<u>18.279</u>	0.137	0.872
15	1, 9-13, 15, 17,19,21,23,25 (1,0,5,6 \emptyset)	109	All	53	8.24	0.9852	18.629	0.311	0.911
			3.6 σ	43	3.72	0.9852	18.535	0.452	0.968
			LSFIT	53	1.41	0.9805	<u>18.625</u>	0.131	0.875
16	1, 8-13, 15, 17,19,21,23,25 (1,0,6,6 \emptyset)	110	All	53	10.53	0.9973	20.400	0.337	0.920
			3.6 σ	38	2.90	0.9973	20.180	0.353	0.926
			LSFIT	53	1.21	0.9964	<u>20.490</u>	0.113	0.864

Table 4.1.2-5 (contd)

Step	Rods	File	Method	Number of FC's	χ^2	Source Ratio	Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
17	14-25 Half-In (0,0,0,12H)	111	All	57	3.36	0.9933	10.760	0.189	0.878
			3.6 σ	53	2.33	0.9933	10.757	0.267	0.898
			LSFIT	55	1.43	0.9915	<u>10.731</u>	0.146	0.871
18	14-25 (0,0,0,12)	112	All	56	6.13	1.0053	22.416	0.250	0.892
			3.6 σ	49	2.79	1.0053	22.376	0.320	0.914
			LSFIT	53	0.92	1.0072	<u>22.477</u>	0.120	0.863
19	1, 14-25 (1,0,0,12)	113	All	56	5.15	1.0132	24.431	0.255	0.893
			3.6 σ	52	2.94	1.0132	24.344	0.342	0.922
			LSFIT	56	1.23	1.0190	<u>24.589</u>	0.118	0.860
20	1, 15-25 (1,0,0,11)	114	All	56	7.24	0.9616	20.610	0.298	0.938
			3.6 σ	47	2.54	0.9616	20.559	0.307	0.941
			LSFIT	52	1.38	0.9541	<u>20.435</u>	0.170	0.879
Repeat Reference		115	All	64	5.14	1.0000	0.0016	18.3	44.4
			3.6 σ	63	1.06	1.0000	0.0017	15.4	40.5

Table 4.1.2-6 Reactivities for Various Rod Insertions in ZPPR-17B

<u>Reactor Run</u>	<u>Reactor Loading</u>	<u>Data File</u>	<u>Rod Insertion, mm</u>	<u>Reactivity, ρ</u>	<u>Drawer Masters</u>
122	111	115	---	-21.5	601
123	112	116	0 ^a	-29.1	617, 618, 619
124	113	117	101.6	-37.3	617, 620, 621
125	114	118	203.2	-49.6	617, 622, 623
126	115	119	304.8	-61.6	617, 624, 625
127	116	120	406.4	-70.8	617, 626, 627
128	117	121	508.0	-77.7	617, 628, 629
129	118	122	609.6	-85.5	628, 634, 635
130	119	123	711.2	-95.0	630, 636, 635
131	120	124	812.8	-106.4	631, 637, 635
135	123	125	914.4	-115.8	632, 638, 635
136	124	126	1016.0	-119.4	633, 635

^aZero insertion corresponds to the rod parked at the core/axial blanket interface.

Table 4.1.2-7 Control Rod Compositions
in ZPPR-17B

Isotope	Master	Master	Master
	617 0-36	618 0-20	618 20-36
B-10	---	---	0.0141573
B-11	---	---	0.0573997
C	0.0000328	0.0000308	0.0185744
O	0.0000013	0.0000013	---
Na	0.0182582	0.0183086	---
Si	0.0001700	0.0001692	0.0002231
Al	0.0000057	0.0000057	0.0000029
Mn	0.0002502	0.0002490	0.0002489
Cr	0.0030568	0.0030443	0.0029936
Fe	0.0108185	0.0107354	0.0107492
Ni	0.0013736	0.0013687	0.0013560
Cu	0.0000365	0.0000363	0.0000344
Mo	0.0000180	0.0000179	0.0000173
P	0.0000040	0.0000040	0.0000041
S	0.0000012	0.0000012	0.0000012
Cl	0.0000006	0.0000006	---
Ca	0.0000042	0.0000042	---
Co	0.0000038	0.0000038	0.0000039

Table 4.1.2-7 (contd)

Isotope	Master	Master	Master	Master	Master	Master
	619 0-24	619 24-36	620 0-16	620 16-36	621 0-20	621 20-36
B-10	0.0142491	---	---	0.0141792	0.0142454	---
B-11	0.0577717	---	---	0.0574884	0.0577568	---
C	0.0186900	0.0000367	0.0000308	0.0186022	0.0186852	0.0000352
O	---	0.0000013	0.0000013	---	---	0.0000013
Na	---	0.0181487	0.0183016	---	---	0.0181954
Si	0.0002214	0.0001716	0.0001691	0.0002229	0.0002213	0.0001710
Al	0.0000029	0.0000057	0.0000057	0.0000029	0.0000029	0.0000057
Mn	0.0002460	0.0002524	0.0002488	0.0002485	0.0002458	0.0002517
Cr	0.0029616	0.0030796	0.0030430	0.0029890	0.0029598	0.0030722
Fe	0.0105490	0.0109768	0.0107306	0.0107158	0.0105426	0.0109217
Ni	0.0013432	0.0013827	0.0013683	0.0013541	0.0013425	0.0013796
Cu	0.0000338	0.0000370	0.0000363	0.0000343	0.0000338	0.0000368
Mo	0.0000170	0.0000182	0.0000179	0.0000172	0.0000170	0.0000181
P	0.0000040	0.0000041	0.0000040	0.0000041	0.0000040	0.0000041
S	0.0000012	0.0000013	0.0000012	0.0000012	0.0000012	0.0000012
Cl	---	0.0000006	0.0000006	---	---	0.0000006
Ca	---	0.0000042	0.0000042	---	---	0.0000042
Co	0.0000038	0.0000039	0.0000038	0.0000038	0.0000038	0.0000039

Table 4.1.2-7 (contd)

Isotope	Master 622 0-12	Master 622 12-36	Master 623 0-16	Master 623 16-36	Master 624 0-8	Master 624 08-36
B-10	---	0.0141939	0.0142399	---	---	0.0142043
B-11	---	0.0575478	0.0577344	---	---	0.0575902
C	0.0000308	0.0186207	0.0186779	0.0000344	0.0000308	0.0186340
O	0.0000013	---	---	0.0000013	0.0000013	---
Na	0.0182898	---	---	0.0182236	0.0182662	---
Si	0.0001691	0.0002227	0.0002211	0.0001707	0.0001690	0.0002226
Al	0.0000057	0.0000029	0.0000029	0.0000057	0.0000057	0.0000029
Mn	0.0002486	0.0002482	0.0002456	0.0002513	0.0002481	0.0002480
Cr	0.0030408	0.0029859	0.0029572	0.0030677	0.0030365	0.0029837
Fe	0.0107226	0.0106934	0.0105331	0.0108886	0.0107065	0.0106774
Ni	0.0013677	0.0013528	0.0013415	0.0013778	0.0013664	0.0013519
Cu	0.0000363	0.0000342	0.0000338	0.0000367	0.0000363	0.0000342
Mo	0.0000179	0.0000172	0.0000170	0.0000180	0.0000179	0.0000172
P	0.0000040	0.0000040	0.0000040	0.0000041	0.0000040	0.0000040
S	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012
Cl	0.0000006	---	---	0.0000006	0.0000006	---
Ca	0.0000042	---	---	0.0000042	0.0000042	---
Co	0.0000038	0.0000038	0.0000038	0.0000038	0.0000039	0.0000038

Table 4.1.2-7 (contd)

Isotope	Master 625 0-12	Master 625 12-36	Master 626 0-4	Master 626 4-36	Master 627 0-8	Master 627 8-36
B-10	0.0142307	---	---	0.0142122	0.0142124	---
B-11	0.0576973	---	---	0.0576221	0.0576230	---
C	0.0186659	0.0000338	0.0000307	0.0186440	0.0186418	0.0000334
O	---	0.0000013	0.0000013	---	---	0.0000013
Na	---	0.0182424	0.0181960	---	---	0.0182558
Si	0.0002209	0.0001704	0.0001688	0.0002225	0.0002205	0.0001703
Al	0.0000029	0.0000057	0.0000057	0.0000029	0.0000029	0.0000057
Mn	0.0002452	0.0002510	0.0002465	0.0002478	0.0002444	0.0002508
Cr	0.0029528	0.0030647	0.0030235	0.0029821	0.0029440	0.0030625
Fe	0.0105172	0.0108664	0.0106586	0.0106654	0.0104854	0.0108505
Ni	0.0013399	0.0013765	0.0013626	0.0013513	0.0013366	0.0013756
Cu	0.0000337	0.0000367	0.0000363	0.0000341	0.0000337	0.0000366
Mo	0.0000170	0.0000180	0.0000180	0.0000172	0.0000169	0.0000180
P	0.0000040	0.0000040	0.0000039	0.0000040	0.0000039	0.0000040
S	0.0000012	0.0000012	0.0000013	0.0000012	0.0000012	0.0000012
Cl	---	0.0000006	0.0000006	---	---	0.0000006
Ca	---	0.0000042	0.0000042	---	---	0.0000042
Co	0.0000038	0.0000038	0.0000041	0.0000038	0.0000039	0.0000038

Table 4.1.2-7 (contd)

Isotope	Master 628 0-36	Master 629 0-4	Master 629 4-36	Master 630 0-32	Master 630 32-36	Master 631 0-28
B-10	0.0142061	0.0141578	---	0.0142537	---	0.0142517
B-11	0.0575975	0.0574015	---	0.0577903	---	0.0577823
C	0.0186358	0.0185699	0.0000330	0.0186961	0.0000480	0.0186935
O	---	---	0.0000013	---	0.0000013	---
Na	---	---	0.0182660	---	0.0177835	---
Si	0.0002223	0.0002191	0.0001701	0.0002217	0.0001760	0.0002217
Al	0.0000029	0.0000029	0.0000057	0.0000029	0.0000056	0.0000029
Mn	0.0002474	0.0002421	0.0002506	0.0002464	0.0002579	0.0002463
Cr	0.0029779	0.0029179	0.0030609	0.0029672	0.0031379	0.0029667
Fe	0.0106454	0.0103906	0.0108386	0.0105690	0.0114074	0.0105673
Ni	0.0013499	0.0013268	0.0013750	0.0013455	0.0014069	0.0013454
Cu	0.0000341	0.0000335	0.0000366	0.0000339	0.0000384	0.0000339
Mo	0.0000172	0.0000169	0.0000180	0.0000170	0.0000190	0.0000170
P	0.0000040	0.0000039	0.0000040	0.0000040	0.0000043	0.0000040
S	0.0000012	0.0000012	0.0000012	0.0000012	0.0000013	0.0000012
Cl	---	---	0.0000006	---	0.0000006	---
Ca	---	---	0.0000042	---	0.0000041	---
Co	0.0000038	0.0000041	0.0000038	0.0000037	0.0000044	0.0000038

Table 4.1.2-7 (contd)

Isotope	Master 631 28-36	Master 632 0-24	Master 632 24-36	Master 633 0-20	Master 633 20-36	Master 634 0-4
B-10	---	0.0142491	---	0.0142454	---	0.0141578
B-11	---	0.0577717	---	0.0577568	---	0.0574015
C	0.0000396	0.0186901	0.0000367	0.0186853	0.0000352	0.0185704
O	0.0000013	---	0.0000013	---	0.0000013	---
Na	0.0180560	---	0.0181487	---	0.0181954	---
Si	0.0001727	0.0002217	0.0001716	0.0002216	0.0001710	0.0002209
Al	0.0000057	0.0000029	0.0000057	0.0000029	0.0000057	0.0000029
Mn	0.0002538	0.0002462	0.0002524	0.0002461	0.0002517	0.0002437
Cr	0.0030944	0.0029661	0.0030796	0.0029653	0.0030722	0.0029449
Fe	0.0110861	0.0105650	0.0109768	0.0105618	0.0109217	0.0104860
Ni	0.0013889	0.0013452	0.0013827	0.0013449	0.0013796	0.0013389
Cu	0.0000374	0.0000339	0.0000370	0.0000339	0.0000368	0.0000339
Mo	0.0000184	0.0000170	0.0000182	0.0000170	0.0000181	0.0000172
P	0.0000041	0.0000040	0.0000041	0.0000040	0.0000041	0.0000039
S	0.0000013	0.0000012	0.0000013	0.0000012	0.0000012	0.0000013
Cl	0.0000006	---	0.0000006	---	0.0000006	---
Ca	0.0000041	---	0.0000042	---	0.0000042	---
Co	0.0000041	0.0000038	0.0000039	0.0000038	0.0000039	0.0000041

Table 4.1.2-7 (contd)

Isotope	Master 634 4-36	Master 635 0-36	Master 636 0-8	Master 636 8-36	Master 637 0-12	Master 637 12-36
B-10	---	---	0.0142124	---	0.0142307	---
B-11	---	---	0.0576230	---	0.0576973	---
C	0.0000330	0.0000327	0.0186420	0.0000334	0.0186660	0.0000338
O	0.0000013	0.0000013	---	0.0000013	---	0.0000013
Na	0.0182660	0.0182582	---	0.0182558	---	0.0182424
Si	0.0001701	0.0001698	0.0002214	0.0001703	0.0002215	0.0001704
Al	0.0000057	0.0000057	0.0000029	0.0000057	0.0000029	0.0000057
Mn	0.0002506	0.0002500	0.0002452	0.0002508	0.0002457	0.0002510
Cr	0.0030609	0.0030537	0.0029576	0.0030625	0.0029619	0.0030647
Fe	0.0108386	0.0108079	0.0105333	0.0108505	0.0105491	0.0108664
Ni	0.0013750	0.0013722	0.0013427	0.0013756	0.0013439	0.0013765
Cu	0.0000366	0.0000365	0.0000339	0.0000366	0.0000339	0.0000367
Mo	0.0000180	0.0000179	0.0000171	0.0000180	0.0000171	0.0000180
P	0.0000040	0.0000040	0.0000040	0.0000040	0.0000040	0.0000040
S	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012
Cl	0.0000006	0.0000006	---	0.0000006	---	0.0000006
Ca	0.0000042	0.0000042	---	0.0000042	---	0.0000042
Co	0.0000038	0.0000038	0.0000039	0.0000038	0.0000038	0.0000038

Table 4.1.2-7 (contd)

Isotope	Master 638 0-16	Master 638 16-36
B-10	0.0142399	---
B-11	0.0577344	---
C	0.0186780	0.0000344
O	---	0.0000013
Na	---	0.0182236
Si	0.0002216	0.0001707
Al	0.0000029	0.0000057
Mn	0.0002460	0.0002513
Cr	0.0029640	0.0030677
Fe	0.0105571	0.0108886
Ni	0.0013446	0.0013778
Cu	0.0000339	0.0000367
Mo	0.0000171	0.0000180
P	0.0000040	0.0000041
S	0.0000012	0.0000012
Cl	---	0.0000006
Ca	---	0.0000042
Co	0.0000038	0.0000038

Table 4.1.2-8 Reactivity Values for Various Rod Insertions Measured with the Long Drawer Technique

<u>Rod Insertion, mm</u>	<u>Reactivity, ρ</u>
-101.6	0.00
-76.2	-0.23
-50.8	-0.59
-25.4	-1.02
0 ^a	-1.56
25.4	-2.18
50.8	-2.90
76.2	-3.75
101.6	-4.68
127.0	-5.70
152.4	-6.80
177.8	-8.02
203.2	-9.27
228.6	-10.51
254.0	-11.73
279.4	-12.96
304.8	-14.16
330.2	-15.23
355.6	-16.26
381.0	-17.19
406.4	-18.08
431.8	-18.90
457.2	-19.65
482.6	-20.40
508.0	-21.14
533.4	-21.87
558.8	-22.60
584.2	-23.38
609.6	-24.21
635.0	-25.08
660.4	-26.00
685.8	-26.98
711.2	-28.09
736.6	-29.22
762.0	-30.34
787.4	-31.46
812.8	-32.59
838.2	-33.63
863.6	-34.65
889.0	-35.59
914.4	-36.37
939.8	-37.08
965.2	-37.56
990.6	-37.87
1016.0	-38.08

^aZero insertion corresponds to the rod parked at the core/axial blanket interface.

Table 4.1.2-9 Data Processing for Control Rod Worth Measurements in ZPPR-17C

Step	Control Rods	File	Method	No. of FCs	χ^2	Source Ratio	Worth, \$	Statistical Uncertainty, %	Total Uncertainty, \$
1	3,5,7 3IR	138	All	62	12.06	0.9948	3.388	0.293	0.915
			3.6 σ	55	3.51	0.9948	3.367	0.299	0.917
			LSFIT	62	1.23	0.9930	<u>3.390</u>	0.111	0.875
2	3,5,7,11,13 3IR + 2MR	139	All	61	14.56	0.9786	5.398	0.439	0.969
			3.6 σ	51	3.35	0.9786	5.363	0.360	0.936
			LSFIT	59	1.35	0.9735	<u>5.370</u>	0.168	0.884
3	3,5,7,9,11,13 3IR + 3MR	140	All	60	17.65	0.9861	6.612	0.418	0.959
			3.6 σ	42	3.89	0.9861	6.574	0.411	0.955
			LSFIT	55	1.40	0.9826	<u>6.613</u>	0.187	0.885
4	5,7,9,11,13 2IR + 3MR	141	All	61	12.59	0.9862	5.658	0.400	0.951
			3.6 σ	50	3.48	0.9862	5.637	0.389	0.947
			LSFIT	60	1.39	0.9828	<u>5.636</u>	0.192	0.887
5	5,6,7 3IR	142	All	63	21.74	0.9735	2.876	0.371	0.944
			3.6 σ	49	3.12	0.9735	2.856	0.259	0.906
			LSFIT	62	1.41	0.9687	<u>2.850</u>	0.138	0.883
6	3,4,5,6,7 5IR	143	All	62	17.68	0.9812	5.055	0.442	0.970
			3.6 σ	45	3.84	0.9812	5.022	0.405	0.954
			LSFIT	58	1.40	0.9751	<u>5.039</u>	0.187	0.889
7A ^a	2,3,4,5,6,7 6IR	144	All	62	19.47	0.9794	5.926	0.507	1.001
			3.6 σ	43	3.10	0.9794	5.867	0.360	0.935
			LSFIT	59	1.37	0.9731	<u>5.884</u>	0.201	0.891
7B ^a	2,3,4,5,6,7 6IR	144	All	62	22.86	0.9813	5.910	0.532	1.014
			3.6 σ	42	2.86	0.9813	5.821	0.332	0.925
			LSFIT	62	1.27	0.9730	<u>5.869</u>	0.132	0.880
8	11,12,13 3MR	145	All	62	17.57	0.9550	3.081	0.331	0.997
			3.6 σ	40	2.79	0.9550	3.068	0.285	0.982
			LSFIT	59	1.37	0.9475	<u>3.052</u>	0.123	0.882

Ref. : PNC SA0765 ANL-ZPR-482

Table 4.1.2-9 (contd)

Step	Control Rods	File	Method	No. of FCs	χ^2	Source Ratio	Worth, \$	Statistical Uncertainty, %	Total Uncertainty, \$
9	9,11,13 3MR	146	ALL	62	9.05	0.9984	3.827	0.256	0.903
			3.6 σ	56	2.94	0.9984	3.809	0.249	0.901
			LSFIT	61	1.18	0.9978	<u>3.827</u>	0.099	0.872
10	9,10,11,12,13 5MR	147	ALL	60	9.39	0.9774	6.058	0.315	0.920
			3.6 σ	49	4.57	0.9774	6.029	0.530	1.014
			LSFIT	59	1.44	0.9722	<u>6.045</u>	0.190	0.889
11A ^a	8,9,10,11,12,13 6MR	148	ALL	60	12.28	0.9946	7.682	0.349	0.930
			3.6 σ	39	2.77	0.9946	7.698	0.345	0.928
			LSFIT	55	1.43	0.9932	<u>7.730</u>	0.211	0.888
11B ^a	8,9,10,11,12,13 6MR	148	ALL	60	13.32	0.9976	7.657	0.339	0.926
			3.6 σ	46	4.06	0.9976	7.583	0.427	0.962
			LSFIT	60	1.35	0.9966	<u>7.682</u>	0.114	0.870
Repeat Reference	149	149	ALL	64	1.16	1.0000	0.0011	9.36	70.25
			3.6 σ	64	1.16	1.0000	0.0011	10.07	70.35

^aThese cases were calculated with the half-z model (steps 7A, 11A) as used for the remaining cases and also with the full-z model (steps 7B, 11B) taking advantage of the quarter-xy symmetry.

^bIR = inner ring, MR = middle ring, OR = outer ring.

Table 4.1.2-10 Reactivity Values for Various Rod Positions
in the Central Location of ZPPR-17C

<u>Rod Position,^a inches</u>	<u>Reactivity, ϕ</u>	<u>Uncertainty, ϕ</u>
0.02	0.024	0.017
0.81	0.426	0.014
2.04	1.315	0.024
2.94	2.155	0.024
3.90	3.253	0.023
4.95	4.641	0.022
6.02	6.240	0.022
7.07	7.896	0.022
8.01	9.464	0.024
8.94	11.134	0.021
9.97	12.947	0.021
11.02	14.674	0.020
12.00	16.160	0.022
12.98	17.690	0.020
13.99	19.206	0.020
14.99	20.500	0.019
16.02	21.733	0.020
16.98	22.715	0.020
17.99	23.753	0.018
19.04	24.794	0.018
20.02	25.744	0.019
20.93	26.522	0.019
21.91	27.461	0.017
22.98	28.443	0.017
24.05	29.486	0.017
25.06	30.521	0.018
25.96	31.462	0.018
26.92	32.620	0.016
27.97	33.944	0.016
29.04	35.357	0.015
30.07	36.709	0.016
30.97	37.907	0.016
31.93	39.242	0.015
32.98	40.623	0.015
34.03	41.944	0.014
35.04	43.126	0.015
35.96	44.108	0.015
36.95	45.146	0.014
37.98	46.070	0.014
39.03	46.863	0.013
40.06	47.529	0.014
40.98	47.986	0.015
41.94	48.411	0.013
43.00	48.789	0.013
43.99	48.964	0.007
44.04	48.959	0.012

^aRod position of zero corresponds to full insertion.

Table 4.1.2-11 Reactivity Values for Various Rod Insertions
in Location 165-49 in ZPPR-17C

<u>Rod Position,^a inches</u>	<u>Reactivity, ρ</u>	<u>Uncertainty, ρ</u>
0.02	0.042	0.012
0.96	0.469	0.014
1.95	1.155	0.013
2.99	2.010	0.013
4.03	3.014	0.013
5.04	4.099	0.013
5.99	5.304	0.013
6.94	6.595	0.012
7.97	8.130	0.012
8.98	9.695	0.012
10.00	11.318	0.012
11.01	12.967	0.012
12.00	14.614	0.012
13.01	16.330	0.011
13.99	17.907	0.012
14.98	19.480	0.011
15.99	21.004	0.011
16.95	22.401	0.011
17.96	23.832	0.010
19.01	25.208	0.010
20.03	26.509	0.010
21.02	27.690	0.010
22.02	28.795	0.010
22.98	29.819	0.010
23.94	30.816	0.009
24.98	31.845	0.009
26.03	32.857	0.009
27.04	33.797	0.009
28.04	34.675	0.009
29.03	35.522	0.009
29.97	36.249	0.009
30.96	37.020	0.009
32.02	37.767	0.008
33.04	38.414	0.009
34.02	38.976	0.009
34.96	39.447	0.009
35.94	39.909	0.008
36.98	40.321	0.008
38.05	40.660	0.008
39.05	40.916	0.009
39.98	41.106	0.009
40.95	41.268	0.008
41.97	41.401	0.008
43.01	41.501	0.008
44.03	41.569	0.004

^aRod position of zero corresponds to full insertion.

Table 4.1.2-12 Summary of Central Control Rod Worth Analysis in ZPPR-17A

No.	Control Rods	Measured Worth (\$) ¹⁾	Calculation Results								
			C/E (Base)	Correction Factors ²⁾						C/E (Fuel) ³⁾	C/E (CRP) ⁴⁾
				f _G	f _M	f _T	f _A	f _H	Total f		
1	2x2 CRP	0.0837	1.030	0.968	0.943	0.970	0.991	1.000	0.878	0.905	—
2	50/50 Nat. B ₄ C/Na 2x2	0.778	0.906	0.950	1.055	0.998	0.993	1.000	0.993	0.899	0.899
3	100% Nat. B ₄ C 2x2	1.073	0.871	0.943	1.103	0.985	0.992	1.000	1.016	0.885	0.883
4	100% Nat. B ₄ C 2x2 Half-inserted	0.619	0.875	0.945	1.097	0.989	(0.991)	1.000	1.016	0.889	0.886
5	Nat. B ₄ C Pins Tight Pack	0.703	0.957	0.949	1.064	0.992	(0.993)	0.930	0.926	0.886	0.883
6	Enr. B ₄ C Pins in Calandria	1.188	0.908	0.934	1.099	0.972	0.993	1.000	0.992	0.900	0.899
7	Enr. B ₄ C Pins Tight Pack	1.083	0.987	0.933	1.112	0.978	0.993	0.897	0.904	0.892	0.890
8	100% Enr. B ₄ C 2x2 Half-inserted	0.817	0.866	0.925	1.149	0.971	(0.992)	1.000	1.024	0.887	0.884
9	50/50 Enr. B ₄ C/Na 2x2	1.195	0.909	0.934	1.102	0.974	0.993	1.000	1.005	0.905	0.905
10	2x3 100% Nat. B ₄ C Plate	1.395	0.871	(0.946)	(1.094)	(0.983)	(0.995)	1.000	1.011	0.880	0.877
11	2X2 100% Nat. B ₄ C Plate Off-center	1.108	0.876	(0.974)	(1.042)	(0.991)	(0.992)	1.000	0.999	0.875	0.872
12	3x3 CRP	0.306	0.975	(0.976)	(0.985)	(0.970)	(0.993)	1.000	0.924	0.901	—
13	3x3 100% Nat. B ₄ C Plate	1.721	0.891	(0.947)	(1.085)	(0.982)	(0.997)	1.000	1.007	0.877	0.871

1) $\beta_{eff} = 0.3492\%$

2) f_G : Energy Group, f_M : Mesh Size, f_T : Transport, f_A : AMM Model, f_H : Heterogeneity
The values in parentheses are extrapolated from correction factors for typical cases.

3) Relative to fuel

4) Relative to CRP

Table 4.1.2-13 Summary of Central Control Rod Worth Analysis in ZPPR-17B

No.	Control Rods ¹⁾	Measured Worth (\$) ²⁾	Calculation Results (Relative to CRPs)						
			C/E (Base)	Correction Factors ³⁾					C/E
				f _G	f _M	f _T	f _A	Total f	
1	C	1.001	0.854	0.943	1.116	0.987	0.993	1.030	0.880
2	R1 Half-inseted	3.171	0.885	0.956	1.113	0.969	(0.996)	1.026	0.908
3	R1	5.822	0.886	0.956	1.106	0.973	0.996	1.024	0.907
4	C, R1	6.137	0.889	0.957	1.100	0.973	(0.995)	1.018	0.905
5	C, R1, R2	12.169	0.899	0.962	1.100	0.968	(0.996)	1.021	0.918
6	R1, R2	11.952	0.900	0.962	1.100	0.968	(0.998)	1.024	0.922
7	C, R1, R2 except No. 8 CR	10.804	0.906	(0.962)	(1.102)	(0.968)	(0.996)	1.020	0.924
8	C, R1 except No. 2 CR, R2	11.718	0.898	(0.962)	(1.100)	(0.968)	(0.996)	1.021	0.917
9	C and R2	9.017	0.893	0.961	1.100	0.967	(0.996)	1.036	0.925
10	R2	8.318	0.896	0.961	1.120	0.965	(0.999)	1.041	0.933
11	R2 except No. 8 CR	6.537	0.902	(0.961)	(1.125)	(0.965)	(0.999)	1.041	0.939
12	C, R1 except No. 2 CR, R3 (Odd)	17.321	0.925	(0.951)	(1.113)	(0.975)	(0.996)	1.027	0.950
13	R1, R3 (Odd)	17.856	0.921	0.957	1.110	0.966	(0.998)	1.025	0.944
14	C, R1, R3 (Odd)	18.279	0.922	0.951	1.113	0.975	(0.996)	1.026	0.946
15	C, R2 except No. 8 CR, R3 (Odd)	18.625	0.927	(0.953)	(1.120)	(0.972)	0.997	1.035	0.959
16	C, R2, R3 (Odd)	20.490	0.921	0.953	1.120	0.972	(0.997)	1.035	0.953
17	R3 Half-inseted	10.731	0.959	0.959	1.113	0.948	(1.001)	1.013	0.971
18	R3	22.477	0.948	0.959	1.119	0.954	1.001	1.024	0.971
19	C, R3	24.589	0.939	0.956	1.127	0.956	(0.997)	1.027	0.964
20	C, R3 except No. 14 CR	20.435	0.941	(0.956)	(1.127)	(0.956)	(0.997)	1.027	0.966

1) C: Central Control Rod, R1, R2 and R3 : Ring 1, Ring 2 and Ring 3 Control Rods, Odd: Odd Number Control Rods

2) $\beta_{eff} = 0.3478\%$

3) f_G : Energy Group, f_M : Mesh Size, f_T : Transport, f_A : AMM Model

The values in parentheses are extrapolated from correction factors for typical cases.

Table 4.1.2-14 C/E Values of Axial Control Rod Profile in ZPPR-17B

Position Relative to Top of Core (mm)	Mesured Worth (\$) ¹⁾	C/E ²⁾
0	0.076	0.827
101.6	0.158	0.892
203.2	0.281	0.890
304.8	0.401	0.887
406.4	0.493	0.885
508.0 (Half-ins.)	0.562	0.886
609.6	0.640	0.879
711.2	0.735	0.883
812.8	0.849	0.884
914.4	0.943	0.883
1016.0 (Full-ins.)	0.979	0.881

1) Relative to CRP

2) Calculation Values are Corrected.

Correction Factors: $f_G = 0.943$, $f_M = 1.116$, $f_T = 0.987$, $f_A = 0.993$

Table 4.1.2-15 Summary of Control Rod Bank Worth Analysis in ZPPR-17C

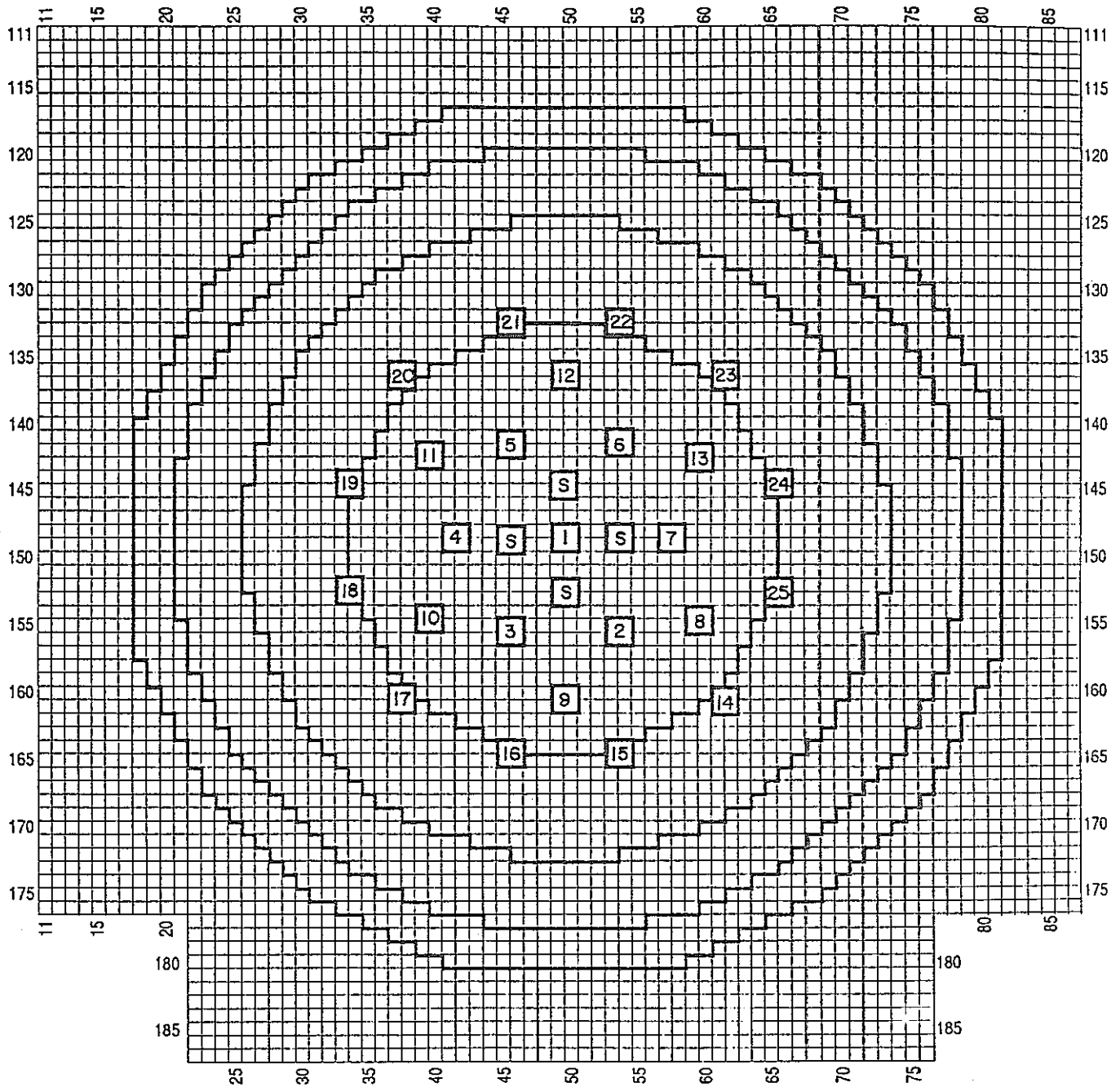
No.	Control Rods ¹⁾	Measured Worth (\$) ²⁾	Calculation Results (Relative to CRPs)						C/E
			C/E (Base)	Correction Factors ³⁾				Total f	
				f _G	f _M	f _T	f _A		
1	R1 (Odd)	3.390	0.877	(0.955)	(1.113)	(0.993)	(0.996)	1.051	0.922
2	R1 (Odd), R2 (No. 11, 13) (No. 9 Stuck)	5.370	0.891	(0.959)	(1.118)	(0.988)	(0.997)	1.056	0.940
3	R1 (Odd), R2 (Odd)	6.613	0.890	(0.959)	(1.118)	(0.988)	(0.997)	1.056	0.940
4	R1 (No. 5, 7), R2 (Odd) (No. 3 Stuck)	5.636	0.893	(0.959)	(1.118)	(0.988)	(0.997)	1.056	0.943
5	R1 (No. 5, 6, 7)	2.850	0.907	(0.955)	(1.113)	(0.993)	(0.996)	1.051	0.953
6	R1 except No. 2 CR (No. 2 Stuck)	5.039	0.895	(0.955)	(1.113)	(0.993)	(0.996)	1.051	0.938
7	R1	5.884	0.885	0.955	1.113	0.993	0.996	1.051	0.928
8	R2 (No. 11, 12, 13)	3.052	0.909	(0.963)	(1.123)	(0.983)	(0.996)	1.058	0.962
9	R2 (Odd)	3.827	0.899	(0.963)	(1.123)	(0.983)	(0.996)	1.058	0.951
10	R1 except No. 8 CR (No. 8 Stuck)	6.045	0.884	(0.963)	(1.123)	(0.983)	(0.996)	1.058	0.936
11	R2	7.682	0.896	0.963	1.123	0.983	0.996	1.058	0.948

1) C: Central Control Rod, R1, R2 and R3 : Ring 1, Ring 2 and Ring 3 Control Rods, Odd: Odd Number Control Rods

2) $\beta_{eff} = 0.3470\%$

3) f_G : Energy Group, f_M : Mesh Size, f_T : Transport, f_A : AMM Model

The values in parentheses are extrapolated from correction factors for typical cases.



- n CRP location
- S Special measurements of four control rods and CRPs

Fig. 4.1.2-1 Control Positions used in ZPPR-17A Measurements.

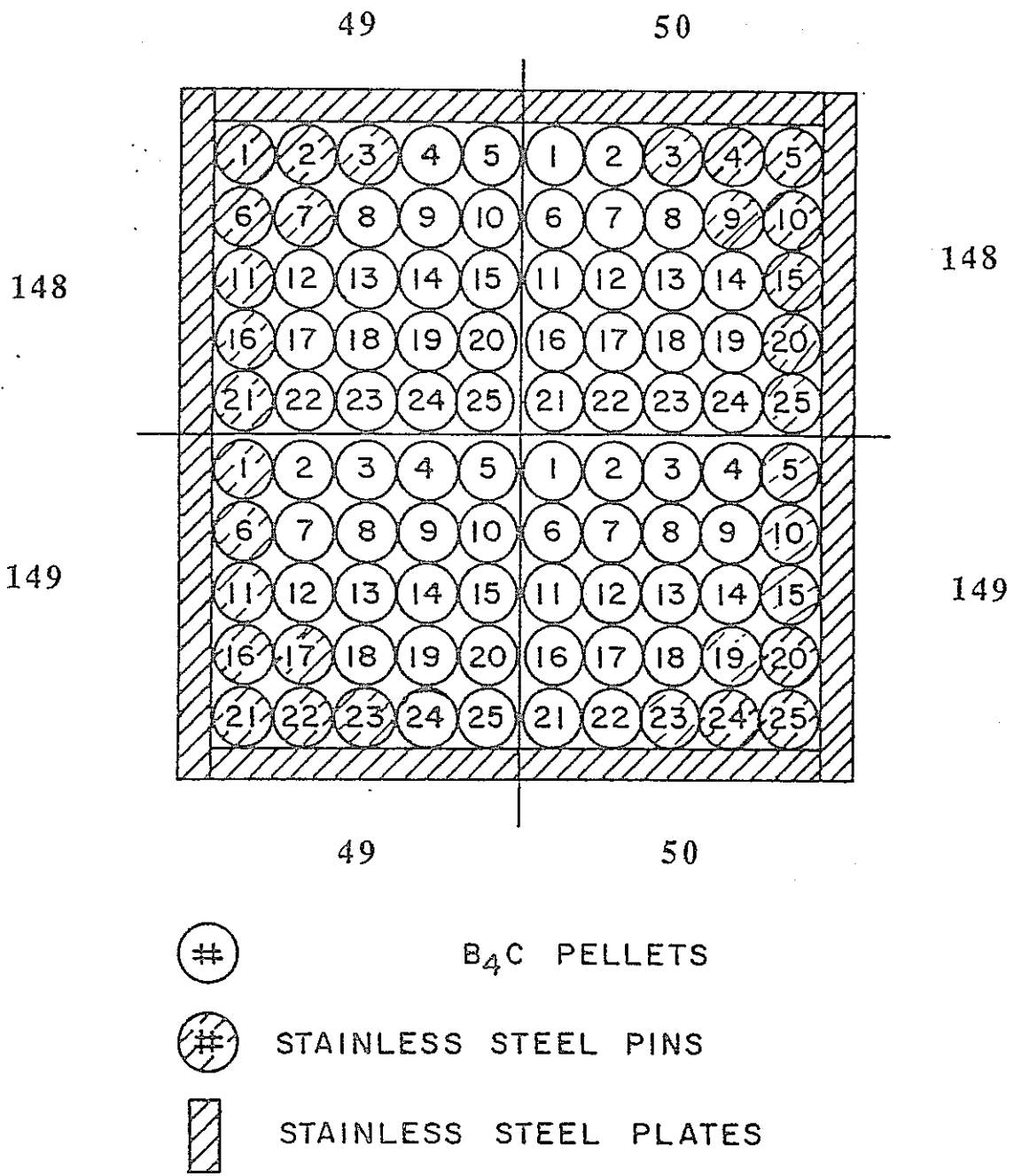


Fig. 4.1.2-2 Loading Pattern for Close-packed Pin Control Rod.

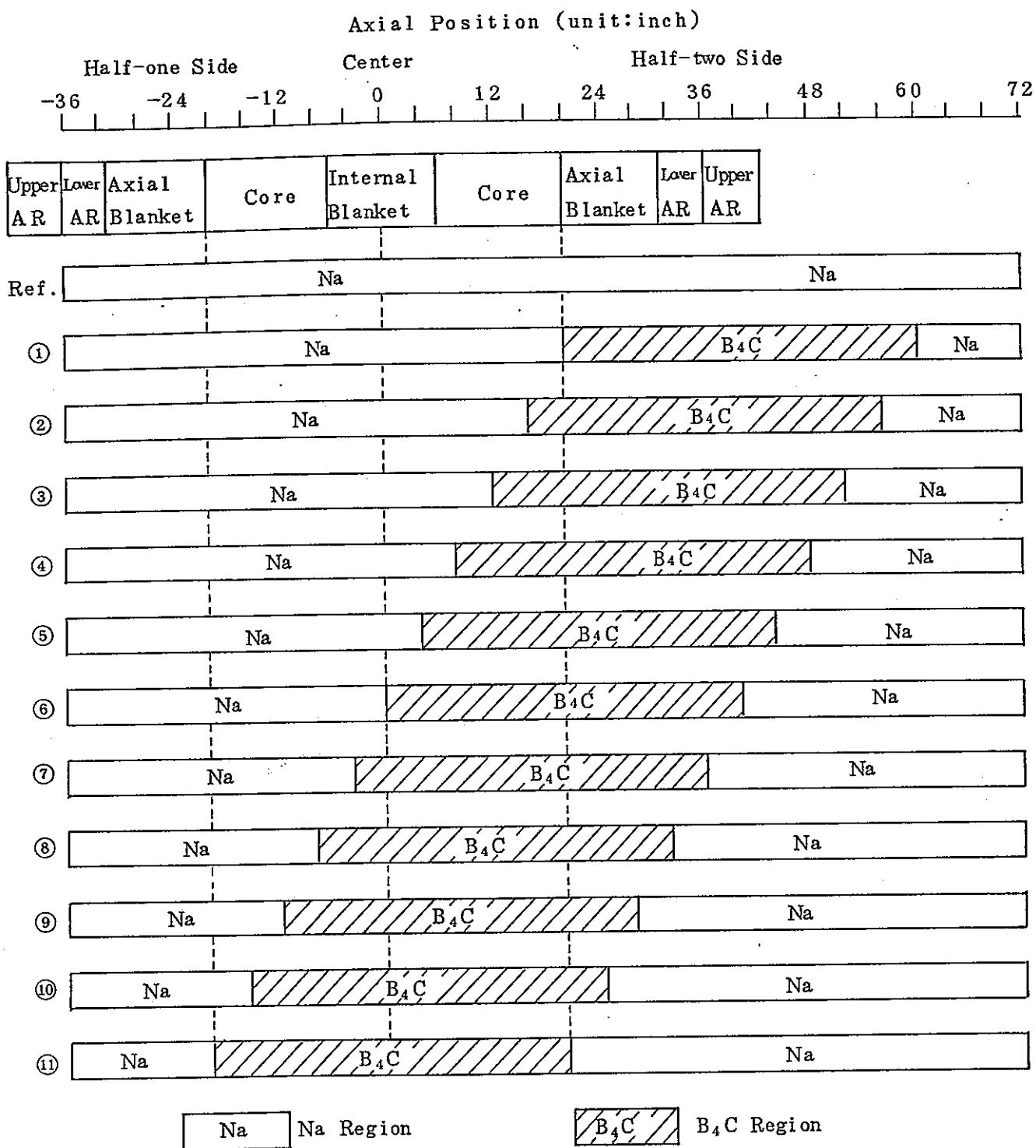


Fig. 4.1.2-3 Schematic View of Axial Control Rod Position

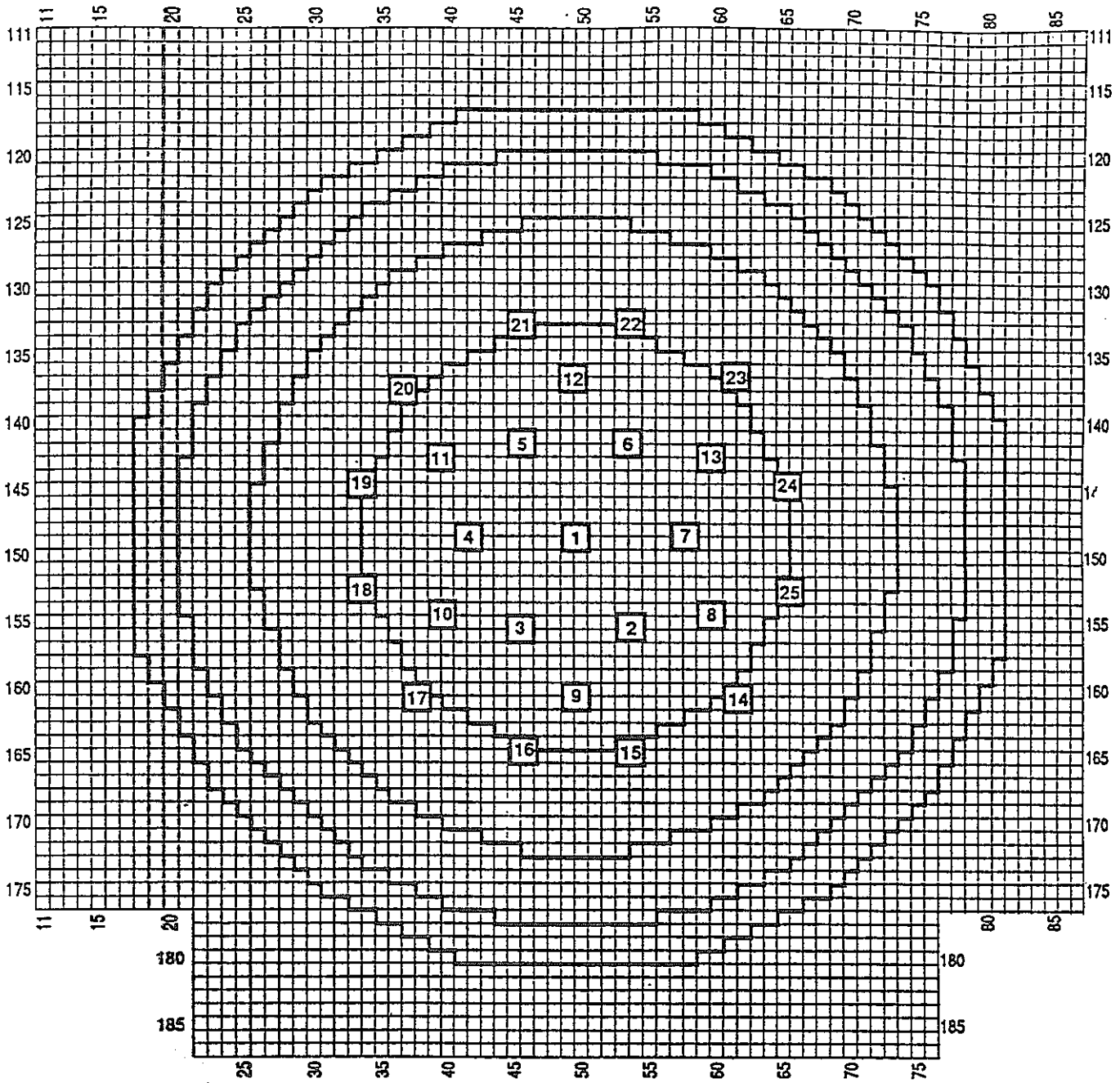


Fig. 4.1.2-4 Control Rod Locations in ZPPR-17B

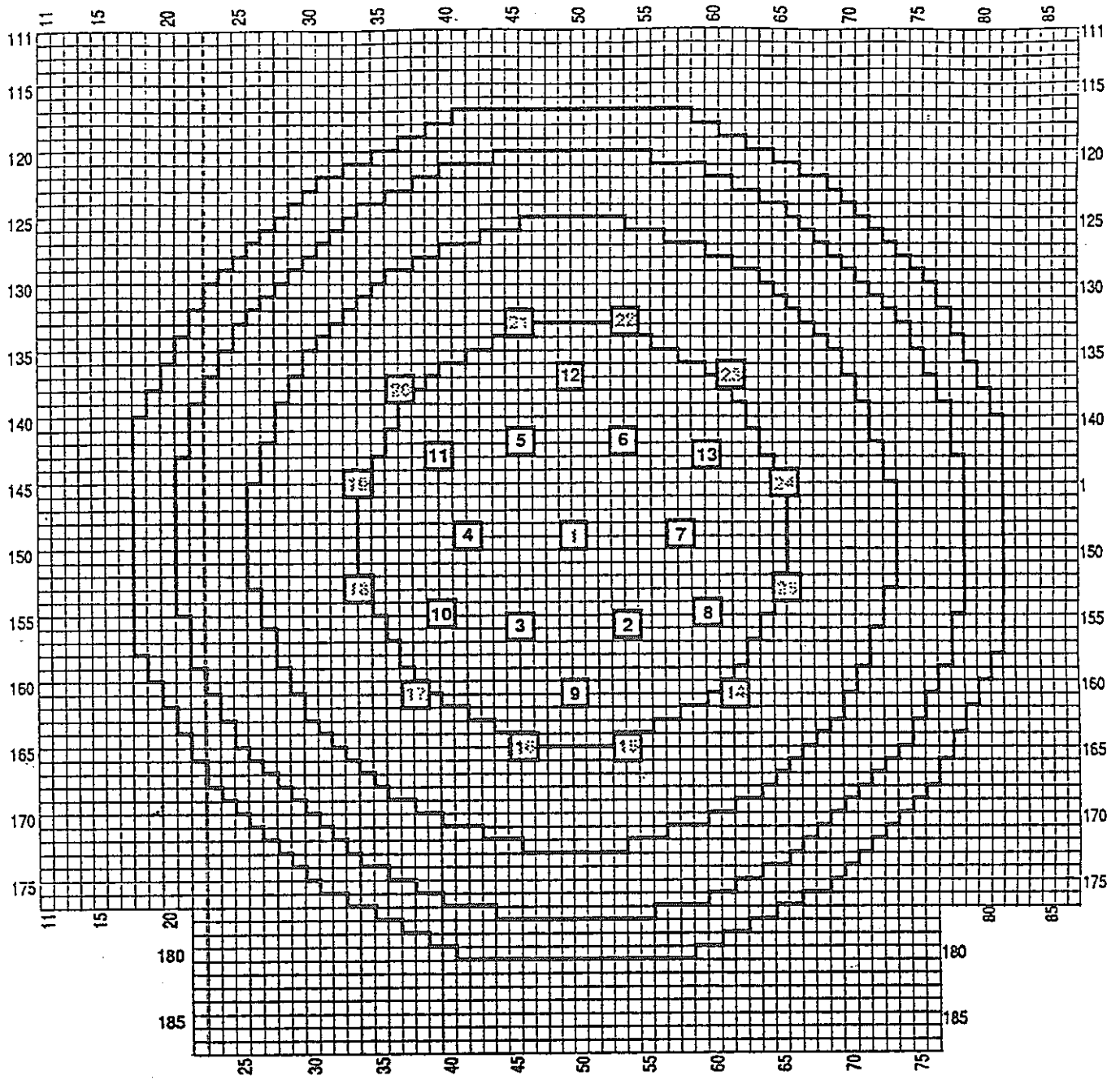


Fig. 4.1.2-5 Control Rod Locations in ZPPR-17C

4. 1. 3 反応率分布

(1) 測定概要

ZPPRにおける反応率分布は箔の放射化法によって行われている。JUPITER-3 プログラムではPu239(n, f), U235(n, f), U238(n, f), (n, g)の4種類の反応率分布が測定されている。

反応率測定は燃料セルを1/16単位で分割した位置に箔ホルダープレート(厚さ0.5mm)を燃料プレートに接する様に配置して照射し、取出し後にガンマ線計測により行われる。セル内に配置される箔の位置は、16分割された位置をアルファベットA, B-Pまでの記号で表示し、例えばHIなどのように示している。Fig. 4.1.3-1にHolder位置の例を示す。この図の様にhalf-1のドロワーのIJにholderが設置された場合は、対称位置のドロワーではGH位置となるように配慮されることが通常の測定方法になっている。holderの正面図はFig. 4.1.3-2のように2つの並べ方でfoilが配置される。またFig. 4.1.3-3のようにTL, TC, TR位置で区別される配置がある。JUPITER-3シリーズでは使用されなかったがPin Carandriaの配置図をFig. 4.1.3-4に示しておく。

このように炉心・ブランケット領域の広い範囲をカバーする“mapping foil”は、セル内の非均質なプレート燃料構成を反映した特定の位置の反応率分布測定値を与えるものである(Basic Data for Reaction Rate Distributions)。反応率分布の解析が燃料セルの非均質構成を直接モデルに取入れている場合には、この“mapping foil”測定値が解析結果の比較対象とすることが出来る。

しかし、実際にはセル非均質構造を均質化した計算を行うので、測定値を均質化されたセルに対応する値にして解析結果と比較することになる。セル内の特定の位置のmapping foil”測定値をセル平均の測定値に対応するように変換する“cell-average factor”を実験的に求めている。セルファクターの決定はZPPRの測定手法に伴う詳細検討の経験が反映されている。基本的には炉心全体の中性子束勾配・スペクトルの変化とセル内の非均質構造による中性子束勾配・スペクトルの変化は重ね合わせる事が出来るという考え方をもとにしている。セルファクターの決定についてはANL-85-44に詳しく述べられている。ZPPRにおける反応率

測定は箔の設定位置等を含めて、従来の経験ではPu239(n, f), U235(n, f), U238(n, g)反応率に対しては“cell averaging factor”は1.00~0.95までの範囲であり JUPITER 実験では、Pu239(n, f), U235(n, f)には概ね1.00である。U238(n, g)には~0.97程度である。一方、“しきい”値反応U238(n, f)についてはセル内の非均質構成の影響が大きい。

セル平均断面積を使用する実験解析では、上述のBasic Dataに“cell Factor”を適用した結果と解析結果を比べる。解析では、averaged data と対応する箔の中心位置を計算モデルと対応させるためにMATRIX2 コードで計算値との比較可能なかたちに変換する。箔の位置における中性子束を周辺のメッシュ点位置とそこの中性子束から3次多項式で内挿してpoint fluxを求め検出断面積を利用して反応率を計算している(LAGOON2コード)。

以下の測定結果は“cell averaged data”である。反応率の単位は一原子あたり・炉出力1ワットあたりに換算されている。ただし、ZPPRの炉出力の絶対値の較正は通常の試験では必要がないので目安として利用されるので正確ではない。したがって、反応率の絶対値には重要な意味はなく反応率分布・反応率比に意味がある。特に、異なる集合体間の測定値の比較等には注意を要する点である。

反応率分布測定は、いずれのケースでも臨界基準体系で行われた。ZPPRのPSR (poison safety rodのboron blades) 挿入深度を調整して照射(通常1時間程度)中の臨界を調整する。この調整ではPSRの挿入量を小さくして炉心の中性子束分布へのPSRによる歪みを小さくすることにより、PSR吸収体の炉内への挿入を最小にして、PSR引抜き状態の基準解析体系における解析結果の解釈に余計な補正が入らないように配慮されている。

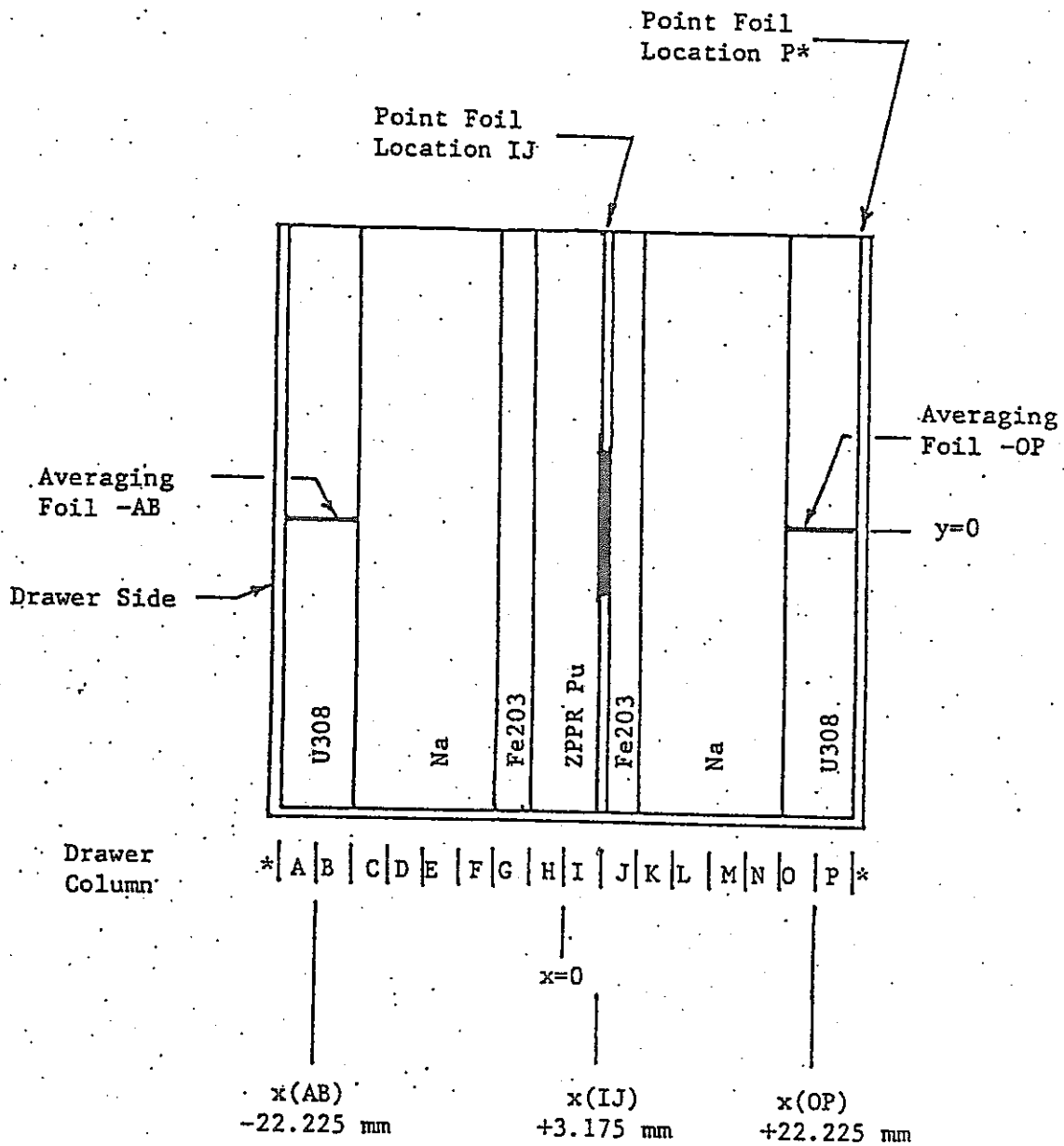
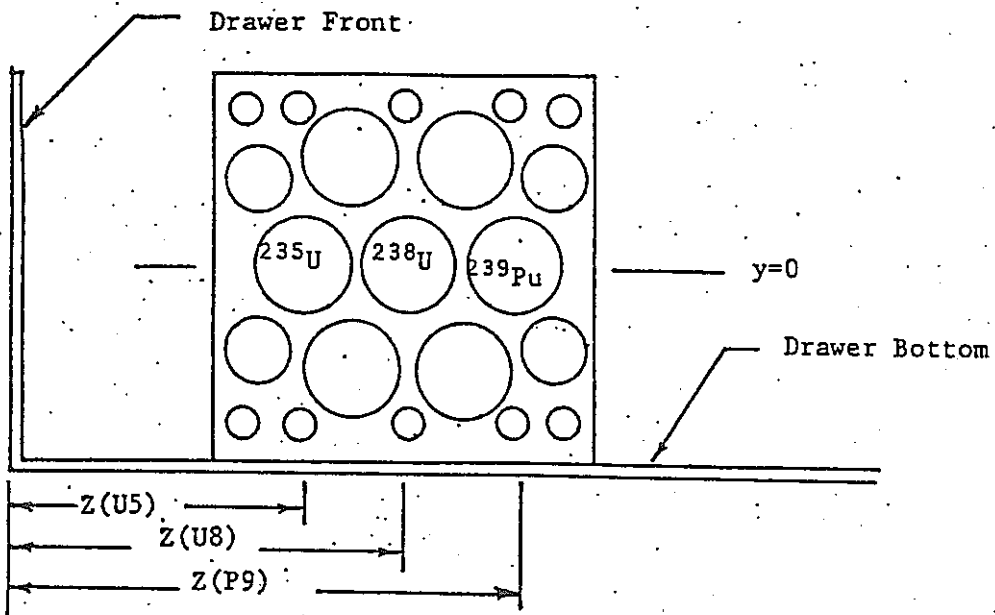
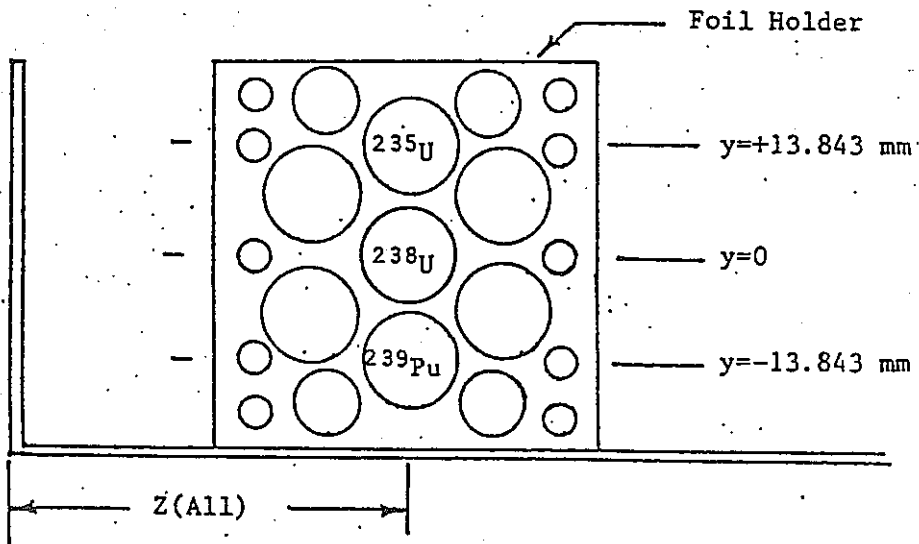


Fig. 4.1.3-1 Cross section of drawer showing typical averaging and point foil locations (view from front of drawer)



HOLDER ORIENTATION R



HOLDER ORIENTATION A

Fig.4.1.3-2 Side view cross section of drawer showing irradiation foil locations.

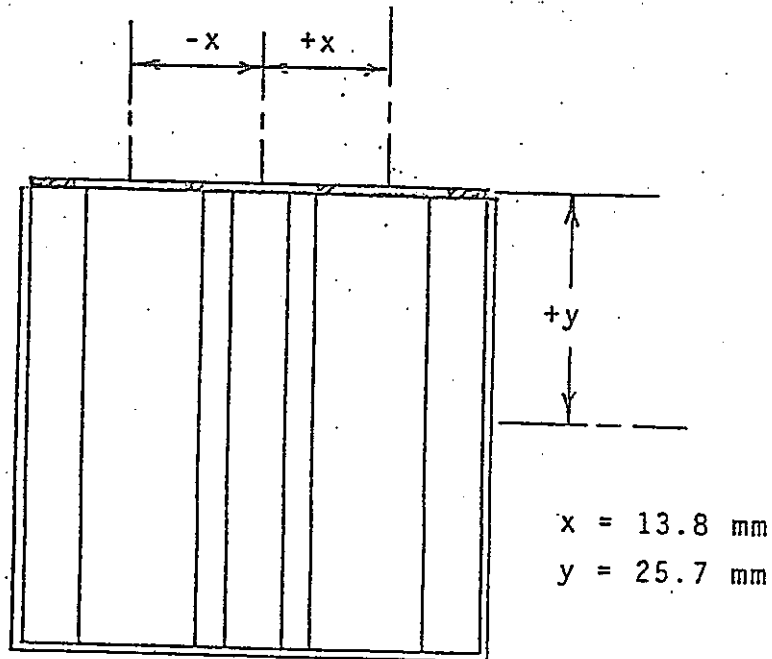
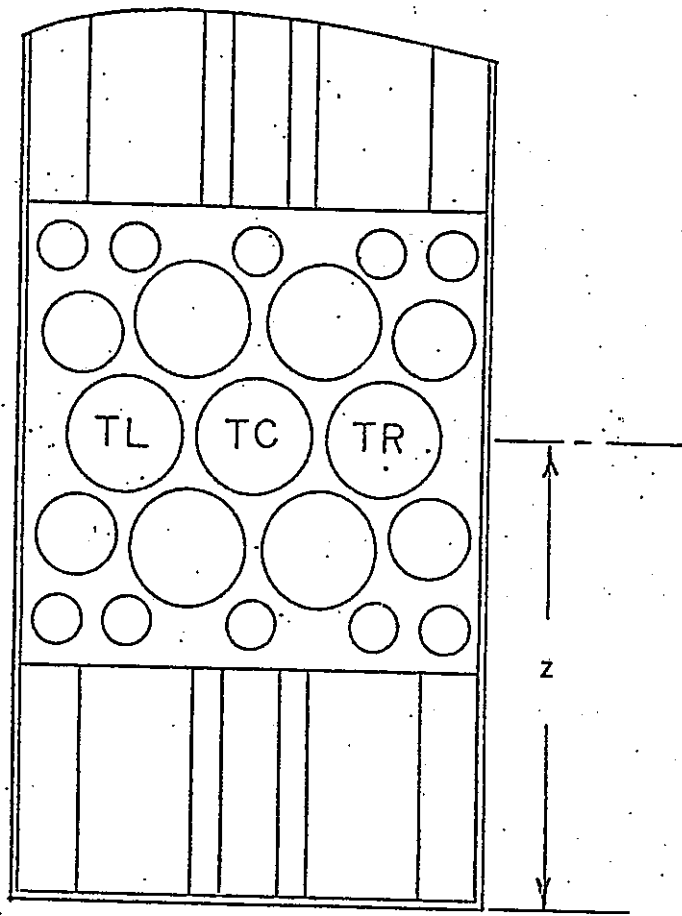
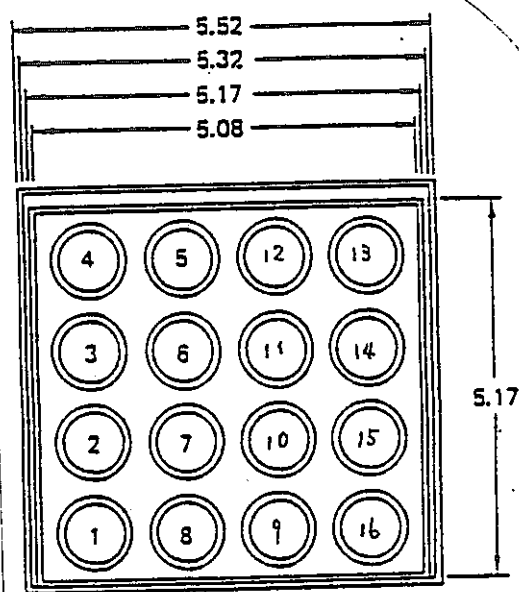


Fig.4.1.3-3 Location of Foils in Holders Loaded Across the Top of Drawers or Calandrias



ZPR Pin Calandria
 (dimensions in cm)

Fig. 4.1.3-4 Foil Location Number in Pin Cell

(2) ZPPR-17体系の測定データ

a. 測定体系のまとめ

項目	ZPPR-17A	ZPPR-17B	ZPPR-17C
体系の特徴	クリーン体系CRP チャンネルなし	サイクル末期模擬 25CRP チャンネル	サイクル初期模擬 13CRP チャンネル 12模擬制御棒半挿入
測定日	1987-04-06	1987-04-20	1987-07-06/09
測定炉心	loading #62 run #65	loading #110 run #120	loading #155 run #172, 173
測定体系	臨界基準体系	同左	同左
PSR 位置	(134-63)と対称位置	同左	同左
深度	炉心中心面より 510 mm	455.8mm	542.3/563.4mm
反応度	4.5 ϵ	10.8 ϵ	3.12/2.66 ϵ

ZPPR-17Cは軸方向分布RUN#172 と径方向分布RUN#173 に別けて測定された。

b. 測定結果

測定結果は"mapping foil"のセル平均値および測定結果そのものを示すbasicデータ(セルファクタ測定用のbasic データを含む)の両方を示す。これは今後の解析技術の開発・進捗に伴い詳細なセル構成を反映した解析にも使用できるデータの存在を示しておくためである。"mapping foil"のセル平均値はドロワー単位に ANLによる解析結果とともに示してある。"basic data"には箔のドロワーセル内の配置位置が示されている。

ZPPR-17A (出典ZPR-TM-481[ref. 19])

Fig. 4.1.3-5/6 ZPPR-17Aのfoil装荷位置

Fig. 4.1.3-7 ~-14 軸非均質炉心の反応率分布の特徴を示すためにIB/core 領域の測定と解析結果を例示する。

Table 4.1.3-1 ~3	炉心中心面 x/y軸方向分布
Table 4.1.3-4	炉心中心対称位置の整合性評価
Table 4.1.3-5	炉心中心面45° 方向分布
Table 4.1.3-6	Z=17.86cm 面 x軸方向分布
Table 4.1.3-7	Z=28.02cm 面 x軸方向分布
Table 4.1.3-8 ~10	Z軸方向分布
Table 4.1.3-11~13	反応率比径方向分布
Table 4.1.3-14~16	反応率比軸方向分布
Table 4.1.3-17~20	basic data (上記の基本データ集)
Table 4.1.3-21~23	cell factor 評価用basic data
Table 4.1.2-24	セルファクター評価結果

Z P P R - 1 7 B (出典ZPR-TM-485[ref. 19], ZPR-TM-489[ref. 22])

Fig. 4.1.3-15 ZPPR-17Aのfoil装荷位置

Table 4.1.3-25~27 径方向分布 x軸

Table 4.1.3-28 炉心中心面45° 方向分布

Table 4.1.3-29~31 Z軸方向分布

Table 4.1.3-32~34 反応率比径方向分布

Table 4.1.3-35 反応率比軸方向分布

Table 4.1.3-36~38 basic data (上記の基本データ集)

Table 4.1.3-39~41 cell factor 評価用basic data

Table 4.1.2-42 セルファクター評価結果

Z P P R - 1 7 B (出典ZPR-TM-485[ref. 19], ZPR-TM-489[22])

Fig. 4.1.3-16 ZPPR-17Aのfoil装荷位置

Table 4.1.3-43~48 径方向分布 x軸 half-1/-2サイド

Table 4.1.3-49/50 炉心中心面45° 方向分布 half-1/-2サイド

Table 4.1.3-51~54 Z軸方向分布

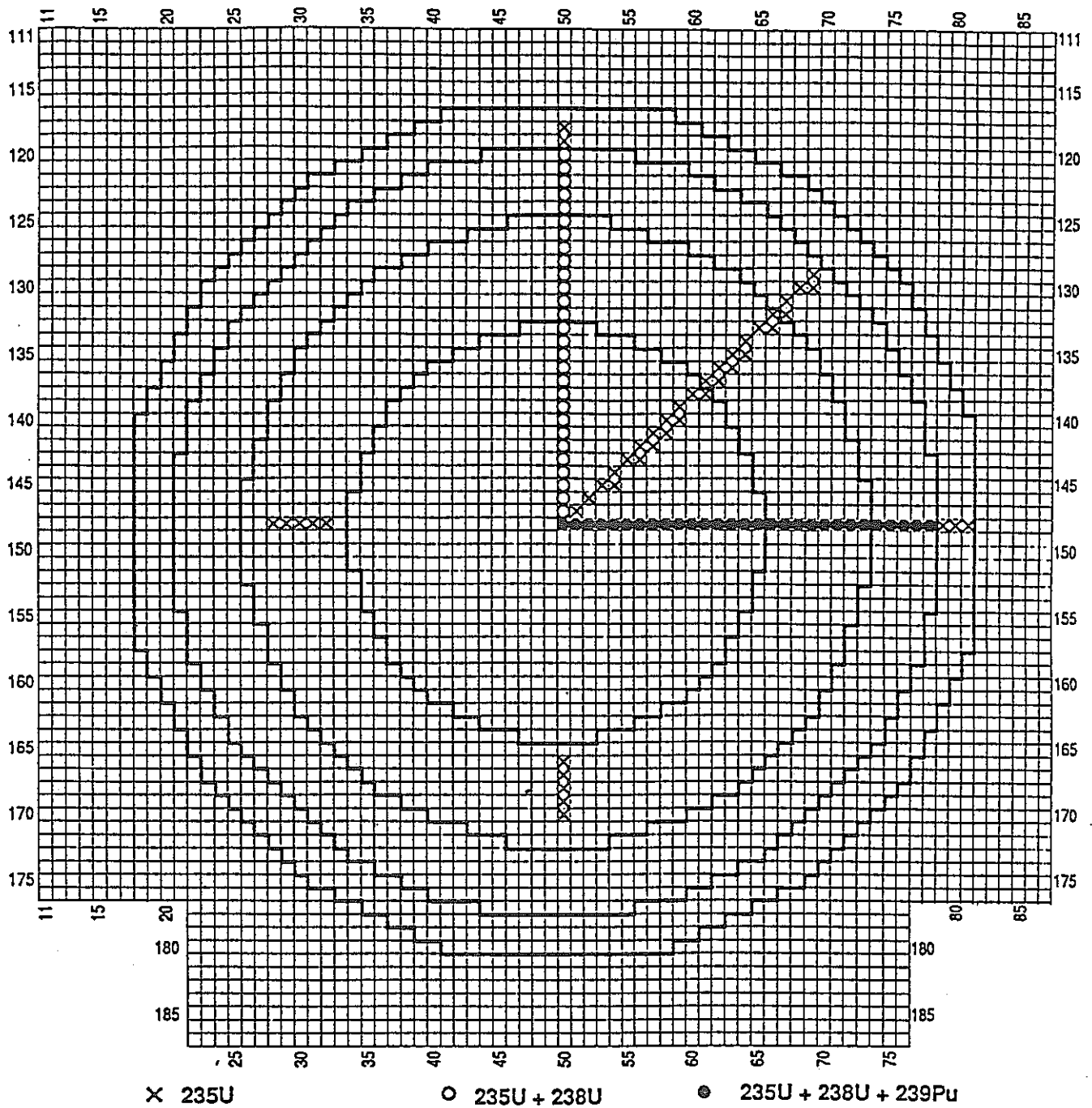
Table 4.1.3-55~59 反応率比径方向分布

Table 4.1.3-60/61 反応率比軸方向分布

Table 4.1.3-62~65 basic data (上記の基本データ集)

Table 4.1.3-66~68 cell factor 評価用basic data

Table 4.1.3-69 cell factor 評価結果



ZPPR-17A

Fig. 4.1.3-5 Foil Locations in ZPPR-17A in the xy Plane.

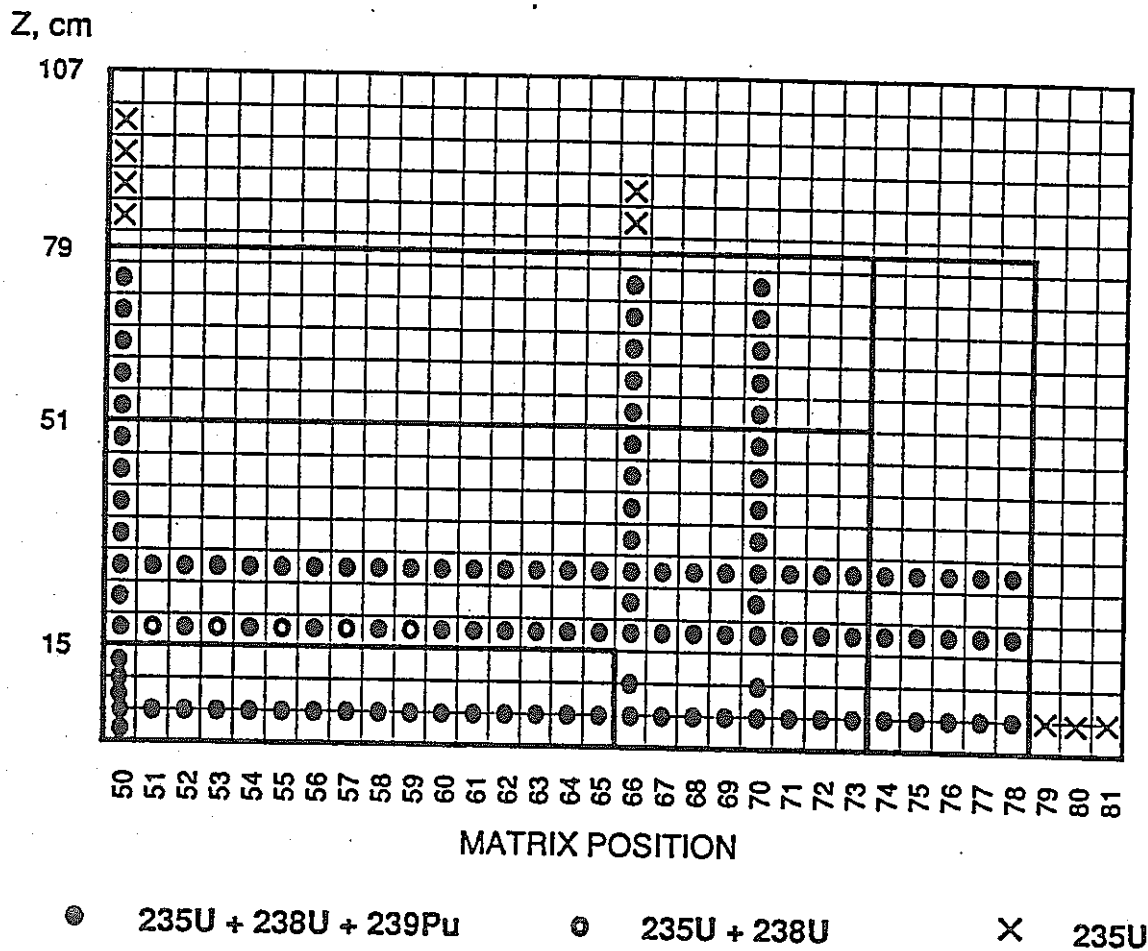


Fig. 4.1.3-6 Foil Locations in ZPPR-17A in the xz Plane.

ZPPR-17A RADIAL PU239(N,F) AT Z=5.2 CM

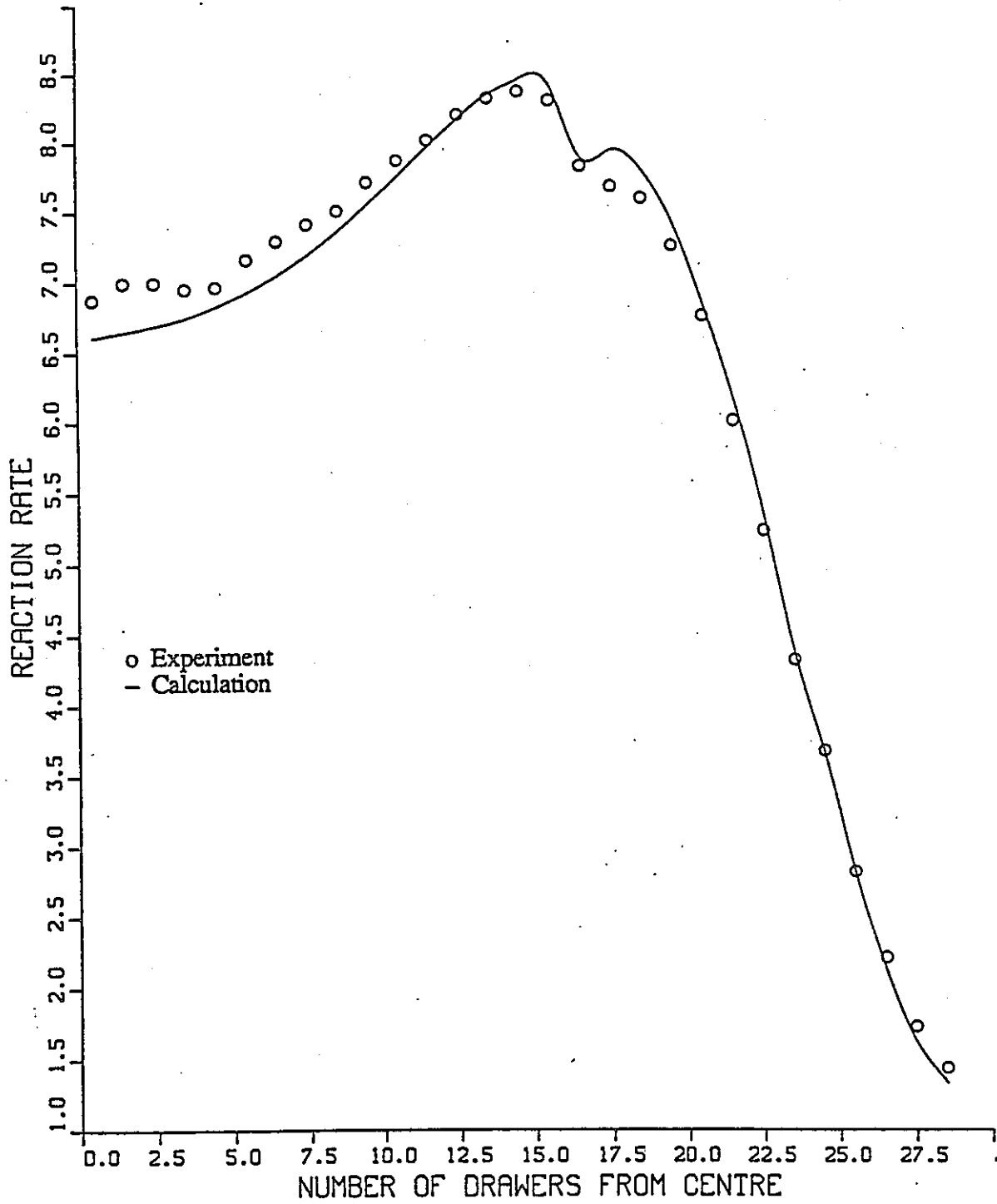


Fig. 4.1.3-7 Radial ^{239}Pu Fission Distribution at 5 cm from the Midplane

ZPPR-17A RADIAL U235(N,F) AT Z-3.8 CM

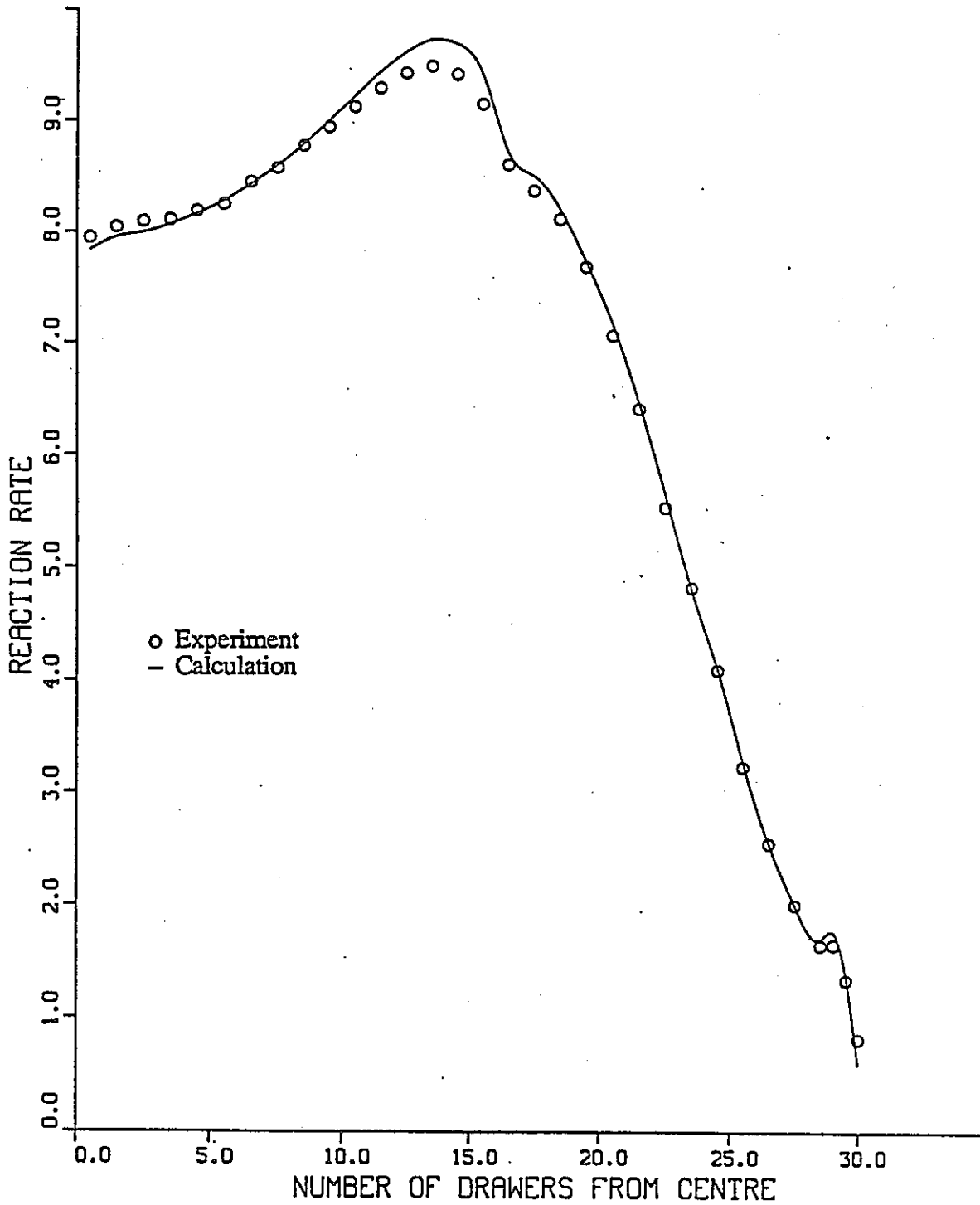


Fig. 4.1.3-8 Radial ^{235}U Fission Distribution at 4 cm from the Midplane

ZPPR-17A RADIAL U238(N,G) AT Z=5.2 CM

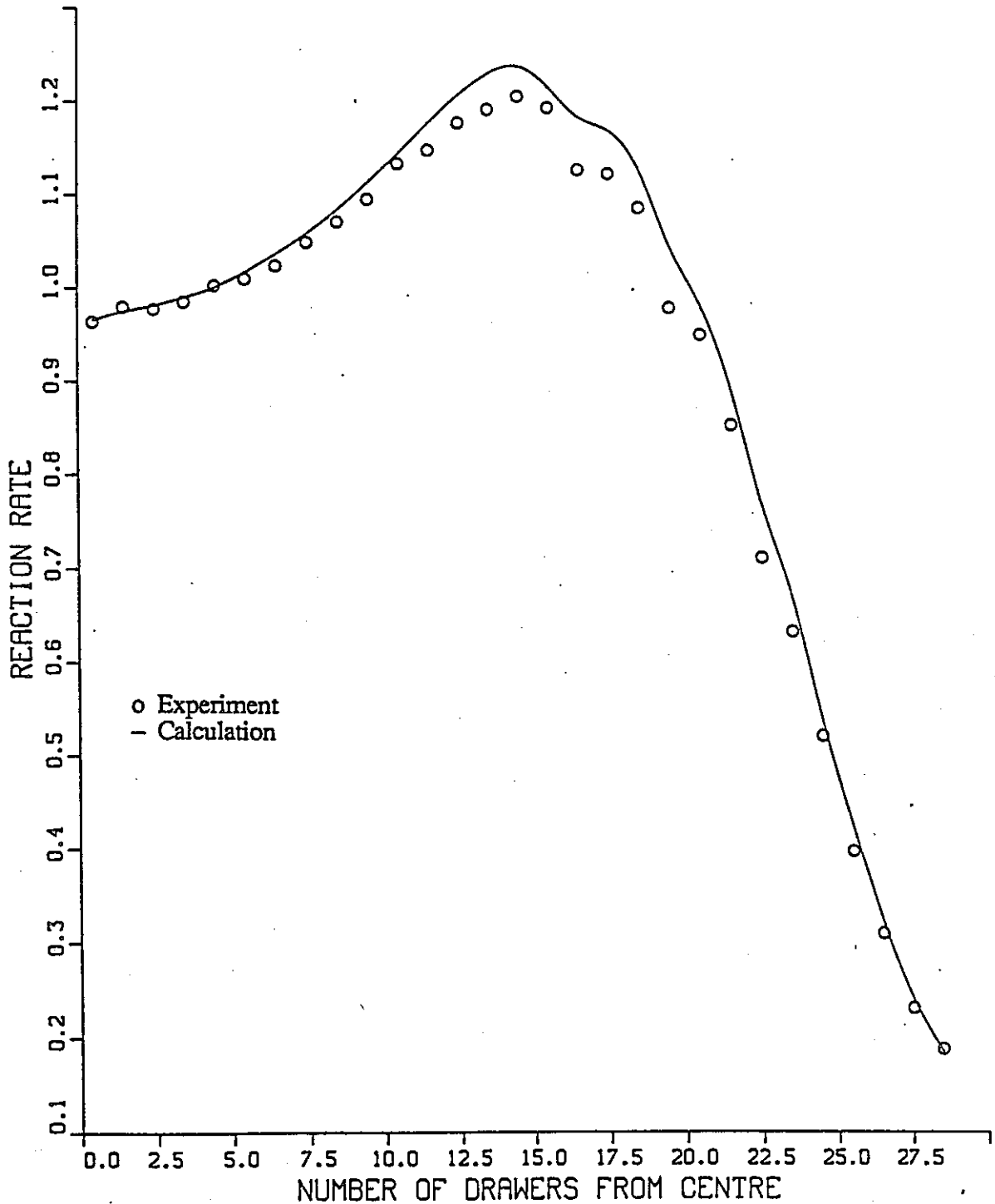


Fig. 4.1.3-9 Radial ^{238}U Capture Distribution at 5 cm from the Midplane

ZPPR-17A RADIAL U238(N,F) AT Z-5.2 CM

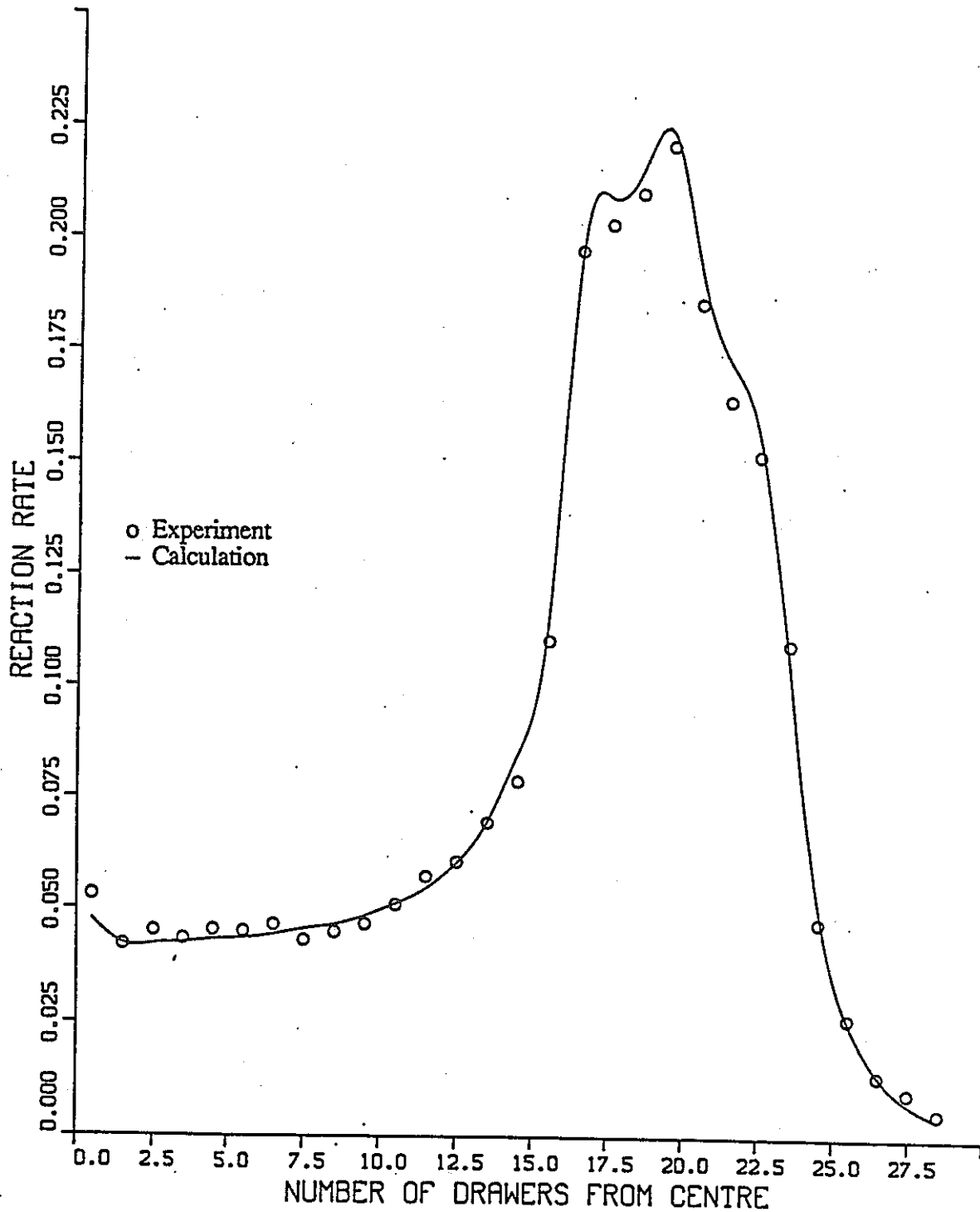


Fig. 4.1.3-10 Radial ^{238}U Fission Distribution at 5 cm from the Midplane

ZPPR-17A RADIAL PU239(N,F) AT Z=28.0 CM

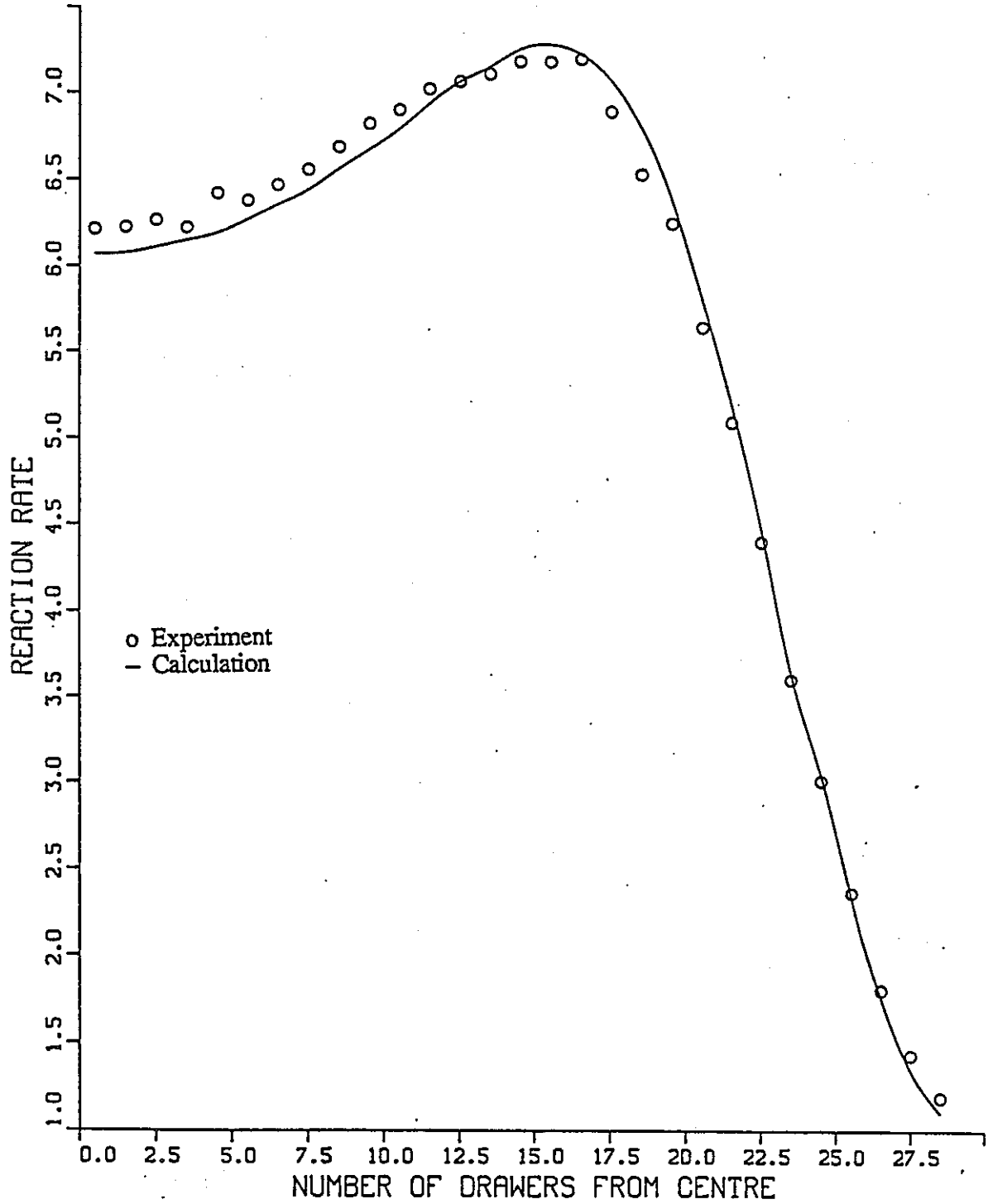


Fig. 4.1.3-11 Radial ^{239}Pu Fission Distribution at 28 cm from the Midplane

ZPPR-17A RADIAL U235(N,F) AT Z-28.0 CM

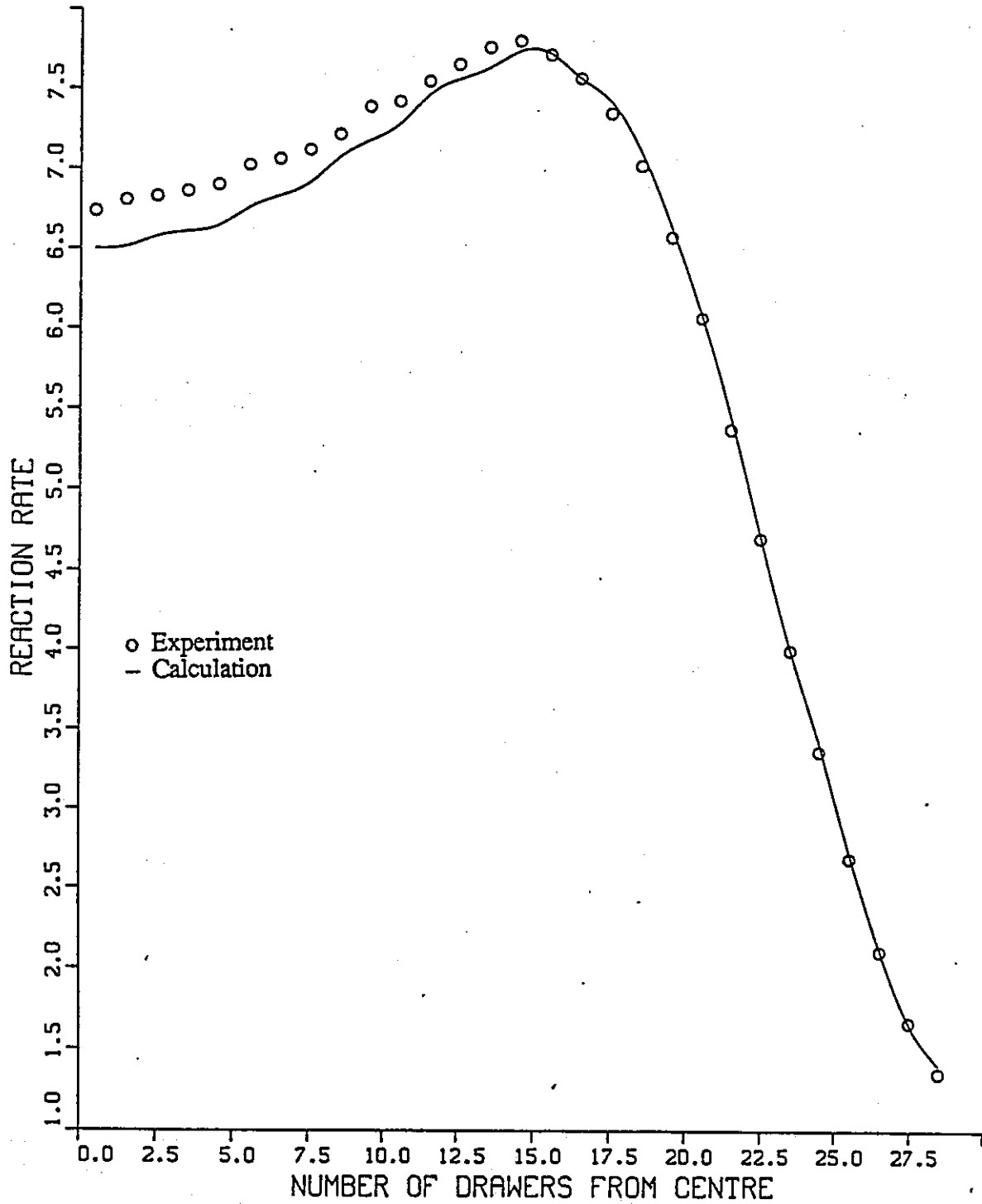


Fig. 4.1.3-12 Radial ^{235}U Fission Distribution at 28 cm from the Midplane

ZPPR-17A RADIAL U238(N,G) AT Z-28.0 CM

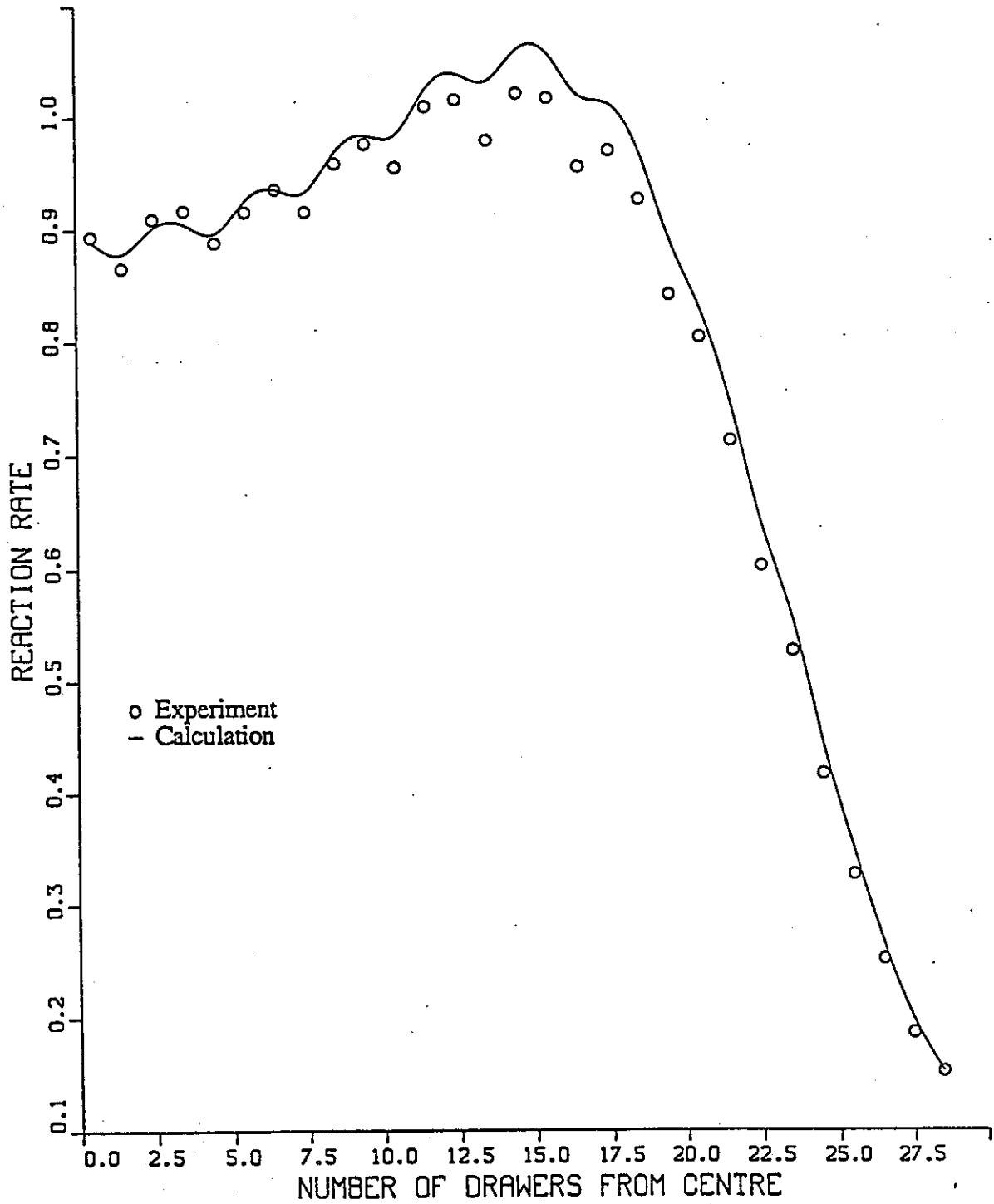


Fig. 4.1.3-13 Radial ^{238}U Capture Distribution at 28 cm from the Midplane

ZPPR-17A RADIAL U238(N,F) AT Z-28.0 CM

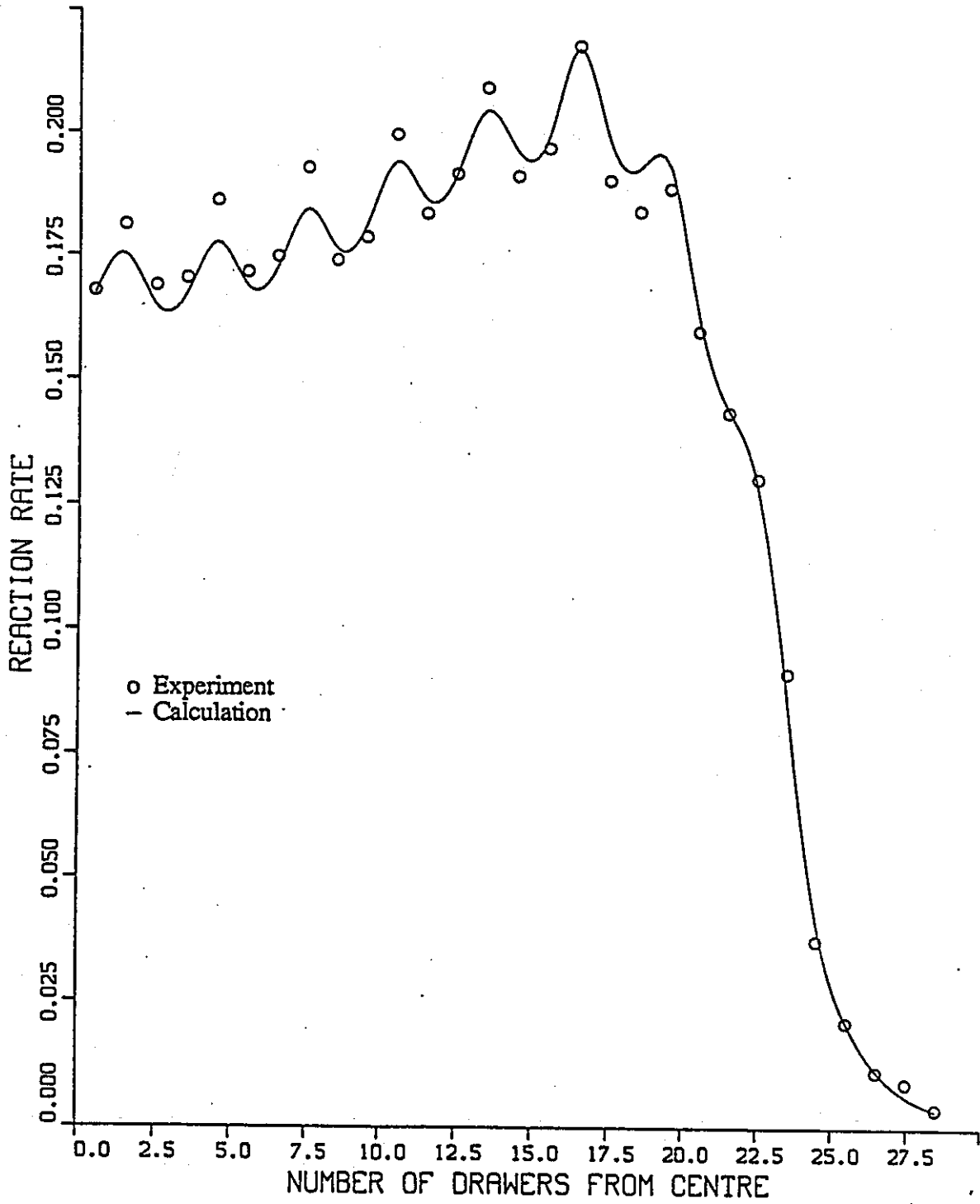
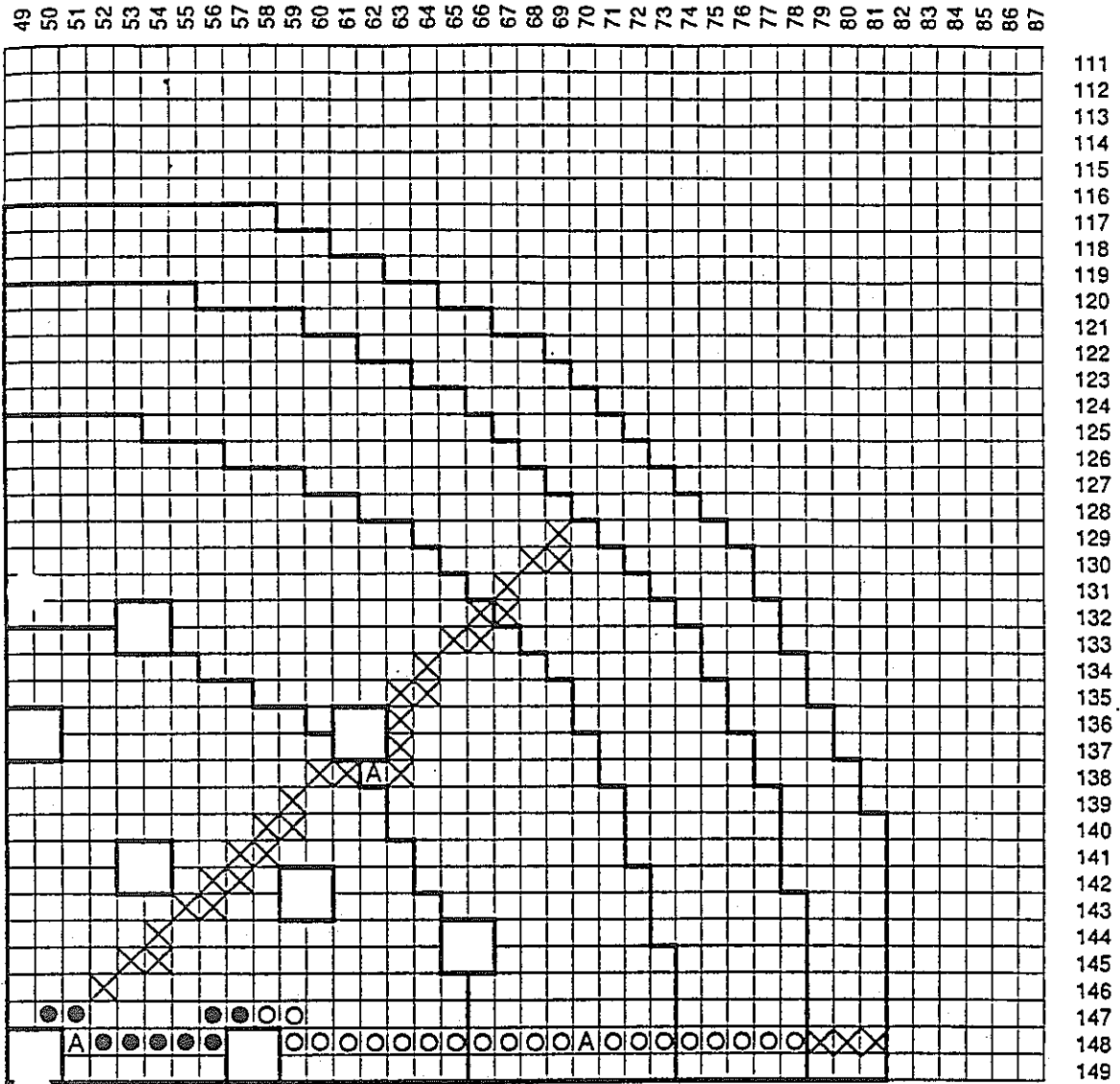
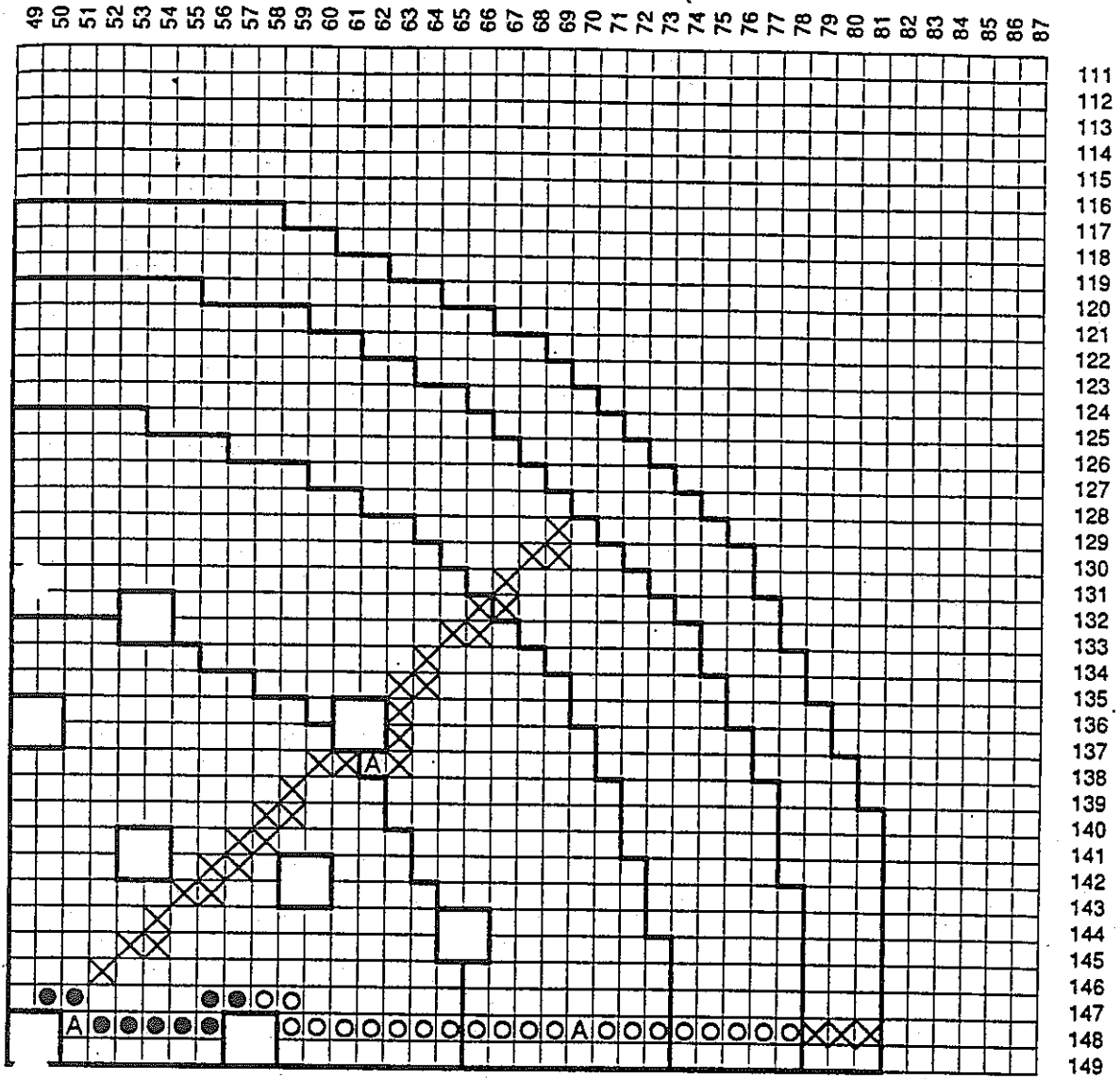


Fig. 4.1.3-14 Radial ^{238}U Fission Distribution at 28 cm from the Midplane



X 235 U O 235 U + 238 U ● 235 U + 238 U + 239 PU
 A Axial Traverse

Fig.4.1.3-15 Foil Locations in ZPPR-17B in the xy Plane



X 235 U O 235 U + 238 U ● 235 U + 238 U + 239 PU
 A Axial Traverse

Fig. 4.1.3-16 Foil Locations in ZPPR-17C in the xy Plane

Table 4.1.3-1 ZPPR-17A: Radial Reaction Rate Distributions along the X-axis near to the Midplane

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IB	6.983	0.962	8.016	0.993	0.9636	1.019	0.0538	0.899
148 51	IB	7.045	0.959	8.109	0.997	0.9790	1.011	0.0428	1.003
148 52	IB	7.079	0.960	8.156	0.997	0.9766	1.020	0.0457	0.935
148 53	IB	7.090	0.967	8.168	1.004	0.9844	1.021	0.0439	0.982
148 54	IB	7.116	0.975	8.256	1.005	1.0020	1.015	0.0460	0.952
148 55	IB	7.211	0.976	8.329	1.011	1.0090	1.023	0.0456	0.967
148 56	IB	7.408	0.967	8.495	1.009	1.0230	1.028	0.0468	0.962
148 57	IB	7.492	0.976	8.650	1.011	1.0480	1.025	0.0437	1.058
148 58	IB	7.633	0.980	8.865	1.009	1.0700	1.028	0.0456	1.037
148 59	IB	7.813	0.982	9.022	1.015	1.0940	1.032	0.0472	1.041
148 60	IB	7.991	0.987	9.220	1.018	1.1320	1.026	0.0518	1.005
148 61	IB	8.115	0.998	9.379	1.024	1.1460	1.042	0.0580	0.955
148 62	IB	8.295	1.002	9.517	1.028	1.1750	1.042	0.0614	0.998
148 63	IB	8.467	1.003	9.582	1.033	1.1890	1.048	0.0704	1.007
148 64	IB	8.522	1.009	9.509	1.037	1.2030	1.043	0.0799	1.081
148 65	IB	8.368	1.024	9.241	1.037	1.1910	1.036	0.1119	1.059
148 66	OC D	7.925	1.013	8.680	1.022	1.1250	1.068	0.1997	1.004
148 67	OC S	7.846	1.030	8.454	1.024	1.1210	1.058	0.2060	1.033
148 68	OC S	7.763	1.023	8.201	1.018	1.0850	1.053	0.2130	1.030
148 69	OC D	7.393	1.024	7.767	1.014	0.9775	1.085	0.2233	1.019
148 70	OC S	6.895	1.012	7.134	1.024	0.9483	1.051	0.1881	1.042
148 71	OC S	6.132	1.026	6.461	1.019	0.8512	1.060	0.1663	1.056
148 72	OC D	5.333	1.024	5.615	1.023	0.7102	1.098	0.1539	1.028
148 73	OC S	4.407	1.011	4.869	1.005	0.6319	1.074	0.1115	0.957
148 74	RB	3.747	0.996	4.123	1.014	0.5204	1.048	0.0482	1.060
148 75	RB	2.871	0.999	3.260	1.023	0.3970	1.084	0.0269	0.978
148 76	RB	2.253	0.961	2.575	1.009	0.3097	1.057	0.0142	1.008
148 77	RB	1.759	0.939	2.022	1.007	0.2309	1.060	0.0103	0.768
148 78	RB	1.464	0.925	1.659	1.041	0.1878	0.999	0.0058	0.766
148 79	RR	--	--	1.665	1.079	--	--	--	--
148 80	RR	--	--	1.350	1.026	--	--	--	--
148 81	RR	--	--	0.828	0.734	--	--	--	--

Table 4.1.3-2 ZPPR-17A: Near-Midplane Radial $^{235}\text{U}(n,f)$ Distribution along the Y-axis and Comparison with X-axis Analysis

Matrix	Zone	Y-axis		Matrix	X-axis		Ratio of C/E's Y/X
		Exp.	C/E		Exp.	C/E	
148 50	IB	8.016	0.993	148 50	8.016	0.993	1.000
147 50	IB	8.175	0.992	148 51	8.109	0.997	0.995
146 50	IB	8.141	1.002	148 52	8.156	0.997	1.005
145 50	IB	8.216	1.001	148 53	8.168	1.004	0.997
144 50	IB	8.330	0.999	148 54	8.256	1.005	0.994
143 50	IB	8.404	1.004	148 55	8.329	1.011	0.993
142 50	IB	8.537	1.005	148 56	8.495	1.009	0.996
141 50	IB	8.689	1.006	148 57	8.650	1.011	0.995
140 50	IB	8.820	1.013	148 58	8.865	1.009	1.004
139 50	IB	9.005	1.014	148 59	9.022	1.015	0.999
138 50	IB	9.171	1.018	148 60	9.220	1.018	1.000
137 50	IB	9.406	1.014	148 61	9.379	1.024	0.990
136 50	IB	9.442	1.028	148 62	9.517	1.028	1.000
135 50	IB	9.589	1.020	148 63	9.582	1.033	0.987
134 50	IB	9.420	1.033	148 64	9.509	1.037	0.996
133 50	IB	9.304	1.016	148 65	9.241	1.037	0.980
132 50	OC D	8.668	1.003	148 66	8.680	1.022	0.981
131 50	OC S	8.465	1.009	148 67	8.454	1.024	0.985
130 50	OC S	8.158	1.011	148 68	8.201	1.018	0.993
129 50	OC D	7.694	1.004	148 69	7.767	1.014	0.990
128 50	OC S	7.149	1.005	148 70	7.134	1.024	0.981
127 50	OC S	6.452	1.007	148 71	6.461	1.019	0.988
126 50	OC D	5.577	1.005	148 72	5.615	1.023	0.982
125 50	OC S	4.825	1.000	148 73	4.869	1.005	0.995
124 50	RB	4.066	1.016	148 74	4.123	1.014	1.002
123 50	RB	3.233	1.020	148 75	3.260	1.023	0.997
122 50	RB	2.534	1.017	148 76	2.575	1.009	1.008
121 50	RB	2.003	1.015	148 77	2.022	1.007	1.008
120 50	RB	1.660	1.051	148 78	1.659	1.041	1.010
119 50	RR	1.570	1.087	148 79	1.665	1.079	1.007
118 50	RR	1.103	0.974	148 80	1.350	1.026	0.949

Table 4.1.3-3 ZPPR-17A: Near-Midplane Radial Distributions of Capture and Fission in ^{238}U along the Y-axis

Matrix	Zone	$^{238}\text{U}(n,\gamma)$		Ratio to C/E at X-axis	$^{238}\text{U}(n,f)$		Ratio to C/E at X-axis
		Exp.	C/E		EXP.	C/E	
148 50	IB	0.9636	1.019	1.000	0.0538	0.899	1.000
147 50	IB	0.9621	1.029	1.018	0.0435	0.986	0.983
146 50	IB	0.9738	1.022	1.002	0.0457	0.935	1.000
145 50	IB	0.9708	1.034	1.013	0.0456	0.945	0.962
144 50	IB	0.9920	1.024	1.009	0.0431	1.016	1.067
143 50	IB	0.9985	1.032	1.009	0.0430	1.024	1.059
142 50	IB	1.0200	1.028	1.000	0.0438	1.024	1.064
141 50	IB	1.0380	1.031	1.006	0.0477	0.968	0.915
140 50	IB	1.0620	1.031	1.003	0.0474	0.993	0.958
139 50	IB	1.0830	1.036	1.004	0.0492	0.996	0.957
138 50	IB	1.1100	1.038	1.012	0.0497	1.042	1.037
137 50	IB	1.1320	1.044	1.002	0.0539	1.022	1.070
136 50	IB	1.1600	1.043	1.001	0.0565	1.077	1.079
135 50	IB	1.1790	1.042	0.994	0.0675	1.041	1.034
134 50	IB	1.1820	1.045	1.002	0.0792	1.082	1.001
133 50	IB	1.1760	1.033	0.997	0.1084	1.078	1.018
132 50	OC D	1.1040	1.066	0.998	0.2046	0.991	0.987
131 50	OC S	1.1290	1.034	0.977	0.2104	0.997	0.965
130 50	OC S	1.0770	1.044	0.991	0.2093	1.032	0.998
129 50	OC D	0.9685	1.071	0.987	0.2236	0.995	0.976
128 50	OC S	0.9265	1.056	0.995	0.1872	1.024	0.983
127 50	OC S	0.8451	1.048	0.989	0.1683	1.022	0.968
126 50	OC D	0.7009	1.082	0.985	0.1574	0.968	0.942
125 50	OC S	0.6208	1.076	1.002	0.1089	0.948	0.991
124 50	RB	0.5109	1.049	1.001	0.0431	1.132	1.067
123 50	RB	0.3958	1.069	0.986	0.0241	1.047	1.071
122 50	RB	0.3052	1.057	1.000	0.0150	0.919	0.912
121 50	RB	0.2295	1.056	0.996	0.0097	0.791	1.030
120 50	RB	0.1868	1.003	1.004	0.0038	1.156	1.509

Table 4.1.3-4 ZPPR-17A: Comparison of Results for $^{235}\text{U}(n,f)$ in Symmetric Positions at the Axes and Near the Midplane

Matrix	Zone	Neg. X-axis		Pos. X-axis		Pos. Y-Axis		Neg. Y-axis	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
148 71	OC S	6.468	1.023	6.461	1.019	6.452	1.007	6.411	1.013
148 70	OC S	7.168	1.021	7.134	1.024	7.149	1.005	7.044	1.020
148 69	OC D	--	--	7.767	1.014	7.694	1.004	7.586	1.018
148 68	OC S	8.147	1.029	8.201	1.018	8.158	1.011	8.090	1.019
148 67	OC S	8.371	1.036	8.454	1.024	8.465	1.009	8.405	1.016
	Mean C/E		1.027		1.020		1.007		1.017
	S.D.		0.007		0.004		0.003		0.003

^aMatrix positions on the positive x-axis, those on the other three axes are symmetric.

Table 4.1.3-5 ZPPR-17A: Radial Distribution
for $^{235}\text{U}(n,f)$ at 45° to the Axes
and Near the Midplane

<u>Matrix</u>	<u>Zone</u>	<u>Experiment</u>	<u>C/E</u>
146 51	IB	8.141	1.011
146 52	IB	8.141	1.011
145 53	IB	8.384	0.999
145 54	IB	8.450	1.003
144 54	IB	8.494	1.009
143 55	IB	8.759	1.007
143 56	IB	8.826	1.017
142 56	IB	9.043	1.009
142 57	IB	9.176	1.012
141 57	IB	9.322	1.013
141 58	IB	9.467	1.016
140 58	IB	9.571	1.019
140 59	IB	9.696	1.019
139 59	IB	9.663	1.028
138 60	IB	9.482	1.033
138 61	IB	9.293	1.024
137 61	OC D	8.802	1.014
137 62	OC S	8.721	1.008
136 62	OC D	8.547	1.002
136 63	OC D	8.312	1.006
135 63	OC S	8.054	1.006
135 64	OC S	7.642	1.020
134 64	OC D	7.291	1.005
133 65	OC S	6.156	1.022
133 66	OC D	5.628	1.006
132 66	OC S	5.011	1.011
132 67	RB	4.448	1.033
131 67	RB	3.903	1.021
130 68	RB	2.794	1.025
130 69	RB	2.367	1.026
129 69	RB	2.069	1.032

Table 4.1.3-6 ZPPR-17A: Radial Reaction Rate Distributions along the X-axis at z = 17.86 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC S	6.274	0.965	7.154	0.980	0.9323	1.027	0.1337	0.975
148 51	IC D	---	---	7.124	0.967	0.9047	1.025	0.1510	0.950
148 52	IC S	6.344	0.961	7.229	0.982	0.9459	1.023	0.1343	0.961
148 53	IC S	---	---	7.266	0.983	0.9498	1.026	0.1323	0.989
148 54	IC D	6.364	0.966	7.249	0.973	0.9374	1.013	0.1577	0.926
148 55	IC S	---	---	7.461	0.982	0.9700	1.030	0.1382	0.960
148 56	IC S	6.616	0.965	7.486	0.992	0.9877	1.027	0.1399	0.970
148 57	IC D	---	---	7.505	0.985	0.9724	1.025	0.1576	0.968
148 58	IC S	6.835	0.973	7.731	1.001	1.0160	1.040	0.1440	0.971
148 59	IC S	---	---	7.953	0.993	1.0400	1.038	0.1477	0.976
148 60	IC D	7.093	0.975	8.045	0.983	1.0330	1.034	0.1700	0.964
148 61	IC S	7.311	0.981	8.297	0.999	1.0970	1.035	0.1542	0.983
148 62	IC S	7.426	0.992	8.416	1.004	1.0920	1.061	0.1605	0.988
148 63	IC D	7.506	1.000	8.475	0.995	1.0690	1.068	0.1830	1.000
148 64	IC S	7.594	1.018	8.546	1.016	1.1090	1.074	0.1751	0.997
148 65	IC S	7.801	1.008	8.582	1.006	1.1000	1.077	0.1845	1.042
148 66	OC D	7.716	1.022	8.260	1.019	1.0350	1.098	0.2217	0.997
148 67	OC S	7.627	1.026	8.090	1.022	1.0770	1.049	0.2018	1.062
148 68	OC S	7.431	1.024	7.839	1.015	1.0200	1.065	0.2072	1.032
148 69	OC D	6.997	1.029	7.349	1.017	0.9318	1.079	0.2148	1.014
148 70	OC S	6.427	1.025	6.765	1.019	0.8865	1.060	0.1764	1.050
148 71	OC S	5.741	1.030	6.062	1.021	0.7993	1.061	0.1564	1.055
148 72	OC D	4.988	1.026	5.327	1.011	0.6761	1.082	0.1409	1.051
148 73	OC S	4.079	1.021	4.589	0.997	0.5918	1.073	0.1025	0.968
148 74	RB	3.455	1.009	3.856	1.013	0.4754	1.071	0.0428	1.111
148 75	RB	2.717	0.984	3.057	1.018	0.3719	1.079	0.0252	0.971
148 76	RB	2.073	0.973	2.384	1.015	0.2874	1.061	0.0124	1.074
148 77	RB	1.650	0.932	1.866	1.017	0.2186	1.042	0.0097	0.759
148 78	RB	1.396	0.902	1.569	1.024	0.1726	1.011	0.0057	0.729

Table 4.1.3-7 ZPPR-17A: Radial Reaction Rate Distributions along the X-axis at Z = 28.02 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC S	6.317	0.976	6.784	0.974	0.8933	1.012	0.1702	0.999
148 51	IC D	6.326	0.976	6.811	0.972	0.8652	1.031	0.1833	0.970
148 52	IC S	6.372	0.974	6.891	0.970	0.9088	1.007	0.1702	0.982
148 53	IC S	6.333	0.986	6.915	0.970	0.9164	1.003	0.1724	0.986
148 54	IC D	6.486	0.970	6.955	0.971	0.8880	1.025	0.1881	0.958
148 55	IC S	6.479	0.983	7.050	0.974	0.9153	1.028	0.1732	0.989
148 56	IC S	6.581	0.980	7.122	0.974	0.9352	1.017	0.1765	0.994
148 57	IC D	6.666	0.981	7.195	0.977	0.9151	1.035	0.1951	0.960
148 58	IC S	6.769	0.985	7.303	0.985	0.9588	1.028	0.1760	1.017
148 59	IC S	6.940	0.978	7.460	0.978	0.9766	1.024	0.1807	1.019
148 60	IC D	6.985	0.989	7.495	0.989	0.9553	1.047	0.2017	0.978
148 61	IC S	7.147	0.988	7.625	0.996	1.0100	1.031	0.1857	1.020
148 62	IC S	7.179	1.001	7.736	0.995	1.0160	1.039	0.1941	1.005
148 63	IC D	7.252	1.004	7.695	1.010	0.9797	1.071	0.2120	0.982
148 64	IC S	7.283	1.014	7.873	1.000	1.0220	1.055	0.1938	1.030
148 65	IC S	7.352	1.009	7.799	1.008	1.0180	1.057	0.1997	1.016
148 66	OC D	7.267	1.013	7.637	1.009	0.9568	1.084	0.2205	1.002
148 67	OC S	7.045	1.023	7.424	1.018	0.9716	1.060	0.1928	1.048
148 68	OC S	6.683	1.037	7.089	1.020	0.9280	1.063	0.1867	1.052
148 69	OC D	6.373	1.021	6.633	1.018	0.8430	1.077	0.1901	1.035
148 70	OC S	5.758	1.026	6.121	1.012	0.8056	1.048	0.1621	1.022
148 71	OC S	5.164	1.022	5.429	1.021	0.7140	1.064	0.1455	1.008
148 72	OC D	4.488	1.014	4.751	1.012	0.6037	1.081	0.1322	0.991
148 73	OC S	3.673	1.007	4.041	1.009	0.5279	1.071	0.0932	0.941
148 74	RB	3.081	1.005	3.397	1.024	0.4185	1.081	0.0381	1.098
148 75	RB	2.405	0.986	2.712	1.020	0.3279	1.086	0.0215	1.001
148 76	RB	1.840	0.973	2.122	1.013	0.2520	1.072	0.0115	1.016
148 77	RB	1.457	0.936	1.678	1.005	0.1865	1.082	0.0092	0.704
148 78	RB	1.213	0.922	1.366	1.046	0.1524	1.014	0.0040	0.918

Table 4.1.3-8 ZPPR-17A: Axial Reaction Rate Distributions in Matrix 148-50 (Core Center)

Zone	z (mm)	$^{239}\text{Pu}(n, f)$		$^{235}\text{U}(n, f)$		$^{238}\text{U}(n, \gamma)$		$^{238}\text{U}(n, f)$		
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E	
IB	26.2	7.049	0.958	8.060	1.006	0.9777	1.013	0.0434	0.906	
IB	49.6	7.115	0.947	8.055	1.001	0.9742	1.013	0.0417	1.015	
IB	77.0	6.983	0.962	8.016	0.993	0.9636	1.019	0.0538	0.899	
IB	100.4	6.912	0.966	7.889	0.994	0.9624	1.011	0.0600	0.953	
IB	127.8	6.813	0.971	7.669	0.996	0.9414	1.018	0.0719	0.998	
Zone Average C/E			0.961	0.988			1.015		0.954	
Standard Deviation			0.009	0.005			0.003		0.052	
IC S	178.6	6.274	0.965	7.154	0.980	0.9323	1.027	0.1337	0.975	
IC S	229.4	6.399	0.960	6.947	0.974	0.8978	1.032	0.1576	1.000	
IC S	280.2	6.317	0.976	6.784	0.974	0.8933	1.012	0.1702	0.999	
IC S	331.0	6.188	0.979	6.574	0.979	0.8623	1.020	0.1691	0.997	
IC S	381.8	5.827	0.989	6.286	0.976	0.8267	1.015	0.1595	0.996	
IC S	432.6	5.460	0.970	5.826	0.981	0.7715	1.014	0.1410	0.991	
IC S	483.4	4.901	0.960	5.405	0.970	0.7189	1.001	0.1183	0.925	
Zone Average C/E			0.971	0.976			1.017		0.983	
Standard Deviation			0.011	0.004			0.010		0.027	
AB	534.2	4.604	0.954	5.115	0.970	0.6556	1.008	0.0611	0.924	
AB	585.0	4.153	0.934	4.637	0.978	0.5819	1.020	0.0364	0.871	
AB	635.8	3.675	0.922	4.221	0.965	0.5176	1.007	0.0241	0.730	
AB	686.6	3.291	0.901	3.756	0.972	0.4435	1.016	0.0162	0.739	
AB	737.4	3.070	0.884	3.450	0.997	0.4033	0.985	0.0105	0.714	
Zone Average C/E			0.919	0.976			1.007		0.796	
Standard Deviation			0.027	0.012			0.014		0.095	
AR	839.0	--	--	3.741	1.126	--	--	--	--	
AR	889.8	--	--	3.713	1.064	--	--	--	--	
AR	946.9	--	--	2.641	1.119	--	--	--	--	
AR	997.7	--	--	1.937	0.988	--	--	--	--	

Table 4.1.3-9 ZPPR-17A: Axial Reaction Rate Distributions in Matrix 148-66 (Outer Core)

Zone	z(mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
OC D	51.6	7.925	1.013	8.680	1.022	1.1250	1.068	0.1997	1.004
OC D	102.4	7.950	1.006	8.496	1.031	1.0900	1.087	0.2119	0.971
OC D	178.6	7.716	1.022	8.260	1.019	1.0350	1.098	0.2217	0.997
OC D	229.4	7.586	1.013	7.993	1.014	0.9971	1.096	0.2185	1.033
OC D	280.2	7.267	1.013	7.637	1.009	0.9568	1.084	0.2205	1.002
OC D	331.0	6.870	1.005	7.206	1.003	0.9086	1.071	0.2027	1.018
OC D	381.8	6.244	1.012	6.580	1.009	0.8377	1.068	0.1781	1.048
OC D	432.6	5.539	1.014	5.936	1.007	0.7507	1.076	0.1539	1.039
OC D	483.4	4.795	1.005	5.264	1.007	0.6661	1.078	0.1202	1.008
Zone Average C/E			1.011	1.013		1.080		1.013	
Standard Deviation			0.005	0.009		0.012		0.024	
AB	534.2	4.410	0.987	4.825	1.015	0.6114	1.072	0.0614	0.891
AB	585.0	3.865	0.973	4.356	1.002	0.5305	1.082	0.0365	0.927
AB	635.8	3.341	0.959	3.781	1.008	0.4655	1.055	0.0230	0.913
AB	686.6	2.937	0.933	3.307	1.011	0.3939	1.059	0.0155	0.801
AB	737.4	2.632	0.931	2.954	1.044	0.3356	1.073	0.0114	0.643
Zone Average C/E			0.957	1.016		1.068		0.835	
Standard Deviation			0.025	0.016		0.011		0.118	
AR	839.0	--	--	3.043	1.188	--	--	--	--
AR	889.8	--	--	2.883	1.162	--	--	--	--

Table 4.1.3-10 ZPPR-17A: Axial Reaction Rate Distributions in Matrix 148-70 (Outer Core)

Zone	z (mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
OC S	51.6	6.895	1.012	7.134	1.024	0.9483	1.051	0.1881	1.042
OC S	102.4	6.740	1.021	7.054	1.020	0.9360	1.049	0.1895	1.020
OC S	178.6	6.427	1.025	6.765	1.019	0.8865	1.060	0.1764	1.050
OC S	229.4	6.163	1.021	6.483	1.016	0.8607	1.043	0.1711	1.033
OC S	280.2	5.758	1.026	6.121	1.012	0.8056	1.048	0.1621	1.022
OC S	331.0	5.305	1.027	5.624	1.018	0.7441	1.050	0.1448	1.048
OC S	381.8	4.809	1.020	5.089	1.021	0.6757	1.051	0.1317	1.019
OC S	432.6	4.266	1.009	4.539	1.020	0.6011	1.056	0.1086	1.037
OC S	483.4	3.734	0.985	4.069	1.005	0.5412	1.038	0.0875	0.974
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	Zone Average C/E		1.016		1.017		1.050		1.027
	Standard Deviation		0.013		0.006		0.006		0.023
AB	534.2	3.344	0.989	3.710	1.002	0.4778	1.041	0.0479	0.907
AB	585.0	2.865	0.986	3.277	1.001	0.4054	1.066	0.0270	0.902
AB	635.8	2.488	0.961	2.863	0.997	0.3521	1.046	0.0158	0.855
AB	686.6	2.174	0.936	2.448	1.015	0.2931	1.057	0.0106	0.840
AB	737.4	1.953	0.928	2.189	1.042	0.2471	1.077	0.0097	0.571
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	Zone Average C/E		0.960		1.011		1.057		0.815
	Standard Deviation		0.028		0.018		0.015		0.139

Table 4.1.3-11 ZPPR-17A: Reaction Rate Ratios along the X-axis near to the Midplane

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IB	1.148	1.032	0.1380	1.059	0.00771	0.935
148 51	IB	1.151	1.040	0.1390	1.054	0.00607	1.046
148 52	IB	1.152	1.039	0.1380	1.063	0.00646	0.974
148 53	IB	1.152	1.038	0.1388	1.056	0.00619	1.016
148 54	IB	1.160	1.031	0.1408	1.041	0.00646	0.976
148 55	IB	1.155	1.036	0.1399	1.048	0.00633	0.991
148 56	IB	1.147	1.043	0.1381	1.063	0.00632	0.995
148 57	IB	1.155	1.036	0.1399	1.050	0.00583	1.084
148 58	IB	1.161	1.030	0.1402	1.049	0.00597	1.058
148 59	IB	1.155	1.034	0.1400	1.051	0.00605	1.060
148 60	IB	1.154	1.031	0.1417	1.040	0.00648	1.018
148 61	IB	1.156	1.026	0.1412	1.044	0.00715	0.957
148 62	IB	1.147	1.026	0.1417	1.040	0.00741	0.996
148 63	IB	1.132	1.030	0.1404	1.045	0.00831	1.004
148 64	IB	1.116	1.028	0.1412	1.034	0.00938	1.071
148 65	IB	1.104	1.013	0.1423	1.012	0.01337	1.034
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Zone Average C/E		1.032		1.047		1.013	
Standard Deviation		0.007		0.013		0.043	
148 66	OC D	1.095	1.009	0.1420	1.054	0.02520	0.991
148 67	OC S	1.077	0.994	0.1429	1.027	0.02626	1.003
148 68	OC S	1.056	0.995	0.1398	1.029	0.02744	1.007
148 69	OC D	1.051	0.990	0.1322	1.060	0.03020	0.995
148 70	OC S	1.035	1.012	0.1375	1.039	0.02728	1.030
148 71	OC S	1.054	0.993	0.1388	1.033	0.02712	1.029
148 72	OC D	1.053	0.999	0.1332	1.072	0.02886	1.004
148 73	OC S	1.105	0.994	0.1434	1.062	0.02530	0.947
		-----		-----		-----	
Zone Average C/E		0.998		1.047		1.001	
Standard Deviation		0.008		0.017		0.026	
148 74	RB	1.100	1.018	0.1389	1.052	0.01286	1.064
148 75	RB	1.135	1.024	0.1383	1.085	0.00937	0.979
148 76	RB	1.143	1.050	0.1375	1.100	0.00630	1.049
148 77	RB	1.150	1.072	0.1313	1.129	0.00588	0.818
148 78	RB	1.133	1.125	0.1283	1.080	0.00399	0.828
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Zone Average C/E		1.058		1.089		0.948	
Standard Deviation		0.043		0.028		0.118	

Table 4.1.3-12 ZPPR-17A: Reaction Rate Ratios along the X-axis at Z = 17.86 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC S	1.140	1.016	0.1486	1.064	0.02131	1.010
148 52	IC S	1.140	1.022	0.1491	1.065	0.02117	1.000
148 54	IC D	1.139	1.007	0.1473	1.049	0.02478	0.959
148 56	IC S	1.131	1.028	0.1493	1.064	0.02115	1.005
148 58	IC S	1.131	1.029	0.1486	1.069	0.02107	0.998
148 60	IC D	1.134	1.008	0.1456	1.061	0.02397	0.989
148 61	IC S	1.135	1.018	0.1500	1.055	0.02109	1.002
148 62	IC S	1.133	1.012	0.1471	1.070	0.02161	0.996
148 63	IC D	1.129	0.995	0.1424	1.068	0.02438	1.000
148 64	IC S	1.125	0.998	0.1460	1.055	0.02306	0.979
148 65	IC S	1.100	0.998	0.1410	1.068	0.02365	1.034
Zone Average C/E			1.012		1.063		0.997
Standard Deviation			0.012		0.007		0.019
148 66	OC D	1.071	0.997	0.1341	1.074	0.02873	0.976
148 67	OC S	1.061	0.996	0.1412	1.022	0.02646	1.035
148 68	OC S	1.055	0.991	0.1373	1.040	0.02788	1.008
148 69	OC D	1.050	0.988	0.1332	1.049	0.03070	0.985
148 70	OC S	1.053	0.994	0.1379	1.034	0.02745	1.024
148 71	OC S	1.056	0.991	0.1392	1.030	0.02724	1.024
148 72	OC D	1.068	0.985	0.1355	1.055	0.02825	1.024
148 73	OC S	1.125	0.976	0.1451	1.051	0.02513	0.948
Zone Average C/E			0.990		1.044		1.003
Standard Deviation			0.007		0.016		0.030
148 74	RB	1.116	1.004	0.1376	1.061	0.01238	1.101
148 75	RB	1.125	1.035	0.1369	1.097	0.00926	0.987
148 76	RB	1.150	1.043	0.1386	1.090	0.00597	1.104
148 77	RB	1.131	1.091	0.1325	1.118	0.00588	0.814
148 78	RB	1.124	1.135	0.1236	1.121	0.00407	0.808
Zone Average C/E			1.062		1.017		0.963
Standard Deviation			0.052		0.024		0.146

Table 4.1.3-13 ZPPR-17A: Reaction Rate Ratios along the X-axis at Z = 28.02 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC S	1.074	0.998	0.1414	1.037	0.02694	1.024
148 51	IC D	1.077	0.996	0.1368	1.056	0.02898	0.994
148 52	IC S	1.081	0.996	0.1426	1.034	0.02671	1.008
148 53	IC S	1.092	0.984	0.1447	1.017	0.02722	1.000
148 54	IC D	1.072	1.001	0.1369	1.057	0.02900	0.988
148 55	IC S	1.088	0.991	0.1413	1.046	0.02673	1.006
148 56	IC S	1.082	0.994	0.1421	1.038	0.02682	1.014
148 57	IC D	1.079	0.996	0.1373	1.055	0.02927	0.979
148 58	IC S	1.079	1.000	0.1416	1.044	0.02600	1.032
148 59	IC S	1.075	1.000	0.1407	1.047	0.02604	1.042
148 60	IC D	1.073	1.000	0.1368	1.059	0.02888	0.989
148 61	IC S	1.067	1.008	0.1413	1.044	0.02598	1.032
148 62	IC S	1.078	0.994	0.1415	1.038	0.02704	1.004
148 63	IC D	1.061	1.006	0.1351	1.067	0.02923	0.978
148 64	IC S	1.081	0.986	0.1403	1.040	0.02661	1.016
148 65	IC S	1.061	0.999	0.1385	1.048	0.02716	1.007
		-----		-----		-----	
Zone Average C/E		0.996		1.045		1.007	
Standard Deviation		0.006		0.012		0.019	
148 66	OC D	1.051	0.996	0.1317	1.070	0.03034	0.989
148 67	OC S	1.054	0.995	0.1379	1.036	0.02737	1.024
148 68	OC S	1.061	0.984	0.1389	1.025	0.02794	1.014
148 69	OC D	1.041	0.997	0.1323	1.055	0.02983	1.014
148 70	OC S	1.063	0.986	0.1399	1.021	0.02815	0.996
148 71	OC S	1.051	0.999	0.1383	1.041	0.02818	0.986
148 72	OC D	1.059	0.998	0.1345	1.066	0.02946	0.977
148 73	OC S	1.100	1.002	0.1437	1.064	0.02538	0.934
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Zone Average C/E		0.995		1.046		0.992	
Standard Deviation		0.006		0.020		0.028	
148 74	RB	1.103	1.019	0.1358	1.076	0.01238	1.093
148 75	RB	1.128	1.034	0.1363	1.101	0.00893	1.015
148 76	RB	1.153	1.041	0.1370	1.102	0.00624	1.044
148 77	RB	1.152	1.074	0.1280	1.156	0.00630	0.752
148 78	RB	1.126	1.134	0.1256	1.100	0.00326	0.996
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Zone Average C/E		1.060		1.107		0.980	
Standard Deviation		0.046		0.029		0.133	

Table 4.1.3-14 ZPPR-17A: Reaction Rate Ratios in Matrix 148-50 (Core Center)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
IB	26.2	1.143	1.050	0.1387	1.057	0.00616	0.946
IB	49.6	1.132	1.057	0.1369	1.070	0.00586	1.072
IB	77.0	1.148	1.032	0.1380	1.059	0.00771	0.935
IB	100.4	1.141	1.029	0.1392	1.047	0.00868	0.987
IB	127.8	1.126	1.026	0.1382	1.048	0.01055	1.028
Zone Average C/E			1.039		1.056		0.994
Standard Deviation			0.014		0.009		0.057
IC S	178.6	1.140	1.016	0.1486	1.064	0.02131	1.010
IC S	229.4	1.086	1.015	0.1403	1.075	0.02463	1.042
IC S	280.2	1.074	0.998	0.1414	1.037	0.02694	1.024
IC S	331.0	1.062	1.000	0.1394	1.042	0.02733	1.018
IC S	381.8	1.079	0.987	0.1419	1.026	0.02737	1.007
IC S	432.6	1.067	1.011	0.1413	1.045	0.02582	1.022
IC S	483.4	1.103	1.010	0.1467	1.043	0.02414	0.964
Zone Average C/E			1.005		1.047		1.012
Standard Deviation			0.011		0.017		0.024
AB	534.2	1.111	1.017	0.1424	1.057	0.01328	0.969
AB	585.0	1.117	1.047	0.1401	1.092	0.00877	0.933
AB	635.8	1.149	1.047	0.1408	1.092	0.00656	0.792
AB	686.6	1.141	1.079	0.1348	1.128	0.00491	0.820
AB	737.4	1.124	1.128	0.1314	1.114	0.00344	0.808
Zone Average C/E			1.064		1.096		0.864
Standard Deviation			0.042		0.026		0.081

Table 4.1.3-15 ZPPR-17A: Reaction Rate Ratios in Matrix 148-66 (Outer Core)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC D	51.6	1.095	1.009	0.1420	1.054	0.02520	0.991
OC D	102.4	1.069	1.025	0.1371	1.081	0.02665	0.965
OC D	178.6	1.071	0.997	0.1341	1.074	0.02873	0.976
OC D	229.4	1.054	1.001	0.1314	1.082	0.02880	1.020
OC D	280.2	1.051	0.996	0.1317	1.070	0.03034	0.989
OC D	331.0	1.049	0.998	0.1323	1.066	0.02951	1.013
OC D	381.8	1.054	0.997	0.1342	1.055	0.02852	1.036
OC D	432.6	1.072	0.993	0.1355	1.061	0.02778	1.025
OC D	483.4	1.098	1.002	0.1389	1.073	0.02507	1.003
Zone Average C/E			1.002	1.068		1.002	
Standard Deviation			0.010	0.010		0.024	
AB	534.2	1.094	1.028	0.1386	1.086	0.01393	0.903
AB	585.0	1.127	1.030	0.1373	1.112	0.00944	0.953
AB	635.8	1.132	1.051	0.1393	1.100	0.00689	0.952
AB	686.6	1.126	1.084	0.1341	1.135	0.00527	0.859
AB	737.4	1.122	1.121	0.1275	1.153	0.00432	0.691
Zone Average C/E			1.063	1.117		0.872	
Standard Deviation			0.040	0.027		0.109	

Table 4.1.3-16 ZPPR-17A: Reaction Rate Ratios in Matrix 148-70 (Outer Core)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC S	51.6	1.035	1.012	0.1375	1.039	0.02728	1.030
OC S	102.4	1.047	0.999	0.1389	1.027	0.02812	0.999
OC S	178.6	1.053	0.994	0.1379	1.034	0.02745	1.024
OC S	229.4	1.052	0.995	0.1397	1.022	0.02776	1.012
OC S	280.2	1.063	0.986	0.1399	1.021	0.02815	0.996
OC S	331.0	1.060	0.991	0.1403	1.022	0.02729	1.020
OC S	381.8	1.058	1.001	0.1405	1.030	0.02739	0.999
OC S	432.6	1.064	1.011	0.1409	1.047	0.02546	1.028
OC S	483.4	1.090	1.020	0.1449	1.054	0.02344	0.989
Zone Average C/E			1.001	1.033		1.009	
Standard Deviation			0.011	0.012		0.020	
AB	534.2	1.109	1.013	0.1429	1.053	0.01433	0.917
AB	585.0	1.144	1.015	0.1415	1.081	0.00942	0.915
AB	635.8	1.151	1.037	0.1415	1.088	0.00637	0.890
AB	686.6	1.126	1.084	0.1348	1.129	0.00489	0.897
AB	737.4	1.121	1.123	0.1265	1.161	0.00495	0.615
Zone Average C/E			1.054	1.102		0.847	
Standard Deviation			0.048	0.043		0.130	

Table 4.1.3-17 Basic Data for Reaction Rate Distributions Measured Along the X-Axis

Matrix	Loc ^a	²³⁹ Pu(n,f) ^b	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
Radial Traverse at z = 51.6 mm ^c					
148 51	HI	7.045 0.045	8.119 0.039	0.0429 0.0018	0.9180 0.0054
148 52	HI	7.079 0.041	8.166 0.038	0.0458 0.0018	0.9158 0.0056
148 53	HI	7.090 0.037	8.178 0.040	0.0440 0.0018	0.9231 0.0055
148 54	HI	7.115 0.040	8.266 0.038	0.0461 0.0018	0.9398 0.0055
148 55	HI	7.211 0.041	8.339 0.042	0.0457 0.0022	0.9460 0.0059
148 56	HI	7.408 0.041	8.505 0.040	0.0469 0.0021	0.9590 0.0057
148 57	HI	7.492 0.044	8.660 0.038	0.0438 0.0017	0.9825 0.0060
148 58	HI	7.633 0.045	8.876 0.043	0.0457 0.0020	1.0036 0.0062
148 59	HI	7.812 0.046	9.033 0.042	0.0473 0.0023	1.0263 0.0068
148 60	HI	7.991 0.043	9.231 0.041	0.0519 0.0022	1.0614 0.0060
148 61	HI	8.115 0.044	9.391 0.041	0.0581 0.0021	1.0745 0.0063
148 62	HI	8.295 0.046	9.528 0.044	0.0616 0.0021	1.1017 0.0063
148 63	HI	8.467 0.045	9.593 0.042	0.0705 0.0020	1.1153 0.0062
148 64	HI	8.522 0.043	9.521 0.041	0.0801 0.0021	1.1278 0.0066
148 65	HI	8.368 0.042	9.252 0.041	0.1121 0.0026	1.1168 0.0068
148 67	GH	7.933 0.042	8.475 0.037	0.2153 0.0032	1.2096 0.0065
148 68	GH	7.849 0.040	8.221 0.037	0.2226 0.0036	1.1701 0.0072
148 69	FG	7.466 0.038	7.779 0.035	0.2293 0.0030	1.0940 0.0065
148 71	GH	6.200 0.036	6.477 0.033	0.1738 0.0026	0.9181 0.0062
148 72	FG	5.385 0.030	5.623 0.028	0.1580 0.0025	0.7948 0.0052
148 73	GH	4.474 0.027	4.859 0.025	0.1140 0.0020	0.7005 0.0047
148 74	GH	3.747 0.024	4.114 0.021	0.0528 0.0017	0.5088 0.0037
148 75	GH	2.871 0.020	3.277 0.017	0.0272 0.0014	0.3904 0.0029
148 76	GH	2.253 0.020	2.588 0.016	0.0144 0.0013	0.3045 0.0028
148 77	GH	1.759 0.017	2.032 0.014	0.0105 0.0013	0.2271 0.0025
148 78	GH	1.464 0.017	1.694 0.013	0.0070 0.0011	0.1787 0.0022
148 79	TC		1.665 0.012		
148 80	TC		1.350 0.011		
148 81	TC		0.829 0.008		
Radial Traverse at z = 178.6 mm ^c					
148 51	FG		7.143 0.034	0.1541 0.0032	1.0471 0.0070
148 52	GH	6.492 0.036	7.232 0.034	0.1431 0.0029	1.0678 0.0062
148 53	GH		7.269 0.034	0.1410 0.0030	1.0722 0.0070
148 54	FG	6.436 0.035	7.268 0.037	0.1609 0.0033	1.0849 0.0066
148 55	GH		7.464 0.037	0.1473 0.0031	1.0951 0.0065
148 56	GH	6.771 0.037	7.489 0.037	0.1491 0.0030	1.1150 0.0064
148 57	FG		7.525 0.034	0.1608 0.0032	1.1254 0.0066
148 58	GH	6.994 0.043	7.734 0.036	0.1535 0.0030	1.1470 0.0066
148 59	GH		7.956 0.040	0.1575 0.0029	1.1746 0.0068

Table 4.1.3-17 (contd)

Matrix	Loc ^a	²³⁹ Pu(n,f) ^b	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
148 60	FG	7.174 0.042	8.066 0.036	0.1734 0.0028	1.1952 0.0072
148 61	GH	7.482 0.042	8.300 0.038	0.1644 0.0032	1.2382 0.0071
148 62	GH	7.599 0.042	8.419 0.038	0.1711 0.0033	1.2334 0.0069
148 63	FG	7.591 0.040	8.497 0.040	0.1867 0.0034	1.2373 0.0070
148 64	GH	7.771 0.039	8.550 0.040	0.1867 0.0029	1.2516 0.0068
148 65	GH	7.983 0.041	8.585 0.039	0.1967 0.0031	1.2418 0.0073
148 67	GH	7.711 0.041	8.111 0.036	0.2108 0.0032	1.1613 0.0068
148 68	GH	7.514 0.040	7.858 0.035	0.2166 0.0032	1.1002 0.0062
148 69	FG	7.066 0.036	7.361 0.034	0.2206 0.0033	1.0429 0.0060
148 71	GH	5.805 0.034	6.078 0.030	0.1634 0.0027	0.8620 0.0054
148 72	FG	5.036 0.029	5.335 0.027	0.1447 0.0023	0.7567 0.0050
148 73	GH	4.141 0.026	4.580 0.024	0.1048 0.0022	0.6561 0.0046
148 74	GH	3.455 0.024	3.847 0.019	0.0469 0.0015	0.4647 0.0033
148 75	GH	2.717 0.019	3.072 0.017	0.0255 0.0013	0.3656 0.0029
148 76	GH	2.073 0.019	2.396 0.016	0.0125 0.0012	0.2825 0.0030
148 77	GH	1.650 0.018	1.875 0.013	0.0098 0.0012	0.2149 0.0023
148 78	GH	1.396 0.017	1.602 0.012	0.0068 0.0011	0.1642 0.0020

Radial Traverse at z = 280.2 mm^c

148 51	FG	6.393 0.038	6.837 0.033	0.1860 0.0034	0.9833 0.0057
148 52	GH	6.426 0.037	6.892 0.034	0.1786 0.0032	0.9908 0.0060
148 53	GH	6.386 0.037	6.917 0.033	0.1809 0.0032	0.9991 0.0079
148 54	FG	6.555 0.038	6.982 0.035	0.1910 0.0033	1.0092 0.0062
148 55	GH	6.534 0.036	7.051 0.036	0.1818 0.0037	0.9979 0.0062
148 56	GH	6.637 0.038	7.123 0.036	0.1852 0.0038	1.0196 0.0070
148 57	FG	6.736 0.041	7.223 0.035	0.1980 0.0032	1.0400 0.0059
148 58	GH	6.826 0.043	7.304 0.037	0.1847 0.0032	1.0453 0.0061
148 59	GH	6.999 0.044	7.461 0.037	0.1896 0.0031	1.0648 0.0061
148 60	FG	7.059 0.041	7.524 0.035	0.2048 0.0035	1.0857 0.0062
148 61	GH	7.207 0.043	7.626 0.036	0.1948 0.0039	1.1016 0.0068
148 62	GH	7.240 0.044	7.737 0.036	0.2037 0.0032	1.1075 0.0064
148 63	FG	7.329 0.039	7.725 0.035	0.2153 0.0031	1.1134 0.0062
148 64	GH	7.345 0.041	7.874 0.036	0.2034 0.0029	1.1145 0.0061
148 65	GH	7.414 0.041	7.800 0.035	0.2095 0.0031	1.1097 0.0068
148 67	GH	7.123 0.037	7.442 0.034	0.2014 0.0030	1.0479 0.0064
148 68	GH	6.757 0.037	7.106 0.034	0.1951 0.0032	1.0009 0.0057
148 69	FG	6.435 0.036	6.644 0.032	0.1952 0.0030	0.9435 0.0060

Table 4.1.3-17 (contd)

Matrix	Loc ^a	²³⁹ Pu(n,f) ^b	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
148 71	GH	5.222 0.031	5.442 0.029	0.1521 0.0024	0.7701 0.0051
148 72	FG	4.531 0.029	4.758 0.025	0.1358 0.0024	0.6757 0.0052
148 73	GH	3.729 0.025	4.033 0.022	0.0953 0.0022	0.5853 0.0042
148 74	GH	3.081 0.025	3.389 0.018	0.0418 0.0015	0.4091 0.0039
148 75	GH	2.405 0.019	2.726 0.015	0.0217 0.0012	0.3224 0.0026
148 76	GH	1.840 0.015	2.133 0.013	0.0116 0.0012	0.2478 0.0022
148 77	GH	1.457 0.016	1.686 0.012	0.0093 0.0011	0.1833 0.0021
148 78	GH	1.213 0.016	1.395 0.010	0.0047 0.0014	0.1450 0.0019

^aIn-drawer column which designates the foil location in the drawer.

The ²³⁵U foils were centered 13.8 mm above, the ²³⁸U foils were centered on, and the ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^bExperimental results in units of 10⁻¹⁶ fissions or captures per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

^cDistance from the reactor interface to the center of the foil.

Table 4.1.3-18 Basic Data for Reaction Rate Distributions Measured Along the Y-Axis

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
118 50	TC	1.103 0.010		
119 50	TC	1.570 0.012		
120 50	GH	1.696 0.011	0.0045 0.0011	0.1778 0.0021
121 50	GH	2.014 0.014	0.0098 0.0013	0.2256 0.0024
122 50	GH	2.547 0.017	0.0152 0.0012	0.3001 0.0031
123 50	GH	3.250 0.017	0.0244 0.0014	0.3892 0.0030
124 50	GH	4.057 0.022	0.0473 0.0020	0.4995 0.0038
125 50	GH	4.816 0.059	0.1113 0.0021	0.6882 0.0047
126 50	FG	5.586 0.027	0.1616 0.0027	0.7845 0.0052
127 50	GH	6.469 0.032	0.1758 0.0031	0.9115 0.0059
128 50	GH	7.167 0.035	0.1956 0.0029	0.9992 0.0061
129 50	FG	7.706 0.037	0.2296 0.0033	1.0839 0.0065
130 50	GH	8.178 0.039	0.2187 0.0030	1.1610 0.0069
131 50	GH	8.486 0.038	0.2198 0.0033	1.2177 0.0077
132 50	FG	8.732 0.041	0.2127 0.0032	1.2595 0.0072
133 50	HI	9.315 0.042	0.1086 0.0023	1.1027 0.0066
134 50	HI	9.432 0.045	0.0793 0.0020	1.1081 0.0066
135 50	HI	9.601 0.043	0.0677 0.0020	1.1059 0.0071
136 50	HI	9.453 0.044	0.0567 0.0018	1.0873 0.0065
137 50	HI	9.418 0.042	0.0540 0.0018	1.0620 0.0065
138 50	HI	9.182 0.040	0.0498 0.0018	1.0407 0.0063
139 50	HI	9.016 0.040	0.0493 0.0018	1.0156 0.0061
140 50	HI	8.830 0.039	0.0475 0.0019	0.9955 0.0068
141 50	HI	8.700 0.039	0.0478 0.0018	0.9729 0.0061
142 50	HI	8.547 0.039	0.0439 0.0017	0.9562 0.0059
143 50	HI	8.414 0.037	0.0431 0.0016	0.9363 0.0057
144 50	HI	8.340 0.038	0.0432 0.0016	0.9303 0.0064
145 50	HI	8.225 0.036	0.0457 0.0016	0.9104 0.0063
146 50	HI	8.151 0.038	0.0458 0.0016	0.9132 0.0056
147 50	HI	8.184 0.037	0.0436 0.0016	0.9022 0.0060

^aIn-drawer column which designates the foil location in the drawer. All foils were centered on the mid-height of the drawer. The ²³⁵U and ²³⁸U foils were centered 37.7 and 51.6, respectively from the reactor interface.

^bExperimental results in units of 10⁻¹⁶ fissions or captures per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-19 Basic Data for Reaction Rate Distributions
Measured at 45° and Symmetric Locations

Matrix	Loc ^a	²³⁵ U(n,f) ^b	Matrix	Loc ^a	²³⁵ U(n,f) ^b		
45 Degree Locations							
147	51	HI	8.135	0.039			
146	52	HI	8.150	0.039			
145	53	HI	8.394	0.042			
144	54	HI	8.504	0.042			
145	54	HI	8.460	0.045			
143	55	HI	8.769	0.043			
142	56	HI	9.054	0.043			
143	56	HI	8.837	0.041			
141	57	HI	9.333	0.044			
142	57	HI	9.187	0.048			
140	58	HI	9.583	0.042			
141	58	HI	9.479	0.045			
139	59	HI	9.674	0.042			
140	59	HI	9.707	0.046			
138	60	HI	9.493	0.042			
137	61	FG	8.868	0.042			
			138	61	HI	9.304	0.045
			136	62	FG	8.561	0.043
			137	62	GH	8.743	0.043
			135	63	GH	8.075	0.040
			136	63	FG	8.325	0.040
			134	64	FG	7.302	0.035
			135	64	GH	7.661	0.035
			133	65	GH	6.171	0.030
			132	66	GH	5.001	0.026
			133	66	FG	5.637	0.028
			131	67	GH	3.923	0.023
			132	67	GH	4.438	0.026
			130	68	GH	2.808	0.019
			129	69	GH	2.080	0.016
			130	69	GH	2.379	0.017
Symmetry Locations							
166	50	GH	8.426	0.038			
167	50	GH	8.110	0.035			
168	50	FG	7.598	0.035			
169	50	GH	7.062	0.031			
170	50	GH	6.427	0.031			
			148	32	IJ	8.392	0.036
			148	31	IJ	8.167	0.036
			149	30	JK	7.731	0.033
			148	29	IJ	7.186	0.033
			148	28	IJ	6.485	0.030

^aIn-drawer column which designates the foil location in the drawer. The foils were centered on the mid-height of the drawer at a distance of 37.7 mm from the reactor interface.

^bExperimental results in units of 10^{-18} fissions per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-20 Basic Data for Reaction Rates Measured for Axial Distributions

<u>z, mm^a</u>	<u>Loc^b</u>	<u>²³⁹Pu(n,f)^c</u>	<u>²³⁵U(n,f)^c</u>	<u>²³⁸U(n,f)^c</u>	<u>²³⁸U(n,γ)^c</u>
Axial Traverse in 148 50					
26.2	HI	7.049 0.041	8.070 0.034	0.0435 0.0021	0.9142 0.0063
49.6	HI	7.115 0.043	8.065 0.035	0.0418 0.0017	0.9135 0.0060
77.0	HI	6.983 0.037	8.026 0.036	0.0539 0.0025	0.9061 0.0063
100.4	HI	6.912 0.039	7.898 0.036	0.0600 0.0020	0.9071 0.0055
127.8	HI	6.813 0.041	7.679 0.034	0.0717 0.0024	0.8893 0.0056
178.6	GH	6.420 0.037	7.157 0.032	0.1425 0.0029	1.0525 0.0067
229.4	GH	6.501 0.042	6.949 0.030	0.1665 0.0028	0.9959 0.0064
280.2	GH	6.371 0.041	6.786 0.030	0.1785 0.0031	0.9739 0.0059
331.0	GH	6.257 0.042	6.590 0.031	0.1771 0.0034	0.9350 0.0058
381.8	GH	5.908 0.035	6.316 0.031	0.1667 0.0034	0.8916 0.0057
432.6	GH	5.520 0.037	5.838 0.030	0.1476 0.0029	0.8364 0.0052
483.4	GH	4.941 0.030	5.401 0.027	0.1241 0.0029	0.7835 0.0051
534.2	GH	4.604 0.028	5.112 0.025	0.0566 0.0021	0.7438 0.0048
585.0	GH	4.152 0.028	4.635 0.025	0.0337 0.0016	0.6829 0.0046
635.8	GH	3.675 0.025	4.219 0.024	0.0223 0.0014	0.6206 0.0043
686.6	GH	3.291 0.025	3.754 0.020	0.0149 0.0012	0.5507 0.0037
737.4	GH	3.070 0.021	3.448 0.020	0.0098 0.0012	0.5160 0.0040
839.0	TC		3.740 0.021		
889.8	TC		3.712 0.024		
946.9	TC		2.641 0.017		
997.7	TC		1.937 0.015		
Axial Traverse in 148 66					
51.6	FG	7.982 0.043	8.744 0.039	0.2076 0.0038	1.2837 0.0075
102.4	FG	8.007 0.045	8.559 0.038	0.2169 0.0036	1.2468 0.0081
178.6	FG	7.804 0.048	8.281 0.038	0.2262 0.0040	1.1985 0.0071
229.4	FG	7.668 0.046	8.018 0.036	0.2225 0.0040	1.1435 0.0068
280.2	FG	7.344 0.040	7.667 0.035	0.2239 0.0035	1.0874 0.0066
331.0	FG	6.937 0.040	7.217 0.034	0.2069 0.0038	1.0247 0.0069
381.8	FG	6.300 0.037	6.575 0.031	0.1829 0.0036	0.9376 0.0059
432.6	FG	5.612 0.036	5.947 0.029	0.1606 0.0036	0.8509 0.0055
483.4	FG	4.878 0.031	5.287 0.025	0.1276 0.0029	0.7648 0.0050
534.2	GH	4.410 0.030	4.832 0.023	0.0577 0.0023	0.7087 0.0050
585.0	GH	3.865 0.029	4.353 0.023	0.0337 0.0019	0.6345 0.0045
635.8	GH	3.340 0.025	3.779 0.020	0.0213 0.0014	0.5581 0.0046
686.6	GH	2.937 0.023	3.305 0.017	0.0143 0.0012	0.4892 0.0037
737.4	GH	2.632 0.023	2.953 0.017	0.0105 0.0015	0.4293 0.0035
839.0	TC		3.043 0.018		
889.8	TC		2.883 0.017		

Table 4.1.3-20 (contd)

<u>z, mm^a</u>	<u>Loc^b</u>	<u>²³⁹Pu(n, f)^c</u>	<u>²³⁵U(n, f)^c</u>	<u>²³⁸U(n, f)^c</u>	<u>²³⁸U(n, γ)^c</u>
Axial Traverse in 148 70					
51.6	GH	6.972 0.040	7.152 0.032	0.1965 0.0037	1.0228 0.0068
102.4	GH	6.815 0.035	7.071 0.033	0.1980 0.0036	1.0095 0.0063
178.6	GH	6.498 0.037	6.782 0.030	0.1843 0.0037	0.9561 0.0060
229.4	GH	6.232 0.036	6.499 0.031	0.1788 0.0033	0.9282 0.0059
280.2	GH	5.822 0.034	6.137 0.030	0.1694 0.0034	0.8689 0.0056
331.0	GH	5.364 0.034	5.638 0.028	0.1513 0.0036	0.8025 0.0053
381.8	GH	4.862 0.034	5.102 0.027	0.1376 0.0031	0.7287 0.0050
432.6	GH	4.312 0.034	4.548 0.024	0.1138 0.0029	0.6516 0.0052
483.4	GH	3.764 0.027	4.066 0.022	0.0918 0.0027	0.5899 0.0043
534.2	GH	3.344 0.028	3.708 0.020	0.0443 0.0020	0.5421 0.0044
585.0	GH	2.865 0.024	3.275 0.018	0.0250 0.0017	0.4758 0.0037
635.8	GH	2.487 0.022	2.862 0.019	0.0147 0.0015	0.4222 0.0035
686.6	GH	2.174 0.020	2.447 0.016	0.0098 0.0013	0.3640 0.0034
737.4	GH	1.952 0.019	2.188 0.015	0.0090 0.0011	0.3162 0.0029

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above, the ²³⁸U foils were centered on, and the ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per atom at at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-21 Basic Data for In-Cell Measurements of $^{239}\text{Pu}(n,f)$

<u>Matrix</u>	<u>Loc^a</u>	<u>z,mm^b</u>	<u>$^{239}\text{Pu}(n,f)^c$</u>	<u>z,mm^b</u>	<u>$^{239}\text{Pu}(n,f)^c$</u>
Measurements in Core Cells With One Fuel Column					
149 59	GH	178.6	7.040 0.028	280.2	6.887 0.030
148 59	GH	178.6	6.986 0.027	280.2	6.839 0.027
148 59	HI	178.6	6.662 0.027	280.2	6.728 0.027
148 59	IJ	178.6	6.973 0.027	280.2	6.847 0.032
149 59	IJ	178.6	7.020 0.027	280.2	6.836 0.027
149 52	GH	381.8	5.902 0.030	483.4	4.891 0.027
148 52	GH	381.8	5.917 0.032	483.4	4.934 0.029
148 52	HI	381.8	5.775 0.034	483.4	4.837 0.026
148 52	IJ	381.8	5.960 0.032	483.4	4.897 0.027
149 52	IJ	381.8	5.919 0.031	483.4	4.984 0.027
149 73	GH	77.0	4.421 0.022		
148 73	GH	77.0	4.413 0.021		
148 73	HI	77.0	4.255 0.021		
148 73	IJ	77.0	4.260 0.021		
Measurements in Core Cells With Two Fuel Columns					
149 54	JK	178.6	6.357 0.030	280.2	6.397 0.031
148 54	JK	178.6	6.395 0.033	280.2	6.403 0.033
148 54	KL	178.6	6.237 0.031	280.2	6.274 0.029
148 54	LM	178.6	6.462 0.035	280.2	6.372 0.029
149 60	JK	381.8	6.259 0.029	483.4	5.081 0.044
148 60	JK	381.8	6.261 0.031	483.4	5.129 0.042
148 60	KL	381.8	6.157 0.030	483.4	4.983 0.026
148 60	LM	381.8	6.270 0.035	483.4	5.090 0.029

Table 4.1.3-21 (contd)

<u>Matrix</u>	<u>Loc^a</u>	<u>z, mm^b</u>	<u>²³⁹Pu(n, f)^c</u>	<u>z, mm^b</u>	<u>²³⁹Pu(n, f)^c</u>
249 66	LM	51.6	8.157 0.036	102.4	8.145 0.035
249 66	KL	51.6	7.898 0.035	102.4	7.888 0.035
249 66	JK	51.6	7.984 0.035	102.4	7.988 0.034
248 66	JK	51.6	7.898 0.034	102.4	7.937 0.035
149 66	JK	51.6	8.089 0.035	102.4	8.024 0.037
148 66	JK	51.6	7.983 0.034	102.4	7.889 0.035
148 66	KL	51.6	7.837 0.034	102.4	7.771 0.033
148 66	LM	51.6	7.956 0.036	102.4	7.901 0.033

^aIn-drawer column which designates the foil location in the drawer. The ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁶ fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-22 Basic Data for In-Cell Measurements of $^{235}\text{U}(n,f)$

Matrix	Loc ^a	z,mm ^b	$^{235}\text{U}(n,f)^c$	z,mm ^b	$^{235}\text{U}(n,f)^c$
Measurements in Cells with One Fuel Column					
Central Blanket Cells					
148 53	AB	26.2	8.308 0.036	77.0	8.130 0.034
148 53	HH	26.2	8.224 0.038	77.0	8.003 0.034
149 53	HI	26.2	8.243 0.038	77.0	8.091 0.038
148 53	II	26.2	8.158 0.035	77.0	8.041 0.035
148 53	OP	26.2	8.420 0.037	77.0	8.195 0.034
148 53	AB	127.8	7.702 0.034		
148 53	HH	127.8	7.737 0.033		
149 53	HI	127.8	7.771 0.035		
148 53	II	127.8	7.797 0.035		
148 53	OP	127.8	7.848 0.033		
Core Cells					
148 53	AB	178.6	7.298 0.034	280.2	6.922 0.032
149 53	AB	178.6	7.365 0.034	280.2	6.848 0.031
149 59	GH	178.6	7.922 0.030	280.2	7.385 0.028
148 59	GH	178.6	7.909 0.030	280.2	7.406 0.028
148 59	HI	178.6	7.678 0.030	280.2	7.315 0.028
148 59	IJ	178.6	7.904 0.030	280.2	7.424 0.028
149 59	IJ	178.6	7.966 0.031	280.2	7.406 0.028
149 53	OP	178.6	7.288 0.032	280.2	6.907 0.033
148 53	OP	178.6	7.256 0.030	280.2	6.877 0.030
148 53	AB	381.8	6.333 0.028	483.4	5.485 0.027
149 53	AB	381.8	6.298 0.029	483.4	5.509 0.026
149 52	GH	381.8	6.310 0.031	483.4	5.508 0.030
148 52	GH	381.8	6.295 0.031	483.4	5.443 0.027
148 52	HI	381.8	6.188 0.030	483.4	5.331 0.027
148 52	IJ	381.8	6.329 0.032	483.4	5.491 0.030
149 52	IJ	381.8	6.300 0.031	483.4	5.409 0.027
149 53	OP	381.8	6.337 0.029	483.4	5.535 0.026
148 53	OP	381.8	6.327 0.030	483.4	5.465 0.027
149 73	AB	77.0	5.063 0.024		
149 73	GH	77.0	4.875 0.024		
148 73	GH	77.0	4.840 0.025		
148 73	HI	77.0	4.705 0.023		
148 73	IJ	77.0	4.653 0.023		
149 73	OP	77.0	4.539 0.021		

Table 4.1.3-22 (contd)

<u>Matrix</u>	<u>Loc^a</u>	<u>z, mm^b</u>	<u>²³⁵U(n, f)^c</u>	<u>z, mm^b</u>	<u>²³⁵U(n, f)^c</u>
Axial Blanket Cells					
148 52	AB	534.2	5.149 0.025	585.0	4.734 0.026
148 52	GG	534.2	4.999 0.025	585.0	4.642 0.028
149 52	GH	534.2	5.170 0.028	585.0	4.665 0.025
149 53	GH	534.2	5.137 0.027	585.0	4.666 0.024
148 53	GG	534.2	5.095 0.026	585.0	4.680 0.024
148 53	AB	534.2	5.144 0.025	585.0	4.692 0.023
148 52	AB	635.8	4.234 0.023	686.6	3.780 0.022
148 52	GG	635.8	4.144 0.023	686.6	3.747 0.023
149 52	GH	635.8	4.187 0.024	686.6	3.756 0.022
148 52	AB	737.4	3.464 0.021		
148 52	GG	737.4	3.430 0.021		
149 52	GH	737.4	3.434 0.020		
Measurements in Cells with Two Fuel Columns					
Central Blanket Cells					
149 57	HI	77.0	8.603 0.040	127.8	8.198 0.040
148 57	II	77.0	8.551 0.037	127.8	8.198 0.037
148 57	OP	77.0	8.740 0.038	127.8	8.425 0.037
Core Cells					
148 54	AB	178.6	7.223 0.032	280.2	6.903 0.032
149 54	FG	178.6	7.212 0.034	280.2	6.857 0.033
149 54	JK	178.6	7.198 0.032	280.2	6.867 0.032
148 54	JK	178.6	7.236 0.033	280.2	6.909 0.035
148 54	KL	178.6	7.129 0.033	280.2	6.822 0.032
148 54	LM	178.6	7.311 0.034	280.2	6.892 0.051
148 54	OP	178.6	7.341 0.032	280.2	6.980 0.031
148 54	AB	381.8	6.344 0.028	483.4	5.445 0.025
149 54	FG	381.8	6.303 0.036	483.4	5.376 0.026
149 60	JK	381.8	6.723 0.032	483.4	5.621 0.029
148 60	JK	381.8	6.693 0.033	483.4	5.655 0.029
148 60	KL	381.8	6.718 0.033	483.4	5.534 0.028
148 60	LM	381.8	6.768 0.033	483.4	5.636 0.029
148 54	OP	381.8	6.390 0.029	483.4	5.491 0.026
248 66	OP	51.6	9.038 0.037	102.4	8.928 0.040
249 66	LM	51.6	8.925 0.038	102.4	8.810 0.038
249 66	KL	51.6	8.732 0.039	102.4	8.672 0.038
249 66	JK	51.6	8.803 0.037	102.4	8.710 0.038
248 66	JK	51.6	8.776 0.037	102.4	8.706 0.038

Table 4.1.3-22 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁵ U(n, f) ^c	z, mm ^b	²³⁵ U(n, f) ^c
149 66	JK	51.6	8.684 0.036	102.4	8.572 0.037
148 66	JK	51.6	8.754 0.039	102.4	8.632 0.036
148 66	KL	51.6	8.529 0.036	102.4	8.458 0.036
148 66	LM	51.6	8.657 0.039	102.4	8.546 0.036
149 66	OP	51.6	8.592 0.035	102.4	8.498 0.035

Axial Blanket Cells

149 57	GH	534.2	5.228 0.025	585.0	4.807 0.026
148 57	JJ	534.2	5.225 0.026	585.0	4.745 0.025
148 57	OP	534.2	5.273 0.027	585.0	4.808 0.024

Measurements in Radial Blanket Cells

248 74	BC	77.0	3.805 0.022
248 74	GG	77.0	3.897 0.019
248 74	HI	77.0	4.006 0.019
249 74	IJ	77.0	4.077 0.020
149 74	GH	77.0	4.098 0.020
248 74	JJ	77.0	4.105 0.022
248 74	NO	77.0	4.320 0.021
248 76	BC	77.0	2.347 0.016
248 76	GG	77.0	2.452 0.018
248 76	HI	77.0	2.488 0.016
249 76	IJ	77.0	2.594 0.018
149 76	GH	77.0	2.562 0.016
248 76	JJ	77.0	2.571 0.018
248 76	NO	77.0	2.774 0.018
248 78	BC	77.0	1.623 0.012
248 78	GG	77.0	1.634 0.012
248 78	HI	77.0	1.662 0.014
249 78	IJ	77.0	1.687 0.013
149 78	GH	77.0	1.687 0.014
248 78	JJ	77.0	1.667 0.013
248 78	NO	77.0	1.775 0.014

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-23 Basic Data for In-Cell Measurements of $^{235}\text{U}(n,f)$ and $^{235}\text{U}(n,\gamma)$

<u>Matrix</u>	<u>Loc^a</u>	<u>z,mm^b</u>	<u>$^{235}\text{U}(n,f)^c$</u>		<u>$^{235}\text{U}(n,\gamma)^c$</u>	
Measurements in Cells with One Fuel Column						
Central Blanket Cells						
148 52	-AB	26.2	0.0386	0.0015	1.0523	0.0058
148 52	-HH	26.2	0.0393	0.0013	0.9245	0.0047
149 52	HI	26.2	0.0380	0.0013	0.9150	0.0045
148 52	-II	26.2	0.0371	0.0014	0.9560	0.0049
148 52	-OP	26.2	0.0388	0.0013	1.0666	0.0053
148 58	-HH	77.0	0.0512	0.0021	1.0033	0.0060
149 58	HI	77.0	0.0567	0.0019	0.9851	0.0060
148 58	-II	77.0	0.0563	0.0019	0.9847	0.0059
148 58	-OP	77.0	0.0529	0.0021	1.1378	0.0071
148 58	-HH	127.8	0.0756	0.0021	0.9797	0.0064
149 58	HI	127.8	0.0780	0.0020	0.9701	0.0053
148 58	-II	127.8	0.0767	0.0023	0.9985	0.0060
148 58	-OP	127.8	0.0823	0.0021	1.0952	0.0064
Core Cells						
148 59	-AB	178.6	0.1274	0.0024	1.0386	0.0058
149 59	GH	178.6	0.1578	0.0023	1.1546	0.0061
148 59	GH	178.6	0.1565	0.0026	1.1533	0.0062
148 59	HI	178.6	0.1681	0.0025	1.0088	0.0060
148 59	IJ	178.6	0.1599	0.0023	1.1553	0.0061
149 59	IJ	178.6	0.1560	0.0026	1.1682	0.0067
148 59	-OP	178.6	0.1384	0.0025	1.0506	0.0067
148 59	-AB	280.2	0.1634	0.0028	0.9850	0.0060
149 59	GH	280.2	0.1911	0.0024	1.0518	0.0063
148 59	GH	280.2	0.1912	0.0025	1.0504	0.0057
148 59	HI	280.2	0.2036	0.0026	0.9516	0.0058
148 59	IJ	280.2	0.1951	0.0026	1.0454	0.0057
149 59	IJ	280.2	0.1949	0.0024	1.0588	0.0058
148 59	-OP	280.2	0.1752	0.0032	0.9822	0.0072
148 52	-AB	381.8	0.1458	0.0020	0.8417	0.0048
149 52	GH	381.8	0.1632	0.0021	0.8990	0.0044
148 52	GH	381.8	0.1610	0.0019	0.8907	0.0044
148 52	HI	381.8	0.1719	0.0018	0.8196	0.0040
148 52	IJ	381.8	0.1635	0.0020	0.8933	0.0044
149 52	IJ	381.8	0.1629	0.0020	0.9037	0.0044
148 52	-OP	381.8	0.1424	0.0022	0.8482	0.0049

Table 4.1.3-23 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁸ U(n, f) ^c	²³⁸ U(n, γ) ^c
148 52	-AB	483.4	0.1018 0.0018	0.7269 0.0039
149 52	GH	483.4	0.1142 0.0017	0.7940 0.0043
148 52	GH	483.4	0.1140 0.0016	0.7826 0.0039
148 52	HI	483.4	0.1223 0.0016	0.7032 0.0038
148 52	IJ	483.4	0.1150 0.0017	0.7810 0.0039
149 52	IJ	483.4	0.1183 0.0020	0.7944 0.0043
148 52	-OP	483.4	0.0980 0.0019	0.7272 0.0039
148 73	-AB	77.0	0.1096 0.0018	0.6681 0.0035
149 73	GH	77.0	0.1127 0.0016	0.7036 0.0034
148 73	GH	77.0	0.1075 0.0018	0.7013 0.0033
148 73	HI	77.0	0.1135 0.0016	0.6266 0.0031
148 73	IJ	77.0	0.0996 0.0016	0.6803 0.0034
148 73	-OP	77.0	0.0781 0.0019	0.6087 0.0032

Axial Blanket Cells

148 58	-JJ	534.2	0.0620 0.0017	0.6825 0.0041
149 58	IJ	534.2	0.0563 0.0012	0.7742 0.0041
148 58	-OP	534.2	0.0594 0.0015	0.6840 0.0041
148 58	-JJ	585.0	0.0336 0.0013	0.5938 0.0040
149 58	IJ	585.0	0.0315 0.0013	0.7008 0.0041
148 58	-OP	585.0	0.0350 0.0013	0.6058 0.0038
149 52	GH	635.8	0.0181 0.0010	0.6191 0.0034
148 52	-JJ	635.8	0.0189 0.0012	0.5065 0.0030
148 52	-OP	635.8	0.0201 0.0012	0.5323 0.0031
148 58	-JJ	661.2	0.0179 0.0012	0.4888 0.0035
149 58	IJ	661.2	0.0162 0.0010	0.6128 0.0037
148 58	-OP	661.2	0.0162 0.0011	0.5187 0.0033
149 52	GH	686.6	0.0105 0.0011	0.5542 0.0030
148 52	-JJ	686.6	0.0133 0.0012	0.4416 0.0029
148 52	-OP	686.6	0.0133 0.0010	0.4544 0.0027
148 58	-JJ	737.4	0.0087 0.0012	0.3947 0.0028
149 58	IJ	737.4	0.0091 0.0009	0.5090 0.0032
148 58	-OP	737.4	0.0106 0.0010	0.4025 0.0028

Measurements in Cells with Two Fuel Columns

Central Blanket Cells

148 57	-AB	77.0	0.0534 0.0024	1.0922 0.0057
148 57	-HH	77.0	0.0547 0.0021	0.9953 0.0056
149 57	HI	77.0	0.0505 0.0024	0.9759 0.0051

Table 4.1.3-23 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁸ U(n, f) ^c	²³⁸ U(n, γ) ^c
148 57	-AB	127.8	0.0762 0.0030	1.0623 0.0055
148 57	-HH	127.8	0.0762 0.0022	0.9823 0.0052
149 57	HI	127.8	0.0755 0.0022	0.9524 0.0047
Core Cells				
149 54	JK	178.6	0.1545 0.0022	1.0589 0.0054
148 54	JK	178.6	0.1559 0.0023	1.0740 0.0055
148 54	KL	178.6	0.1625 0.0024	0.9291 0.0049
148 54	LM	178.6	0.1517 0.0026	1.0004 0.0052
148 54	-OP	178.6	0.1323 0.0027	0.9706 0.0052
149 54	JK	280.2	0.1897 0.0026	0.9831 0.0051
148 54	JK	280.2	0.1871 0.0026	0.9978 0.0052
148 54	KL	280.2	0.1952 0.0028	0.8883 0.0052
148 54	LM	280.2	0.1848 0.0027	0.9345 0.0050
148 54	-OP	280.2	0.1652 0.0030	0.9047 0.0049
149 60	JK	381.8	0.1908 0.0026	0.9651 0.0051
148 60	JK	381.8	0.1863 0.0025	0.9637 0.0051
148 60	KL	381.8	0.1942 0.0028	0.8692 0.0050
148 60	LM	381.8	0.1820 0.0026	0.9188 0.0053
148 60	-OP	381.8	0.1623 0.0032	0.8884 0.0056
149 60	JK	483.4	0.1325 0.0025	0.8211 0.0045
148 60	JK	483.4	0.1354 0.0026	0.8283 0.0046
148 60	KL	483.4	0.1338 0.0024	0.7254 0.0042
148 60	LM	483.4	0.1267 0.0026	0.7746 0.0045
148 60	-OP	483.4	0.1096 0.0029	0.7479 0.0043
249 66	-OP	51.6	0.1563 0.0024	1.1830 0.0062
249 66	LM	51.6	0.1886 0.0025	1.2188 0.0059
249 66	KL	51.6	0.2098 0.0023	1.1448 0.0056
249 66	JK	51.6	0.2063 0.0024	1.2850 0.0062
248 66	JK	51.6	0.2113 0.0022	1.2731 0.0061
149 66	JK	51.6	0.2161 0.0024	1.2716 0.0064
148 66	JK	51.6	0.2142 0.0023	1.2667 0.0061
148 66	KL	51.6	0.2278 0.0024	1.1218 0.0055
148 66	LM	51.6	0.2184 0.0024	1.1748 0.0058
148 66	-OP	51.6	0.1926 0.0026	1.1214 0.0064
249 66	-OP	102.4	0.1673 0.0024	1.1823 0.0062
249 66	LM	102.4	0.1964 0.0021	1.2129 0.0059
249 66	KL	102.4	0.2165 0.0022	1.1317 0.0058
249 66	JK	102.4	0.2113 0.0023	1.2772 0.0064
248 66	JK	102.4	0.2136 0.0023	1.2590 0.0064
149 66	JK	102.4	0.2182 0.0024	1.2486 0.0061
148 66	JK	102.4	0.2153 0.0024	1.2458 0.0061
148 66	KL	102.4	0.2321 0.0024	1.1034 0.0057

Table 4.1.3-23 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁸ U(n, f) ^c		²³⁸ U(n, γ) ^c	
148 66	LM	102.4	0.2216	0.0023	1.1601	0.0057
148 66	-OP	102.4	0.1967	0.0024	1.1225	0.0059
Axial Blanket Cells						
148 57	-AB	534.2	0.0615	0.0027	0.6717	0.0042
148 57	-GG	534.2	0.0593	0.0022	0.6459	0.0038
149 57	GH	534.2	0.0567	0.0023	0.7615	0.0032
148 57	-AB	585.0	0.0357	0.0026	0.6100	0.0038
148 57	-GG	585.0	0.0372	0.0017	0.5847	0.0036
149 57	GH	585.0	0.0336	0.0026	0.7124	0.0038
Measurements in Radial Blanket Cells						
148 74	-AB	77.0	0.0552	0.0016	0.5692	0.0032
148 74	-CD	77.0	0.0507	0.0021	0.5372	0.0030
148 74	-GG	77.0	0.0503	0.0013	0.5032	0.0030
149 74	GH	77.0	0.0498	0.0013	0.4998	0.0026
249 74	IJ	77.0	0.0500	0.0013	0.5006	0.0026
148 74	-HI	77.0	0.0420	0.0014	0.4906	0.0030
148 74	-JJ	77.0	0.0460	0.0013	0.4797	0.0029
148 74	-MN	77.0	0.0346	0.0014	0.4841	0.0027
148 74	-OP	77.0	0.0334	0.0013	0.4801	0.0029
148 76	-AB	77.0	0.0170	0.0010	0.3481	0.0022
148 76	-CD	77.0	0.0156	0.0009	0.3303	0.0022
148 76	-GG	77.0	0.0151	0.0010	0.2952	0.0021
149 76	GH	77.0	0.0140	0.0009	0.2999	0.0020
249 76	IJ	77.0	0.0159	0.0010	0.2985	0.0019
148 76	-HI	77.0	0.0159	0.0010	0.2911	0.0020
148 76	-JJ	77.0	0.0152	0.0012	0.2787	0.0020
148 76	-MN	77.0	0.0117	0.0009	0.2876	0.0020
148 76	-OP	77.0	0.0111	0.0009	0.2843	0.0021

Table 4.1.3-23 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁸ U(n, f) ^c		²³⁸ U(n, γ) ^c	
148 78	-AB	77.0	0.0061	0.0009	0.2041	0.0016
148 78	-CD	77.0	0.0060	0.0010	0.1906	0.0016
148 78	-GG	77.0	0.0066	0.0010	0.1712	0.0015
149 78	GH	77.0	0.0067	0.0009	0.1746	0.0014
249 78	IJ	77.0	0.0077	0.0011	0.1720	0.0013
148 78	-HI	77.0	0.0058	0.0011	0.1690	0.0015
148 78	-JJ	77.0	0.0036	0.0010	0.1635	0.0015
148 78	-MN	77.0	0.0068	0.0010	0.1833	0.0017
148 78	-OP	77.0	0.0059	0.0008	0.2006	0.0016

^aIn-drawer column which designates the foil location in the drawer. The ²³⁸U foils were centered on the mid-height of the drawer. A negative sign designates a plate-spanning averaging foil.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-24 Cell-Averaging Factors for ZPPR-17A

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		REG./ENV. ^b	z, mm ^c
1.0	.006	.9988	.0051	.998	.022	1.0664	.0078	IC F/SC/F	0-51.6
.9772	.0046	.9996	.0069	.938	.013	.8858	.0057	IC F/SC/F	178.6
.9916	.0058	.9998	.0052	.953	.012	.9172	.0061	IC F/SC/F	280.2
.9890	.0061	.9975	.0059	.957	.011	.9272	.0054	OC F/SC/F	0-280.2
.9850	.0059	1.0020	.0057	.978	.019	.9020	.0051	OC F/SC/RB	0-280.2
1.0	.006	.9988	.0051	.998	.022	1.0664	.0078	IC SC/DC/SC	0-51.6
.9888	.0060	.9974	.0050	.980	.014	.8640	.0055	IC SC/DC/SC	178.6
.9895	.0055	.9961	.0055	.985	.013	.8799	.0059	IC SC/DC/SC	280.2
.9929	.0047	.9926	.0042	.962	.013	.8762	.0048	OC CB/DC/SC	0-51.6
.9903	.0057	.9984	.0049	.974	.013	.8935	.0061	OC SC/DC/SC	0-280.2
1.0	.008	1.0022	.0063	.912	.026	1.0229	.0058	RB SC/RB/RB	ALL
1.0	.008	.9949	.0074	.988	.071	1.0170	.0071	RB RB/RB/RB	ALL
1.0	.008	.9791	.0085	.838	.100	1.0508	.0090	RB RB/RB/RR	ALL
.	.	1.0	.010	.	.	.	.	RR, AR	ALL
1.0	.006	.9988	.0051	.998	.022	1.0694	.0063	148-50	26.2
1.0	.006	.9988	.0051	.998	.022	1.0664	.0078	148-50	49.6
1.0	.006	.9988	.0051	.998	.022	1.0634	.0093	148-50	77.0
1.0	.006	.9988	.0051	1.000	.026	1.0610	.0089	148-50	100.4
1.0	.006	.9988	.0051	1.003	.030	1.0586	.0085	148-50	127.8
.9772	.0046	.9996	.0069	.938	.013	.8858	.0057	148-50	178.6
.9844	.0052	.9997	.0059	.946	.013	.9015	.0059	148-50	229.4
.9916	.0058	.9998	.0052	.953	.013	.9172	.0061	148-50	280.2
.9890	.0059	.9975	.0055	.955	.012	.9222	.0058	148-50	331.0
.9863	.0063	.9952	.0058	.957	.011	.9272	.0054	148-50	381.8
.9892	.0064	.9980	.0067	.955	.013	.9224	.0054	148-50	432.6
.9920	.0065	1.0007	.0076	.953	.014	.9175	.0054	148-50	483.4
1.0	.008	1.0005	.0059	1.081	.031	.8815	.0061	148-50	534.2
1.0	.008	1.0005	.0059	1.081	.053	.8521	.0064	148-50	585.0
1.0	.008	1.0005	.0070	1.081	.077	.8340	.0060	148-50	635.8
1.0	.008	1.0005	.0073	1.081	.16	.8053	.0058	148-50	686.6
1.0	.008	1.0005	.0074	1.081	.14	.7817	.0064	148-50	734.4
.9929	.0047	.9926	.0042	.962	.013	.8762	.0048	148-66	51.6
.9929	.0047	.9926	.0044	.977	.009	.8745	.0050	148-66	102.4
.9888	.0060	.9974	.0050	.980	.014	.8640	.0055	148-66	178.6
.9892	.0058	.9968	.0053	.982	.014	.8720	.0057	148-66	229.4
.9895	.0055	.9961	.0055	.985	.013	.8799	.0059	148-66	280.2
.9903	.0057	.9984	.0049	.980	.013	.8867	.0060	148-66	331.0
.9911	.0059	1.0007	.0043	.974	.013	.8935	.0061	148-66	381.8
.9870	.0072	.9982	.0043	.958	.015	.8822	.0067	148-66	432.6
.9829	.0086	.9957	.0042	.942	.017	.8709	.0073	148-66	483.4

Table 4.1.3-24 (contd)

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		REG./ENV. ^b	z, mm ^c
1.0	.008	.9986	.0059	1.064	.052	.8627	.0057	148-66	534.2
1.0	.008	1.0005	.0059	1.081	.053	.8361	.0064	148-66	585.0
1.0	.008	1.0005	.0070	1.081	.077	.8340	.0060	148-66	635.8
1.0	.008	1.0005	.0073	1.081	.16	.8053	.0058	148-66	686.6
1.0	.008	1.0005	.0074	1.081	.14	.7817	.0064	148-66	734.4
.9890	.0061	.9975	.0059	.957	.011	.9272	.0054	148-70	0-381.8
.9892	.0064	.9980	.0067	.955	.013	.9224	.0054	148-70	432.6
.9920	.0065	1.0007	.0076	.953	.014	.9175	.0054	148-70	483.4
1.0	.008	1.0005	.0059	1.081	.031	.8815	.0061	148-70	534.2
1.0	.008	1.0005	.0059	1.081	.053	.8521	.0064	148-70	585.0
1.0	.008	1.0005	.0070	1.081	.077	.8340	.0060	148-70	635.8
1.0	.008	1.0005	.0073	1.081	.16	.8053	.0058	148-70	686.6
1.0	.008	1.0005	.0074	1.081	.14	.7817	.0064	148-70	734.4

^aThe second number for each cell factor is a one standard deviation uncertainty. See text for details.

^bReactor region and local environment. See text for key and discussion.

^cAxial position to which this cell factor is useable.

Table 4.1.3-25 ZPPR-17B: Radial Reaction Rate Distributions along the X-axis at z = 5 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IB CP	7.082	1.020	8.051	1.044	0.9425	1.076	0.0466	0.970
147 51	IB CP	7.006	1.013	7.989	1.042	0.9443	1.065	0.0412	1.084
148 51	IB CP	7.023	1.014	8.109	1.027	0.9523	1.057	0.0511	1.006
148 52	IB	6.896	1.023	7.999	1.039	0.9418	1.066	0.0421	1.061
148 53	IB	6.938	1.017	7.985	1.043	0.9468	1.064	0.0431	1.037
148 54	IB	7.028	1.019	8.159	1.036	0.9492	1.077	0.0417	1.078
148 55	IB	7.129	1.033	8.213	1.057	0.9680	1.082	0.0449	1.006
148 56	IB CP	7.464	1.033	8.647	1.049	1.0170	1.072	0.0438	1.056
147 56	IB CP	7.445	1.023	8.471	1.055	1.0130	1.064	0.0443	1.043
147 57	IB CP	7.697	1.031	8.848	1.045	1.0280	1.085	0.0451	1.056
147 58	IB CP	--	--	9.058	1.045	1.0480	1.089	0.0484	1.020
147 59	IB CP	--	--	9.048	1.059	1.0740	1.081	0.0484	1.060
148 59	IB CP	--	--	9.255	1.044	1.0810	1.079	0.0491	1.041
148 60	IB	--	--	9.205	1.056	1.0800	1.095	0.0465	1.163
148 61	IB	--	--	9.303	1.061	1.1080	1.094	0.0503	1.155
148 62	IB	--	--	9.415	1.068	1.1380	1.093	0.0573	1.122
148 63	IB	--	--	9.489	1.077	1.1560	1.103	0.0630	1.178
148 64	IB	--	--	9.534	1.074	1.1850	1.089	0.0805	1.130
148 65	IB	--	--	9.275	1.078	1.1720	1.088	0.1111	1.138
148 66	OC D	--	--	8.796	1.049	1.0990	1.115	0.2023	1.035
148 67	OC S	--	--	8.544	1.060	1.1170	1.097	0.2137	1.087
148 68	OC S	--	--	8.229	1.072	1.0780	1.106	0.2208	1.077
148 69	OC D	--	--	7.893	1.061	0.9945	1.118	0.2379	1.023
148 70	OC S	--	--	7.390	1.062	0.9561	1.108	0.1951	1.094
148 71	OC S	--	--	6.627	1.074	0.8777	1.099	0.1725	1.115
148 72	OC D	--	--	5.823	1.067	0.7302	1.138	0.1617	1.069
148 73	OC S	--	--	4.967	1.070	0.6440	1.132	0.1194	0.986
148 74	RB	--	--	4.233	1.072	0.5314	1.102	0.0501	1.135
148 75	RB	--	--	3.401	1.066	0.4159	1.113	0.0270	1.082
148 76	RB	--	--	2.651	1.067	0.3167	1.112	0.0170	0.932
148 77	RB	--	--	2.093	1.060	0.2404	1.094	0.0112	0.781
148 78	RB	--	--	1.736	1.083	0.1941	1.036	0.0059	0.831
148 79	RR	--	--	1.756	1.117	--	--	--	--
148 80	RR	--	--	1.394	1.086	--	--	--	--
148 81	RR	--	--	0.866	0.766	--	--	--	--

Table 4.1.3-26 ZPPR-17B Radial Reaction Rate Distributions long the X-axis at z = 18 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	6.202	0.977	6.984	1.001	0.8997	1.022	0.1450	0.949
147 51	IC S CP	6.095	1.003	7.014	1.017	0.9039	1.055	0.1298	1.002
148 51	IC D CP	6.063	0.995	7.049	0.995	0.8894	1.034	0.1434	0.962
148 52	IC S	6.091	1.002	6.983	1.017	0.8979	1.061	0.1314	0.989
148 53	IC S	6.117	1.001	6.942	1.026	0.8941	1.070	0.1283	1.016
148 54	IC D	6.185	0.981	6.962	1.009	0.8897	1.040	0.1463	0.974
148 55	IC S	6.260	1.010	7.250	1.025	0.9351	1.065	0.1262	1.018
148 56	IC S CP	6.532	1.000	7.636	1.013	0.9846	1.053	0.1261	0.996
147 56	IC D CP	6.463	0.983	7.270	1.012	0.9314	1.043	0.1454	0.985
147 57	IC S CP	6.706	1.000	7.652	1.027	1.0120	1.045	0.1282	1.006
147 58	IC S CP	--	--	7.837	1.023	1.0340	1.043	0.1328	1.003
147 59	IC D CP	--	--	7.816	1.009	0.9856	1.054	0.1538	0.998
148 59	IC S CP	--	--	8.035	1.023	1.0340	1.063	0.1340	1.016
148 60	IC D	--	--	7.794	1.027	0.9972	1.059	0.1594	1.008
148 61	IC S	--	--	8.023	1.043	1.0340	1.092	0.1533	1.016
148 62	IC S	--	--	8.222	1.043	1.0610	1.092	0.1510	1.073
148 63	IC D	--	--	8.236	1.042	1.0330	1.103	0.1810	1.019
148 64	IC S	--	--	8.464	1.056	1.0890	1.110	0.1697	1.050
148 65	IC S	--	--	8.463	1.056	1.0770	1.123	0.1821	1.086
148 66	OC D	--	--	8.307	1.050	1.0080	1.149	0.2227	1.034
148 67	OC S	--	--	8.018	1.077	1.0610	1.099	0.2166	1.078
148 68	OC S	--	--	7.882	1.063	1.0250	1.103	0.2167	1.069
148 69	OC D	--	--	7.492	1.058	0.9369	1.122	0.2182	1.068
148 70	OC S	--	--	6.935	1.066	0.9064	1.100	0.1812	1.114
148 71	OC S	--	--	--	--	--	--	--	--
148 72	OC D	--	--	5.517	1.054	0.6956	1.119	0.1546	1.048
148 73	OC S	--	--	4.672	1.063	0.6061	1.124	0.1054	1.040
148 74	RB	--	--	3.936	1.076	0.4927	1.108	0.0438	1.211
148 75	RB	--	--	3.167	1.067	0.3875	1.112	0.0246	1.111
148 76	RB	--	--	2.490	1.057	0.2938	1.115	0.0145	1.019
148 77	RB	--	--	1.975	1.045	0.2216	1.103	0.0106	0.771
148 78	RB	--	--	1.609	1.089	0.1786	1.048	0.0048	0.966

Table 4.1.3-27 ZPPR-17B: Radial Reaction Rate Distributions along the X-axis at z = 28 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	6.194	0.981	6.522	1.016	0.8504	1.031	0.1732	0.957
147 51	IC S CP	6.037	1.014	6.492	1.016	0.8509	1.046	0.1609	1.046
148 51	IC D CP	6.160	0.985	6.582	1.008	0.8414	1.041	0.1693	0.984
148 52	IC S	6.068	1.009	6.519	1.009	0.8508	1.045	0.1589	1.058
148 53	IC S	6.156	0.999	6.568	1.005	0.8499	1.051	0.1633	1.034
148 54	IC D	6.055	1.015	6.584	1.010	0.8330	1.059	0.1757	0.992
148 55	IC S	6.157	1.023	6.684	1.029	0.8869	1.048	0.1618	1.012
148 56	IC S CP	6.380	1.011	6.971	1.028	0.9176	1.053	0.1543	1.013
147 56	IC D CP	6.274	1.012	6.811	1.020	0.8724	1.057	0.1729	0.992
147 57	IC S CP	6.459	1.018	6.984	1.039	0.9325	1.052	0.1570	1.023
147 58	IC S CP	--	--	7.126	1.033	0.9477	1.050	0.1643	1.010
147 59	IC D CP	--	--	7.147	1.027	0.9071	1.072	0.1812	1.006
148 59	IC S CP	--	--	7.347	1.021	0.9573	1.055	0.1667	1.014
148 60	IC D	--	--	7.196	1.030	0.9049	1.086	0.1920	0.998
148 61	IC S	--	--	7.379	1.027	0.9497	1.082	0.1790	1.091
148 62	IC S	--	--	7.404	1.046	0.9675	1.085	0.1881	1.062
148 63	IC D	--	--	7.609	1.032	0.9412	1.110	0.2043	1.028
148 64	IC S	--	--	7.751	1.039	0.9988	1.092	0.1928	1.056
148 65	IC S	--	--	7.802	1.037	0.9995	1.095	0.1967	1.061
148 66	OC D	--	--	7.579	1.050	0.9422	1.120	0.2200	1.044
148 67	OC S	--	--	7.407	1.063	0.9699	1.094	0.2035	1.080
148 68	OC S	--	--	7.129	1.067	0.9323	1.100	0.1961	1.083
148 69	OC D	--	--	6.760	1.057	0.8432	1.124	0.2004	1.049
148 70	OC S	--	--	6.246	1.061	0.8137	1.099	0.1691	1.067
148 71	OC S	--	--	5.617	1.062	0.7283	1.110	0.1479	1.088
148 72	OC D	--	--	4.870	1.063	0.6195	1.119	0.1360	1.053
148 73	OC S	--	--	4.193	1.053	0.5459	1.110	0.0958	1.012
148 74	RB	--	--	3.489	1.078	0.4376	1.108	0.0411	1.140
148 75	RB	--	--	2.807	1.069	0.3429	1.114	0.0228	1.054
148 76	RB	--	--	2.206	1.060	0.2619	1.108	0.0126	1.032
148 77	RB	--	--	1.740	1.055	0.1985	1.092	0.0090	0.800
148 78	RB	--	--	1.438	1.083	0.1579	1.051	0.0046	0.879

Table 4.1.3-28 ZPPR-17B: Radial $^{235}\text{U}(n,f)$ Distributions at 45° to the Axes

Matrix	Zone ^a	Z = 5 cm		Z = 18 cm		Z = 28 cm	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	8.051	1.044	6.984	1.001	6.522	1.016
147 51	IC S CP	7.989	1.042	7.014	1.017	6.492	1.016
146 52	IC D CP	8.033	1.035	6.939	1.000	6.583	0.998
145 53	IC S	--	--	7.073	1.025	6.663	1.006
145 54	IC D	8.238	1.046	7.099	1.007	6.676	1.008
144 54	IC S	8.284	1.067	7.265	1.037	6.879	1.004
143 55	IC D	8.707	1.055	7.449	1.023	7.009	1.014
143 56	IC S	8.828	1.048	7.678	1.022	7.043	1.016
142 56	IC S	9.047	1.040	7.793	1.022	7.132	1.016
142 57	IC D	9.053	1.061	7.822	1.008	7.152	1.022
141 57	IC S	9.276	1.042	7.853	1.043	7.213	1.030
141 58	IC S	9.397	1.056	8.026	1.043	7.341	1.033
140 58	IC D	9.278	1.069	7.961	1.030	7.333	1.029
140 59	IC S	9.510	1.063	8.200	1.045	7.462	1.033
139 59	IC D	9.394	1.074	8.078	1.041	--	--
138 60	IC S CP	9.500	1.062	8.401	1.055	7.657	1.040
138 61	IC S CP	9.427	1.061	8.614	1.043	7.814	1.038
138 62	OC S CP	8.954	1.040	8.452	1.038	7.677	1.037
138 63	OC S CP	8.806	1.031	--	--	7.410	1.060
137 63	OC S CP	8.612	1.048	8.208	1.042	7.362	1.055
136 63	OC D CP	8.307	1.041	7.747	1.057	7.053	1.052
135 63	OC S CP	7.985	1.036	7.402	1.054	6.676	1.055
135 64	OC S	7.519	1.053	7.022	1.062	6.290	1.065
134 64	OC D	7.074	1.041	6.656	1.038	5.865	1.055
133 65	OC S	5.995	1.047	5.584	1.052	4.991	1.047
133 66	OC D	5.386	1.048	4.993	1.055	4.502	1.039
132 66	OC S	4.856	1.052	4.478	1.064	4.057	1.042
132 67	RB	4.286	1.074	3.986	1.075	3.549	1.071
131 67	RB	3.693	1.074	3.446	1.072	3.035	1.079
130 68	RB	2.676	1.063	2.444	1.082	2.229	1.052
130 69	RB	2.265	1.070	2.128	1.060	1.895	1.056
129 69	RB	1.994	1.077	1.860	1.074	1.652	1.074

^aInner core (IC) results are in the internal blanket (IB) for Z = 5 cm.

Table 4.1.3-29 ZPPR-17B: Local Reaction Rate Distributions in Matrix 148-51 (Near Core Center)

Zone	z(mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
IB	26.2	7.078	1.018	8.280	1.026	0.9673	1.052	0.0435	0.969
IB	49.6	7.082	1.014	8.227	1.026	0.9658	1.050	0.0491	0.918
IB	77.0	7.023	1.014	8.109	1.027	0.9523	1.057	0.0511	1.006
IB	100.4	6.909	1.020	7.814	1.046	0.9382	1.061	0.0560	1.075
IB	127.8	6.800	1.017	7.751	1.021	0.9319	1.048	0.0722	1.029
Zone Average C/E			1.017		1.029		1.054		0.999
Standard Deviation			0.003		0.010		0.005		0.060
IC D	178.6	6.063	0.995	7.049	0.995	0.8894	1.034	0.1434	0.962
IC D	229.4	6.060	1.003	--	--	0.8573	1.043	0.1613	0.984
IC D	280.2	6.160	0.985	6.582	1.008	0.8414	1.041	0.1693	0.984
IC D	331.0	5.919	1.001	6.276	1.020	0.7954	1.064	0.1733	0.962
IC D	432.6	5.235	0.992	5.652	1.003	0.7253	1.034	0.1431	0.985
IC D	483.4	4.725	0.981	5.270	0.995	0.6647	1.040	0.1136	0.967
Zone Average C/E			0.993		1.004		1.043		0.974
Standard Deviation			0.009		0.010		0.011		0.011
AB	534.2	4.594	0.994	5.100	1.009	0.6141	1.073	0.0536	0.981
AB	585.0	4.171	0.995	4.777	1.001	0.5723	1.045	0.0332	1.030
AB	635.8	3.878	0.961	4.336	1.009	0.4972	1.069	0.0219	1.018
AB	686.6	3.573	0.945	3.997	1.007	0.4422	1.061	0.0147	0.913
AB	737.4	3.423	0.927	3.808	1.008	0.3937	1.066	0.0111	0.740
Zone Average C/E			0.964		1.007		1.063		0.936
Standard Deviation			0.030		0.003		0.011		0.119
AR	825.2	--	--	4.008	1.129	--	--	--	--
AR	876.0	--	--	3.771	1.171	--	--	--	--
AR	933.1	--	--	3.008	1.152	--	--	--	--
AR	983.9	--	--	2.168	1.106	--	--	--	--
AR	1034.7	--	--	1.383	0.864	--	--	--	--

Table 4.1.3-30 ZPPR-17B: Axial Reaction Rate Distributions
in Matrix 148-70 (Outer Core)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC S	51.6	7.390	1.062	0.9561	1.108	0.1951	1.094
OC S	102.4	7.036	1.098	0.9415	1.108	0.1949	1.079
OC S	178.6	6.935	1.066	0.9064	1.100	0.1812	1.114
OC S	229.4	6.658	1.059	0.8677	1.097	0.1759	1.096
OC S	280.2	6.246	1.061	0.8137	1.099	0.1691	1.067
OC S	331.0	5.767	1.062	0.7514	1.100	0.1514	1.092
OC S	381.8	5.207	1.066	0.6885	1.091	0.1321	1.105
OC S	432.6	4.703	1.052	0.6153	1.090	0.1127	1.086
OC S	483.4	4.155	1.052	0.5563	1.066	0.0897	1.032
Zone Average C/E			1.064		1.095		1.083
Standard Deviation			0.014		0.013		0.025
AB	534.2	3.814	1.039	0.4753	1.092	0.0475	1.019
AB	585.0	3.304	1.061	0.4129	1.091	0.0306	0.883
AB	635.8	2.917	1.050	0.3560	1.080	0.0178	0.845
AB	686.6	2.549	1.050	0.2976	1.090	0.0119	0.836
AB	737.4	2.275	1.084	0.2597	1.076	0.0088	0.702
Zone Average C/E			1.057		1.086		0.857
Standard Deviation			0.017		0.007		0.114

Table 4.1.3-31 ZPPR-17B: Axial Reaction Rate Distributions
in Matrix 138-62 (next to CRP)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC S	51.6	8.954	1.040	1.1320	1.083	0.1856	0.971
OC S	102.4	8.808	1.041	1.1000	1.098	0.1967	0.944
OC S	178.6	8.452	1.038	1.0500	1.099	0.2032	0.999
OC S	229.4	8.016	1.047	1.0150	1.090	0.2089	1.002
OC S	280.2	7.677	1.037	0.9642	1.087	0.2025	1.017
OC S	331.0	7.178	1.037	0.9180	1.070	0.1905	1.006
OC S	381.8	6.595	1.040	0.8487	1.065	0.1745	0.994
OC S	432.6	5.986	1.037	0.7622	1.073	0.1529	0.976
OC S	483.4	5.338	1.040	0.6829	1.069	0.1167	0.976
Zone Average C/E			1.040		1.082		0.987
Standard Deviation			0.003		0.013		0.022
AB	534.2	5.041	1.038	0.6090	1.101	0.0572	0.938
AB	585.0	4.523	1.041	0.5327	1.108	0.0354	1.001
AB	635.8	4.008	1.042	0.4566	1.115	0.0227	1.034
AB	686.6	3.526	1.061	0.3869	1.133	0.0142	0.960
AB	737.4	3.211	1.085	0.3471	1.103	0.0102	0.798
Zone Average C/E			1.053		1.112		0.946
Standard Deviation			0.020		0.013		0.091
AR	825.2	3.227	1.182	--	--	--	--
AR	876.0	2.957	1.227	--	--	--	--

Table 4.1.3-32 ZPPR-17B: Reaction Rate Ratios along the X-axis at z = 5 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IB CP	1.137	1.024	0.1331	1.055	0.00658	0.951
147 51	IB CP	1.140	1.029	0.1348	1.051	0.00588	1.070
148 51	IB CP	1.155	1.013	0.1356	1.042	0.00728	0.992
148 52	IB	1.160	1.016	0.1366	1.042	0.00611	1.037
148 53	IB	1.151	1.026	0.1365	1.046	0.00621	1.020
148 54	IB	1.161	1.017	0.1351	1.057	0.00593	1.058
148 55	IB	1.152	1.023	0.1358	1.047	0.00629	0.974
148 56	IB	1.158	1.015	0.1363	1.038	0.00587	1.022
147 56	IB	1.138	1.031	0.1361	1.040	0.00596	1.020
147 57	IB	1.150	1.014	0.1336	1.052	0.00586	1.024
Zone Average C/E			1.021		1.047		1.017
Standard Deviation			0.007		0.007		0.036

Table 4.1.3-33 ZPPR-17B: Reaction Rate Ratios along the X-axis at z = 18 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	1.126	1.025	0.1451	1.046	0.02338	0.971
147 51	IC S CP	1.151	1.014	0.1483	1.052	0.02130	0.999
148 51	IC D CP	1.163	1.000	0.1467	1.039	0.02365	0.967
148 52	IC S	1.146	1.015	0.1474	1.059	0.02157	0.987
148 53	IC S	1.135	1.025	0.1462	1.069	0.02097	1.015
148 54	IC D	1.126	1.029	0.1438	1.060	0.02365	0.993
148 55	IC S	1.158	1.015	0.1494	1.054	0.02016	1.008
148 56	IC S CP	1.169	1.013	0.1507	1.053	0.01930	0.996
147 56	IC D CP	1.125	1.030	0.1441	1.061	0.02250	1.002
147 57	IC S CP	1.141	1.027	0.1509	1.045	0.01912	1.006
Zone Average C/E			1.019		1.054		0.994
Standard Deviation			0.009		0.009		0.016

Table 4.1.3-34 ZPPR-17B: Reaction Rate Ratios along the X-axis at z = 28 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	1.053	1.036	0.1373	1.051	0.02796	0.976
147 51	IC S CP	1.075	1.002	0.1409	1.032	0.02665	1.032
148 51	IC D CP	1.069	1.023	0.1366	1.057	0.02748	0.999
148 52	IC S	1.074	1.000	0.1402	1.036	0.02619	1.049
148 53	IC S	1.067	1.006	0.1381	1.052	0.02653	1.035
148 54	IC D	1.087	0.995	0.1376	1.043	0.02902	0.977
148 55	IC S	1.086	1.006	0.1440	1.024	0.02628	0.989
148 56	IC S CP	1.093	1.017	0.1438	1.042	0.02418	1.002
147 56	IC D CP	1.086	1.008	0.1391	1.044	0.02756	0.980
147 57	IC S CP	1.081	1.021	0.1444	1.033	0.02431	1.005
Zone Average C/E			1.011		1.041		1.004
Standard Deviation			0.013		0.010		0.025

Table 4.1.3-35 ZPPR-17B: Reaction Rate Ratios in Matrix 148-51 (core center)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
IB	26.2	1.170	1.008	0.1367	1.033	0.00615	0.952
IB	49.6	1.162	1.012	0.1364	1.036	0.00693	0.905
IB	77.0	1.155	1.013	0.1356	1.042	0.00728	0.992
IB	100.4	1.131	1.025	0.1358	1.040	0.00810	1.054
IB	127.8	1.140	1.004	0.1370	1.030	0.01062	1.012
Zone Average C/E			1.012		1.036		0.983
Standard Deviation			0.008		0.005		0.057
IC D	178.6	1.163	1.000	0.1467	1.039	0.02365	0.967
IC D	229.4	--	--	0.1415	1.040	0.02662	0.981
TC D	280.2	1.069	1.023	0.1366	1.057	0.02748	0.999
IC D	331.0	1.060	1.019	0.1344	1.063	0.02928	0.961
IC D	432.6	1.080	1.011	0.1385	1.042	0.02734	0.993
IC D	483.4	1.115	1.014	0.1407	1.060	0.02404	0.986
Zone Average C/E			1.013		1.050		0.981
Standard Deviation			0.009		0.011		0.015
AB	534.2	1.110	1.015	0.1337	1.079	0.01167	0.987
AB	585.0	1.145	1.006	0.1372	1.050	0.00796	1.035
AB	635.8	1.118	1.050	0.1282	1.112	0.00565	1.059
AB	686.6	1.119	1.066	0.1238	1.123	0.00412	0.966
AB	737.4	1.112	1.087	0.1150	1.150	0.00324	0.798
Zone Average C/E			1.045		1.103		0.969
Standard Deviation			0.034		0.039		0.103

Table 4.1.3-36 Basic Data for $^{239}\text{Pu}(n,f)$ and $^{235}\text{U}(n,f)$ Radial Distributions in ZPPR-17B

Matrix	Loc ^a	z=51.6 mm ^b		Loc ^a	z=178.6 mm ^b		z=280.2 mm ^b	
Basic Data for $^{239}\text{Pu}(n,f)$ ^c on the X Axis								
147 50	HI	7.082	0.043	FG	6.294	0.039	6.248	0.039
147 51	HI	7.006	0.054	GH	6.237	0.037	6.089	0.044
148 52	HI	6.895	0.039	GH	6.233	0.037	6.120	0.036
148 53	HI	6.938	0.045	GH	6.260	0.040	6.208	0.039
148 54	HI	7.028	0.043	FG	6.255	0.058	6.119	0.036
148 55	HI	7.129	0.040	GH	6.406	0.037	6.209	0.034
148 56	HI	7.464	0.041	GH	6.607	0.039	6.366	0.037
147 56	HI	7.445	0.044	FG	6.537	0.036	6.341	0.038
147 57	HI	7.697	0.041	GH	6.824	0.038	6.517	0.038
Basic Data for $^{235}\text{U}(n,f)$ ^c on the X Axis								
147 50	HI	8.000	0.041	FG	6.994	0.039	6.556	0.036
147 51	HI	7.998	0.042	GH	7.017	0.038	6.493	0.037
148 52	HI	8.009	0.042	GH	6.986	0.037	6.520	0.036
148 53	HI	7.995	0.042	GH	6.945	0.037	6.570	0.037
148 54	HI	8.169	0.043	FG	6.980	0.036	6.609	0.036
148 55	HI	8.223	0.042	GH	7.253	0.038	6.685	0.036
148 56	HI	8.592	0.042	GH	7.536	0.041	6.964	0.038
147 56	HI	8.481	0.043	FG	7.289	0.039	6.838	0.038
147 57	HI	8.792	0.043	GH	7.601	0.039	6.998	0.037
147 58	HI	9.001	0.046	GH	7.786	0.041	7.140	0.042
147 59	HI	9.059	0.047	FG	7.836	0.043	7.175	0.039
148 59	HI	9.197	0.052	GH	8.035	0.044	7.383	0.042
148 60	HI	9.216	0.046	FG	7.814	0.042	7.224	0.041
148 61	HI	9.315	0.049	GH	8.026	0.044	7.380	0.041
148 62	HI	9.426	0.049	GH	8.225	0.044	7.405	0.038
148 63	HI	9.501	0.048	FG	8.258	0.044	7.639	0.057
148 64	HI	9.545	0.053	GH	8.468	0.043	7.753	0.040
148 65	HI	9.286	0.047	GH	8.467	0.043	7.804	0.055
148 66	FG	8.861	0.051	FG	8.329	0.045	7.608	0.044
148 67	GH	8.565	0.047	GH	8.038	0.048	7.425	0.040
148 68	GH	8.249	0.048	GH	7.902	0.043	7.147	0.039
148 69	FG	7.905	0.048	FG	7.504	0.043	6.771	0.042
148 71	GH	6.643	0.039	GH			5.631	0.036
148 72	FG	5.833	0.038	FG	5.526	0.035	4.878	0.030
148 73	GH	4.957	0.030	GH	4.663	0.031	4.185	0.030
148 74	GH	4.224	0.022	GH	3.927	0.021	3.481	0.019
148 75	GH	3.418	0.019	GH	3.183	0.019	2.822	0.018
148 76	GH	2.665	0.015	GH	2.503	0.015	2.217	0.015
148 77	GH	2.104	0.015	GH	1.985	0.013	1.749	0.013
148 78	GH	1.774	0.013	GH	1.643	0.012	1.469	0.011
148 79	TC	1.756	0.014					
148 80	TC	1.394	0.011					
148 81	TC	0.866	0.008					

Table 4.1.3-36 (contd)

Matrix	Loc ^a	z=51.6 mm ^b		Loc ^a	z=178.6 mm ^b		z=280.2 mm ^b		
Basic Data for ²³⁵ U(n,f) ^c on the 45° Radial									
146	52	HI	8.042	0.055	FG	6.957	0.044	6.608	0.047
145	53	HI	8.172	0.048	GH	7.076	0.040	6.664	0.038
145	54	HI	8.248	0.048	FG	7.117	0.044	6.702	0.051
144	54	HI	8.294	0.045	GH	7.268	0.047	6.880	0.044
143	55	HI	8.717	0.045	FG	7.469	0.054	7.037	0.044
143	56	HI	8.839	0.053	GH	7.681	0.045	7.044	0.048
142	56	HI	9.057	0.061	GH	7.796	0.046	7.134	0.046
142	57	HI	9.064	0.043	FG	7.842	0.042	7.180	0.041
141	57	HI	9.287	0.063	GH	7.856	0.041	7.214	0.037
141	58	HI	9.408	0.057	GH	8.029	0.045	7.343	0.045
140	58	HI	9.289	0.055	FG	7.981	0.041	7.362	0.045
140	59	HI	9.522	0.057	GH	8.203	0.046	7.464	0.053
139	59	HI	9.405	0.048	FG	8.099	0.044		
138	60	HI	9.511	0.051	GH	8.404	0.043	7.659	0.041
138	61	HI	9.367	0.055	GH	8.557	0.048	7.830	0.085
138	63	GH	8.828	0.074	GH			7.428	0.061
137	63	GH	8.656	0.055	GH	8.249	0.054	7.399	0.055
136	63	FG	8.373	0.052	FG	7.809	0.046	7.109	0.039
135	63	GH	8.005	0.048	GH	7.420	0.040	6.693	0.042
135	64	GH	7.538	0.039	GH	7.039	0.041	6.305	0.035
134	64	FG	7.086	0.038	FG	6.666	0.046	5.874	0.035
133	65	FG	6.005	0.037	FG	5.593	0.036	4.999	0.040
133	66	FG	5.394	0.034	FG	5.001	0.034	4.509	0.037
132	66	GH	4.847	0.031	GH	4.469	0.027	4.049	0.030
132	67	GH	4.276	0.022	GH	3.977	0.020	3.541	0.018
131	67	GH	3.712	0.019	GH	3.464	0.018	3.051	0.020
130	68	GH	2.690	0.016	GH	2.457	0.015	2.241	0.014
130	69	GH	2.277	0.014	GH	2.138	0.014	1.905	0.014
129	69	GH	2.004	0.014	GH	1.869	0.012	1.660	0.012

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above and the ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-37 Basic Data for $^{238}\text{U}(n,f)$ and $^{238}\text{U}(n,\gamma)$ Radial Distributions in ZPPR-17B

Matrix	Loc ^a	$^{238}\text{U}(n,f)^c$		$^{238}\text{U}(n,\gamma)^c$	
Basic Data at $z = 51.6 \text{ mm}^b$					
147 50	HI	0.0459	0.0015	0.8813	0.0055
147 51	HI	0.0413	0.0016	0.8855	0.0059
148 52	HI	0.0422	0.0015	0.8832	0.0057
148 53	HI	0.0432	0.0015	0.8879	0.0057
148 54	HI	0.0418	0.0014	0.8901	0.0053
148 55	HI	0.0450	0.0017	0.9077	0.0058
148 56	HI	0.0431	0.0017	0.9509	0.0057
147 56	HI	0.0444	0.0015	0.9500	0.0056
147 57	HI	0.0444	0.0015	0.9612	0.0056
147 58	HI	0.0476	0.0018	0.9804	0.0058
147 59	HI	0.0485	0.0017	1.0069	0.0058
148 59	HI	0.0483	0.0017	1.0106	0.0064
148 60	HI	0.0466	0.0016	1.0132	0.0059
148 61	HI	0.0504	0.0018	1.0393	0.0067
148 62	HI	0.0574	0.0018	1.0676	0.0061
148 63	HI	0.0632	0.0019	1.0839	0.0062
148 64	HI	0.0807	0.0020	1.1113	0.0059
148 65	HI	0.1113	0.0025	1.0991	0.0064
148 66	FG	0.2103	0.0037	1.2539	0.0067
148 67	GH	0.2233	0.0032	1.2047	0.0063
148 68	GH	0.2307	0.0035	1.1627	0.0066
148 69	FG	0.2443	0.0039	1.1130	0.0061
148 71	GH	0.1803	0.0029	0.9466	0.0053
148 72	FG	0.1660	0.0030	0.8172	0.0047
148 73	GH	0.1220	0.0024	0.7140	0.0043
148 74	GH	0.0549	0.0019	0.5195	0.0034
148 75	GH	0.0273	0.0014	0.4089	0.0028
148 76	GH	0.0172	0.0016	0.3114	0.0024
148 77	GH	0.0114	0.0011	0.2363	0.0021
148 78	GH	0.0071	0.0012	0.1847	0.0019

Basic Data at $z = 178.6 \text{ mm}^b$

147 50	FG	0.1469	0.0024	1.0449	0.0060
147 51	GH	0.1384	0.0022	1.0204	0.0059
148 52	GH	0.1401	0.0022	1.0136	0.0064
148 53	GH	0.1367	0.0023	1.0094	0.0058
148 54	FG	0.1492	0.0029	1.0297	0.0067
148 55	GH	0.1345	0.0022	1.0556	0.0061
148 56	GH	0.1352	0.0022	1.0936	0.0062
147 56	FG	0.1484	0.0022	1.0780	0.0061
147 57	GH	0.1374	0.0023	1.1389	0.0065
147 58	GH	0.1423	0.0027	1.1640	0.0065
147 59	FG	0.1569	0.0027	1.1407	0.0065
148 59	GH	0.1436	0.0024	1.1789	0.0065

Table 4.1.3-37 (contd)

Matrix	Loc ^a	²³⁸ U(n,f) ^c		²³⁸ U(n,γ) ^c	
148 60	FG	0.1627	0.0028	1.1542	0.0066
148 61	GH	0.1634	0.0026	1.1671	0.0066
148 62	GH	0.1610	0.0026	1.1973	0.0066
148 63	FG	0.1847	0.0028	1.1951	0.0070
148 64	GH	0.1809	0.0034	1.2288	0.0070
148 65	GH	0.1941	0.0032	1.2155	0.0068
148 66	FG	0.2273	0.0033	1.1661	0.0062
148 67	GH	0.2264	0.0032	1.1438	0.0065
148 68	GH	0.2265	0.0035	1.1058	0.0060
148 69	FG	0.2240	0.0032	1.0486	0.0057
148 72	FG	0.1587	0.0028	0.7785	0.0045
148 73	GH	0.1078	0.0023	0.6719	0.0049
148 74	GH	0.0480	0.0018	0.4816	0.0034
148 75	GH	0.0249	0.0016	0.3810	0.0029
148 76	GH	0.0147	0.0015	0.2889	0.0023
148 77	GH	0.0108	0.0011	0.2179	0.0020
148 78	GH	0.0057	0.0010	0.1700	0.0017

Basic Data at Z = 280.2 mm^b

147 50	FG	0.1750	0.0024	0.9635	0.0056
147 51	GH	0.1688	0.0026	0.9277	0.0056
148 52	GH	0.1667	0.0025	0.9276	0.0055
148 53	GH	0.1713	0.0024	0.9267	0.0055
148 54	FG	0.1784	0.0033	0.9467	0.0062
148 55	GH	0.1697	0.0031	0.9669	0.0073
148 56	GH	0.1596	0.0025	0.9973	0.0058
147 56	FG	0.1756	0.0026	0.9915	0.0059
147 57	GH	0.1624	0.0024	1.0229	0.0065
147 58	GH	0.1699	0.0028	1.0396	0.0060
147 59	FG	0.1839	0.0025	1.0309	0.0060
148 59	GH	0.1724	0.0024	1.0599	0.0073
148 60	FG	0.1949	0.0031	1.0284	0.0061
148 61	GH	0.1878	0.0027	1.0354	0.0059
148 62	GH	0.1974	0.0030	1.0549	0.0061
148 63	FG	0.2074	0.0027	1.0697	0.0062
148 64	GH	0.2023	0.0030	1.0890	0.0058
148 65	GH	0.2064	0.0032	1.0897	0.0058
148 66	FG	0.2233	0.0034	1.0708	0.0058
148 67	GH	0.2126	0.0033	1.0460	0.0058
148 68	GH	0.2049	0.0033	1.0055	0.0060
148 69	FG	0.2057	0.0030	0.9437	0.0066
148 71	GH	0.1545	0.0026	0.7855	0.0045
148 72	FG	0.1396	0.0025	0.6934	0.0045
148 73	GH	0.0980	0.0022	0.6051	0.0037
148 74	GH	0.0450	0.0018	0.4278	0.0030
148 75	GH	0.0231	0.0013	0.3371	0.0025
148 76	GH	0.0128	0.0012	0.2575	0.0021
148 77	GH	0.0091	0.0010	0.1951	0.0019

Table 4.1.3-37 (contd)

<u>Matrix</u>	<u>Loc^a</u>	<u>²³⁸U(n,f)^c</u>		<u>²³⁸U(n,γ)^c</u>	
148 78	GH	0.0055	0.0010	0.1503	0.0016

^aIn-drawer column which designates the foil location in the drawer. The ²³⁸U foils were centered on the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-38 Basic Reaction Rate Data for Axial Distributions in ZPPR-17B

<u>z,mm^a</u>	<u>Loc^b</u>	<u>²³⁹Pu(n,f)^c</u>	<u>²³⁵U(n,f)^c</u>	<u>²³⁸U(n,f)^c</u>	<u>²³⁸U(n,γ)^c</u>
Axial Traverse in Position 148 51					
26.2	HI	7.078 0.039	8.228 0.043	0.0428 0.0017	0.9003 0.0050
49.6	HI	7.082 0.041	8.174 0.049	0.0483 0.0021	0.9032 0.0052
77.0	HI	7.023 0.042	8.057 0.048	0.0503 0.0017	0.8946 0.0052
100.4	HI	6.909 0.039	7.765 0.053	0.0551 0.0016	0.8831 0.0048
127.8	HI	6.800 0.039	7.702 0.042	0.0712 0.0020	0.8788 0.0049
178.6	GH	6.211 0.036	7.036 0.038	0.1456 0.0023	1.0305 0.0055
229.4	GH	6.153 0.035		0.1633 0.0024	0.9834 0.0053
280.2	GH	6.201 0.042	6.614 0.038	0.1710 0.0025	0.9556 0.0052
331.0	GH	5.958 0.042	6.326 0.034	0.1760 0.0025	0.8951 0.0049
432.6	GH	5.266 0.033	5.677 0.032	0.1460 0.0024	0.8209 0.0047
483.4	GH	4.751 0.031	5.259 0.031	0.1159 0.0021	0.7636 0.0043
534.2	GH	4.594 0.031	5.127 0.031	0.0530 0.0015	0.7302 0.0042
585.0	GH	4.170 0.030	4.802 0.030	0.0317 0.0014	0.7027 0.0050
635.8	GH	3.878 0.028	4.359 0.028	0.0209 0.0013	0.6342 0.0040
686.6	GH	3.573 0.030	4.018 0.025	0.0141 0.0010	0.5856 0.0038
737.4	GH	3.423 0.027	3.828 0.034	0.0106 0.0009	0.5422 0.0033
825.2	TC		4.008 0.021		
876.0	TC		3.771 0.020		
933.1	TC		3.008 0.016		
983.9	TC		2.168 0.014		
1034.7	TC		1.383 0.011		
Axial Traverse in Position 138 62					
51.6	FG		8.967 0.046	0.1881 0.0030	1.3151 0.0067
102.4	FG		8.821 0.047	0.1992 0.0028	1.2780 0.0065
178.6	FG		8.481 0.045	0.2057 0.0033	1.2045 0.0063
229.4	FG		8.063 0.041	0.2108 0.0032	1.1514 0.0062
280.2	FG		7.740 0.041	0.2038 0.0030	1.0826 0.0058
331.0	FG		7.248 0.039	0.1912 0.0030	1.0260 0.0056
381.8	FG		6.668 0.043	0.1750 0.0032	0.9443 0.0053
432.6	FG		6.018 0.041	0.1548 0.0027	0.8589 0.0052
483.4	FG		5.338 0.033	0.1191 0.0024	0.7795 0.0045
534.2	GH		5.068 0.030	0.0565 0.0020	0.7241 0.0046
585.0	GH		4.547 0.030	0.0338 0.0014	0.6540 0.0039
635.8	GH		4.030 0.026	0.0217 0.0014	0.5824 0.0036
686.6	GH		3.545 0.023	0.0136 0.0011	0.5124 0.0032
737.4	GH		3.228 0.025	0.0098 0.0010	0.4780 0.0031
825.2	TC		3.227 0.018		
876.0	TC		2.957 0.017		
Axial Traverse in Position 148 70					
51.6	GH		7.408 0.068	0.2038 0.0030	1.0312 0.0061
102.4	GH		7.054 0.083	0.2036 0.0029	1.0154 0.0055
178.6	GH		6.952 0.040	0.1894 0.0030	0.9775 0.0054
229.4	GH		6.675 0.045	0.1838 0.0026	0.9358 0.0051

Table 4.1.3-38 (contd)

z, mm^a	Loc ^b	$^{239}\text{Pu}(n,f)^c$	$^{235}\text{U}(n,f)^c$	$^{238}\text{U}(n,f)^c$	$^{238}\text{U}(n,\gamma)^c$
280.2	GH		6.262 0.042	0.1767 0.0026	0.8776 0.0049
331.0	GH		5.781 0.039	0.1581 0.0026	0.8104 0.0046
381.8	GH		5.220 0.037	0.1381 0.0025	0.7426 0.0047
432.6	GH		4.713 0.030	0.1181 0.0023	0.6671 0.0040
483.4	GH		4.152 0.028	0.0941 0.0020	0.6063 0.0041
534.2	GH		3.813 0.028	0.0439 0.0015	0.5392 0.0034
585.0	GH		3.303 0.030	0.0284 0.0015	0.4846 0.0036
635.8	GH		2.915 0.022	0.0165 0.0014	0.4269 0.0029
686.6	GH		2.548 0.022	0.0110 0.0010	0.3695 0.0026
737.4	GH		2.274 0.030	0.0081 0.0010	0.3323 0.0024

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ^{235}U foils were centered 13.8 mm above, the ^{238}U foils were centered on, and the ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer.

^cExperimental results in units of 10^{-18} fissions or captures per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-39 Basic Data for ^{239}Pu Cell Studies in ZPPR-17B

Matrix	Loc ^a	z,mm ^b	$^{239}\text{Pu}(n,f)^c$	z,mm ^b	$^{239}\text{Pu}(n,f)^c$
Measurements in Cells with One Fuel Column					
148 56	GH	178.6	6.581 0.034	229.4	6.476 0.031
148 56	HI	178.6	6.407 0.032	229.4	6.334 0.032
148 56	IJ	178.6	6.694 0.039	229.4	6.565 0.030
148 56	GH	280.2	6.350 0.030		
148 56	HI	280.2	6.317 0.033		
148 56	IJ	280.2	6.518 0.034		
Measurements in Cells with Two Fuel Columns					
249 51	LM	178.6	6.288 0.029	280.2	6.147 0.031
249 51	KL	178.6	5.997 0.034	280.2	6.076 0.030
249 51	JK	178.6	6.257 0.031	280.2	6.112 0.030
148 51	JK	178.6	6.130 0.032	280.2	6.130 0.031
148 51	KL	178.6	5.979 0.030	280.2	5.966 0.031
148 51	LM	178.6	6.202 0.029	280.2	6.071 0.028
249 48	LM	381.8	5.642 0.029	483.4	4.676 0.026
249 48	KL	381.8	5.571 0.028	483.4	4.590 0.023
249 48	JK	381.8	5.633 0.030	483.4	4.672 0.027
148 48	JK	381.8	5.578 0.031	483.4	4.743 0.025
148 48	KL	381.8	5.530 0.030	483.4	4.593 0.025
148 48	LM	381.8	5.740 0.032	483.4	4.787 0.025

^aIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10^{-18} fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-40 Basic Data for ^{235}U Cell Studies in ZPPR-17B

Matrix	Loc ^a	z,mm ^b	$^{235}\text{U}(n,f)^c$	z,mm ^b	$^{235}\text{U}(n,f)^c$
Measurements in Cells with One Fuel Column					
149 56	AB	178.6	7.467 0.030	229.4	7.076 0.029
148 56	GH	178.6	7.350 0.030	229.4	7.023 0.028
148 56	HI	178.6	7.309 0.033	229.4	7.019 0.030
148 56	IJ	178.6	7.506 0.030	229.4	7.166 0.028
149 56	OP	178.6	7.920 0.031	229.4	7.519 0.030
149 56	AB	280.2	6.862 0.028		
148 56	GH	280.2	6.895 0.028		
148 56	HI	280.2	6.841 0.027		
148 56	IJ	280.2	6.979 0.027		
149 56	OP	280.2	7.192 0.029		
Measurements in Cells with Two Fuel Columns					
Central Blanket Cells					
249 51	OP	26.2	8.311 0.035	77.0	8.203 0.035
249 51	II	26.2	8.070 0.034	77.0	7.994 0.035
248 51	HI	26.2	8.002 0.032	77.0	7.896 0.032
149 51	HI	26.2	8.097 0.032	77.0	7.868 0.031
148 51	II	26.2	8.023 0.032	77.0	7.889 0.031
148 51	OP	26.2	8.095 0.031	77.0	7.979 0.036
249 51	OP	127.8	7.829 0.034		
249 51	II	127.8	7.626 0.033		
248 51	HI	127.8	7.589 0.031		
149 51	HI	127.8	7.598 0.031		
148 51	II	127.8	7.568 0.031		
148 51	OP	127.8	7.575 0.030		
Core Cells					
248 51	OP	178.6	7.181 0.029	280.2	6.675 0.028
249 51	LM	178.6	7.062 0.033	280.2	6.647 0.030
249 51	KL	178.6	6.820 0.030	280.2	6.458 0.030
249 51	JK	178.6	6.961 0.032	280.2	6.572 0.031
148 51	JK	178.6	6.907 0.028	280.2	6.519 0.027
148 51	KL	178.6	6.801 0.030	280.2	6.405 0.027
148 51	LM	178.6	6.855 0.030	280.2	6.463 0.027
149 51	OP	178.6	6.948 0.030	280.2	6.484 0.027
248 48	OP	381.8	5.900 0.026	483.4	5.191 0.025
249 48	LM	381.8	5.926 0.028	483.4	5.164 0.026
249 48	KL	381.8	5.878 0.028	483.4	5.045 0.024
249 48	JK	381.8	5.971 0.028	483.4	5.141 0.024
148 48	JK	381.8	6.057 0.029	483.4	5.181 0.026
148 48	KL	381.8	5.949 0.028	483.4	5.114 0.025

Table 4.1.3-40 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁵ U(n, f) ^c	z, mm ^b	²³⁵ U(n, f) ^c
148 48	LM	381.8	6.068 0.028	483.4	5.223 0.026
149 48	OP	381.8	6.115 0.028	483.4	5.320 0.023
Axial Blanket Cells					
249 51	OP	534.2	5.110 0.023	585.0	4.736 0.023
249 51	JJ	534.2	4.964 0.024	585.0	4.592 0.021
248 51	IJ	534.2	5.041 0.023	585.0	4.661 0.020
248 51	GH	534.2	4.942 0.021	585.0	4.593 0.020
149 51	GH	534.2	4.976 0.021	585.0	4.684 0.021
149 51	IJ	534.2	4.979 0.021	585.0	4.626 0.020
148 51	JJ	534.2	4.913 0.021	585.0	4.538 0.019
148 51	OP	534.2	4.992 0.022	585.0	4.628 0.021
249 51	OP	635.8	4.305 0.022	686.6	3.994 0.019
249 51	JJ	635.8	4.233 0.021	686.6	3.867 0.024
248 51	IJ	635.8	4.264 0.020	686.6	3.861 0.018
248 51	GH	635.8	4.218 0.019	686.6	3.820 0.017
149 51	GH	635.8	4.284 0.019	686.6	3.913 0.018
149 51	IJ	635.8	4.219 0.019	686.6	3.852 0.017
148 51	JJ	635.8	4.144 0.018	686.6	3.771 0.017
148 51	OP	635.8	4.190 0.019	686.6	3.820 0.018
249 51	OP	737.4	3.727 0.020		
249 51	JJ	737.4	3.576 0.018		
248 51	IJ	737.4	3.577 0.017		
248 51	GH	737.4	3.539 0.017		
149 51	GH	737.4	3.667 0.017		
149 51	IJ	737.4	3.577 0.017		
148 51	JJ	737.4	3.512 0.016		
148 51	OP	737.4	3.556 0.017		

^aIn-drawer column which designated the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁶ fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-41 Basic Data for ^{238}U Cell Studies in ZPPR-17B

Matrix	z,mm ^a	Loc ^b	$^{238}\text{U}(n,f)^c$	$^{238}\text{U}(n,\gamma)^c$
Measurements in Cells with One Fuel Column				
148 56	178.6	-AB	0.1069 0.0019	0.9741 0.0054
148 56	178.6	GH	0.1283 0.0020	1.0930 0.0053
148 56	178.6	HI	0.1385 0.0017	0.9674 0.0048
148 56	178.6	IJ	0.1314 0.0018	1.1303 0.0054
148 56	178.6	-OP	0.1038 0.0020	1.0783 0.0056
148 56	229.4	-AB	0.1298 0.0019	0.9421 0.0049
148 56	229.4	GH	0.1499 0.0018	1.0399 0.0050
148 56	229.4	HI	0.1575 0.0019	0.9343 0.0046
148 56	229.4	IJ	0.1458 0.0020	1.0686 0.0052
148 56	229.4	-OP	0.1236 0.0020	1.0467 0.0053
148 56	280.2	-AB	0.1353 0.0020	0.9152 0.0052
148 56	280.2	GH	0.1549 0.0020	0.9989 0.0052
148 56	280.2	HI	0.1655 0.0021	0.9032 0.0049
148 56	280.2	IJ	0.1516 0.0022	1.0232 0.0055
148 56	280.2	-OP	0.1295 0.0020	0.9953 0.0051
Measurements in Cells with Two Fuel Columns				
Central Blanket Cells				
249 51	26.2	OP	0.0447 0.0014	1.0641 0.0059
249 51	26.2	II	0.0400 0.0015	0.9153 0.0049
248 51	26.2	HI	0.0400 0.0012	0.8900 0.0046
149 51	26.2	HI	0.0400 0.0012	0.8988 0.0048
148 51	26.2	II	0.0401 0.0013	0.9151 0.0049
148 51	26.2	OP	0.0414 0.0012	1.0033 0.0052
249 51	77.0	OP	0.0520 0.0013	1.0434 0.0058
249 51	77.0	II	0.0476 0.0014	0.9014 0.0052
248 51	77.0	HI	0.0496 0.0013	0.8839 0.0050
149 51	77.0	HI	0.0481 0.0012	0.8920 0.0044
148 51	77.0	II	0.0478 0.0014	0.9001 0.0045
148 51	77.0	OP	0.0508 0.0014	0.9871 0.0048
249 51	127.8	OP	0.0732 0.0016	1.0178 0.0057
249 51	127.8	II	0.0688 0.0016	0.8820 0.0047
248 51	127.8	HI	0.0692 0.0013	0.8750 0.0051
149 51	127.8	HI	0.0696 0.0013	0.8686 0.0043
148 51	127.8	II	0.0704 0.0015	0.8827 0.0044
148 51	127.8	OP	0.0703 0.0016	0.9640 0.0047
Core Cells				
249 51	178.6	-OP	0.1171 0.0019	0.9651 0.0053
249 51	178.6	LM	0.1358 0.0017	0.9755 0.0051

Table 4.1.3-41 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁵ U(n, f) ^c	²³⁵ U(n, γ) ^c
249 51	178.6	KL	0.1463 0.0018	0.8855 0.0047
249 51	178.6	JK	0.1413 0.0019	1.0302 0.0057
148 51	178.6	JK	0.1427 0.0020	1.0287 0.0050
148 51	178.6	KL	0.1546 0.0018	0.8742 0.0044
148 51	178.6	LM	0.1395 0.0018	0.9425 0.0050
148 51	178.6	-OP	0.1205 0.0019	0.9039 0.0048
249 51	280.2	-OP	0.1446 0.0021	0.8947 0.0051
249 51	280.2	LM	0.1628 0.0019	0.9059 0.0048
249 51	280.2	KL	0.1750 0.0019	0.8530 0.0046
249 51	280.2	JK	0.1704 0.0021	0.9583 0.0051
148 51	280.2	JK	0.1726 0.0020	0.9500 0.0047
148 51	280.2	KL	0.1817 0.0022	0.8394 0.0043
148 51	280.2	LM	0.1689 0.0018	0.8762 0.0043
148 51	280.2	-OP	0.1522 0.0023	0.8463 0.0051
249 48	381.8	-OP	0.1404 0.0021	0.7741 0.0048
249 48	381.8	LM	0.1604 0.0018	0.7975 0.0043
249 48	381.8	KL	0.1698 0.0021	0.7602 0.0042
249 48	381.8	JK	0.1623 0.0020	0.8556 0.0046
148 48	381.8	JK	0.1581 0.0021	0.8550 0.0046
148 48	381.8	KL	0.1630 0.0020	0.7734 0.0042
148 48	381.8	LM	0.1517 0.0018	0.8292 0.0048
148 48	381.8	-OP	0.1347 0.0019	0.8322 0.0052
249 48	483.4	-OP	0.0990 0.0018	0.6694 0.0041
249 48	483.4	LM	0.1128 0.0018	0.6984 0.0039
249 48	483.4	KL	0.1196 0.0016	0.6601 0.0040
249 48	483.4	JK	0.1148 0.0018	0.7619 0.0042
148 48	483.4	JK	0.1135 0.0016	0.7556 0.0040
148 48	483.4	KL	0.1153 0.0016	0.6665 0.0038
148 48	483.4	LM	0.1101 0.0016	0.7182 0.0040
148 48	483.4	-OP	0.0952 0.0017	0.7202 0.0043
Axial Blanket Cells				
249 51	534.2	OP	0.0580 0.0015	0.6695 0.0042
249 51	534.2	JJ	0.0528 0.0011	0.6025 0.0034
248 51	534.2	IJ	0.0542 0.0013	0.7329 0.0041
248 51	534.2	GH	0.0533 0.0012	0.7363 0.0041
149 51	534.2	GH	0.0526 0.0013	0.7404 0.0038
149 51	534.2	IJ	0.0547 0.0013	0.7325 0.0038
148 51	534.2	JJ	0.0531 0.0015	0.5974 0.0035
148 51	534.2	OP	0.0555 0.0012	0.6288 0.0033
249 51	585.0	OP	0.0347 0.0011	0.6106 0.0036
249 51	585.0	JJ	0.0321 0.0011	0.5446 0.0032
248 51	585.0	IJ	0.0346 0.0012	0.6860 0.0041
248 51	585.0	GH	0.0324 0.0011	0.6862 0.0041

Table 4.1.3-41 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁸ U(n,f) ^c		²³⁸ U(n,γ) ^c	
149 51	585.0	GH	0.0314	0.0010	0.6898	0.0036
149 51	585.0	IJ	0.0323	0.0011	0.6869	0.0036
148 51	585.0	JJ	0.0339	0.0011	0.5399	0.0030
148 51	585.0	OP	0.0337	0.0011	0.5659	0.0031
249 51	635.8	OP	0.0218	0.0011	0.5432	0.0035
249 51	635.8	JJ	0.0226	0.0010	0.4842	0.0031
248 51	635.8	IJ	0.0194	0.0009	0.6310	0.0039
248 51	635.8	GH	0.0217	0.0014	0.6360	0.0040
149 51	635.8	GH	0.0203	0.0010	0.6438	0.0034
149 51	635.8	IJ	0.0210	0.0010	0.6319	0.0034
148 51	635.8	JJ	0.0217	0.0010	0.4804	0.0027
148 51	635.8	OP	0.0219	0.0009	0.5062	0.0028
249 51	686.6	OP	0.0152	0.0009	0.4869	0.0030
249 51	686.6	JJ	0.0143	0.0009	0.4293	0.0027
248 51	686.6	IJ	0.0139	0.0009	0.5822	0.0033
248 51	686.6	GH	0.0120	0.0010	0.5821	0.0035
149 51	686.6	GH	0.0141	0.0010	0.5899	0.0035
149 51	686.6	IJ	0.0122	0.0009	0.5754	0.0033
148 51	686.6	JJ	0.0137	0.0010	0.4164	0.0025
148 51	686.6	OP	0.0133	0.0009	0.4482	0.0028
249 51	737.4	OP	0.0105	0.0008	0.4317	0.0028
249 51	737.4	JJ	0.0091	0.0009	0.3766	0.0025
248 51	737.4	IJ	0.0068	0.0010	0.5364	0.0031
248 51	737.4	GH	0.0100	0.0008	0.5315	0.0032
149 51	737.4	GH	0.0082	0.0009	0.5426	0.0032
149 51	737.4	IJ	0.0095	0.0008	0.5353	0.0029
148 51	737.4	JJ	0.0101	0.0008	0.3721	0.0025
148 51	737.4	OP	0.0091	0.0009	0.3964	0.0023

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ²³⁸U foils were centered on the mid-height of the drawer. A negative sign designates a plate-spanning averaging foil.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-42 Cell-Averaging Factors for ZPPR-17B

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)$		Environment ^b	z, mm^c
1.0	.006	1.0064	.0046	1.017	.026	1.0694	.0058	IC 147-50	51.6
0.9853	.0056	0.9985	.0046	0.987	.015	0.8610	.0051	IC 147-50	178.6
0.9914	.0054	0.9948	.0048	0.990	.013	0.8826	.0052	IC 147-50	280.2
1.0	.006	1.0064	.0046	1.017	.026	1.0694	.0058	IC 148-56	51.6
0.9885	.0058	1.0132	.0047	0.933	.016	0.9003	.0052	IC 148-56	178.6
1.0021	.0056	1.0010	.0044	0.967	.015	0.9201	.0056	IC 148-56	280.2
1.0	.006	1.0064	.0046	1.017	.026	1.0694	.0058	IC 147-57,58	51.6
0.9826	.0061	1.0066	.0066	0.933	.016	0.8886	.0051	IC 147-57,58	178.6
0.9910	.0112	0.9980	.0044	0.967	.015	0.9116	.0057	IC 147-57,58	280.2
1.0	.006	1.0064	.0046	1.017	.026	1.0694	.0058	IC 148-59	51.6
0.9768	.0063	1.0000	.0044	0.933	.015	0.8768	.0050	IC 148-59	178.6
0.9798	.0059	0.9950	.0044	0.967	.016	0.9032	.0057	IC 148-59	280.2
1.0	.006	0.9988	.0051	0.998	.022	1.0664	.0078	IC F/SC/F	0-51.6
0.9772	.0046	0.9996	.0069	0.938	.013	0.8858	.0057	IC F/SC/F	178.6
0.9916	.0058	0.9998	.0052	0.953	.012	0.9172	.0061	IC F/SC/F	280.2
1.0	.006	0.9988	.0051	0.998	.022	1.0664	.0078	IC SC/DC/SC	0-51.6
0.9888	.0060	0.9974	.0050	0.980	.014	0.8640	.0055	IC SC/DC/SC	178.6
0.9895	.0055	0.9961	.0055	0.985	.013	0.8799	.0059	IC SC/DC/SC	280.2
		0.9950	.0044					OC 137-63	0-280.2
		0.9921	.0050					OC 136-63	0-280.2
0.9903	.0057	0.9984	.0049	0.974	.013	0.8935	.0061	OC SC/DC/SC	0-280.2
0.9890	.0061	0.9975	.0059	0.957	.011	0.9272	.0054	OC F/SC/F	0-280.2
0.9850	.0059	1.0020	.0057	0.978	.019	0.9020	.0051	OC F/SC/RB	0-280.2
0.9929	.0047	0.9926	.0042	0.962	.013	0.8762	.0048	OC CB/DC/SC	0-51.6
0.9888	.0060	0.9974	.0050	0.980	.014	0.8640	.0055	OC CB/DC/SC	178.6
0.9895	.0055	0.9961	.0055	0.985	.013	0.8799	.0059	OC CB/DC/SC	280.2
1.0	.008	1.0022	.0063	0.912	.026	1.0229	.0058	RB SC/RB/RB	ALL
1.0	.008	0.9949	.0074	0.988	.071	1.0170	.0071	RB RB/RB/RB	ALL
1.0	.008	0.9791	.0085	0.838	.100	1.0508	.0090	RB RB/RB/RR	ALL
		1.0	.010					RR	ALL
1.0	.006	1.0064	.0046	1.017	.026	1.0744	.0060	148-51	26.2
1.0	.006	1.0064	.0046	1.017	.026	1.0694	.0058	148-51	49.6
1.0	.006	1.0064	.0046	1.017	.026	1.0645	.0056	148-51	77.0
1.0	.006	1.0064	.0046	1.017	.026	1.0625	.0053	148-51	100.4
1.0	.006	1.0064	.0046	1.015	.018	1.0604	.0049	148-51	127.8
0.9762	.0054	1.0018	.0049	0.985	.015	0.8631	.0053	148-51	178.6
0.9848	.0052	0.9985	.0050	0.988	.013	0.8718	.0059	148-51	229.4

Table 4.1.3-42 (contd)

$^{239}\text{Pn}(n,f)^a$	$^{235}\text{U}(n,f)^a$	$^{238}\text{U}(n,f)^a$	$^{238}\text{U}(n,\gamma)$	Environment ^b	z, mm ^c
0.9933 .0054	0.9952 .0050	0.990 .014	0.8805 .0053	148-51	280.2
0.9935 .0056	0.9921 .0050	0.985 .014	0.8886 .0054	148-51	331.0
0.9937 .0058	0.9890 .0050	0.980 .013	0.8968 .0055	148-51	381.8
0.9941 .0060	0.9956 .0066	0.980 .015	0.8836 .0056	148-51	432.6
0.9945 .0062	1.0022 .0051	0.980 .017	0.8704 .0056	148-51	483.4
1.0 .008	0.9947 .0055	1.012 .019	0.8410 .0045	148-51	534.2
1.0 .008	0.9947 .0055	1.047 .038	0.8145 .0040	148-51	585.0
1.0 .008	0.9947 .0055	1.047 .042	0.7839 .0061	148-51	635.8
1.0 .008	0.9947 .0055	1.047 .063	0.7551 .0052	148-51	686.6
1.0 .008	0.9947 .0055	1.047 .101	0.7262 .0042	148-51	737.4
1.0 .006	0.9985 .0065	0.987 .021	0.8610 .0072	138-62	51.6
1.0 .006	0.9985 .0065	0.987 .021	0.8610 .0072	138-62	102.4
1.0 .006	0.9966 .0068	0.988 .020	0.8718 .0073	138-62	178.6
1.0 .006	0.9942 .0069	0.991 .020	0.8812 .0075	138-62	229.4
1.0 .006	0.9919 .0069	0.994 .020	0.8906 .0076	138-62	280.2
1.0 .006	0.9904 .0060	0.996 .017	0.8947 .0066	138-62	331.0
1.0 .006	0.9890 .0050	0.997 .014	0.8988 .0055	138-62	381.8
1.0 .006	0.9946 .0052	0.988 .015	0.8874 .0056	138-62	432.6
1.0 .006	1.0001 .0053	0.980 .016	0.8761 .0057	138-62	483.4
1.0 .008	0.9947 .0055	1.012 .019	0.8410 .0045	138-62	534.2
1.0 .008	0.9947 .0055	1.047 .038	0.8145 .0040	138-62	585.0
1.0 .008	0.9947 .0055	1.047 .042	0.7839 .0061	138-62	635.8
1.0 .008	0.9947 .0055	1.047 .063	0.7551 .0052	138-62	686.6
1.0 .008	0.9947 .0055	1.047 .101	0.7262 .0042	138-62	737.4
0.9890 .0061	0.9975 .0059	0.957 .011	0.9272 .0054	148-70	0-381.8
0.9892 .0064	0.9980 .0067	0.955 .013	0.9224 .0054	148-70	432.6
0.9920 .0065	1.0007 .0076	0.953 .014	0.9175 .0054	148-70	483.4
1.0 .008	1.0005 .0059	1.081 .031	0.8815 .0061	148-70	534.2
1.0 .008	1.0005 .0059	1.081 .053	0.8521 .0064	148-70	585.0
1.0 .008	1.0005 .0070	1.081 .077	0.8340 .0060	148-70	635.8
1.0 .008	1.0005 .0073	1.081 .16	0.8053 .0058	148-70	686.6
1.0 .008	1.0005 .0074	1.081 .14	0.7817 .0064	148-70	734.4

^aThe second number for each cell factor is a one standard deviation uncertainty. See text for details.

^bReactor region and local environment. See Text for key and discussion.

^cAxial position to which this cell factor applies.

Table 4.1.3-43 R-17C: Radial Reaction Rate Distributions along the X-axis at 5 cm above the Midplane

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IB CP	5.919	0.992	7.075	1.022	0.8327	1.063	0.0433	1.033
147 51	IB CP	6.152	0.993	7.186	1.029	0.8677	1.048	0.0449	1.003
148 51	IB CP	6.267	1.011	7.211	1.032	0.8680	1.069	0.0534	0.986
148 52	IB	6.285	1.007	7.324	1.028	0.8821	1.055	0.0445	1.016
148 53	IB	6.550	1.011	7.553	1.042	0.9079	1.066	0.0438	1.052
148 54	IB	6.695	1.028	7.794	1.049	0.9372	1.070	0.0455	1.040
148 55	IB	7.078	1.011	8.138	1.045	0.9741	1.067	0.0474	1.019
148 56	IB CP	7.426	1.007	8.648	1.024	0.9988	1.079	0.0472	1.052
147 56	IB CP	7.270	1.020	8.345	1.051	0.9932	1.077	0.0474	1.045
147 57	IB CP	7.583	1.012	8.715	1.036	1.0100	1.090	0.0496	1.025
147 58	IB CP	--	--	8.797	1.010	1.0390	1.116	0.0538	1.016
147 59	IB CP	--	--	8.778	1.052	1.0490	1.079	0.0509	1.052
148 59	IB CP	--	--	8.931	1.042	1.0450	1.087	0.0506	1.052
148 60	IB	--	--	8.710	1.066	1.0500	1.088	0.0506	1.093
148 61	IB	--	--	8.665	1.072	1.0420	1.106	0.0500	1.169
148 62	IB	--	--	8.556	1.087	1.0570	1.100	0.0543	1.173
148 63	IB	--	--	8.510	1.089	1.0570	1.107	0.0629	1.156
148 64	IB	--	--	8.357	1.068	1.0600	1.135	0.0781	1.176
148 65	IB	--	--	8.150	1.090	1.0450	1.099	0.1078	1.107
148 66	OC D	--	--	7.790	1.077	0.9847	1.151	0.1939	1.070
148 67	OC D	--	--	7.786	1.070	0.9803	1.141	0.2283	1.076
148 68	OC S	--	--	7.703	1.084	0.9923	1.140	0.2215	1.096
148 69	OC D	--	--	7.626	1.066	0.9310	1.164	0.2363	1.092
148 70	OC D	--	--	7.074	1.088	0.8810	1.163	0.2270	1.085
148 71	OC S	--	--	6.469	1.090	0.8369	1.140	0.1879	1.104
148 72	OC D	--	--	5.798	1.081	0.7259	1.161	0.1759	1.081
148 73	OC D	--	--	5.012	1.069	0.6121	1.185	0.1362	1.069
148 74	RB	--	--	4.189	1.087	0.5251	1.127	0.0555	1.143
148 75	RB	--	--	3.393	1.093	0.4143	1.151	0.0306	1.055
148 76	RB	--	--	2.669	1.099	0.3229	1.140	0.0174	1.003
148 77	RB	--	--	2.076	1.121	0.2467	1.128	0.0100	0.959
148 78	RB	--	--	1.707	1.166	0.1957	1.099	0.0053	1.015
148 79	RR	--	--	1.720	1.169	--	--	--	--
148 80	RR	--	--	1.372	1.140	--	--	--	--
148 81	RR	--	--	0.855	0.805	--	--	--	--

Table 4.1.3-44 ZPPR-17C: Radial Reaction Rate Distributions along the X-axis at 5 cm below the Midplane

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
247 50	IB CR	4.047	1.011	5.583	0.985	0.6411	1.052	0.0349 ²	1.000
247 51	IB CR	4.949	0.996	6.082	1.022	0.7157	1.063	0.0364	1.010
248 51	IB CR	4.735	0.992	5.671	1.024	0.6850	1.058	0.0334	1.032
248 52	IB	5.436	1.001	6.391	1.021	0.7685	1.053	0.0387	0.966
248 53	IB	6.012	0.996	6.893	1.039	0.8266	1.064	0.0393	1.000
248 54	IB	6.300	1.010	7.240	1.050	0.8721	1.065	0.0392	1.050
248 55	IB	6.615	1.004	7.540	1.052	0.9096	1.060	0.0408	1.033
248 56	IB CP	7.030	1.000	8.073	1.035	0.9387	1.080	0.0450	0.979
247 56	IB CP	6.924	1.006	7.811	1.059	0.9384	1.072	0.0417	1.053
247 57	IB CP	7.174	1.008	8.162	1.045	0.9474	1.095	0.0449	1.008
247 58	IB CP	--	--	8.178	1.025	0.9754	1.120	0.0463	1.049
247 59	IB CP	--	--	8.193	1.062	0.9746	1.090	0.0455	1.040
248 59	IB CP	--	--	8.368	1.048	0.9880	1.081	0.0462	1.023
248 60	IB	--	--	8.129	1.071	0.9785	1.092	0.0469	1.038
248 61	IB	--	--	8.000	1.082	0.9768	1.096	0.0470	1.089
248 62	IB	--	--	7.879	1.088	0.9907	1.081	0.0520	1.066
248 63	IB	--	--	7.784	1.084	0.9767	1.091	0.0577	1.092
248 64	IB	--	--	7.523	1.064	0.9593	1.128	0.0678	1.175
248 65	IB	--	--	7.227	1.090	0.9317	1.099	0.0942	1.108
248 66	OC D	--	--	6.952	1.073	0.8807	1.149	0.1710	1.080
248 67	OC D	--	--	7.003	1.073	0.8812	1.149	0.2017	1.105
248 68	OC S	--	--	7.018	1.091	0.9136	1.137	0.2023	1.106
248 69	OC D	--	--	6.985	1.080	0.8654	1.163	0.2189	1.097
248 70	OC D	--	--	6.636	1.088	0.8245	1.166	0.2083	1.110
248 71	OC S	--	--	6.085	1.094	0.7916	1.139	0.1786	1.097
248 72	OC D	--	--	5.468	1.088	0.6867	1.165	0.1649	1.094
248 73	OC D	--	--	4.775	1.069	0.5847	1.183	0.1277	1.085
248 74	RB	--	--	4.024	1.083	0.4968	1.139	0.0508	1.192
248 75	RB	--	--	3.218	1.106	0.3958	1.156	0.0292	1.056
248 76	RB	--	--	2.565	1.100	0.3072	1.151	0.0170	0.984
248 77	RB	--	--	2.009	1.117	0.2318	1.155	0.0091	1.009
248 78	RB	--	--	1.629	1.179	0.1844	1.125	0.0060	0.857
248 79	RR	--	--	1.652	1.188	--	--	--	--
248 80	RR	--	--	1.347	1.134	--	--	--	--
248 81	RR	--	--	0.839	0.801	--	--	--	--

Table 4.1.3-45 ZPPR-17C Radial Reaction Rate Distributions along the X-axis at 18 cm above the Midplane

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	6.421	0.995	7.184	1.008	0.9191	1.058	0.1536	0.998
147 51	IC S CP	6.501	0.995	7.252	1.019	0.9311	1.079	0.1415	1.023
148 51	IC D CP	6.332	1.009	7.171	1.013	0.9163	1.063	0.1574	0.967
148 52	IC S	6.382	1.018	7.316	1.016	0.9306	1.087	0.1437	0.998
148 53	IC S	6.482	1.016	7.360	1.024	0.9419	1.088	0.1432	1.015
148 54	IC D	6.630	0.999	7.399	1.015	0.9298	1.080	0.1637	0.996
148 55	IC D	6.744	1.003	7.575	1.011	0.9516	1.077	0.1670	1.002
148 56	IC S CP	7.053	0.999	8.089	1.008	1.0420	1.061	0.1477	1.001
147 56	IC D CP	6.908	1.004	7.717	1.015	0.9851	1.069	0.1695	0.989
147 57	IC S CP	7.207	0.998	8.065	1.025	1.0540	1.068	0.1527	0.986
147 58	IC D CP	--	--	8.068	1.016	1.0420	1.057	0.1642	1.039
147 59	IC D CP	--	--	8.027	1.031	1.0150	1.095	0.1774	0.992
148 59	IC S CP	--	--	8.331	1.029	1.1000	1.057	0.1502	1.025
148 60	IC D	--	--	8.156	1.029	1.0220	1.102	0.1758	1.020
148 61	IC S	--	--	8.287	1.046	1.0510	1.124	0.1663	1.022
148 62	IC S	--	--	8.373	1.050	1.0620	1.129	0.1720	1.023
148 63	IC D	--	--	8.278	1.056	1.0380	1.133	0.1942	1.046
148 64	IC D	--	--	8.449	1.044	1.0420	1.139	0.2036	1.064
148 65	IC S	--	--	8.420	1.066	1.0530	1.160	0.2044	1.058
148 66	OC D	--	--	8.267	1.072	1.0130	1.172	0.2402	1.049
148 67	OC D	--	--	8.220	1.068	1.0340	1.133	0.2503	1.081
148 68	OC S	--	--	8.042	1.074	1.0340	1.127	0.2267	1.129
148 69	OC D	--	--	7.706	1.074	0.9507	1.159	0.2398	1.105
148 70	OC D	--	--	7.193	1.075	0.8889	1.157	0.2229	1.113
148 71	OC S	--	--	6.556	1.068	0.8775	1.080	0.1824	1.133
148 72	OC D	--	--	5.782	1.068	0.7234	1.148	0.1712	1.097
148 73	OC D	--	--	4.945	1.061	0.6176	1.150	0.1314	1.090
148 74	RB	--	--	4.119	1.078	0.5065	1.138	0.0540	1.155
148 75	RB	--	--	3.325	1.082	0.4061	1.140	0.0293	1.081
148 76	RB	--	--	2.603	1.090	0.3128	1.138	0.0160	1.069
148 77	RB	--	--	2.031	1.106	0.2314	1.160	0.0127	0.739
148 78	RB	--	--	1.644	1.166	0.1893	1.094	0.0069	0.757

Table 4.1.3-46 ZPPR-17C: Radial Reaction Rate Distributions along the X-axis at 18 cm below the Midplane

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
247 50	IC D CR	3.316	1.021	4.387	0.986	0.5191	1.072	0.0934	0.999
247 51	IC S CR	3.969	1.018	4.759	1.021	0.5871	1.106	0.0959	0.990
248 51	IC D CR	3.909	1.002	4.592	1.015	0.5681	1.047	0.0500	1.041
248 52	IC S	4.400	1.009	5.063	1.013	0.6448	1.086	0.0989	0.983
248 53	IC S	4.868	1.003	5.527	1.028	0.7185	1.074	0.1027	1.018
248 54	IC D	5.141	0.998	5.839	1.012	0.7381	1.070	0.1259	0.974
248 55	IC D	5.470	0.984	6.099	1.014	0.7761	1.066	0.1324	0.974
248 56	IC S CP	5.721	0.995	6.616	1.012	0.8607	1.053	0.1135	1.009
247 56	IC D CP	5.688	0.986	6.310	1.017	0.8093	1.065	0.1318	0.995
247 57	IC S CP	5.903	0.990	6.634	1.027	0.8712	1.064	0.1149	1.021
247 58	IC D CP	--	--	6.594	1.022	0.8517	1.064	0.1366	0.980
247 59	IC D CP	--	--	6.582	1.026	0.8369	1.083	0.1377	0.994
248 59	IC S CP	--	--	6.803	1.030	0.8825	1.077	0.1182	1.004
248 60	IC D	--	--	6.533	1.036	0.8187	1.110	0.1415	0.973
248 61	IC S	--	--	6.525	1.050	0.8399	1.112	0.1218	1.041
248 62	IC S	--	--	6.321	1.073	0.8314	1.116	0.1239	1.037
248 63	IC D	--	--	6.139	1.068	0.7876	1.127	0.1432	1.025
248 64	IC D	--	--	6.069	1.054	0.7597	1.144	0.1453	1.059
248 65	IC S	--	--	5.924	1.074	0.7652	1.144	0.1395	1.085
248 66	OC D	--	--	5.883	1.070	0.7286	1.171	0.1710	1.056
248 67	OC D	--	--	5.942	1.082	0.7520	1.150	0.1834	1.097
248 68	OC S	--	--	6.064	1.089	0.7747	1.155	0.1784	1.109
248 69	OC D	--	--	6.037	1.082	0.7423	1.173	0.1919	1.096
248 70	OC D	--	--	5.759	1.090	0.7150	1.169	0.1855	1.089
248 71	OC S	--	--	5.392	1.079	0.7221	1.091	0.1465	1.172
248 72	OC D	--	--	4.790	1.086	0.6092	1.149	0.1427	1.106
248 73	OC D	--	--	4.157	1.077	0.5205	1.165	0.1094	1.113
248 74	RB	--	--	3.529	1.086	0.4349	1.144	0.0451	1.179
248 75	RB	--	--	2.862	1.095	0.3488	1.155	0.0247	1.100
248 76	RB	--	--	2.296	1.085	0.2812	1.110	0.0160	0.916
248 77	RB	--	--	1.790	1.109	0.2058	1.150	0.0084	0.967
248 78	RB	--	--	1.435	1.188	0.1655	1.110	0.0058	0.788

Table 4.1.3-47 ZPPR-17C: Radial Reaction Rate Distributions along the X-axis at 28 cm above the Midplane

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	7.297	1.011	0.9299	1.061	0.1934	1.008
147 51	IC S CP	7.223	1.013	0.9416	1.054	0.1820	1.079
148 51	IC D CP	7.232	1.022	0.9209	1.073	0.1978	0.979
148 52	IC S	7.291	1.009	0.9383	1.065	0.1872	1.031
148 53	IC S	7.367	1.005	0.9544	1.054	0.1865	1.047
148 54	IC D	7.345	1.019	0.9250	1.081	0.2146	0.981
148 55	IC D	7.467	1.020	0.9382	1.084	0.2166	0.987
148 56	IC S CP	7.709	1.025	1.0030	1.068	0.1916	1.006
147 56	IC D CP	7.579	1.025	0.9579	1.086	0.2132	0.995
147 57	IC S CP	7.778	1.026	1.0190	1.066	0.1933	1.014
147 58	IC D CP	7.825	1.031	1.0120	1.067	0.2148	0.984
147 59	IC D CP	7.868	1.031	0.9967	1.089	0.2150	1.027
148 59	IC S CP	8.040	1.023	1.0440	1.069	0.1914	1.038
148 60	IC D	7.986	1.029	0.9994	1.100	0.2218	1.011
148 61	IC S	8.072	1.030	1.0450	1.081	0.2041	1.088
148 62	IC S	8.098	1.040	1.0420	1.099	0.2160	1.050
148 63	IC D	8.162	1.042	1.0080	1.129	0.2423	1.018
148 64	IC D	8.193	1.046	1.0180	1.126	0.2468	1.024
148 65	IC S	8.219	1.047	1.0520	1.108	0.2277	1.063
148 66	OC D	8.118	1.052	0.9985	1.141	0.2473	1.072
148 67	OC D	7.994	1.052	0.9878	1.133	0.2462	1.084
148 68	OC S	7.623	1.070	0.9815	1.121	0.2179	1.120
148 69	OC D	7.257	1.068	0.9053	1.141	0.2288	1.088
148 70	OC D	6.717	1.068	0.8365	1.141	0.2101	1.096
148 71	OC S	6.081	1.058	0.7750	1.124	0.1697	1.117
148 72	OC D	5.326	1.062	0.6594	1.154	0.1573	1.091
148 73	OC D	4.543	1.053	0.5560	1.165	0.1213	1.074
148 74	RB	3.752	1.075	0.4601	1.138	0.0470	1.204
148 75	RB	3.010	1.086	0.3717	1.129	0.0292	0.982
148 76	RB	2.391	1.077	0.2795	1.154	0.0136	1.136
148 77	RB	1.848	1.103	0.2162	1.124	0.0080	1.060
148 78	RB	1.518	1.146	0.1705	1.099	0.0067	0.707

Table 4.1.3-48 ZPPR-17C: Radial Reaction Rate Distributions along the X-axis at 28 cm below the Midplane

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
247 50	IC D CR	3.337	1.029	4.034	1.009	0.4868	1.069	0.1144	0.994
247 51	IC S CR	3.944	1.015	4.367	1.012	0.5385	1.091	0.1163	1.053
248 51	IC D CR	3.552	1.004	3.863	(1.019)	0.4949	1.059	0.1088	1.004
248 52	IC S	4.254	1.024	4.659	0.999	0.5883	1.075	0.1188	1.045
248 53	IC S	4.694	1.009	5.050	1.005	0.6459	1.067	0.1281	1.038
248 54	IC D	4.966	1.008	5.318	1.009	0.6638	1.080	0.1458	1.016
248 55	IC D	5.207	1.008	5.494	1.024	0.6909	1.088	0.1567	0.986
248 56	IC S CP	5.429	1.002	5.841	(1.018)	0.7575	1.065	0.1399	1.012
247 56	IC D CP	5.360	1.011	5.691	1.025	0.7319	1.068	0.1556	1.000
247 57	IC S CP	5.596	0.990	5.891	1.024	0.7733	1.062	0.1433	1.011
247 58	IC D CP	---	---	5.855	1.038	0.7659	1.063	0.1599	0.971
247 59	IC D CP	---	---	5.863	1.030	0.7434	1.088	0.1588	1.010
248 59	IC S CP	---	---	6.013	(1.022)	0.7838	1.065	0.1394	1.039
248 60	IC D	---	---	5.858	1.028	0.7385	1.092	0.1583	1.013
248 61	IC S	---	---	5.729	1.037	0.7497	1.079	0.1474	1.057
248 62	IC S	---	---	5.611	1.043	0.7324	1.089	0.1435	1.082
248 63	IC D	---	---	5.427	1.051	0.6801	1.129	0.1537	1.065
248 64	IC D	---	---	5.223	1.060	0.6512	1.147	0.1572	1.038
248 65	IC S	---	---	5.129	1.061	0.6657	1.118	0.1387	1.110
248 66	OC D	---	---	5.007	1.080	0.6282	1.161	0.1662	1.033
248 67	OC D	---	---	5.131	1.074	0.6317	1.170	0.1684	1.060
248 68	OC S	---	---	5.171	1.085	0.6654	1.141	0.1512	1.127
248 69	OC D	---	---	5.117	1.083	0.6355	1.162	0.1630	1.100
248 70	OC D	---	---	5.294	1.097	0.6732	1.148	0.1684	1.110
248 71	OC S	---	---	4.576	1.073	0.5884	1.131	0.1277	1.134
248 72	OC D	---	---	4.092	1.076	0.5126	1.156	0.1233	1.081
248 73	OC D	---	---	3.548	1.068	0.4394	1.169	0.0967	1.061
248 74	RB	---	---	2.983	1.088	0.3706	1.136	0.0360	1.245
248 75	RB	---	---	2.460	1.082	0.2922	1.169	0.0216	1.058
248 76	RB	---	---	1.931	1.098	0.2286	1.159	0.0138	0.894
248 77	RB	---	---	1.510	1.122	0.1759	1.145	0.0087	0.785
248 78	RB	---	---	1.243	1.172	0.1418	1.104	0.0051	0.758

Table 4.1.3-49 ZPPR-17C: Radial $^{235}\text{U}(n,f)$ Distributions at 45° to the Axes in Matrix Half-1

Matrix	Zone	Z = 5 cm		Z = 18 cm		Z = 28 cm	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	7.075	1.022	7.184	1.008	7.297	1.011
147 51	IC S CP	7.186	1.029	7.252	1.019	7.223	1.013
146 52	IC D	7.467	1.056	7.197	1.022	7.193	1.028
145 53	IC S	7.828	1.057	7.400	1.044	7.356	1.022
145 54	IC D	7.975	1.060	7.443	1.029	7.385	1.028
144 54	IC S	8.185	1.056	7.649	1.043	7.495	1.026
143 55	IC D	8.579	1.042	7.888	1.015	7.666	1.024
143 56	IC S	8.565	1.049	7.978	1.031	7.691	1.022
142 56	IC S	8.656	1.048	7.982	1.039	7.748	1.021
142 57	IC D	8.646	1.063	7.998	1.028	7.800	1.027
141 57	IC S	8.660	1.059	8.099	1.043	7.804	1.032
141 58	IC S	8.710	1.068	8.152	1.053	7.932	1.031
140 58	IC D	8.612	1.069	8.065	1.042	7.914	1.034
140 59	IC S	8.517	1.084	8.172	1.060	7.920	1.041
139 59	IC D	8.473	1.068	8.111	1.045	7.905	1.041
138 60	IC S CP	7.879	1.083	8.140	1.067	7.892	1.052
138 61	IC S CP	7.745	1.051	8.273	1.053	7.963	1.051
138 62	OC D CP	7.370	1.045	8.130	1.054	7.933	1.042
138 63	OC S CP	7.314	1.066	8.005	1.060	7.744	1.051
137 63	OC D CP	7.021	1.068	7.789	1.065	7.523	1.061
136 63	OC D CP	6.883	1.073	7.531	1.068	7.235	1.064
135 63	OC S CP	6.777	1.078	7.256	1.062	6.887	1.060
135 64	OC D	6.644	1.074	6.949	1.062	6.582	1.055
134 64	OC D	6.380	1.066	6.483	1.066	6.110	1.058
133 65	OC D	5.561	1.067	5.501	1.076	5.142	1.062
133 66	OC D	4.999	1.077	4.992	1.067	4.629	1.057
132 66	OC S	4.549	1.072	4.473	1.074	4.132	1.063
132 67	RB	4.073	1.075	4.028	1.064	3.676	1.065
131 67	RB	3.520	1.077	3.453	1.071	3.161	1.068
130 68	RB	2.502	1.099	2.448	1.090	2.222	1.094
130 69	RB	2.135	1.107	2.111	1.085	1.946	1.071
129 69	RB	1.896	1.116	1.827	1.120	1.671	1.115

^aInner core (IC) results are in the internal blanket (IB) for Z = 5 cm.

Table 4.1.3-50 ZPPR-17C: Radial $^{235}\text{U}(n,f)$ Distributions at 45° to the Axes in Matrix Half-2

Matrix	Zone	Z = -5 cm		Z = -18 cm		Z = -28 cm	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
247 50	IC D CR	5.583	0.985	4.387	0.986	4.034	1.009
247 51	IC S CR	6.082	1.022	4.759	1.021	4.367	1.012
246 52	IC D	6.898	1.045	5.531	1.013	5.035	1.019
245 53	IC S	7.367	1.051	5.994	1.035	5.356	1.030
245 54	IC D	7.579	1.049	6.150	1.012	5.556	1.016
244 54	IC S	7.735	1.054	6.391	1.025	5.714	1.012
243 55	IC D	7.975	1.060	6.509	1.016	5.756	1.033
243 56	IC S	7.988	1.063	6.478	1.047	5.760	1.031
242 56	IC S	7.996	1.072	6.594	1.034	5.877	1.013
242 57	IC D	8.118	1.067	6.515	1.031	5.748	1.040
241 57	IC S	8.044	1.072	6.595	1.038	5.733	1.038
241 58	IC S	8.105	1.075	6.613	1.042	5.713	1.045
240 58	IC D	7.890	1.086	6.301	1.053	5.581	1.050
240 59	IC S	7.909	1.078	6.389	1.049	5.585	1.032
239 59	IC D	7.612	1.080	6.095	1.041	5.313	1.043
238 60	IC S CR	6.661	1.062	5.329	1.043	4.621	1.035
238 61	IC S CR	5.559	1.085	4.560	1.047	3.951	1.054
238 62	OC D CR	5.356	1.073	4.349	1.074	4.067	1.076
238 63	OC S CR	6.081	1.073	5.056	1.074	4.336	1.078
237 63	OC D CR	5.348	1.084	4.378	1.080	3.756	1.083
236 63	OC D CR	5.456	1.074	4.498	1.066	3.799	1.076
235 63	OC S CR	5.840	1.081	4.827	1.091	4.105	1.085
235 64	OC D	5.984	1.073	5.055	1.074	4.285	1.069
234 64	OC D	5.850	1.066	4.974	1.071	4.210	1.067
233 65	OC D	5.183	1.073	4.504	1.069	3.768	1.077
233 66	OC D	4.704	1.080	4.171	1.059	3.483	1.069
232 66	OC S	4.281	1.080	3.737	1.079	3.169	1.072
232 67	RB	3.894	1.084	3.422	1.079	2.918	1.068
231 67	RB	3.352	1.096	2.939	1.095	2.510	1.086
230 68	RB	2.470	1.086	2.183	1.081	1.838	1.092
230 69	RB	2.046	1.128	1.815	1.122	1.570	1.104
229 69	RB	1.811	1.135	1.609	1.129	1.379	1.124

^aInner core (IC) results are in the internal blanket (IB) for Z = 5 cm.

Table 4.1.3-51 ZPPR-17C: Axial Reaction Rate Distributions in Matrix 248-51 (near Core Center)

Zone	z(mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
AR	1034.7	---	---	0.900	0.779	---	---	---	---
AR	983.9	---	---	1.356	1.063	---	---	---	---
AR	933.1	---	---	1.787	1.206	---	---	---	---
AR	876.0	---	---	2.043	1.152	---	---	---	---
AR	825.2	---	---	2.022	1.052	---	---	---	---
AB	737.4	1.306	0.964	1.474	1.140	0.1871	1.061	0.0055	0.851
AB	686.6	1.415	0.964	1.642	1.060	0.2062	1.071	0.0096	0.806
AB	635.8	1.594	0.984	1.885	1.022	0.2448	1.037	0.0121	1.108
AB	585.0	1.860	1.015	2.138	1.053	0.2827	1.059	0.0194	1.069
AB	534.2	2.161	1.032	2.463	1.041	0.3226	1.062	0.0331	1.081
Zone Average C/E			0.992	1.063		1.058		0.983	
Standard Deviation			0.031	0.045		0.013		0.143	
IC D	483.4	2.491	1.007	2.717	1.024	0.3494	1.065	0.0709	0.986
IC D	432.6	2.879	1.008	3.034	1.029	0.3929	1.055	0.0907	1.014
IC D	381.8	3.193	1.012	3.386	1.016	0.4341	1.049	0.1032	1.009
IC D	331.0	3.414	1.025	3.631	1.019	0.4585	1.069	0.1103	1.030
IC D	280.2	3.491	1.020	3.770	1.021	0.4827	1.057	0.1117	1.003
IC D	229.4	3.552	1.004	3.863	1.019	0.4949	1.059	0.1088	1.004
IC D	178.6	3.525	1.000	4.107	0.989	0.5175	1.053	0.0908	1.013
Zone Average C/E			1.011	1.017		1.058		1.006	
Standard Deviation			0.009	0.013		0.007		0.020	
IB	127.8	3.909	1.002	4.592	1.015	0.5681	1.047	0.0500	1.041
IB	100.4	4.020	1.000	4.833	1.010	0.5946	1.041	0.0421	1.022
IB	77.0	4.170	0.988	5.025	1.009	0.6173	1.037	0.0364	1.034
IB	49.6	4.375	1.006	5.314	1.016	0.6497	1.048	0.0349	0.998
IB	26.2	4.735	0.992	5.671	1.024	0.6850	1.058	0.0334	1.032
Zone Average C/E			0.998	1.015		1.046		1.025	
Standard Deviation			0.007	0.006		0.007		0.017	

Table 4.1.3-52 ZPPR-17C: Axial Reaction Rate Distributions in Matrix 148-51 (near Core Center)

Zone	z(mm)	²³⁹ Pu(n,f)		²³⁵ U(n,f)		²³⁸ U(n,γ)		²³⁸ U(n,f)	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
IB	26.2	5.625	0.995	6.648	1.008	0.8000	1.046	0.0390	1.013
IB	49.6	5.924	1.005	6.990	(1.018)	0.8319	1.062	0.0444	(0.996)
IB	77.0	6.267	1.011	7.211	1.032	0.8680	1.069	0.0534	0.986
IB	100.4	6.482	1.001	7.371	(1.022)	0.8921	1.058	0.0604	(1.051)
IB	127.8	6.596	1.005	7.428	1.020	0.8985	1.064	0.0775	1.033
			-----		-----		-----		-----
	Zone Average C/E		1.003		1.020		1.059		1.016
	Standard Deviation		0.006		0.009		0.009		0.027
IC D	178.6	6.332	1.009	7.171	1.013	0.9163	1.063	0.1574	0.967
IC D	229.4	6.609	1.010	7.106	1.030	0.9108	1.075	0.1865	0.993
IC D	280.2	6.846	1.001	7.232	1.022	0.9209	1.073	0.1978	0.979
IC D	331.0	6.725	1.029	7.026	1.045	0.9013	1.091	0.2028	0.988
IC D	381.8	6.494	1.010	6.758	1.039	0.8855	1.059	0.1876	1.003
IC D	432.6	6.064	1.001	6.458	1.018	0.8302	1.058	0.1684	1.015
IC D	483.4	5.555	0.987	6.029	1.017	0.7786	1.054	0.1386	0.960
			-----		-----		-----		-----
	Zone Average C/E		1.007		1.026		1.068		0.983
	Standard Deviation		0.013		0.012		0.013		0.021
AB	534.2	--	--	5.832	1.027	0.7209	1.091	0.0639	1.051
AB	585.0	--	--	5.405	1.044	0.6618	1.093	0.0414	0.960
AB	635.8	--	--	5.008	1.045	0.5845	1.115	0.0279	0.962
AB	686.6	--	--	4.577	1.077	0.5135	1.140	0.0190	0.838
AB	737.4	--	--	4.222	1.120	0.4592	1.146	0.0107	0.945
			-----		-----		-----		-----
	Zone Average C/E		--		1.063		1.117		0.951
	Standard Deviation		--		0.037		0.026		0.076
AR	825.2	--	--	4.668	1.099	--	--	--	--
AR	876.0	--	--	4.350	1.155	--	--	--	--
AR	933.1	--	--	3.453	1.251	--	--	--	--
AR	983.9	--	--	2.550	1.120	--	--	--	--
AR	1034.7	--	--	1.597	0.861	--	--	--	--

Table 4.1.3-53 ZPPR-17C: Axial Reaction Rate Distributions
in Matrix 248-70 (Outer Core)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
AB	737.4	1.406	1.100	0.1657	1.118	0.0078	0.619
AB	686.6	1.597	1.077	0.1905	1.149	0.0084	0.953
AB	635.8	1.876	1.050	0.2342	1.108	0.0137	1.017
AB	585.0	2.169	1.068	0.2739	1.133	0.0211	1.051
AB	534.2	2.535	1.054	0.3199	1.129	0.0370	1.072
Zone Average C/E			1.070		1.127		0.942
Standard Deviation			0.020		0.016		0.186
OC D	483.4	2.881	1.080	0.3696	1.133	0.0738	1.070
OC D	432.6	3.361	1.091	0.4244	1.157	0.0993	1.104
OC D	381.8	3.897	1.089	0.4935	1.148	0.1213	1.087
OC D	331.0	4.384	1.095	0.5559	1.152	0.1393	1.104
OC D	280.2	4.912	1.082	0.6138	1.153	0.1499	1.141
OC D	229.4	5.294	1.097	0.6732	1.148	0.1684	1.110
OC D	178.6	5.759	1.090	0.7150	1.169	0.1855	1.089
OC D	102.4	6.230	1.105	0.7849	1.167	0.2016	1.095
OC D	51.6	6.636	1.088	0.8245	1.166	0.2083	1.110
Zone Average C/E			1.091		1.155		1.097
Standard Deviation			0.008		0.012		0.024

Table 4.1.3-54 ZPPR-17C: Axial Reaction Rate Distributions
in Matrix 148-70 (Outer Core)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC D	51.6	7.074	1.088	0.8810	1.163	0.2270	1.085
OC D	102.4	7.166	1.090	0.8865	1.172	0.2301	1.087
OC D	178.6	7.193	1.075	0.8889	1.157	0.2229	1.113
OC D	229.4	6.971	1.074	0.8701	1.144	0.2184	1.102
OC D	280.2	6.717	1.068	0.8365	1.141	0.2101	1.096
OC D	331.0	6.236	1.091	0.7828	1.158	0.1957	1.105
OC D	381.8	5.700	1.088	0.7155	1.155	0.1796	1.061
OC D	432.6	5.113	1.082	0.6444	1.147	0.1482	1.099
OC D	483.4	4.531	1.077	0.5715	1.146	0.1087	1.107
			-----		-----		-----
	Zone Average C/E		1.081		1.154		1.095
	Standard Deviation		0.008		0.010		0.016
AB	534.2	4.150	1.046	0.5286	1.105	0.0573	1.066
AB	585.0	3.704	1.048	0.4601	1.121	0.0315	1.091
AB	635.8	3.245	1.052	0.4029	1.102	0.0221	0.986
AB	686.6	2.828	1.085	0.3418	1.124	0.0117	1.072
AB	737.4	2.549	1.109	0.2933	1.135	0.0098	0.783
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	Zone Average C/E		1.068		1.117		1.000
	Standard Deviation		0.028		0.014		0.128

Table 4.1.3-55 ZPPR-17C: Reaction Rate Ratios along the X-axis at 5 cm above the Midplane

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IB CP	1.195	1.030	0.1407	1.072	0.00732	1.041
147 51	IB CP	1.168	1.036	0.1410	1.055	0.00729	1.010
148 51	IB CP	1.151	1.021	0.1385	1.057	0.00853	0.975
148 52	IB	1.165	1.021	0.1403	1.048	0.00708	1.009
148 53	IB	1.153	1.031	0.1386	1.054	0.00668	1.041
148 54	IB	1.164	1.020	0.1400	1.041	0.00680	1.012
148 55	IB	1.150	1.034	0.1376	1.056	0.00670	1.008
148 56	IB	1.165	1.017	0.1345	1.071	0.00635	1.045
147 56	IB	1.148	1.030	0.1366	1.056	0.00652	1.025
147 57	IB	1.149	1.024	0.1332	1.077	0.00654	1.013
Zone Average C/E		1.026		1.059		1.018	
Standard Deviation		0.007		0.011		0.021	

Table 4.1.3-56 ZPPR-17C: Reaction Rate Ratios along the X-axis at 5 cm below the Midplane

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IB CR	1.380	0.974	0.1584	1.041	0.00862	0.989
147 51	IB CR	1.229	1.026	0.1446	1.067	0.00735	1.014
148 51	IB CR	1.198	1.032	0.1447	1.067	0.00706	1.040
148 52	IB	1.176	1.020	0.1414	1.052	0.00713	0.965
148 53	IB	1.147	1.043	0.1375	1.068	0.00655	1.004
148 54	IB	1.149	1.040	0.1384	1.054	0.00622	1.040
148 55	IB	1.140	1.048	0.1375	1.056	0.00617	1.029
148 56	IB	1.148	1.035	0.1335	1.080	0.00640	0.979
147 56	IB	1.128	1.053	0.1355	1.066	0.00602	1.047
147 57	IB	1.138	1.037	0.1321	1.086	0.00626	1.000
Zone Average C/E			1.031		1.060		1.011
Standard Deviation			0.022		0.009		0.028

Table 4.1.3-57 ZPPR-17C: Reaction Rate Ratios along the X-axis at 18 cm above the Midplane

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
147 50	IC D CP	1.119	1.013	0.1431	1.063	0.02392	1.003
147 51	IC S CP	1.116	1.024	0.1432	1.084	0.02177	1.028
148 51	IC D CP	1.133	1.004	0.1447	1.054	0.02486	0.958
148 52	IC S	1.146	0.998	0.1458	1.068	0.02252	0.980
148 53	IC S	1.135	1.008	0.1453	1.071	0.02209	0.999
148 54	IC D	1.116	1.016	0.1402	1.081	0.02469	0.997
148 55	IC D	1.123	1.008	0.1411	1.074	0.02476	0.999
148 56	IC S	1.147	1.009	0.1477	1.062	0.02094	1.002
147 56	IC D	1.117	1.011	0.1426	1.065	0.02454	0.985
147 57	IC S	1.119	1.027	0.1462	1.070	0.02119	0.988
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	Zone Average C/E		1.012		1.069		0.994
	Standard Deviation		0.009		0.009		0.018

Table 4.1.3-58 ZPPR-17C: Reaction Rate Ratios along the X-axis at 18 cm below the Midplane

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
247 50	IC D CR	1.323	0.966	0.1565	1.050	0.02818	0.978
247 51	IC S CR	1.199	1.003	0.1479	1.086	0.02417	0.972
248 51	IC D CR	1.175	1.013	0.1453	1.045	0.01279	1.039
248 52	IC S	1.151	1.004	0.1465	1.076	0.02249	0.974
248 53	IC S	1.135	1.025	0.1476	1.071	0.02110	1.015
248 54	IC D	1.136	1.014	0.1436	1.072	0.02449	0.976
248 55	IC D	1.115	1.030	0.1419	1.083	0.02420	0.990
248 56	IC S	1.156	1.017	0.1504	1.058	0.01984	1.014
247 56	IC D	1.109	1.031	0.1423	1.080	0.02317	1.009
247 57	IC S	1.124	1.037	0.1476	1.075	0.01946	1.031
Zone Average C/E			1.014		1.070		1.000
Standard Deviation			0.020		0.014		0.025

Table 4.1.3-59 ZPPR-17C: Reaction Rate Ratios along the X-axis at 28 cm below the Midplane

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
247 50	IC D CR	1.209	0.981	0.1459	10396	0.03428	0.966
247 51	IC S CR	1.107	0.997	0.1365	1.075	0.02949	1.037
248 51	IC D CR	1.088	1.015	0.1393	1.055	0.03063	1.000
248 52	IC S	1.095	0.976	0.1383	1.050	0.02793	1.021
248 53	IC S	1.076	0.996	0.1376	1.057	0.02729	1.029
248 54	IC D	1.071	1.001	0.1337	1.071	0.02936	1.008
248 55	IC D	1.055	1.016	0.1327	1.079	0.03009	0.978
248 56	IC S	1.076	1.016	0.1395	1.063	0.02577	1.010
247 56	IC D	1.062	1.014	0.1365	1.056	0.02903	0.989
247 57	IC S	1.053	1.034	0.1382	1.073	0.02561	1.021
Zone Average C/E			1.005		1.062		1.006
Standard Deviation			0.018		0.013		0.023

Table 4.1.3-60 ZPPR-17C: Reaction Rate Ratios in Matrix 248-51 (near Core Center)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
AB	737.4	1.129	1.183	0.1433	1.101	0.00424	0.883
AB	686.6	1.160	1.100	0.1457	1.111	0.00681	0.836
AB	635.8	1.183	1.039	0.1536	1.054	0.00760	1.126
AB	585.0	1.149	1.037	0.1520	1.043	0.01045	1.053
AB	534.2	1.140	1.009	0.1493	1.029	0.01532	1.047
Zone Average C/E			1.074		1.068		0.989
Standard Deviation			0.070		0.036		0.123
IC D	483.4	1.091	1.017	0.1403	1.058	0.02845	0.979
IC D	432.6	1.054	1.021	0.1365	1.047	0.03150	1.006
IC D	381.8	1.060	1.004	0.1360	1.037	0.03232	0.997
IC D	331.0	1.064	0.994	0.1343	1.043	0.03231	1.005
IC D	280.2	1.080	1.001	0.1383	1.036	0.03200	0.983
IC D	229.4	1.088	1.015	0.1393	1.055	0.03063	1.000
IC D	178.6	1.165	0.989	0.1468	1.053	0.02575	1.013
Zone Average C/E			1.006		1.047		0.998
Standard Deviation			0.012		0.009		0.012
IB	127.8	1.175	1.013	0.1453	1.045	0.01279	1.039
IB	100.4	1.202	1.010	0.1479	1.041	0.01048	1.022
IB	77.0	1.205	1.021	0.1480	1.050	0.00874	1.047
IB	49.6	1.215	1.010	0.1485	1.042	0.00797	0.992
IB	26.2	1.198	1.032	0.1447	1.067	0.00706	1.040
Zone Average C/E			1.017		1.049		1.028
Standard Deviation			0.009		0.011		0.022

Table 4.1.3-61 ZPPR-17C: Reaction Rate Ratios in Matrix 148-51 (near Core Center)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
IB	26.2	1.182	1.013	0.1422	1.051	0.00693	1.018
IB	49.6	1.180	1.013	0.1404	1.057	0.00750	0.991
IB	77.0	1.151	1.021	0.1385	1.057	0.00853	0.975
IB	100.4	1.137	1.021	0.1376	1.057	0.00932	1.050
IB	127.8	1.126	1.015	0.1362	1.059	0.01175	1.028
Zone Average C/E			1.017		1.056		1.012
Standard Deviation			0.004		0.003		0.029
IC D	178.6	1.133	1.004	0.1447	1.054	0.02486	0.958
IC D	229.4	1.075	1.020	0.1378	1.064	0.02822	0.983
IC D	280.2	1.056	1.021	0.1345	1.072	0.02889	0.978
IC D	331.0	1.045	1.016	0.1340	1.060	0.03016	0.960
IC D	381.8	1.041	1.029	0.1364	1.049	0.02889	0.993
IC D	432.6	1.065	1.017	0.1369	1.057	0.02777	1.014
IC D	483.4	1.085	1.030	0.1402	1.068	0.02495	0.973
Zone Average C/E			1.020		1.061		0.980
Standard Deviation			0.009		0.008		0.020

Table 4.1.3-62 Basic Data for $^{239}\text{Pu}(n,f)$ Radial Distributions in ZPPR-17C

Matrix	Loc ^a	z=51.6 mm ^b		Loc ^a	z=178.6 mm ^b		z=280.2 mm ^b	
Data on the X Axis ^c								
247 50	HI	4.047	0.028	JK	3.350	0.025	3.359	0.024
247 51	HI	4.949	0.031	IJ	4.061	0.029	3.977	0.030
248 52	HI	5.436	0.033	IJ	4.503	0.029	4.290	0.029
248 53	HI	6.012	0.034	IJ	4.981	0.032	4.734	0.032
248 54	HI	6.300	0.036	JK	5.199	0.033	5.019	0.030
248 55	HI	6.615	0.039	JK	5.532	0.034	5.263	0.031
248 56	HI	7.030	0.040	IJ	5.788	0.034	5.418	0.032
247 56	HI	6.924	0.037	JK	5.752	0.033	5.417	0.032
247 57	HI	7.174	0.040	IJ	6.008	0.033	5.647	0.033
147 50	HI	5.919	0.035	FG	6.517	0.037		
147 51	HI	6.152	0.035	GH	6.653	0.037		
148 52	HI	6.285	0.035	GH	6.531	0.036		
148 53	HI	6.550	0.034	GH	6.633	0.035		
148 54	HI	6.695	0.038	FG	6.705	0.038		
148 55	HI	7.078	0.039	FG	6.820	0.038		
148 56	HI	7.426	0.043	GH	7.135	0.038		
147 56	HI	7.270	0.039	FG	6.986	0.039		
147 57	HI	7.583	0.041	GH	7.335	0.042		

^aIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10^{-18} fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-63 Basic Data for $^{235}\text{U}(n,f)$ Radial Distributions in ZPPR-17C

Matrix	Loc ^a	Z=51.6 mm ^b	Loc ^a	Z=178.6 mm ^b	Z=280.2 mm ^b
Data on the X Axis ^c					
247 50	HI	5.520 0.026	JK	4.359 0.022	4.034 0.021
247 51	HI	6.089 0.030	IJ	4.761 0.024	4.368 0.024
248 52	HI	6.398 0.033	IJ	5.065 0.028	4.659 0.025
248 53	HI	6.901 0.032	IJ	5.529 0.027	5.051 0.026
248 54	HI	7.249 0.035	JK	5.854 0.027	5.339 0.027
248 55	HI	7.549 0.032	JK	6.115 0.028	5.515 0.029
248 56	HI	7.951 0.038	IJ	6.530 0.032	5.835 0.029
247 56	HI	7.820 0.037	JK	6.327 0.029	5.714 0.030
247 57	HI	8.038 0.038	IJ	6.591 0.032	5.903 0.030
247 58	HI	8.126 0.039	JK	6.604 0.034	5.885 0.031
247 59	HI	8.203 0.035	JK	6.599 0.030	5.886 0.030
248 59	HI	8.242 0.037	IJ	6.802 0.033	6.043 0.029
248 60	HI	8.139 0.036	JK	6.550 0.029	5.881 0.028
248 61	HI	8.009 0.038	IJ	6.528 0.030	5.730 0.027
248 62	HI	7.889 0.038	IJ	6.323 0.032	5.612 0.028
248 63	HI	7.793 0.036	JK	6.155 0.032	5.448 0.028
248 64	HI	7.532 0.035	JK	6.085 0.029	5.243 0.025
248 65	HI	7.236 0.035	IJ	5.926 0.031	5.130 0.025
248 66	JK	7.004 0.032	JK	5.899 0.029	5.027 0.027
248 67	JK	7.014 0.032	JK	5.951 0.030	5.139 0.025
248 68	IJ	7.036 0.034	IJ	6.079 0.029	5.184 0.029
248 69	JK	6.996 0.034	JK	6.047 0.030	5.125 0.027
248 71	IJ	6.101 0.030	IJ	5.406 0.028	4.587 0.025
248 72	JK	5.476 0.028	JK	4.798 0.026	4.099 0.023
248 73	JK	4.761 0.025	JK	4.145 0.022	3.538 0.021
248 74	IJ	4.015 0.022	IJ	3.521 0.020	2.977 0.018
248 75	IJ	3.234 0.020	IJ	2.877 0.017	2.473 0.016
248 76	IJ	2.578 0.018	IJ	2.308 0.016	1.941 0.015
248 77	IJ	2.019 0.013	IJ	1.799 0.011	1.518 0.010
248 78	IJ	1.664 0.012	IJ	1.465 0.012	1.270 0.009
248 79	TC	1.652 0.011			
248 80	TC	1.347 0.009			
248 81	TC	0.839 0.007			
147 50	HI	6.969 0.033	FG	7.194 0.032	7.335 0.033
147 51	HI	7.195 0.033	GH	7.254 0.034	7.224 0.033
148 52	HI	7.333 0.035	GH	7.319 0.034	7.293 0.033
148 53	HI	7.562 0.034	GH	7.363 0.034	7.368 0.036
148 54	HI	7.803 0.033	FG	7.418 0.033	7.373 0.033
148 55	HI	8.148 0.037	FG	7.595 0.036	7.497 0.034
148 56	HI	8.518 0.036	GH	7.984 0.035	7.701 0.037
147 56	HI	8.355 0.036	FG	7.737 0.034	7.608 0.035
147 57	HI	8.584 0.036	GH	8.012 0.035	7.794 0.036
147 58	HI	8.741 0.038	FG	8.080 0.036	7.866 0.035
147 59	HI	8.788 0.041	FG	8.048 0.037	7.899 0.039
148 59	HI	8.796 0.041	GH	8.331 0.039	8.081 0.035

Table 4.1.3-63 (contd)

Matrix	Loc ^a	Z=51.6 mm ^b	Loc ^a	Z=178.6 mm ^b	Z=280.2 mm ^b
148 60	HI	8.720 0.040	FG	8.177 0.037	8.017 0.036
148 61	HI	8.675 0.039	GH	8.291 0.037	8.074 0.036
148 62	HI	8.567 0.040	GH	8.376 0.040	8.099 0.037
148 63	HI	8.520 0.038	FG	8.300 0.040	8.194 0.040
148 64	HI	8.367 0.040	FG	8.471 0.041	8.225 0.039
148 65	HI	8.160 0.039	IJ	8.424 0.040	8.220 0.038
148 66	FG	7.848 0.038	FG	8.288 0.040	8.150 0.038
148 67	FG	7.799 0.036	FG	8.233 0.040	8.007 0.038
148 68	GH	7.722 0.035	GH	8.063 0.037	7.643 0.039
148 69	FG	7.638 0.038	FG	7.719 0.036	7.269 0.034
148 71	GH	6.485 0.032	GH	6.572 0.034	6.096 0.033
148 72	FG	5.807 0.030	FG	5.791 0.029	5.335 0.030
148 73	FG	4.997 0.027	FG	4.931 0.027	4.530 0.026
148 74	GH	4.179 0.024	GH	4.110 0.023	3.744 0.021
148 75	GH	3.410 0.021	GH	3.342 0.020	3.025 0.019
148 76	GH	2.683 0.017	GH	2.616 0.017	2.403 0.016
148 77	GH	2.087 0.013	GH	2.042 0.012	1.857 0.012
148 78	GH	1.744 0.011	GH	1.679 0.012	1.551 0.011
148 79	TC	1.720 0.011			
148 80	TC	1.372 0.010			
148 81	TC	0.855 0.007			

Data on the 45° Radial

246 52	HI	6.906 0.033	JK	5.546 0.026	5.054 0.024
245 53	HI	7.376 0.032	IJ	5.997 0.029	5.357 0.028
245 54	HI	7.588 0.034	JK	6.166 0.028	5.578 0.026
244 54	HI	7.745 0.035	IJ	6.393 0.029	5.715 0.027
243 55	HI	7.984 0.036	JK	6.526 0.030	5.779 0.028
243 56	HI	7.997 0.037	IJ	6.481 0.031	5.761 0.028
242 56	HI	8.005 0.033	IJ	6.597 0.030	5.879 0.027
242 57	HI	8.127 0.037	JK	6.532 0.032	5.770 0.028
241 57	HI	8.054 0.037	IJ	6.597 0.033	5.734 0.029
241 58	HI	8.115 0.038	IJ	6.615 0.030	5.714 0.029
240 58	HI	7.899 0.036	JK	6.318 0.031	5.603 0.028
240 59	HI	7.918 0.036	IJ	6.391 0.029	5.586 0.026
239 59	HI	7.621 0.034	JK	6.111 0.028	5.334 0.027
238 60	HI	6.669 0.031	IJ	5.331 0.025	4.622 0.024
238 61	HI	5.496 0.028	IJ	4.533 0.025	3.927 0.023
238 63	IJ	6.096 0.029	IJ	5.068 0.024	4.347 0.023
237 63	JK	5.391 0.027	JK	4.413 0.023	3.786 0.019
236 63	JK	5.499 0.025	JK	4.534 0.023	3.829 0.021
235 63	IJ	5.854 0.030	IJ	4.839 0.026	4.116 0.022
235 64	JK	5.994 0.027	JK	5.063 0.024	4.292 0.022
234 64	JK	5.860 0.027	JK	4.982 0.024	4.217 0.021
233 65	JK	5.192 0.026	JK	4.511 0.025	3.774 0.022
233 66	JK	4.711 0.024	JK	4.177 0.021	3.489 0.021
232 66	IJ	4.273 0.024	IJ	3.730 0.020	3.163 0.019
232 67	IJ	3.885 0.020	IJ	3.414 0.019	2.912 0.017

Table 4.1.3-63 (contd)

Matrix	Loc ^a	Z=51.6 mm ^b	Loc ^a	Z=178.6 mm ^b	Z=280.2 mm ^b
231 67	IJ	3.369 0.019	IJ	2.954 0.017	2.523 0.016
230 68	IJ	2.482 0.015	IJ	2.194 0.014	1.847 0.013
230 69	IJ	2.057 0.011	IJ	1.824 0.010	1.578 0.009
229 69	IJ	1.820 0.010	IJ	1.617 0.009	1.386 0.010
146 52	HI	7.476 0.035	FG	7.216 0.033	7.221 0.034
145 53	HI	7.838 0.035	GH	7.403 0.033	7.357 0.033
145 54	HI	7.984 0.036	FG	7.462 0.034	7.414 0.035
144 54	HI	8.195 0.034	GH	7.652 0.032	7.496 0.035
143 55	HI	8.590 0.036	FG	7.909 0.034	7.696 0.033
143 56	HI	8.575 0.036	GH	7.981 0.033	7.693 0.032
142 56	HI	8.666 0.036	GH	7.985 0.033	7.749 0.034
142 57	HI	8.657 0.038	FG	8.019 0.036	7.831 0.036
141 57	HI	8.670 0.036	GH	8.102 0.034	7.806 0.033
141 58	HI	8.721 0.036	GH	8.155 0.036	7.934 0.033
140 58	HI	8.622 0.036	FG	8.086 0.034	7.945 0.033
140 59	HI	8.527 0.038	GH	8.175 0.034	7.921 0.035
139 59	HI	8.483 0.036	FG	8.132 0.036	7.936 0.036
138 60	HI	7.888 0.035	GH	8.143 0.036	7.893 0.035
138 61	HI	7.628 0.035	GH	8.218 0.037	7.979 0.036
138 63	GH	7.332 0.035	GH	8.025 0.036	7.764 0.036
137 63	FG	7.077 0.033	FG	7.851 0.038	7.583 0.035
136 63	FG	6.938 0.032	FG	7.591 0.036	7.292 0.034
135 63	GH	6.794 0.032	GH	7.275 0.034	6.904 0.032
135 64	FG	6.655 0.030	FG	6.960 0.032	6.592 0.030
134 64	FG	6.390 0.030	FG	6.493 0.030	6.120 0.030
133 65	FG	5.570 0.027	FG	5.510 0.027	5.150 0.025
133 66	FG	5.007 0.025	FG	5.000 0.025	4.636 0.023
132 66	GH	4.540 0.023	GH	4.465 0.023	4.124 0.022
132 67	IJ	4.064 0.021	IJ	4.019 0.021	3.668 0.020
131 67	IJ	3.538 0.019	IJ	3.470 0.019	3.178 0.018
130 68	IJ	2.515 0.013	IJ	2.461 0.013	2.233 0.012
130 69	IJ	2.146 0.012	IJ	2.122 0.012	1.956 0.011
129 69	IJ	1.906 0.012	IJ	1.836 0.011	1.679 0.010

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-64 Basic Data for $^{238}\text{U}(n,f)$ and $^{238}\text{U}(n,\gamma)$ Radial Distributions in ZPPR-17C

Matrix	Loc ^a	$^{238}\text{U}(n,f)^c$		$^{238}\text{U}(n,\gamma)^c$		
Data at Z = 51.6 mm ^b						
247	50	HI	0.0347	0.0014	0.6057	0.0044
247	51	HI	0.0364	0.0015	0.6711	0.0045
248	52	HI	0.0388	0.0018	0.7207	0.0047
248	53	HI	0.0394	0.0018	0.7751	0.0046
248	54	HI	0.0393	0.0015	0.8178	0.0054
248	55	HI	0.0409	0.0016	0.8530	0.0048
248	56	HI	0.0442	0.0015	0.8882	0.0053
247	56	HI	0.0418	0.0015	0.8800	0.0054
247	57	HI	0.0441	0.0017	0.8965	0.0060
247	58	HI	0.0456	0.0018	0.9121	0.0056
247	59	HI	0.0456	0.0018	0.9139	0.0055
248	59	HI	0.0453	0.0017	0.9349	0.0058
248	60	HI	0.0470	0.0016	0.9176	0.0064
248	61	HI	0.0471	0.0016	0.9160	0.0055
248	62	HI	0.0521	0.0019	0.9290	0.0052
248	63	HI	0.0578	0.0018	0.9159	0.0052
248	64	HI	0.0680	0.0020	0.8996	0.0054
248	65	HI	0.0944	0.0022	0.8736	0.0054
248	66	JK	0.1778	0.0029	1.0051	0.0055
248	67	JK	0.2071	0.0034	0.9863	0.0055
248	68	IJ	0.2114	0.0030	0.9854	0.0055
248	69	JK	0.2248	0.0039	0.9686	0.0055
248	71	IJ	0.1866	0.0035	0.8537	0.0050
248	72	JK	0.1693	0.0030	0.7686	0.0050
248	73	JK	0.1307	0.0025	0.6727	0.0040
248	74	IJ	0.0557	0.0018	0.4857	0.0037
248	75	IJ	0.0296	0.0014	0.3891	0.0032
248	76	IJ	0.0172	0.0017	0.3020	0.0037
248	77	IJ	0.0092	0.0011	0.2279	0.0024
248	78	IJ	0.0072	0.0018	0.1754	0.0021
147	50	HI	0.0425	0.0015	0.7879	0.0046
147	51	HI	0.0450	0.0018	0.8137	0.0047
148	52	HI	0.0446	0.0015	0.8272	0.0047
148	53	HI	0.0439	0.0017	0.8513	0.0048
148	54	HI	0.0456	0.0015	0.8788	0.0049
148	55	HI	0.0475	0.0016	0.9135	0.0052
148	56	HI	0.0463	0.0015	0.9451	0.0060
147	56	HI	0.0475	0.0015	0.9314	0.0062
147	57	HI	0.0487	0.0015	0.9558	0.0056
147	58	HI	0.0529	0.0020	0.9714	0.0054
147	59	HI	0.0510	0.0020	0.9836	0.0060
148	59	HI	0.0497	0.0020	0.9892	0.0055
148	60	HI	0.0507	0.0021	0.9845	0.0055
148	61	HI	0.0501	0.0024	0.9775	0.0054

Table 4.1.3-64 (contd)

Matrix	Loc ^a	²³⁸ U(n,f) ^c		²³⁸ U(n,γ) ^c	
148 62	HI	0.0544	0.0021	0.9911	0.0060
148 63	HI	0.0630	0.0020	0.9910	0.0055
148 64	HI	0.0783	0.0024	0.9940	0.0056
148 65	HI	0.1080	0.0026	0.9798	0.0055
148 66	FG	0.2016	0.0032	1.1238	0.0061
148 67	FG	0.2344	0.0035	1.0972	0.0065
148 68	GH	0.2314	0.0033	1.0702	0.0063
148 69	FG	0.2426	0.0033	1.0420	0.0061
148 71	GH	0.1964	0.0030	0.9026	0.0055
148 72	FG	0.1805	0.0033	0.8124	0.0052
148 73	FG	0.1394	0.0028	0.7042	0.0047
148 74	GH	0.0609	0.0018	0.5133	0.0038
148 75	GH	0.0310	0.0013	0.4074	0.0033
148 76	GH	0.0176	0.0012	0.3175	0.0028
148 77	GH	0.0102	0.0011	0.2425	0.0028
148 78	GH	0.0063	0.0010	0.1862	0.0023

Data at Z = 178.6 mm^b

247 50	JK	0.0947	0.0023	0.5809	0.0041
247 51	IJ	0.1023	0.0020	0.6627	0.0049
248 52	IJ	0.1055	0.0024	0.7279	0.0044
248 53	IJ	0.1094	0.0024	0.8112	0.0048
248 54	JK	0.1285	0.0025	0.8543	0.0049
248 55	JK	0.1351	0.0023	0.8983	0.0050
248 56	IJ	0.1216	0.0022	0.9560	0.0058
247 56	JK	0.1345	0.0023	0.9367	0.0052
247 57	IJ	0.1231	0.0023	0.9804	0.0058
247 58	JK	0.1384	0.0026	0.9892	0.0054
247 59	JK	0.1405	0.0026	0.9687	0.0057
248 59	IJ	0.1267	0.0026	1.0065	0.0060
248 60	JK	0.1444	0.0028	0.9475	0.0057
248 61	IJ	0.1299	0.0024	0.9482	0.0057
248 62	IJ	0.1321	0.0025	0.9385	0.0052
248 63	JK	0.1461	0.0025	0.9116	0.0051
248 64	JK	0.1482	0.0026	0.8793	0.0050
248 65	IJ	0.1487	0.0023	0.8639	0.0053
248 66	JK	0.1745	0.0030	0.8433	0.0053
248 67	JK	0.1883	0.0033	0.8417	0.0052
248 68	IJ	0.1864	0.0029	0.8355	0.0048
248 69	JK	0.1970	0.0032	0.8307	0.0049
248 71	IJ	0.1531	0.0029	0.7788	0.0046
248 72	JK	0.1466	0.0027	0.6818	0.0042
248 73	JK	0.1120	0.0024	0.5988	0.0040
248 74	IJ	0.0495	0.0018	0.4252	0.0034
248 75	IJ	0.0250	0.0017	0.3430	0.0030
248 76	IJ	0.0162	0.0012	0.2765	0.0027
248 77	IJ	0.0085	0.0011	0.2024	0.0024
248 78	IJ	0.0069	0.0010	0.1574	0.0019

Table 4.1.3-64 (contd)

Matrix	Loc ^a	²³⁸ U(n,f) ^c	²³⁸ U(n,γ) ^c
147 50	FG	0.1556 0.0027	1.0675 0.0058
147 51	GH	0.1508 0.0026	1.0511 0.0057
148 52	GH	0.1532 0.0029	1.0506 0.0061
148 53	GH	0.1526 0.0026	1.0633 0.0057
148 54	FG	0.1671 0.0028	1.0762 0.0058
148 55	FG	0.1704 0.0025	1.1014 0.0063
148 56	GH	0.1583 0.0026	1.1575 0.0066
147 56	FG	0.1729 0.0027	1.1401 0.0065
147 57	GH	0.1636 0.0029	1.1856 0.0063
147 58	FG	0.1663 0.0030	1.2103 0.0065
147 59	FG	0.1810 0.0028	1.1745 0.0063
148 59	GH	0.1610 0.0030	1.2543 0.0068
148 60	FG	0.1794 0.0029	1.1830 0.0068
148 61	GH	0.1773 0.0029	1.1866 0.0064
148 62	GH	0.1833 0.0033	1.1992 0.0064
148 63	FG	0.1982 0.0031	1.2010 0.0068
148 64	FG	0.2078 0.0033	1.2056 0.0064
148 65	IJ	0.2180 0.0035	1.1885 0.0065
148 66	FG	0.2451 0.0038	1.1728 0.0069
148 67	FG	0.2569 0.0044	1.1573 0.0071
148 68	GH	0.2369 0.0033	1.1154 0.0072
148 69	FG	0.2461 0.0031	1.0640 0.0069
148 71	GH	0.1906 0.0031	0.9464 0.0058
148 72	FG	0.1757 0.0030	0.8096 0.0048
148 73	FG	0.1345 0.0025	0.7106 0.0043
148 74	GH	0.0592 0.0017	0.4952 0.0037
148 75	GH	0.0297 0.0014	0.3993 0.0034
148 76	GH	0.0162 0.0012	0.3076 0.0028
148 77	GH	0.0129 0.0013	0.2276 0.0026
148 78	GH	0.0083 0.0014	0.1802 0.0024

Data at Z = 280.2 mm^b

247 50	JK	0.1159 0.0023	0.5330 0.0035
247 51	IJ	0.1220 0.0021	0.5871 0.0041
248 52	IJ	0.1247 0.0023	0.6414 0.0045
248 53	IJ	0.1344 0.0022	0.7042 0.0049
248 54	JK	0.1480 0.0027	0.7544 0.0045
248 55	JK	0.1591 0.0025	0.7852 0.0050
248 56	IJ	0.1447 0.0025	0.8233 0.0051
247 56	JK	0.1580 0.0027	0.8318 0.0053
247 57	IJ	0.1482 0.0023	0.8483 0.0053
247 58	JK	0.1615 0.0027	0.8677 0.0055
247 59	JK	0.1613 0.0026	0.8449 0.0058
248 59	IJ	0.1442 0.0025	0.8678 0.0058
248 60	JK	0.1607 0.0027	0.8392 0.0060
248 61	IJ	0.1547 0.0024	0.8174 0.0052
248 62	IJ	0.1506 0.0028	0.7985 0.0047
248 63	JK	0.1560 0.0029	0.7730 0.0046

Table 4.1.3-64 (contd)

Matrix	Loc ^a	²³⁸ U(n,f) ^c		²³⁸ U(n,γ) ^c	
248 64	JK	0.1596	0.0028	0.7401	0.0045
248 65	IJ	0.1456	0.0024	0.7258	0.0052
248 66	JK	0.1687	0.0029	0.7139	0.0048
248 67	JK	0.1728	0.0028	0.7070	0.0047
248 68	IJ	0.1580	0.0031	0.7177	0.0043
248 69	JK	0.1674	0.0031	0.7112	0.0046
248 71	IJ	0.1334	0.0028	0.6346	0.0041
248 72	JK	0.1266	0.0028	0.5737	0.0038
248 73	JK	0.0989	0.0025	0.5055	0.0035
248 74	IJ	0.0395	0.0014	0.3623	0.0030
248 75	IJ	0.0219	0.0016	0.2873	0.0027
248 76	IJ	0.0140	0.0011	0.2248	0.0024
248 77	IJ	0.0088	0.0010	0.1730	0.0021
248 78	IJ	0.0061	0.0012	0.1349	0.0018
147 50	FG	0.1953	0.0032	1.0536	0.0059
147 51	GH	0.1910	0.0028	1.0266	0.0057
148 52	GH	0.1965	0.0033	1.0230	0.0056
148 53	GH	0.1957	0.0031	1.0405	0.0062
148 54	FG	0.2179	0.0032	1.0512	0.0058
148 55	FG	0.2199	0.0035	1.0662	0.0059
148 56	GH	0.1981	0.0029	1.0905	0.0063
147 56	FG	0.2165	0.0032	1.0887	0.0060
147 57	GH	0.1999	0.0031	1.1173	0.0060
147 58	FG	0.2170	0.0034	1.1469	0.0063
147 59	FG	0.2182	0.0033	1.1328	0.0061
148 59	GH	0.1979	0.0033	1.1554	0.0063
148 60	FG	0.2252	0.0033	1.1358	0.0062
148 61	GH	0.2142	0.0034	1.1399	0.0062
148 62	GH	0.2266	0.0033	1.1356	0.0062
148 63	FG	0.2460	0.0033	1.1456	0.0067
148 64	FG	0.2506	0.0036	1.1569	0.0063
148 65	IJ	0.2390	0.0036	1.1468	0.0063
148 66	FG	0.2511	0.0036	1.1348	0.0065
148 67	FG	0.2528	0.0036	1.1056	0.0061
148 68	GH	0.2277	0.0030	1.0586	0.0062
148 69	FG	0.2349	0.0038	1.0132	0.0068
148 71	GH	0.1773	0.0030	0.8359	0.0052
148 72	FG	0.1615	0.0031	0.7380	0.0044
148 73	FG	0.1241	0.0025	0.6396	0.0039
148 74	GH	0.0515	0.0017	0.4498	0.0043
148 75	GH	0.0295	0.0014	0.3654	0.0031

Table 4.1.3-64 (contd)

Matrix	Loc ^a	²³⁸ U(n,f) ^c		²³⁸ U(n,γ) ^c	
148 76	GH	0.0138	0.0013	0.2749	0.0026
148 77	GH	0.0081	0.0011	0.2126	0.0026
148 78	GH	0.0080	0.0013	0.1623	0.0020

^aIn-drawer column which designates the foil location in the drawer. The ²³⁸U foils were centered on the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-65 Basic Reaction Rate Data for Axial Distributions in ZPPR-17C

Matrix	z, mm ^a	Loc ^b	²³⁹ Pu(n,f) ^c	²³⁵ U(n,f) ^c	²³⁸ U(n,f) ^c	²³⁸ U(n,γ) ^c
248 51	1034.7	TC		0.900 0.006		
248 51	983.9	TC		1.356 0.009		
248 51	933.1	TC		1.787 0.010		
248 51	875.9	TC		2.043 0.012		
248 51	825.1	TC		2.022 0.012		
248 51	737.4	IJ	1.306 0.024	1.480 0.008	0.0057 0.0012	0.2233 0.0021
248 51	686.6	IJ	1.415 0.016	1.648 0.010	0.0100 0.0009	0.2415 0.0021
248 51	635.8	IJ	1.593 0.016	1.891 0.010	0.0125 0.0011	0.2760 0.0020
248 51	585.0	IJ	1.860 0.016	2.146 0.011	0.0201 0.0012	0.3161 0.0024
248 51	534.2	IJ	2.161 0.019	2.472 0.012	0.0342 0.0014	0.3491 0.0026
248 51	483.4	JK	2.510 0.019	2.732 0.013	0.0718 0.0019	0.3906 0.0028
248 51	432.6	JK	2.885 0.021	3.053 0.015	0.0919 0.0021	0.4347 0.0034
248 51	381.8	JK	3.182 0.021	3.408 0.016	0.1046 0.0021	0.4755 0.0036
248 51	331.0	JK	3.420 0.024	3.642 0.017	0.1117 0.0020	0.5020 0.0036
248 51	280.2	JK	3.515 0.024	3.770 0.038	0.1132 0.0022	0.5285 0.0034
248 51	229.4	JK	3.582 0.023	3.850 0.018	0.1103 0.0020	0.5477 0.0034
248 51	178.6	JK	3.561 0.023	4.080 0.036	0.0920 0.0018	0.5791 0.0039
248 51	127.8	HI	3.909 0.024	4.540 0.021	0.0498 0.0017	0.5371 0.0035
248 51	100.4	HI	4.020 0.025	4.778 0.022	0.0420 0.0014	0.5607 0.0035
248 51	77.0	HI	4.170 0.025	4.968 0.022	0.0363 0.0014	0.5806 0.0039
248 51	49.6	HI	4.375 0.025	5.255 0.034	0.0347 0.0014	0.6126 0.0040
248 51	26.2	HI	4.735 0.027	5.607 0.025	0.0333 0.0016	0.6473 0.0042
148 51	26.2	HI	5.625 0.032	6.548 0.032	0.0383 0.0014	0.7550 0.0043
148 51	49.6	HI	5.924 0.031	6.885 0.040	0.0437 0.0014	0.7872 0.0048
148 51	77.0	HI	6.267 0.034	7.103 0.034	0.0525 0.0016	0.8236 0.0050
148 51	100.4	HI	6.482 0.034	7.260 0.031	0.0593 0.0016	0.8501 0.0047
148 51	127.8	HI	6.596 0.035	7.316 0.031	0.0761 0.0018	0.8598 0.0051
148 51	178.6	FG	6.486 0.035	7.158 0.049	0.1598 0.0027	1.0616 0.0057
148 51	229.4	FG	6.711 0.036	7.116 0.030	0.1888 0.0027	1.0447 0.0056
148 51	280.2	FG	6.892 0.036	7.267 0.097	0.1998 0.0028	1.0459 0.0056
148 51	331.0	FG	6.769 0.035	7.081 0.029	0.2058 0.0030	1.0143 0.0061
148 51	381.8	FG	6.535 0.035	6.833 0.028	0.1914 0.0025	0.9875 0.0054
148 51	432.6	FG	6.100 0.032	6.487 0.026	0.1718 0.0025	0.9395 0.0055
148 51	483.4	FG	5.585 0.031	6.016 0.025	0.1415 0.0025	0.8945 0.0050
148 51	534.2	GH		5.863 0.026	0.0631 0.0020	0.8571 0.0049
148 51	585.0	GH		5.434 0.025	0.0396 0.0017	0.8125 0.0047
148 51	635.8	GH		5.035 0.027	0.0267 0.0015	0.7457 0.0048
148 51	686.6	GH		4.601 0.022	0.0182 0.0015	0.6800 0.0041
148 51	737.4	GH		4.244 0.021	0.0102 0.0012	0.6324 0.0049
148 51	825.1	TC		4.668 0.021		
148 51	875.9	TC		4.350 0.024		
148 51	933.1	TC		3.453 0.023		
148 51	983.9	TC		2.550 0.013		
148 51	1034.7	TC		1.597 0.009		
238 62	875.9	TC		1.290 0.010		
238 62	825.1	TC		1.232 0.009		
238 62	737.4	IJ		1.061 0.009	0.0066 0.0012	0.1846 0.0020

Table 4.1.3-65 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁹ Pu(n, f) ^c	²³⁵ U(n, f) ^c	²³⁸ U(n, f) ^c	²³⁸ U(n, γ) ^c
238 62	686.6	IJ		1.197 0.010	0.0112 0.0009	0.1999 0.0018
238 62	635.8	IJ		1.415 0.011	0.0149 0.0010	0.2357 0.0022
238 62	585.0	IJ		1.696 0.011	0.0205 0.0013	0.2820 0.0026
238 62	534.2	IJ		2.041 0.014	0.0337 0.0013	0.3213 0.0024
238 62	483.4	JK		2.350 0.015	0.0690 0.0018	0.3678 0.0031
238 62	432.6	JK		2.777 0.017	0.0958 0.0023	0.4253 0.0030
238 62	381.8	JK		3.165 0.017	0.1124 0.0023	0.4748 0.0032
238 62	331.0	JK		3.488 0.018	0.1257 0.0026	0.5288 0.0035
238 62	280.2	JK		3.783 0.024	0.1325 0.0024	0.5797 0.0040
238 62	229.4	JK		4.067 0.020	0.1419 0.0029	0.6206 0.0039
238 62	178.6	JK		4.335 0.015	0.1397 0.0026	0.6720 0.0040
238 62	102.4	JK		4.838 0.024	0.1351 0.0025	0.7597 0.0045
238 62	51.6	JK		5.322 0.025	0.1429 0.0028	0.8378 0.0048
138 62	51.6	FG		7.382 0.023	0.1713 0.0026	1.0795 0.0058
138 62	102.4	FG		7.916 0.033	0.1898 0.0030	1.1477 0.0061
138 62	178.6	FG		8.158 0.048	0.2185 0.0027	1.1662 0.0066
138 62	229.4	FG		8.146 0.035	0.2291 0.0030	1.1574 0.0061
138 62	280.2	FG		7.998 0.035	0.2336 0.0031	1.1305 0.0060
138 62	331.0	FG		7.670 0.033	0.2169 0.0029	1.0798 0.0057
138 62	381.8	FG		7.173 0.031	0.2057 0.0028	1.0183 0.0055
138 62	432.6	FG		6.551 0.030	0.1781 0.0032	0.9328 0.0052
138 62	483.4	FG		5.912 0.028	0.1392 0.0025	0.8572 0.0049
138 62	534.2	GH		5.544 0.025	0.0640 0.0020	0.7899 0.0051
138 62	585.0	GH		5.031 0.024	0.0354 0.0017	0.7310 0.0053
138 62	635.8	GH		4.477 0.022	0.0245 0.0016	0.6596 0.0043
138 62	686.6	GH		4.005 0.020	0.0165 0.0013	0.5925 0.0038
138 62	737.4	GH		3.621 0.019	0.0117 0.0012	0.5321 0.0036
138 62	825.1	TC		3.601 0.020		
138 62	875.9	TC		3.378 0.018		
248 70	737.4	IJ		1.406 0.009	0.0072 0.0010	0.2120 0.0019
248 70	686.6	IJ		1.597 0.009	0.0077 0.0010	0.2366 0.0020
248 70	635.8	IJ		1.875 0.010	0.0127 0.0011	0.2808 0.0022
248 70	585.0	IJ		2.167 0.012	0.0195 0.0011	0.3276 0.0025
248 70	534.2	IJ		2.538 0.014	0.0348 0.0013	0.3707 0.0029
248 70	483.4	JK		2.894 0.015	0.0784 0.0019	0.4244 0.0032
248 70	432.6	JK		3.367 0.016	0.1036 0.0020	0.4811 0.0036
248 70	381.8	JK		3.895 0.018	0.1245 0.0023	0.5523 0.0037
248 70	331.0	JK		4.380 0.019	0.1431 0.0027	0.6221 0.0038
248 70	280.2	JK		4.908 0.046	0.1539 0.0027	0.6870 0.0036
248 70	229.4	JK		5.290 0.027	0.1729 0.0026	0.7535 0.0044
248 70	178.6	JK		5.755 0.046	0.1904 0.0028	0.8002 0.0050
248 70	102.4	JK		6.226 0.027	0.2070 0.0031	0.8785 0.0050
248 70	51.6	JK		6.631 0.059	0.2138 0.0029	0.9227 0.0055
148 70	51.6	FG		7.069 0.064	0.2331 0.0029	0.9860 0.0054
148 70	102.4	FG		7.161 0.033	0.2362 0.0033	0.9922 0.0057
148 70	178.6	FG		7.188 0.026	0.2289 0.0030	0.9948 0.0055

Table 4.1.3-65 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁹ Pu(n, f) ^c	²³⁵ U(n, f) ^c	²³⁸ U(n, f) ^c	²³⁸ U(n, γ) ^c
148 70	229.4	FG		6.966 0.029	0.2242 0.0029	0.9738 0.0053
148 70	280.2	FG		6.712 0.034	0.2157 0.0031	0.9362 0.0052
148 70	331.0	FG		6.232 0.026	0.2009 0.0030	0.8761 0.0050
148 70	381.8	FG		5.696 0.024	0.1844 0.0026	0.8007 0.0045
148 70	432.6	FG		5.122 0.022	0.1547 0.0027	0.7305 0.0044
148 70	483.4	FG		4.551 0.020	0.1153 0.0022	0.6562 0.0044
148 70	534.2	GH		4.155 0.020	0.0539 0.0016	0.6127 0.0038
148 70	585.0	GH		3.702 0.017	0.0291 0.0012	0.5503 0.0037
148 70	635.8	GH		3.244 0.019	0.0204 0.0011	0.4830 0.0031
148 70	686.6	GH		2.827 0.015	0.0108 0.0011	0.4244 0.0029
148 70	737.4	GH		2.548 0.013	0.0091 0.0010	0.3752 0.0029

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above, the ²³⁸U foils were centered on, and the ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^cExperimental results in units of 10⁻¹⁶ fissions or captures per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-66 Basic Data for ^{239}Pu Cell Studies in ZPPR-17C

Matrix	Loc ^a	z,mm ^b	$^{239}\text{Pu}(n,f)^c$	z,mm ^b	$^{239}\text{Pu}(n,f)^c$
248 51	LM	178.6	3.321 0.025	280.2	3.335 0.026
248 51	KL	178.6	3.438 0.025	280.2	3.419 0.029
248 51	JK	178.6	3.650 0.025	280.2	3.538 0.025
248 48	JK	178.6	3.763 0.027	280.2	3.728 0.024
248 48	KL	178.6	3.810 0.028	280.2	3.723 0.025
248 48	LM	178.6	4.020 0.028	280.2	3.872 0.025
249 51	LM	381.8	3.209 0.024	483.4	2.499 0.021
249 51	KL	381.8	3.277 0.030	483.4	2.540 0.021
249 51	JK	381.8	3.360 0.026	483.4	2.663 0.023
249 48	JK	381.8	3.506 0.025	483.4	2.779 0.026
249 48	KL	381.8	3.605 0.031	483.4	2.809 0.030
249 48	LM	381.8	3.654 0.025	483.4	2.914 0.024

^aIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10^{-18} fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-67 Basic Data for $^{235}\text{U}(n,f)$ Cell
Studies in ZPPR-17C

Matrix	Loc ^a	z,mm ^b	$^{235}\text{U}(n,f)^c$	z,mm ^b	$^{235}\text{U}(n,f)^c$
Central Blanket Cells					
249 51	OP	26.2	4.566 0.021	77.0	3.929 0.019
249 51	II	26.2	5.253 0.025	77.0	4.579 0.022
249 51	HI	26.2	5.337 0.024	77.0	4.677 0.022
249 48	HI	26.2	5.375 0.024	77.0	4.708 0.022
249 48	II	26.2	5.497 0.025	77.0	4.792 0.023
249 48	OP	26.2	6.031 0.026	77.0	5.394 0.023
249 51	OP	127.8	3.593 0.018		
249 51	II	127.8	4.154 0.021		
249 51	HI	127.8	4.298 0.021		
249 48	HI	127.8	4.281 0.022		
249 48	II	127.8	4.382 0.021		
249 48	OP	127.8	4.948 0.023		
149 51	AB	26.2	6.298 0.027	77.0	7.171 0.032
149 51	HH	26.2	6.498 0.030	77.0	7.111 0.031
149 51	HI	26.2	6.422 0.032	77.0	7.064 0.030
149 48	HI	26.2	6.437 0.028	77.0	7.095 0.031
149 48	HH	26.2	6.500 0.028	77.0	7.152 0.031
149 48	AB	26.2	6.798 0.029	77.0	7.336 0.031
149 51	AB	127.8	7.452 0.031		
149 51	HH	127.8	7.360 0.032		
149 51	HI	127.8	7.259 0.031		
149 48	HI	127.8	7.276 0.031		
149 48	HH	127.8	7.395 0.031		
149 48	AB	127.8	7.440 0.032		
Core Cells					
248 51	OP	178.6	3.665 0.018	280.2	3.407 0.017
248 51	LM	178.6	3.795 0.019	280.2	3.568 0.018
248 51	KL	178.6	3.861 0.019	280.2	3.642 0.018
248 51	JK	178.6	4.035 0.019	280.2	3.775 0.019
248 48	JK	178.6	4.217 0.021	280.2	3.911 0.020
248 48	KL	178.6	4.312 0.021	280.2	3.983 0.020
248 48	LM	178.6	4.437 0.022	280.2	4.092 0.020
248 48	OP	178.6	4.612 0.021	280.2	4.199 0.020
249 51	OP	381.8	2.836 0.016	483.4	2.235 0.013
249 51	LM	381.8	3.002 0.016	483.4	2.394 0.014
249 51	KL	381.8	3.088 0.016	483.4	2.488 0.015
249 51	JK	381.8	3.233 0.017	483.4	2.599 0.014
249 48	JK	381.8	3.448 0.018	483.4	2.777 0.015
249 48	KL	381.8	3.466 0.017	483.4	2.809 0.015
249 48	LM	381.8	3.638 0.018	483.4	2.938 0.016

Table 4.1.3-67 (contd)

Matrix	Loc ^a	z,mm ^b	²³⁵ U(n,f) ^c	z,mm ^b	²³⁵ U(n,f) ^c
249 48	OP	381.8	3.706 0.018	483.4	3.030 0.015
Axial Blanket Cells					
249 51	OP	534.2	2.008 0.012	585.0	1.732 0.011
248 51	JJ	534.2	2.629 0.016	585.0	2.315 0.014
248 51	IJ	534.2	2.685 0.015	585.0	2.380 0.014
248 48	IJ	534.2	2.388 0.014	585.0	2.078 0.013
248 48	JJ	534.2	2.400 0.014	585.0	2.122 0.014
249 48	OP	534.2	2.656 0.014	585.0	2.354 0.013
249 51	OP	635.8	1.477 0.010	686.6	1.273 0.009
248 51	JJ	635.8	2.025 0.013	686.6	1.805 0.012
248 51	IJ	635.8	2.085 0.013	686.6	1.853 0.013
248 48	IJ	635.8	1.808 0.012	686.6	1.578 0.011
248 48	JJ	635.8	1.815 0.012	686.6	1.598 0.011
249 48	OP	635.8	2.081 0.012	686.6	1.845 0.011
249 51	OP	737.4	1.163 0.009		
248 51	JJ	737.4	1.628 0.011		
248 51	IJ	737.4	1.686 0.012		
248 48	IJ	737.4	1.445 0.010		
248 48	JJ	737.4	1.449 0.011		
249 48	OP	737.4	1.698 0.010		

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-68 Basic Data for $^{238}\text{U}(n,f)$ and $^{238}\text{U}(n,\gamma)$
Cell Studies in ZPPR-17C

Matrix	Loc ^a	z,mm ^b	$^{238}\text{U}(n,f)^c$		$^{238}\text{U}(n,\gamma)$	
Central Blanket Cells						
249 51	OP	26.2	0.0337	0.0013	0.6281	0.0035
249 51	II	26.2	0.0326	0.0013	0.6434	0.0036
249 51	HI	26.2	0.0344	0.0015	0.6495	0.0040
249 48	HI	26.2	0.0343	0.0014	0.6356	0.0039
249 48	II	26.2	0.0353	0.0012	0.6673	0.0044
249 48	OP	26.2	0.0327	0.0013	0.7643	0.0045
249 51	OP	77.0	0.0369	0.0012	0.5540	0.0032
249 51	II	77.0	0.0356	0.0012	0.5766	0.0033
249 51	HI	77.0	0.0359	0.0016	0.5775	0.0036
249 48	HI	77.0	0.0372	0.0014	0.5711	0.0038
249 48	II	77.0	0.0360	0.0012	0.5936	0.0037
249 48	OP	77.0	0.0367	0.0013	0.6936	0.0042
249 51	OP	127.8	0.0490	0.0013	0.5045	0.0030
249 51	II	127.8	0.0501	0.0016	0.5349	0.0032
249 51	HI	127.8	0.0480	0.0015	0.5376	0.0035
249 48	HI	127.8	0.0503	0.0016	0.5271	0.0035
249 48	II	127.8	0.0475	0.0014	0.5459	0.0035
249 48	OP	127.8	0.0548	0.0016	0.6454	0.0041
149 51	AB	26.2	0.0397	0.0012	0.8427	0.0049
149 51	HH	26.2	0.0400	0.0015	0.7651	0.0042
149 51	HI	26.2	0.0387	0.0014	0.7577	0.0041
149 48	HI	26.2	0.0392	0.0015	0.7543	0.0050
149 48	HH	26.2	0.0407	0.0017	0.7716	0.0049
149 48	AB	26.2	0.0395	0.0014	0.8495	0.0052
149 51	AB	77.0	0.0536	0.0014	0.9420	0.0049
149 51	HH	77.0	0.0531	0.0015	0.8407	0.0045
149 51	HI	77.0	0.0485	0.0016	0.8257	0.0047
149 48	HI	77.0	0.0491	0.0016	0.8273	0.0048
149 48	HH	77.0	0.0516	0.0016	0.8319	0.0048
149 48	AB	77.0	0.0519	0.0016	0.9086	0.0052
149 51	AB	127.8	0.0767	0.0016	0.9809	0.0051
149 51	HH	127.8	0.0765	0.0018	0.8819	0.0050
149 51	HI	127.8	0.0775	0.0017	0.8639	0.0046
149 48	HI	127.8	0.0768	0.0018	0.8681	0.0050
149 48	HH	127.8	0.0743	0.0018	0.8584	0.0054
149 48	AB	127.8	0.0776	0.0018	0.9416	0.0058
Core Cells						
248 51	OP	178.6	0.0701	0.0017	0.4659	0.0029
248 51	LM	178.6	0.0881	0.0018	0.5095	0.0032

Table 4.1.3-68 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁸ U(n, f) ^c		²³⁸ U(n, γ)	
248 51	KL	178.6	0.0983	0.0020	0.5066	0.0034
248 51	JK	178.6	0.0949	0.0020	0.5802	0.0034
248 48	JK	178.6	0.0938	0.0018	0.6001	0.0037
248 48	KL	178.6	0.0997	0.0017	0.5504	0.0037
248 48	LM	178.6	0.0978	0.0017	0.6060	0.0042
248 48	OP	178.6	0.0832	0.0017	0.5913	0.0041
248 51	OP	280.2	0.0920	0.0017	0.4380	0.0030
248 51	LM	280.2	0.1052	0.0020	0.4723	0.0030
248 51	KL	280.2	0.1128	0.0021	0.4742	0.0030
248 51	JK	280.2	0.1092	0.0019	0.5296	0.0035
248 48	JK	280.2	0.1119	0.0017	0.5478	0.0034
248 48	KL	280.2	0.1187	0.0018	0.5209	0.0036
248 48	LM	280.2	0.1136	0.0018	0.5529	0.0035
248 48	OP	280.2	0.1080	0.0018	0.5408	0.0036
249 51	OP	381.8	0.0841	0.0016	0.3923	0.0031
249 51	LM	381.8	0.0963	0.0021	0.4207	0.0027
249 51	KL	381.8	0.1047	0.0021	0.4199	0.0028
249 51	JK	381.8	0.1024	0.0019	0.4692	0.0030
249 48	JK	381.8	0.1087	0.0018	0.4873	0.0035
249 48	KL	381.8	0.1112	0.0017	0.4594	0.0034
249 48	LM	381.8	0.1076	0.0021	0.4942	0.0034
249 48	OP	381.8	0.0965	0.0018	0.4827	0.0036
249 51	OP	483.4	0.0555	0.0014	0.3130	0.0025
249 51	LM	483.4	0.0641	0.0018	0.3421	0.0023
249 51	KL	483.4	0.0724	0.0017	0.3392	0.0024
249 51	JK	483.4	0.0698	0.0019	0.3912	0.0029
249 48	JK	483.4	0.0737	0.0016	0.4024	0.0029
249 48	KL	483.4	0.0789	0.0017	0.3732	0.0028
249 48	LM	483.4	0.0758	0.0018	0.4039	0.0030
249 48	OP	483.4	0.0681	0.0016	0.4020	0.0029
Axial Blanket Cells						
249 51	OP	534.2	0.0326	0.0012	0.2827	0.0021
248 51	JJ	534.2	0.0359	0.0014	0.3274	0.0024
248 51	IJ	534.2	0.0365	0.0013	0.3694	0.0025
248 48	IJ	534.2	0.0356	0.0016	0.3163	0.0027
248 48	JJ	534.2	0.0334	0.0011	0.2984	0.0026
249 48	OP	534.2	0.0359	0.0013	0.3381	0.0026
249 51	OP	585.0	0.0203	0.0010	0.2415	0.0018
248 51	JJ	585.0	0.0225	0.0011	0.2830	0.0021
248 51	IJ	585.0	0.0223	0.0012	0.3323	0.0026
248 48	IJ	585.0	0.0209	0.0015	0.2774	0.0024
248 48	JJ	585.0	0.0204	0.0011	0.2552	0.0024
249 48	OP	585.0	0.0233	0.0011	0.2925	0.0024

Table 4.1.3-68 (contd)

Matrix	Loc ^a	z, mm ^b	²³⁸ U(n, f) ^c		²³⁸ U(n, γ)	
249 51	OP	635.8	0.0122	0.0010	0.2047	0.0018
248 51	JJ	635.8	0.0130	0.0012	0.2466	0.0021
248 51	IJ	635.8	0.0134	0.0010	0.2918	0.0023
248 48	IJ	635.8	0.0131	0.0010	0.2375	0.0024
248 48	JJ	635.8	0.0118	0.0009	0.2165	0.0019
249 48	OP	635.8	0.0134	0.0011	0.2728	0.0024
249 51	OP	686.6	0.0089	0.0009	0.1778	0.0015
248 51	JJ	686.6	0.0092	0.0011	0.2077	0.0020
248 51	IJ	686.6	0.0101	0.0009	0.2548	0.0021
248 48	IJ	686.6	0.0098	0.0014	0.2138	0.0021
248 48	JJ	686.6	0.0092	0.0011	0.1859	0.0018
249 48	OP	686.6	0.0105	0.0011	0.2336	0.0020
249 51	OP	737.4	0.0057	0.0010	0.1541	0.0016
248 51	JJ	737.4	0.0068	0.0009	0.1857	0.0018
248 51	IJ	737.4	0.0080	0.0009	0.2317	0.0019
248 48	IJ	737.4	0.0080	0.0010	0.1936	0.0020
248 48	JJ	737.4	0.0064	0.0011	0.1610	0.0018
249 48	OP	737.4	0.0084	0.0013	0.2070	0.0021

^aIn-drawer column which designates the foil location in the drawer. The ²³⁸U foils were centered on the mid-height of the drawer. A negative sign designates a plate-spanning averaging foil.

^bDistance from the reactor interface to the center of the foil.

^cExperimental results in units of 10⁻¹⁸ fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.1.3-69 Cell-Averaging Factors for ZPPR-17C

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		Environment ^b	z, mm ^c
1.0	.006	1.0153	.0052	1.018	.020	1.0568	.0070	IC 147-50	51.6
0.9853	.0056	0.9985	.0046	0.987	.015	0.8610	.0051	IC 147-50	178.6
0.9914	.0054	0.9948	.0048	0.990	.013	0.8826	.0052	IC 147-50	280.2
1.0	.008	1.0114	.0054	1.004	.028	1.0583	.0119	IC 247-50,248-51	51.6
0.9900	.0173	1.0064	.0096	0.987	.022	0.8936	.0154	IC 247-50,248-51	178.6
0.9932	.0074	0.9999	.0105	0.987	.022	0.9134	.0132	IC 247-50,248-51	280.2
1.0	.006	1.0153	.0052	1.018	.020	1.0568	.0070	IC 148,248-56	51.6
0.9885	.0058	1.0132	.0047	0.933	.016	0.9003	.0052	IC 148,248-56	178.6
1.0021	.0056	1.0010	.0044	0.967	.015	0.9201	.0056	IC 148,248-56	280.2
1.0	.006	1.0153	.0052	1.018	.020	1.0568	.0070	IC 147,247-57	51.6
0.9826	.0061	1.0066	.0066	0.933	.016	0.8886	.0051	IC 147,247-57	178.6
0.9910	.0112	0.9980	.0044	0.967	.015	0.9116	.0057	IC 147,247-57	280.2
1.0	.006	1.0064	.0046	1.017	.026	1.0694	.0058	IC 147,247-58	51.6
0.9853	.0056	0.9985	.0046	0.987	.015	0.8610	.0051	IC 147,247-58	178.6
0.9914	.0054	0.9948	.0048	0.990	.013	0.8826	.0052	IC 147,247-58	280.2
1.0	.006	1.0153	.0052	1.018	.020	1.0568	.0070	IC 148,248-59	51.6
0.9768	.0063	1.0000	.0044	0.933	.015	0.8768	.0050	IC 148,248-59	178.6
0.9798	.0059	0.9950	.0044	0.967	.016	0.9032	.0057	IC 148,248-59	280.2
1.0	.006	1.0153	.0052	1.018	.020	1.0568	.0070	IC 138-61	51.6
1.0	.006	1.0066	.0066	0.933	.016	0.8886	.0051	IC 138-61	178.6
1.0	.006	0.9980	.0044	0.967	.015	0.9116	.0057	IC 138-61	280.2
1.0	.006	1.0114	.0054	1.004	.028	1.0607	.0097	IC 238-61	51.6
1.0	.006	1.0060	.0107	0.942	.022	0.9179	.0126	IC 238-61	178.6
1.0	.006	1.0062	.0096	0.957	.022	0.9504	.0132	IC 238-61	280.2
1.0	.006	0.9988	.0051	0.998	.022	1.0664	.0078	IC F/SC/F	0-51.6
0.9772	.0046	0.9996	.0069	0.938	.013	0.8858	.0057	IC F/SC/F	178.6
0.9916	.0058	0.9998	.0052	0.953	.012	0.9172	.0061	IC F/SC/F	280.2
1.0	.006	0.9988	.0051	0.998	.022	1.0664	.0078	IC SC/DC/SC	0-51.6
0.9888	.0060	0.9974	.0050	0.980	.014	0.8640	.0055	IC SC/DC/SC	178.6
0.9895	.0055	0.9961	.0055	0.985	.013	0.8799	.0059	IC SC/DC/SC	280.2
0.9863	.0098	1.0029	.0096	0.977	.026	0.8692	.0092	OC 148,248-73	0-280.2
		0.9950	.0044					OC CRP-SC-F	0-280.2
		0.9921	.0050					OC CRP-DC-F	0-280.2
0.9903	.0057	0.9984	.0049	0.974	.013	0.8935	.0061	OC SC/DC/SC	0-280.2
0.9890	.0061	0.9975	.0059	0.957	.011	0.9272	.0054	OC F/SC/F	0-280.2
0.9850	.0059	1.0020	.0057	0.978	.019	0.9020	.0051	OC F/SC/RB	0-280.2
0.9929	.0047	0.9926	.0042	0.962	.013	0.8762	.0048	OC CB/DC/SC	0-51.6

Table 4.1.3-69 (contd)

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		Environment ^b	z, mm^c
0.9888	.0060	0.9974	.0050	0.980	.014	0.8640	.0055	OC CB/DC/SC	178.6
0.9895	.0055	0.9961	.0055	0.985	.013	0.8799	.0059	OC CB/DC/SC	280.2
1.0	.008	1.0022	.0063	0.912	.026	1.0229	.0058	RB SC/RB/RB	ALL
1.0	.008	0.9949	.0074	0.988	.071	1.0170	.0071	RB RB/RB/RB	ALL
1.0	.008	0.9791	.0085	0.838	.100	1.0508	.0090	RB RB/RB/RR	ALL
		1.0	.010					RR	ALL
1.0	.006	1.0153	.0052	1.018	.020	1.0596	.0072	148-51	26.2
1.0	.006	1.0153	.0052	1.018	.020	1.0568	.0070	148-51	49.6
.0	.006	1.0153	.0052	1.018	.020	1.0539	.0068	148-51	77.0
1.0	.006	1.0153	.0052	1.018	.020	1.0494	.0067	148-51	100.4
1.0	.006	1.0153	.0052	1.018	.020	1.0450	.0065	148-51	127.8
0.9762	.0054	1.0018	.0049	0.985	.015	0.8631	.0053	148-51	178.6
0.9848	.0052	0.9985	.0050	0.988	.013	0.8718	.0059	148-51	229.4
0.9933	.0054	0.9952	.0050	0.990	.014	0.8805	.0053	148-51	280.2
0.9935	.0056	0.9921	.0050	0.985	.014	0.8886	.0054	148-51	331.0
0.9937	.0058	0.9890	.0050	0.980	.013	0.8968	.0055	148-51	381.8
0.9941	.0060	0.9956	.0066	0.980	.015	0.8836	.0056	148-51	432.6
0.9945	.0062	1.0022	.0051	0.980	.017	0.8704	.0056	148-51	483.4
1.0	.008	0.9947	.0055	1.012	.019	0.8410	.0045	148-51	534.2
1.0	.008	0.9947	.0055	1.047	.038	0.8145	.0040	148-51	585.0
1.0	.008	0.9947	.0055	1.047	.042	0.7839	.0061	148-51	635.8
1.0	.008	0.9947	.0055	1.047	.063	0.7551	.0052	148-51	686.6
1.0	.008	0.9947	.0055	1.047	.101	0.7262	.0042	148-51	737.4
1.0	.006	1.0114	.0054	1.004	.028	1.0583	.0119	248-51	26.2
1.0	.006	1.0114	.0054	1.004	.028	1.0607	.0097	248-51	49.6
1.0	.006	1.0114	.0054	1.004	.028	1.0631	.0068	248-51	77.0
.0	.006	1.0114	.0054	1.004	.028	1.0604	.0091	248-51	100.4
1.0	.006	1.0114	.0054	1.004	.028	1.0577	.0110	248-51	127.8
0.9900	.0173	1.0064	.0096	0.987	.022	0.8936	.0154	248-51	178.6
0.9916	.0133	1.0032	.0101	0.987	.022	0.9035	.0143	248-51	229.4
0.9932	.0074	0.9999	.0105	0.987	.022	0.9134	.0132	248-51	280.2
0.9983	.0079	0.9968	.0084	0.987	.022	0.9132	.0119	248-51	331.0
1.0034	.0084	0.9937	.0056	0.987	.022	0.9130	.0104	248-51	381.8
0.9979	.0091	0.9940	.0057	0.987	.022	0.9038	.0133	248-51	432.6
0.9924	.0098	0.9944	.0058	0.987	.022	0.8945	.0157	248-51	483.4
1.0	.008	0.9964	.0085	0.967	.034	0.9241	.0212	248-51	534.2
1.0	.008	0.9964	.0085	0.967	.052	0.8945	.0278	248-51	585.0
1.0	.008	0.9964	.0085	0.967	.067	0.8868	.0280	248-51	635.8
1.0	.008	0.9964	.0085	0.967	.097	0.8539	.0230	248-51	686.6
1.0	.008	0.9964	.0085	0.967	.100	0.8377	.0253	248-51	737.4
1.0	.006	0.9985	.0065	0.987	.021	0.8610	.0072	138-62	51.6
1.0	.006	0.9985	.0065	0.987	.021	0.8610	.0072	138-62	102.4
1.0	.006	0.9966	.0068	0.988	.020	0.8718	.0073	138-62	178.6
1.0	.006	0.9942	.0069	0.991	.020	0.8812	.0075	138-62	229.4

Table 4.1.3-69 (contd)

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		Environment ^b	z, mm ^c
1.0	.006	0.9919	.0069	0.994	.020	0.8906	.0076	138-62	280.2
1.0	.006	0.9904	.0060	0.996	.017	0.8947	.0066	138-62	331.0
1.0	.006	0.9890	.0050	0.997	.014	0.8988	.0055	138-62	381.8
1.0	.006	0.9946	.0052	0.988	.015	0.8874	.0056	138-62	432.6
1.0	.006	1.0001	.0053	0.980	.016	0.8761	.0057	138-62	483.4
1.0	.008	0.9947	.0055	1.012	.019	0.8410	.0045	148-51	534.2
1.0	.008	0.9947	.0055	1.047	.038	0.8145	.0040	148-51	585.0
1.0	.008	0.9947	.0055	1.047	.042	0.7839	.0061	148-51	635.8
1.0	.008	0.9947	.0055	1.047	.063	0.7551	.0052	148-51	686.6
1.0	.008	0.9947	.0055	1.047	.101	0.7262	.0042	148-51	737.4
1.0	.006	1.0064	.0136	0.987	.031	0.8936	.0218	238-62	51.6
1.0	.006	1.0064	.0136	0.987	.031	0.8936	.0218	238-62	102.4
1.0	.006	1.0032	.0143	0.987	.031	0.9035	.0202	238-62	178.6
1.0	.006	1.0000	.0129	0.987	.031	0.9084	.0185	238-62	229.4
1.0	.006	0.9968	.0114	0.987	.031	0.9132	.0167	238-62	280.2
1.0	.006	0.9952	.0090	0.987	.022	0.9131	.0139	238-62	331.0
1.0	.006	0.9937	.0056	0.987	.022	0.9130	.0104	238-62	381.8
1.0	.006	0.9940	.0057	0.987	.022	0.9038	.0133	238-62	432.6
1.0	.006	0.9944	.0058	0.987	.022	0.8945	.0157	238-62	483.4
1.0	.008	0.9964	.0085	0.967	.034	0.9241	.0212	238-62	534.2
1.0	.008	0.9964	.0085	0.967	.052	0.8945	.0278	238-62	585.0
1.0	.008	0.9964	.0085	0.967	.067	0.8868	.0280	238-62	635.8
1.0	.008	0.9964	.0085	0.967	.097	0.8539	.0230	238-62	686.6
1.0	.008	0.9964	.0085	0.967	.100	0.8377	.0253	238-62	737.4
0.9911	.0059	1.0007	.0043	0.974	.013	0.8935	.0061	148,248-70	0-381.8
0.9870	.0072	0.9982	.0043	0.958	.015	0.8822	.0067	148,248-70	432.6
0.9829	.0086	0.9957	.0042	0.942	.017	0.8709	.0073	148,248-70	483.4
1.0	.008	0.9986	.0059	1.064	.052	0.8627	.0057	148,248-70	534.2
1.0	.008	1.0005	.0059	1.081	.053	0.8361	.0064	148,248-70	585.0
1.0	.008	1.0005	.0070	1.081	.077	0.8340	.0060	148,248-70	635.8
1.0	.008	1.0005	.0073	1.081	.16	0.8053	.0058	148,248-70	686.6
1.0	.008	1.0005	.0074	1.081	.14	0.7817	.0064	148,248-70	734.4

^aThe second number for each cell factor is a one standard deviation uncertainty. See test for details.

^bReactor region and local environment. See text for key and discussion.

^cAxial position to which this cell factor applies.

4.1.4 Naボイド

(1) 広領域Naボイド反応度 (ZPPR-17A)

この節に記載した実験データの内容は、次のとおりである。

① Naボイド体系と基準体系の反応度差 (累積Naボイド反応度)

-----Table 4.1.4-1

② ステップボイド反応度

-----Table 4.1.4-2

なお、データ点数は、内側炉心4点と外側炉心4点の計8点である。(Fig.

4.1.4-2 参照)

a 測定方法の概要

ZPPR-17Aの未臨界基準体系のNaプレートの一部をボイド缶に置換し、修正中性子源増倍法により未臨界基準体系との反応度差が測定された。

ボイド化されたドロワ数は、内側炉心の炉心中心領域が52ドロワ(1/2炉心当たり)、外側炉心の内側炉心に隣接する領域が36ドロワ(1/2炉心当たり)である。(Fig.4.1.4-1)

この2領域において、軸方向に順次ボイド領域を拡大していき、この各ステップでの反応度が測定された。軸方向のボイド化の順序は次のとおりである。

(Fig.4.1.4-2)

内側炉心

ステップ1	±152mm から±330mm (炉心部)
ステップ2	±152mm から±508mm (炉心部)
ステップ3	0mm から±508mm (内部ブランケットを追加)
ステップ4	0mm から±787mm (軸方向ブランケットを追加)

外側炉心

ステップ1	0mm から±203mm (炉心部)
ステップ2	0mm から±406mm (炉心部)
ステップ3	0mm から±508mm (炉心部)
ステップ4	0mm から±787mm (軸方向ブランケットを追加)

ZPPR-17A のドロワは、Naプレートの他、DCF ドロワの炉心部に炭酸ナトリウムプレートが用いられている。この炭酸ナトリウムプレートはボイド化から除外されている。

b 測定結果

各測定ステップと基準体系の反応度差をTable 4.1.4-1 に示す。

また、ステップ反応度（着目するステップとその一つ前のステップとの反応度差）をTable 4.1.4-2 に示す。Table 4.1.4-2 には、各測定点の基準体系とのNa重量の差と構造材重量の差が示されている。引用文献には1か所誤記があったので修正値を示した。

なお、これらの表において、プレートを置換したときのプレート缶の重量差によって生ずる反応度効果は、測定精度（ $\pm 0.2 \phi$ ）と比べて小さいと推定される為（最大のステップで $\sim 0.06 \phi$ ）、補正は行われていない。

TABLE 4.1.4-1 Sodium Voiding Reactivities in ZPPR-17A

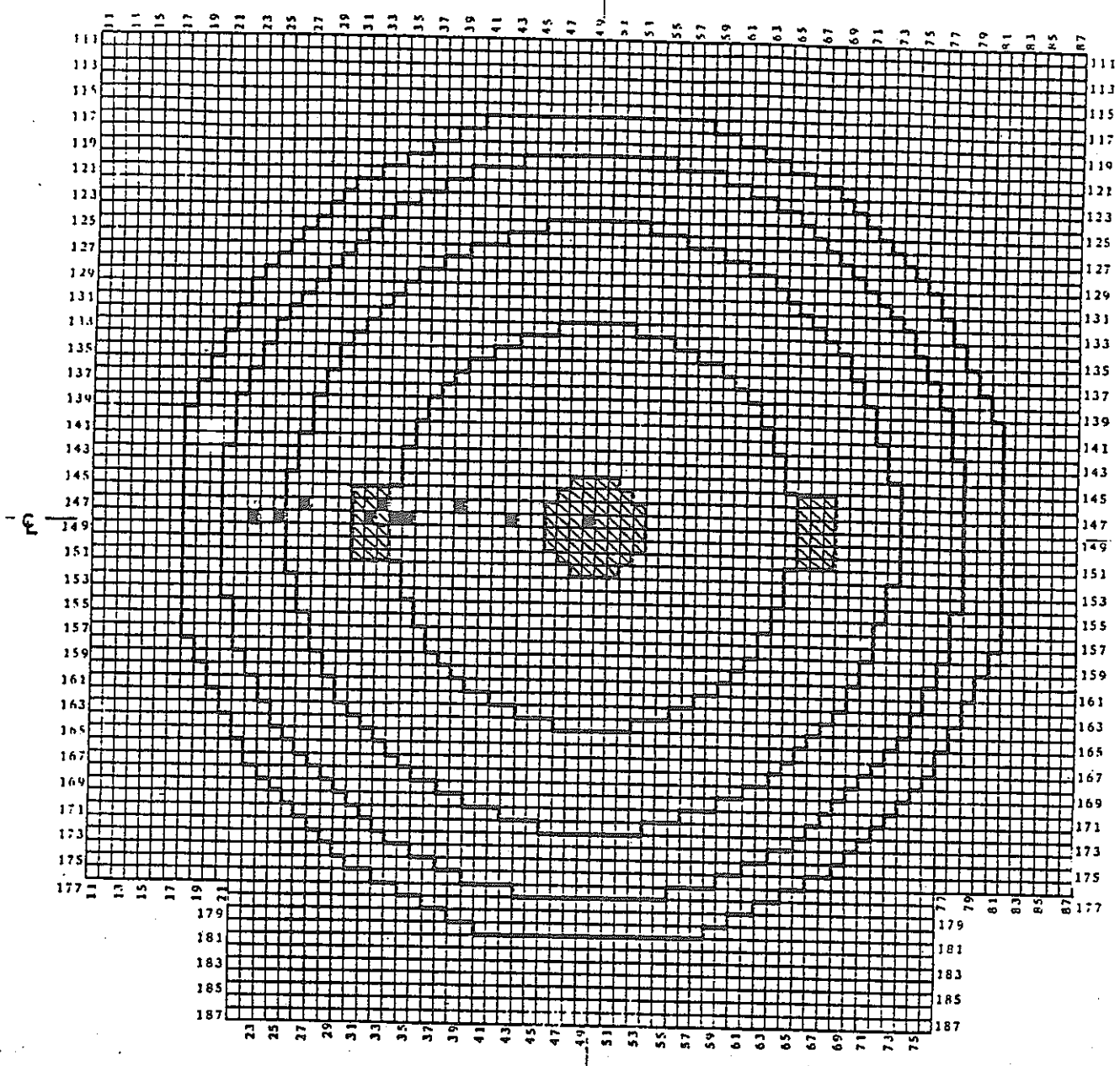
<u>State</u>	<u>Data File</u>	<u>Loading Number</u>	<u>Reactivity^a Difference, ϕ</u>	<u>σ, ϕ</u>
<u>Outer Core</u>				
±203 mm	60	42	+6.82	0.21
±406 mm	61	43	+8.50	0.21
±508 mm	63	44	+6.41	0.21
±787 mm	64	45	+2.54	0.20
<u>Inner Core</u>				
±152 to ±330 mm	66	47	+4.92	0.21
±152 to ±508 mm	67	48	+6.27	0.21
±508 mm	68	49	+14.25	0.23
±787 mm	69	50	+9.73	0.22

^aWith respect to subcritical reference reactivity of -25.54ϕ , the average value from inverse kinetics analysis of rod drops in two measurements in loadings 41 and 46.

TABLE 4.1.4-2 Step Reactivity Worths for Sodium Voiding in ZPPR-17A

<u>Step^a</u>	<u>Mass Sodium Voided, kg</u>	<u>Mass Steel Added, kg</u>	<u>Measured Reactivity Change, ϕ</u>	<u>σ, ϕ</u>	<u>Specific Reactivity ϕ/kg (Na)</u>
<u>Outer Core</u>					
0 - 203 mm	12.625	0.111	+6.82	0.21	+0.540
203 - 406 mm	12.624	0.111	+1.68	0.30	+0.133
406 - 508 mm	6.160	0.065	-0.41	0.30	-0.066
508 - 787 mm	21.097	0.071	-4.28	0.30	-0.203
<u>Inner Core</u>					
152 - 330 mm	15.472	0.341	+4.92	0.21	+0.318
330 - 508 mm	15.472	0.340	+1.35	0.30	+0.087
0 - 152 mm	16.821	0.020	+7.98	0.31	+0.474
508 - 787 mm	30.741	0.101	-4.52	0.30	-0.147

^aVoided symmetrically in each half.



\ Void Zones
 ■ Oscillator Measurement

Fig 4.1.4-1 Locations of Sodium Void Worth Measurements in ZPPR-17A

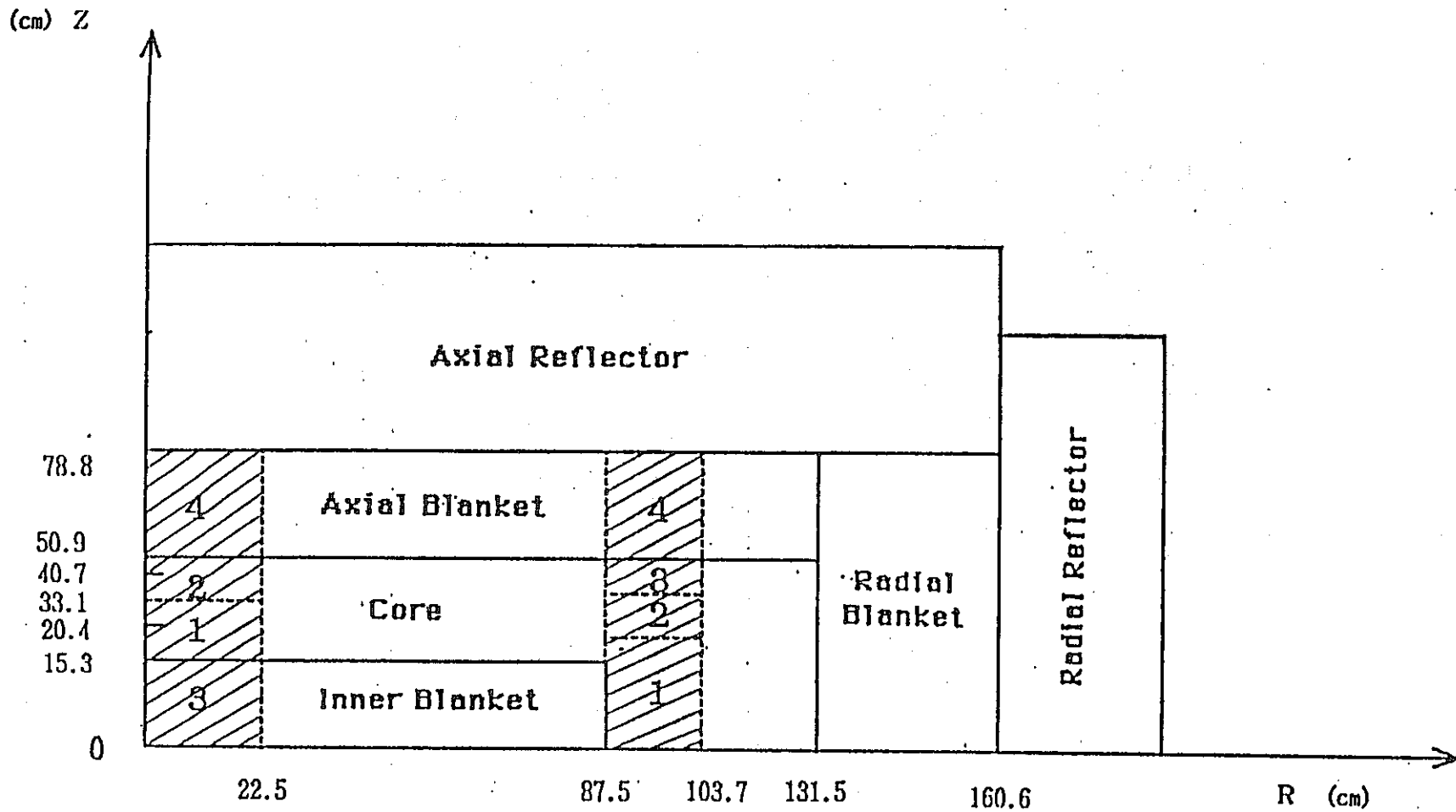


Fig 4.1.4-2 Sequence of Sodium Void Worth Measurements in ZPPR-17A

(2) NaプレートオシレータによるNaボイド反応度分布 (Z P P R - 1 7 A)

この節の記載したデータの内容は、以下のとおりである。

- ① 軸方向のNaボイド反応度分布 (内側炉心) -----Table 4.1.4-3
(測定位置 148-49、147-39、148-35、148-34)
- ② 軸方向のNaボイド反応度分布 (外側炉心) -----Table 4.1.4-4
(測定位置 147-33、148-32、147-27)
- ③ 軸方向のNaボイド反応度分布 (ブランケット) -----Table 4.1.4-5
(測定位置 148-25、148-23)

なお、測定点の数は、①が4点、②が3点、③が2点の9点であるが、炉心中心についてはNaボイド状態の反応度分布も測定されているので、データ点数としては計10点である。

a 測定方法の概要

臨界基準体系において、26号につなげたNaプレート又はボイド缶を軸方向に移動させ、出力変化を逆時間方程式で解くことにより、反応度変化が測定された。Naプレートとボイド缶の反応度差から、Naの反応度が求められた。

炉心領域の測定対象のドロワはSCFであり、プレートの動きを容易にするため、1/16号のプレート(炉心部では酸化鉄プレート)が取り除かれている。また、ブランケット領域では、2枚の1/4号Naプレートを1枚の1/2号Naプレートに置換し更に1/4号の酸化ウランプレートを1/8号のプレートに置換している。

Naの重量は約358g、缶の重量は約264gである。

測定位置は、Fig. 4.1.4-1に示すとおりであるが、炉心中心の一点については、炉中心の広領域ボイド状態での軸方向分布も測定されている。

b 測定結果

測定結果を、Table 4.1.4-3 ~Table 4.1.4-5に示す。また、Table 4.1.4-3 ~Table 4.1.4-5の数値をプロットした結果をFig. 4.1.4-3に示す。

Table 4.1.4-3の内側炉心領域の炉心中心位置では、臨界基準体系の他に、

内側炉心のボイド状態での分布も記載されている。

これらの表の反応度は、炉心中心からの積分価値であるが、炉心中心面から26 ϕ の点を零に規格化している。

Table 4.1.4-3 ~Table 4.1.4-5 に示された反応度について、測定手法による誤差は、0.0015 ϕ と報告されている。

TABLE 4.1.4-3 Axial Sodium Worth Profiles, in cents, in Core
Locations with Internal Blanket in ZPPR-17A

<u>Location</u> <u>Displacement,</u> <u>Inches</u>	<u>148-49</u> <u>Voided</u> <u>Zone</u>	<u>148-49</u> <u>Flooded</u> <u>Zone</u>	<u>147-39</u>	<u>148-35</u>	<u>148-34</u>
0	-0.0733	-0.0599	-0.0657	-0.0714	-0.0557
1	-0.0625	-0.0473	-0.0527	-0.0536	-0.0472
2	-0.0544	-0.0402	-0.0454	-0.0476	-0.0365
3	-0.0445	-0.0307	-0.0371	-0.0376	-0.0273
4	-0.0373	-0.0211	-0.0287	-0.0267	-0.0142
5	-0.0323	-0.0215	-0.0208	-0.0229	-0.0082
6	-0.0278	-0.0146	-0.0212	-0.0097	-0.0031
7	-0.0226	-0.0118	-0.0137	-0.0024	0.0079
8	-0.0167	-0.0054	-0.0054	0.0054	0.0205
9	-0.0040	-0.0042	-0.0040	0.0148	0.0284
10	-0.0036	0.0008	0.0035	0.0250	0.0316
11	0.0076	0.0067	0.0086	0.0342	0.0407
12	0.0162	0.0165	0.0127	0.0403	0.0529
13	0.0177	0.0188	0.0176	0.0435	0.0541
14	0.0236	0.0275	0.0197	0.0464	0.0508
15	0.0302	0.0336	0.0296	0.0494	0.0577
16	0.0306	0.0284	0.0321	0.0545	0.0551
17	0.0304	0.0266	0.0276	0.0485	0.0524
18	0.0321	0.0310	0.0284	0.0432	0.0502
19	0.0257	0.0266	0.0274	0.0398	0.0378
20	0.0216	0.0188	0.0204	0.0305	0.0357
21	0.0189	0.0146	0.0170	0.0210	0.0221
22	0.0073	0.0116	0.0058	0.0173	0.0198
23	0.0086	0.0067	0.0018	0.0136	0.0175
24	0.0059	0.0027	0.0033	0.0081	0.0068
25	-0.0002	0.0024	0.0028	0.0009	0.0011
26	0.0000	0.0000	0.0000	0.0000	0.0000

TABLE 4.1.4-4 Axial Sodium Worth Profiles,
in cents, in Core Locations
without Internal Blanket
in ZPPR-17A

<u>Location</u> <u>Displacement,</u> <u>Inches</u>	<u>147-33</u>	<u>148-32</u>	<u>147-27</u>
0	-0.0557	-0.0398	0.0660
1	-0.0473	-0.0293	0.0639
2	-0.0329	-0.0195	0.0584
3	-0.0242	-0.0071	0.0607
4	-0.0149	-0.0025	0.0611
5	-0.0065	0.0129	0.0545
6	0.0017	0.0171	0.0518
7	0.0108	0.0249	0.0531
8	0.0175	0.0335	0.0461
9	0.0272	0.0427	0.0484
10	0.0370	0.0471	0.0466
11	0.0406	0.0506	0.0423
12	0.0448	0.0564	0.0336
13	0.0494	0.0553	0.0355
14	0.0563	0.0559	0.0313
15	0.0557	0.0565	0.0322
16	0.0492	0.0594	0.0268
17	0.0485	0.0488	0.0203
18	0.0387	0.0460	0.0188
19	0.0360	0.0358	0.0130
20	0.0296	0.0324	0.0115
21	0.0170	0.0188	0.0043
22	0.0126	0.0203	0.0065
23	0.0113	0.0132	0.0023
24	0.0047	0.0095	0.0005
25	0.0012	0.0022	-0.0042
26	0.0000	0.0000	0.0000

TABLE 4.1.4-5 Axial Sodium Worth Profiles,
in cents, in Radial Blanket
Locations in ZPPR-17A

<u>Location</u> <u>Displacement,</u> <u>Inches</u>	<u>148-25</u>	<u>148-23</u>
0	0.0675	0.0171
1	0.0573	0.0157
2	0.0581	0.0096
3	0.0520	0.0101
4	0.0478	0.0122
5	0.0411	0.0131
6	0.0418	0.0110
7	0.0388	0.0071
8	0.0357	0.0100
9	0.0284	0.0041
10	0.0286	0.0075
11	0.0236	0.0049
12	0.0203	0.0045
13	0.0148	0.0062
14	0.0156	0.0024
15	0.0069	0.0026
16	0.0079	0.0019
17	0.0054	0.0011
18	0.0051	0.0064
19	0.0044	0.0024
20	0.0057	0.0001
21	0.0000	0.0024
22	-0.0029	0.0031
23	-0.0040	-0.0009
24	-0.0021	0.0031
25	0.0010	0.0044
26	0.0000	0.0000

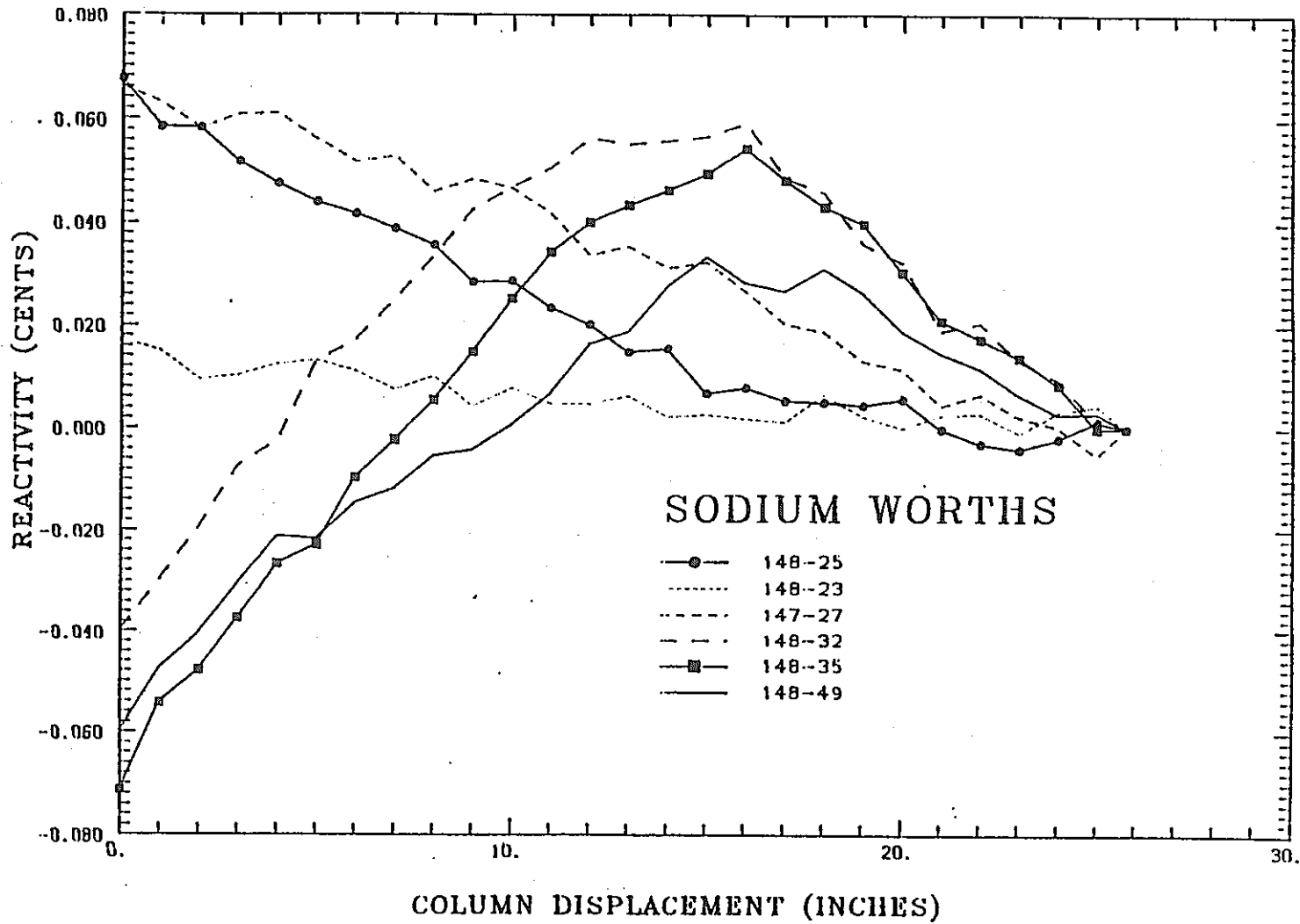


Fig 4.1.4-3 Reactivity versus Sodium Column Displacement for Various Locations in ZPPR-17A

4. 1. 5 ガンマ発熱分布

(1) 測定概要

ZPPRにおける反応率分布は熱蛍光線量計(Thermoluminescent dosimeter: TLD)によって測定されている。TLDはLi-7Fの1mmx1mmx6mm chipを使用している。このTLD chipは0.25-in.高さ、0.5-in.直径の円筒形状のスリーブに入れて測定する。この形状をタイプ1と呼んでおり炉心/ブランケット部の軸・径方向分布測定に使用されている。反射体領域ではタイプ2と呼ぶ0.5-in.高さ0.125-in.直径の円筒形状のスリーブを使用して測定されている。

セル内の詳細分布はこのタイプ2で測定し、箔による反応率分布と同様にセルファクターが求められている。タイプ1で測定された“mapping TLD”の測定結果を均質化したセル定数(中性子/ガンマ線用の均質化定数)で解析可能とする“cell averaged data”を求めている。

燃料セルを1/16単位で分割した位置にTLD chipホルダーNaプレート(Tunnel sodium Plate)を使用して約1時間の照射を行い、一日後に取出し蛍光線量を測定する。したがって、TLDには照射中のガンマ線と炉停止後の核分裂生成物から発生する遅発ガンマ線を吸収していることになる。また、TLDには中性子による発光成分を含んでいる結果が示されている。

解析には中性子によるTLD response関数とガンマ線によるTLD response関数をdetector cross sectionとして必要とする。

TLDの測定値はCo-60のガンマエネルギーで較正されている(calibration誤差:2%系統誤差)。測定結果はmrad/sの単位で、炉出力1ワットあたりに換算されている。ただし、ZPPRの炉出力の絶対値の較正は目安であり、正確ではない。反応率の規格化と統一的に行うことが必要である。ガンマ線線量率分布data tapeにあるTLD location dataも必要になる。

Fig. 4.1.5-1にTLD CHIP装荷位置(タイプ1)を示す。Fig.4.1.5-2はセル内分布測定位置を示している。

Table 4.1.5-1~3にはTLD response解析に必要な中性子・ガンマ線による寄与を把握するために必要なデータを示す。エネルギー分割とTLD(Li-7)のresponse

関数とガンマ線線量率計算のためのenergy attenuation function を示している。
。これらはANL の解析で使用されたものである。

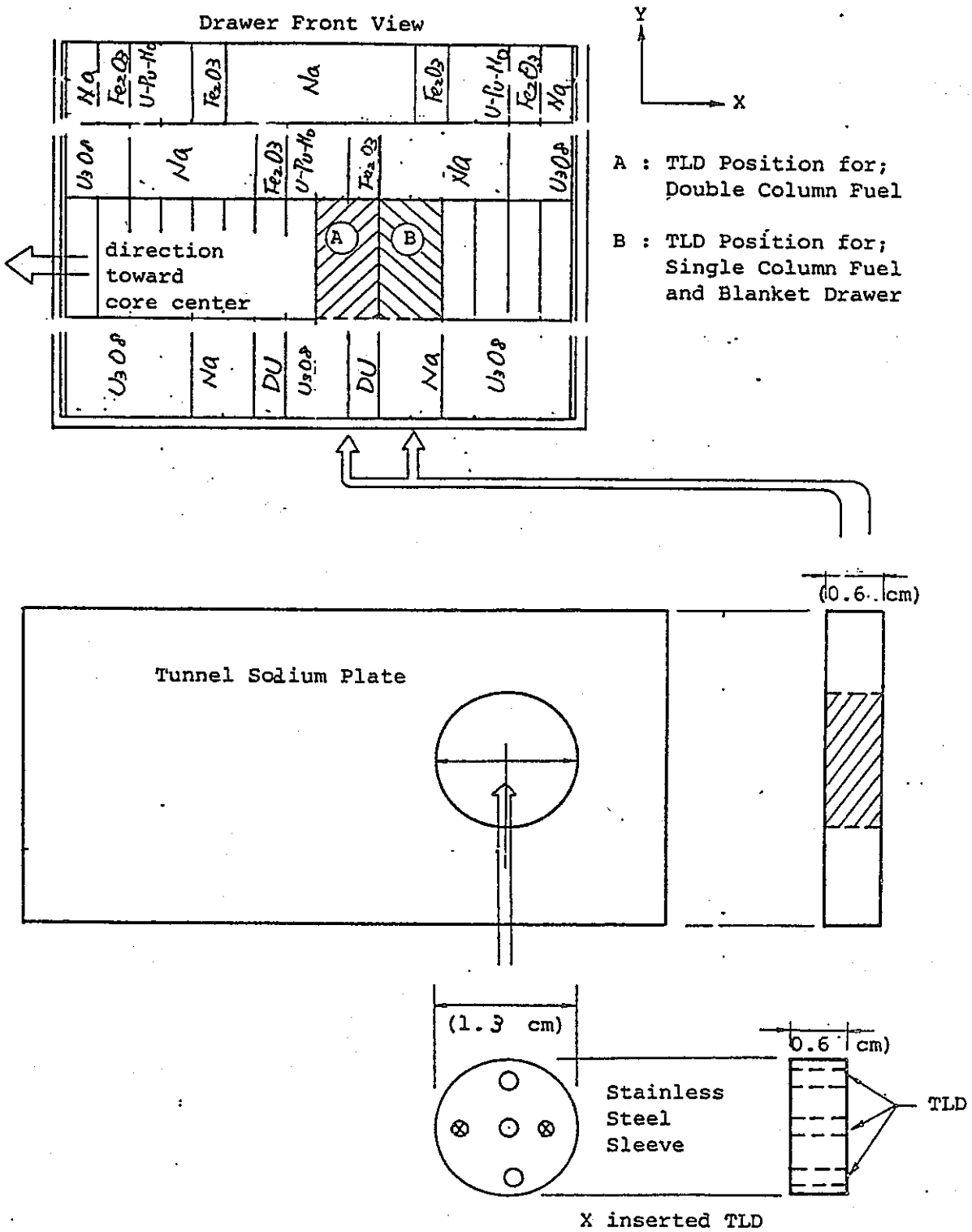


Fig. 4.1.5-1 Schematic View of TLD Insertion into the Fuel and Blanket Drawers

SINGLE COLUMN FUEL

MTRX	
U308	x 0.4136
NA†	x 0.4082
NA†	x 0.4020
FE203	x 0.4311
PU-U-MO	
FE203	
NA†	x 0.4210
NA†	x 0.4266
U308	x 0.4145
MTRX	x 0.4067

+ 1/2" Na replaced by two 1/4" Na

INTERNAL BLANKET

MTRX	
U308	x 0.1797
NA†	x 0.1802
NA†	x 0.1716
FE203	x 0.1678
DEP.U	
DEP.U	x 0.1892
FE203	
NA†	x 0.1711
NA†	x 0.1661
U308	x 0.1817
MTRX	x 0.1822

+ 1/2" Na replaced by two 1/4" Na

DOUBLE COLUMN FUEL

MTRX	
U308	x 0.4333
NA	x 0.4516
PU-U-MO	x 0.4959
NA†	x 0.5486
NA†	x 0.4828
PU-U-MO	x 0.5229
NA	x 0.5052
U308	x 0.4671
MTRX	x 0.4373

† 1/2" Na2CO3 replaced by two 1/4" Na

x TLD Location

Fig. 4.1.5-2 In-cell TLD Locations and Measured Dose

Table 4.1.5-1 Broad Group Structures for Neutron
and Gamma Cross Section Library

Broad Group Number	Upper Bound, eV	
	Neutron	Gamma
1	1.41907 + 7	2.00000 + 7
2	6.06531 + 6	1.00000 + 7
3	3.67879 + 6	8.00000 + 6
4	2.23130 + 6	7.00000 + 6
5	1.35335 + 6	6.00000 + 6
6	8.20850 + 5	5.00000 + 6
7	4.97671 + 5	4.00000 + 6
8	3.01974 + 5	3.00000 + 6
9	1.83156 + 5	2.50000 + 6
10	1.11090 + 5	2.00000 + 6
11	6.73795 + 4	1.50000 + 6
12	4.08677 + 4	1.00000 + 6
13	2.47675 + 4	7.00000 + 5
14	1.50344 + 4	4.50000 + 5
15	9.11883 + 3	3.00000 + 5
16	5.53085 + 3	1.50000 + 5
17	3.35463 + 3	1.00000 + 5
18	2.03469 + 3	2.50000 + 4
19	1.23410 + 3	4.50000 + 4
20	4.54000 + 2	3.00000 + 4
21	6.14423 + 1	2.00000 + 4

Table 4.1.5-2 Neutron and Gamma Response Functions
for TLDS

<u>Group</u>	<u>Neutron S(E)</u>	<u>Gamma f(E)</u>
1	3.20027E-10	1.06001
2	1.85294E-10	1.05745
3	1.05852E-10	1.05828
4	6.19877E-11	1.06023
5	3.91033E-11	1.06297
6	2.35668E-11	1.06685
7	2.36631E-11	1.07483
8	1.84305E-11	1.08027
9	5.73654E-12	1.08257
10	3.28962E-12	1.07968
11	4.73238E-12	1.06549
12	2.80550E-12	1.04134
13	9.61333E-13	1.00073
14	5.93583E-13	0.91057
15	4.35426E-13	0.62258
16	3.16693E-13	0.21927
17	2.10752E-13	0.08248
18	1.44300E-13	0.04020
19	7.29792E-14	0.02764
20	2.87526E-14	0.02843
21	4.54593E-14	0.03775

Table 4.1.5-3 Mass Absorption Coefficients for
Stainless Steel

<u>Gamma Group</u>	<u>E (eV)</u>	<u>$(\frac{\mu}{\rho})_{ss}^a$</u>
1	1.5 + 7	0.0224
2	9.0 + 6	0.0210
3	7.5 + 6	0.0206
4	6.5 + 6	0.0203
5	5.5 + 6	0.0200
6	4.5 + 6	0.0199
7	3.5 + 6	0.0202
8	2.75 + 6	0.0209
9	2.25 + 6	0.0217
10	1.75 + 6	0.0230
11	1.25 + 6	0.0250
12	8.5 + 5	0.0269
13	5.75 + 5	0.0287
14	3.75 + 5	0.0311
15	2.25 + 5	0.0440
16	1.25 + 5	0.1458
17	8.75 + 4	0.3320
18	6.0 + 4	0.9382
19	3.75 + 4	4.1026
20	2.50 + 4	14.7236
21	1.25 + 4	92.2460

^aStainless steel composition is 18% Cr, 2% Mn,
70% Fe and 10% Ni.

(2) Z P P R - 1 7 体系の測定データ

a. 測定体系のまとめ

項目	ZPPR-17A	ZPPR-17B	ZPPR-17C
体系の特徴	クリーン体系CRP チャンネルなし	サイクル末期模擬 25CRP チャンネル	サイクル初期模擬 13CRP チャンネル 12模擬制御棒半挿入
測定日	1987-04-02	1987-05-27	1987-06-30
測定炉心	loading #60 run #63	loading #121 run #132	loading #153 run #171
測定体系	臨界基準体系	同左	同左
PSR 位置	(134-63)と対称位置	同左	同左
深度	炉心中心面より 480 mm	444.0mm	505.0mm
反応度			

b. 測定結果

中性子反応率分布の箔による測定と同様に、ドロワーセル内のbasic dataとセルファクターを補正したmapping dataが用意されている。

Z P P R - 1 7 A (出典ZPR-TM-485)

Fig.4.1.5-3/4 TLD 装荷位置

Fig.4.1.5-5/6 軸非均質炉心内TLD response測定値分布例

Table 4.1.5-4 セルファクター例(SUMMARY)

Table 4.1.5-5 gamma dose rate 径方向分布測定値

Table 4.1.5-6/7 gamma dose rate 軸方向分布測定値

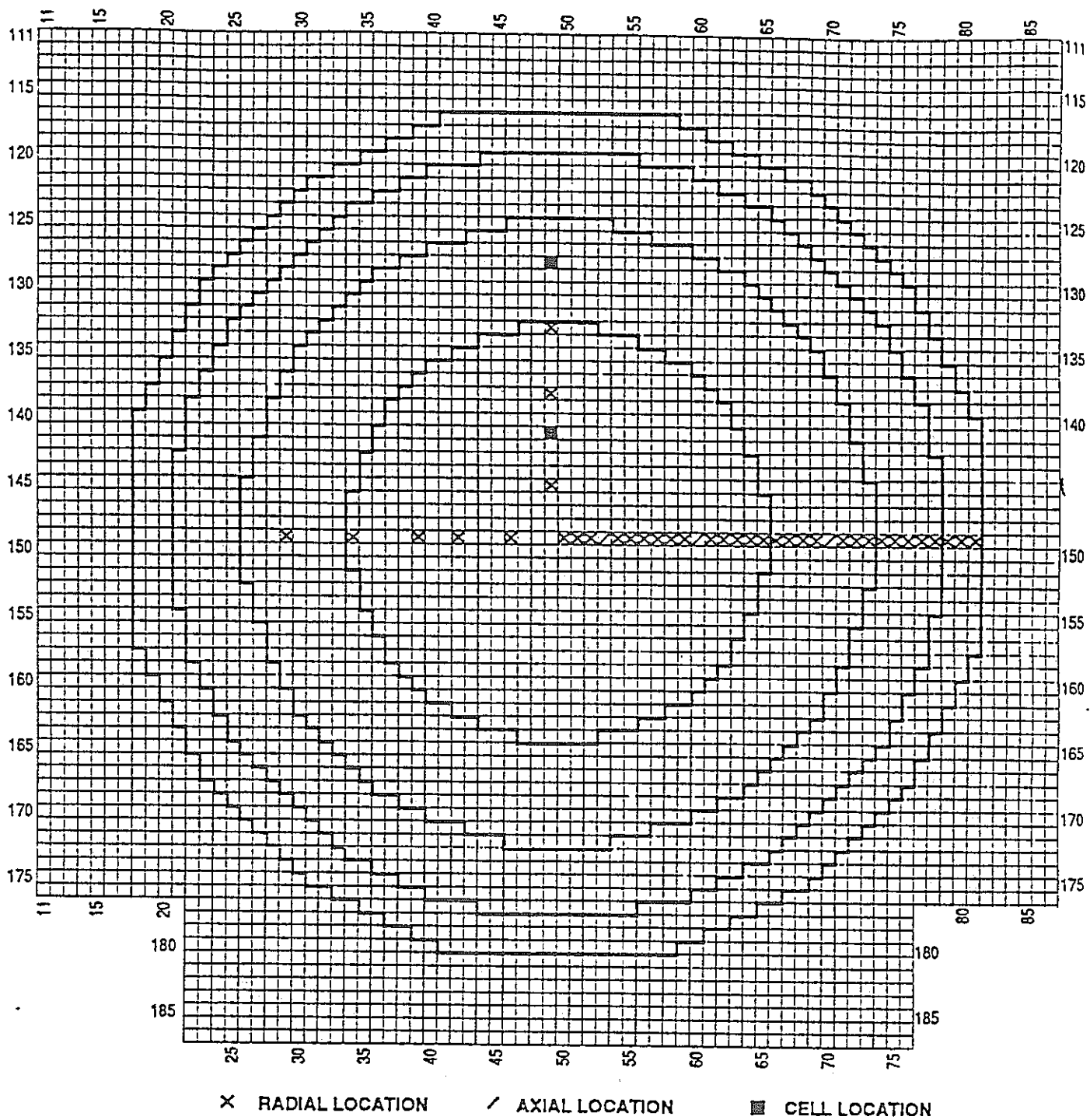
Table 4.1.5-8 ~11 gamma dose rate "Mapping Data"分布測定値/解析値

Z P P R - 1 7 B (出典ZPR-TM-485)

Table 4.1.5-12/13 gamma dose rate "Mapping Data"分布測定値/解析値

Z P P R - 1 7 C (出典ZPR-TM-485)

Table 4.1.5-14~16 gamma dose rate "Mapping Data"分布測定値/解析値



ZPPR-17A

Fig. 4.1.5-3 Gamma Heating Locations in ZPPR-17A

⊗ RADIAL LOCATION (z = 3" & 9")

⊙ AXIAL LOCATION (z = 3, 5, 9, 13, 17, 23, & 27")

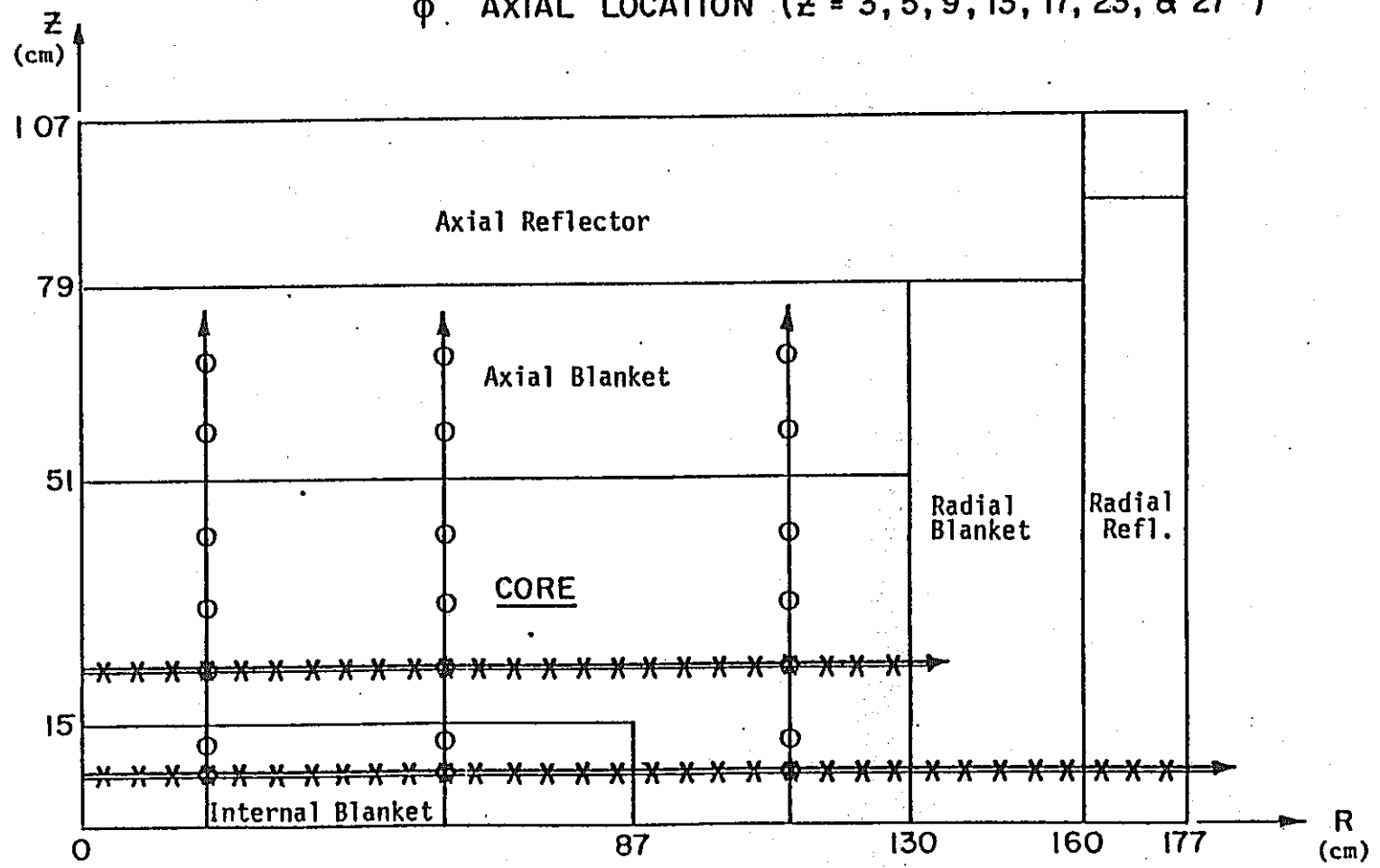


Fig. 4.1.5-4 RZ Plot of ZPPR-17 and TLD Locations

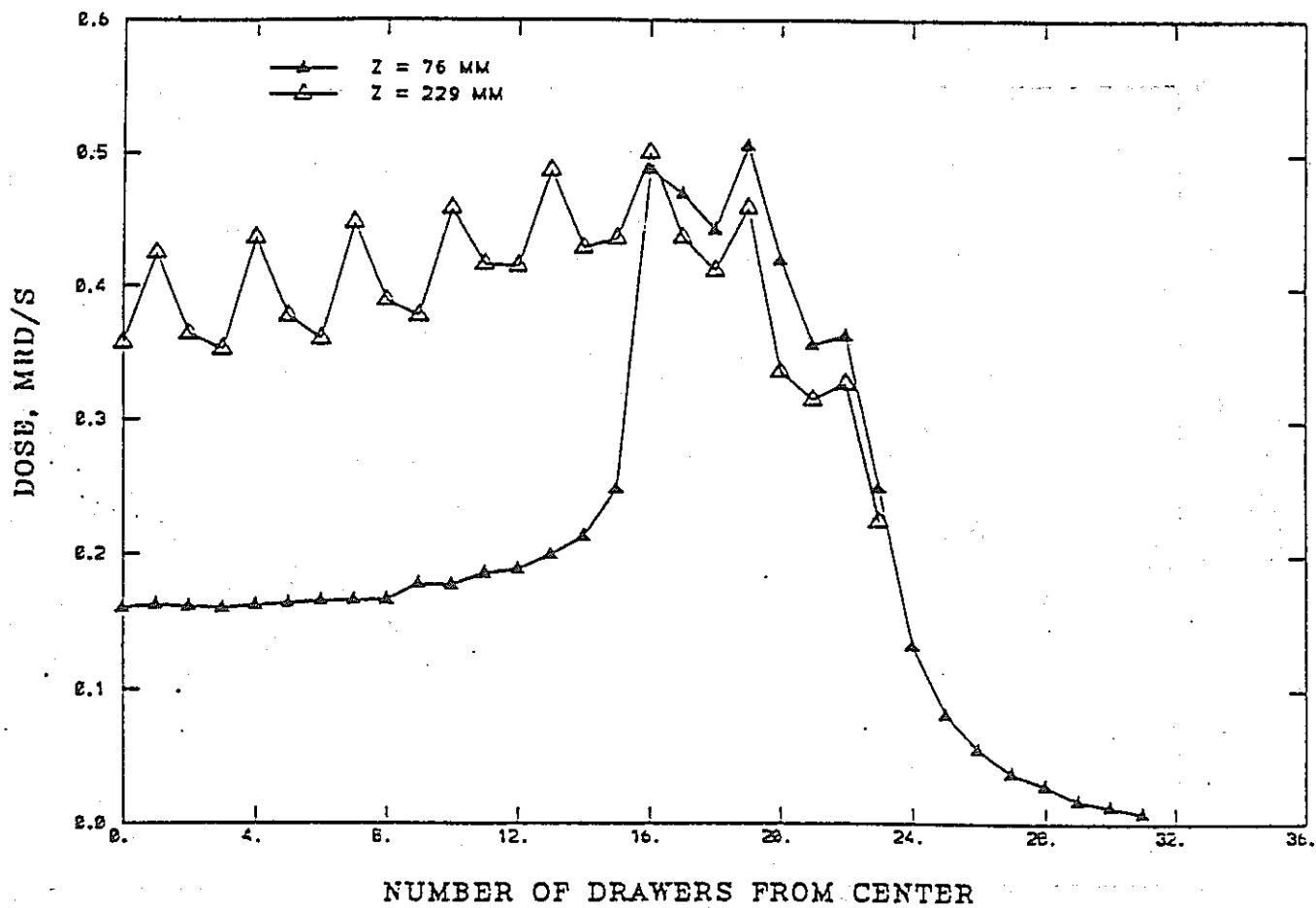


Fig. 4.1.5-5 Radial Gamma Dose Distributions in ZPPR-17A

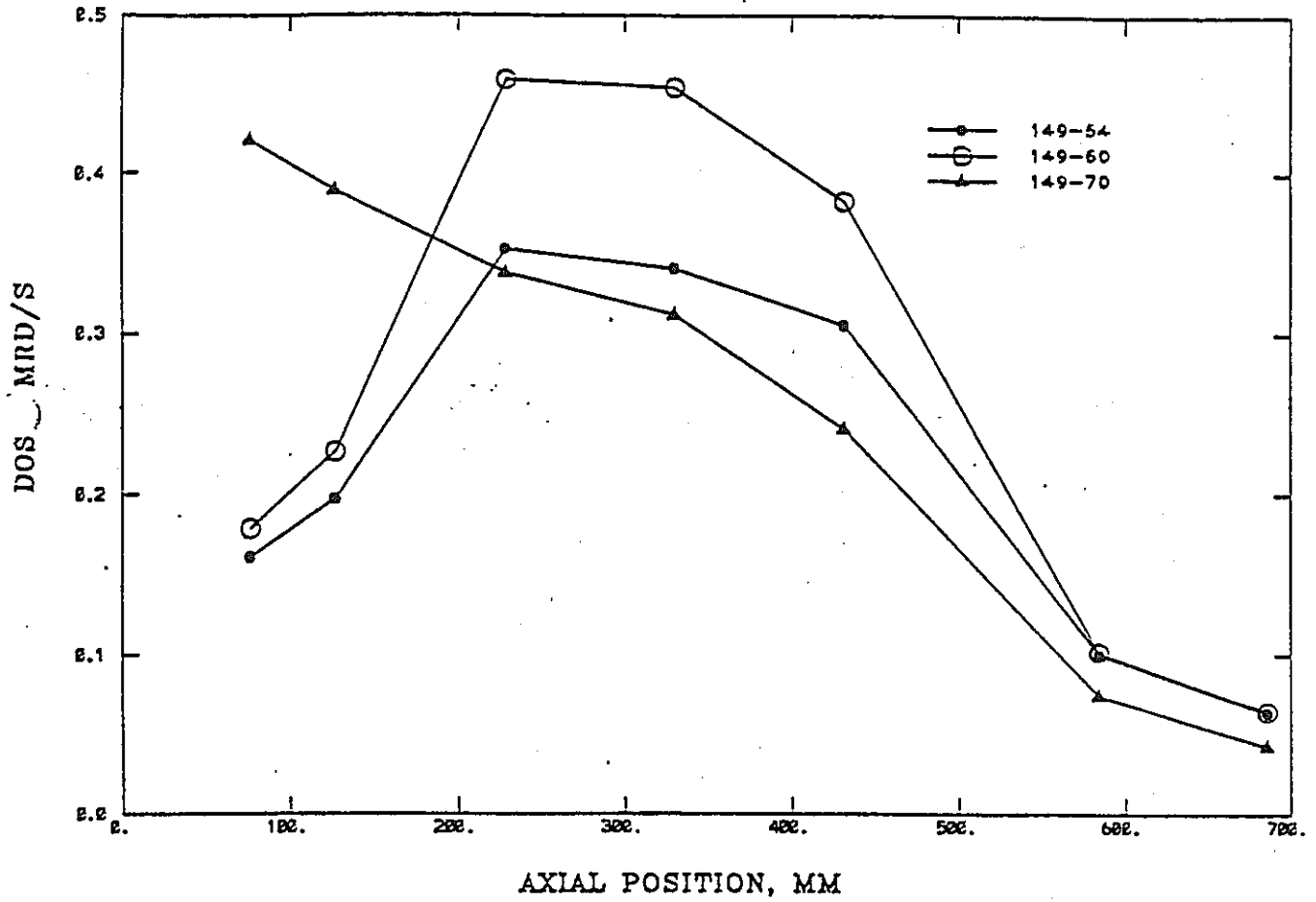


Fig. 4.1.5-6 Axial Gamma Dose Distributions in ZPPR-17A

Table 4.1.5-4 Summary of Cell Averaging Factors

<u>Cell Type</u>	<u>Environment</u>	<u>Cell Factor (Total Dose)</u>
SCF	Asymptotic	1.0220
"	$\underline{S} + S + D$	1.0049
"	$\underline{S} + \underline{S} + D$	1.0368
"	$\underline{S} + RB$	0.9845
DCF	Asymptotic	1.0392
"	$S + S + \underline{D}$	1.0444
"	$IB + \underline{D}$	1.1050
IBK	Asymptotic	0.9993
"	$\underline{IB} + D$	1.0915
RBK	Asymptotic	0.9960
"	$S + \underline{RB}$	0.9657

Table 4.1.5-5 ZPPR-17A Radial Dose (gamma plus neutron)
Distributions

Matrix Location	Drawer Type ^a	In-Cell Location ^b	Dose Rate (mrd/s) ^c	
			z = 76 mm ^d	z = 229 mm
149-50	SF	CD	0.1601	0.3573
149-51	DF	CD	0.1625	0.4248
149-52	SF	CD	0.1612	0.3640
149-53	SF	CD	0.1600	0.3523
149-54	DF	CD	0.1622	0.4359
149-55	SF	CD	0.1636	0.3776
149-56	SF	CD	0.1655	0.3607
149-57	DF	CD	0.1663	0.4477
149-58	SF	CD	0.1667	0.3897
149-59	SF	CD	0.1789	0.3786
149-60	DF	CD	0.1781	0.4592
149-61	SF	CD	0.1866	0.4176
149-62	SF	CD	0.1896	0.4161
149-63	DF	CD	0.2002	0.4879
149-64	SF	CD	0.2136	0.4294
149-65	SF	CD	0.2489	0.4358
149-66	DF	CD	0.4885	0.5010
149-67	SF	CD	0.4698	0.4372
149-68	SF	CD	0.4434	0.4129
149-69	DF	CD	0.5065	0.4598
149-70	SF	CD	0.4204	0.3374
149-71	SF	CD	0.3573	0.3167
149-72	DF	CD	0.3642	0.3291
149-73	SF	CD	0.2510	0.2259
149-74	B	EF	0.1330	
149-75	B	EF	0.0814	
149-76	B	EF	0.0555	
149-77	B	EF	0.0377	
149-78	B	EF	0.0258	
149-79	R	HI	0.0171	
149-80	R	HI	0.0127	
149-81	R	HI	0.0076	

Table 4.1.5-5 (contd)

Matrix Location	Drawer Type ^a	In-Cell Location ^b	Dose Rate (mrd/s) ^c	
			z = 76 mm ^d	z = 229 mm
149-46	SF	MN	0.1588	
149-42	DF	MN	0.1631	
149-39	DF	MN	0.1770	
149-34	SF	MN	0.2367	
145-49	SF	MN	0.1579	
138-49	DF	MN	0.1774	
133-49	SF	MN	0.2693	

^aSF is single fuel column, DF is double fuel column, B is blanket and R is reflector.

^bDrawer column which designates the TLD location.

^cDose rates normalized to an estimated reactor power of 1 watt.

^dLocations 149-50 through 149-65 contain internal blanket.

Table 4.1.5-6 ZPPR-17A Axial Dose (gamma plus neutron) Distributions

Axial Displacement (mm)	Dose Rate (mrd/s) ^a		
	149-54	149-60	149-70
76.2	0.1600	0.1781	0.4204
127.0	0.1965	0.2257	0.3889
228.6	0.3523	0.4592	0.3374
330.2	0.3400	0.4544	0.3112
431.8	0.3051	0.3823	0.2407
584.2	0.1005	0.1016	0.0744
685.8	0.0638	0.0640	0.0423

^aDose rates normalized to an estimated power of 1 watt.

Table 4.1.5-7 Measured and Calculated Dose Rates along the X-axis at 3 in. from the Midplane

Location	Drawer Type ^a	Exp. ^b	Cell Factor	Corrected Exp.	Calc. ^c	C/E
149-50	SF	0.1601	0.9993	0.1600	0.85903E-03	0.9514
149-51	DF	0.1625	0.9993	0.1624	0.86263E-03	0.9412
149-52	SF	0.1612	0.9993	0.1611	0.86386E-03	0.9502
149-53	SF	0.1600	0.9993	0.1599	0.87177E-03	0.9661
149-54	DF	0.1622	0.9993	0.1621	0.88390E-03	0.9662
149-55	SF	0.1636	0.9993	0.1635	0.89344E-03	0.9683
149-56	SF	0.1655	0.9993	0.1654	0.91013E-03	0.9751
149-57	DF	0.1663	0.9993	0.1662	0.93169E-03	0.9934
149-58	SF	0.1667	0.9993	0.1666	0.95112E-03	1.0117
149-59	SF	0.1789	0.9993	0.1788	0.97890E-03	0.9702
149-60	DF	0.1781	0.9993	0.1780	0.10129E-02	1.0084
149-61	SF	0.1866	0.9993	0.1865	0.10462E-02	0.9941
149-62	SF	0.1896	0.9993	0.1895	0.10920E-02	1.0212
149-63	DF	0.2002	0.9993	0.2001	0.11538E-02	1.0219
149-64	SF	0.2136	0.9993	0.2135	0.12480E-02	1.0360
149-65	SF	0.2489	1.0915	0.2717	0.15602E-02	1.0176
149-66	DF	0.4885	1.1050	0.5398	0.27325E-02	0.8969
149-67	SF	0.4698	1.0049	0.4721	0.26702E-02	1.0021
149-68	SF	0.4434	1.0368	0.4597	0.25691E-02	1.0287
149-69	DF	0.5065	1.0444	0.5290	0.27598E-02	0.9244
149-70	SF	0.4204	1.0049	0.4225	0.23253E-02	0.9752
149-71	SF	0.3573	1.0368	0.3704	0.21000E-02	1.0044
149-72	DF	0.3642	1.0444	0.3804	0.19379E-02	0.9027
149-73	SF	0.2510	0.9845	0.2471	0.13487E-02	0.9571
149-74	B	0.1330	0.9657	0.1284	0.64630E-03	0.8916
149-75	B	0.0814	0.9960	0.0811	0.39647E-03	0.8665
149-76	B	0.0555	0.9960	0.0553	0.27384E-03	0.8778
149-77	B	0.0377	0.9960	0.0375	0.19310E-03	0.9112
149-78	B	0.0258	0.9960	0.0257	0.13518E-03	0.9321
149-79	R	0.0171	1.0000	0.0171	0.71451E-04	0.7404
149-80	R	0.0127	1.0000	0.0127	0.39789E-04	0.5551
149-81	R	0.0076	1.0000	0.0076	0.17826E-04	0.4156

^aSF is single fuel column DF is double fuel column, B is blanket and R is reflector.

^bMeasured total dose rate (gamma and neutron) in mrd/s at an estimated reactor power of 1 watt. Statistical uncertainties 2%.

^cNodal transport calculation in xyz geometry with fluxes normalized to 8 watts, calculated doses in rads. For comparison with measurement the calculated doses are normalized by the mean C/E for ²³⁹Pu fission from 62 foil measurements in the core region.

Table 4.1.5-8 Measured and Calculated Dose Rates along
the X-Axis at 9 in. from the Midplane

Location	Drawer Type ^a	Exp. ^b	Cell Factor	Corrected Exp.	Calc. ^c	C/E
149-50	SF	0.3573	1.0368	0.3704	0.19986E-02	0.9559
149-51	DF	0.4248	1.0444	0.4437	0.21643E-02	0.8644
149-52	SF	0.3640	1.0049	0.3658	0.19721E-02	0.9553
149-53	SF	0.3523	1.0368	0.3653	0.20115E-02	0.9758
149-54	DF	0.4359	1.0444	0.4553	0.22078E-02	0.8593
149-55	SF	0.3776	1.0049	0.3795	0.20282E-02	0.9471
149-56	SF	0.3607	1.0368	0.3740	0.20845E-02	0.9876
149-57	DF	0.4477	1.0444	0.4676	0.23047E-02	0.8733
149-58	SF	0.3897	1.0049	0.3916	0.21311E-02	0.9642
149-59	SF	0.3786	1.0368	0.3925	0.22033E-02	0.9945
149-60	DF	0.4592	1.0444	0.4796	0.24484E-02	0.9046
149-61	SF	0.4176	1.0049	0.4196	0.22709E-02	0.9588
149-62	SF	0.4161	1.0368	0.4314	0.23510E-02	0.9656
149-63	DF	0.4879	1.0444	0.5096	0.26099E-02	0.9075
149-64	SF	0.4294	1.0049	0.4315	0.24135E-02	0.9911
149-65	SF	0.4358	1.0368	0.4518	0.24997E-02	0.9802
149-66	DF	0.5010	1.0444	0.5232	0.27825E-02	0.9422
149-67	SF	0.4372	1.0049	0.4393	0.25154E-02	1.0145
149-68	SF	0.4129	1.0368	0.4261	0.24575E-02	1.0172
149-69	DF	0.4598	1.0444	0.4802	0.25035E-02	0.9237
149-70	SF	0.3374	1.0049	0.3391	0.20904E-02	1.0924
149-71	SF	0.3167	1.0368	0.3284	0.18772E-02	1.0130
149-72	DF	0.3291	1.0444	0.3437	0.17229E-02	0.8882
149-73	SF	0.2259	0.9845	0.2224	0.11928E-02	0.9503

^aSF is single fuel column, DF is double fuel column, B is blanket and R is reflector.

^bMeasured total dose rate (gamma and neutron) in mrd/s at an estimated reactor power of 1 watt. Statistical uncertainties 2%.

^cNodal transport calculation in xyz geometry with fluxes normalized to 8 watts, calculated doses in rads. For comparison with measurement the calculated doses are normalized by the mean C/E for ²³⁹Pu fission from 62 foil measurements in the core region.

Table 4.1.5-9 Measured and Calculated Dose Rates in the Axial Direction in Matrix 149-53

<u>Axial Displacement (mm)</u>	<u>Exp.^a</u>	<u>Cell Factor</u>	<u>Corrected Exp.</u>	<u>Calc.^b</u>	<u>C/E</u>
76.2	0.1600	0.9993	0.1599	0.87177E-03	0.9661
127.0	0.1965	0.9993	0.1964	0.11017E-02	0.9941
228.6	0.3523	1.0368	0.3653	0.20115E-02	0.9758
330.2	0.3400	1.0368	0.3525	0.20730E-02	1.0420
431.8	0.3051	1.0368	0.3163	0.17344E-02	0.9715
584.2	0.1005	1.0000	0.1005	0.54986E-03	0.9694
685.8	0.0638	1.0000	0.0638	0.34260E-03	0.9515

^aMeasured total dose rate (gamma and neutron) in mrd/s at an estimated reactor power of 1 watt. Statistical uncertainties 2%.

^bNodal transport calculation in xyz geometry with fluxes normalized to 8 watts, calculated doses in rads. For comparison with measurement the calculated doses are normalized by the mean C/E for ²³⁹Pu fission from 62 foil measurements in the core region.

Table 4.1.5-10 Measured and Calculated Dose Rates in the Axial Direction in Matrix 149-60

Axial Displacement (mm)	Exp. ^a	Cell Factor	Corrected Exp.	Calc. ^b	C/E
76.2	0.1781	0.9993	0.1780	0.10129E-02	1.0084
127.0	0.2257	0.9993	0.2255	0.12830E-02	1.0079
228.6	0.4592	1.0444	0.4796	0.24484E-02	0.9046
330.2	0.4544	1.0444	0.4746	0.24471E-02	0.9137
431.8	0.3823	1.0444	0.3993	0.20229E-02	0.8977
584.2	0.1016	1.0000	0.1016	0.57995E-03	1.0114
685.8	0.0640	1.0000	1.0640	0.35406E-03	0.9802

^aMeasured total dose rate (gamma and neutron) in mrd/s at an estimated reactor power of 1 watt. Statistical uncertainties 2%.

^bNodal transport calculation in xyz geometry with fluxes normalized to 8 watts, calculated doses in rads. For comparison with measurement the calculated doses are normalized by the mean C/E for ²³⁹Pu fission from 62 foil measurements in the core region.

Table 4.1.5-11 Measured and Calculated Dose Rates in the Axial Direction in Matrix 149-70

Axial Displacement (mm)	Exp. ^a	Cell Factor	Corrected Exp.	Calc. ^b	C/E
76.2	1.0049	1.0049	0.4225	0.23253E-02	0.9753
127.0	0.3889	1.0049	0.3908	0.22681E-02	1.0263
228.6	0.3374	1.0049	0.3391	0.20904E-02	1.0924
330.2	0.3112	1.0049	0.3127	0.18131E-02	1.0273
431.8	0.2407	1.0049	0.2419	0.13580E-02	1.0168
584.2	0.0744	1.0000	0.0744	0.40232E-03	0.9581
685.8	0.0423	1.0000	0.0423	0.23565E-03	0.9879

^aMeasured total dose rate (gamma and neutron) in mrd/s at an estimated reactor power of 1 watt. Statistical uncertainties 2%.

^bNodal transport calculation in xyz geometry with fluxes normalized to 8 watts, calculated doses in rads. For comparison with measurement the calculated doses are normalized by the mean C/E for ²³⁹Pu fission from 62 foil measurements in the core region.

Table 4.1.5-12 ZPPR-17B Radial Dose (gamma plus neutron)
Distributions

Matrix Location	Drawer Type ^a	In-Cell Location ^b	Dose Rate (mrd/s) ^c	
			z = 76 mm ^u	z = 229 mm
149-50	CRP	IJ	0.1525	0.2706
149-51	DF	CD	0.1513	0.3692
149-52	SF	CD	0.1562	0.3392
149-53	SF	CD	0.1467	0.3125
149-54	DF	CD	0.1518	0.3871
149-55	SF	CD	0.1519	0.3323
149-56	SF	CD	0.1530	0.3224
149-57	CRP	IJ	0.1585	0.2619
149-58	CRP	IJ	0.1631	0.2624
149-59	SF	CD	0.1660	0.3191
149-60	DF	CD	0.1668	0.4365
149-61	SF	CD	0.1715	0.3737
149-62	SF	CD	0.1771	0.3797
149-63	DF	CD	0.1850	0.4641
149-64	SF	CD	0.1970	0.4022
149-65	SF	CD	0.2320	0.4188
149-66	DF	CD	0.4620	0.4773
149-67	SF	CD	0.4557	0.4286
149-68	SF	CD	0.4389	0.4115
149-69	DF	CD	0.4930	0.4517
149-70	SF	CD	0.3910	0.3448
149-71	SF	CD	0.3481	0.3237
149-72	DF	CD	0.3626	0.3283
149-73	SF	CD	0.2518	0.2316
148-74	R	EF	0.1359	
149-76	R	EF	0.0556	
149-78	R	EF	0.0289	
149-46	SF	MN	0.1459	
149-39	DF	MN	0.1672	
149-34	SF	MN	0.2349	

Table 4.1.5-12 (contd)

Matrix Location	Drawer Type ^a	In-Cell Location ^b	Dose Rate (mrd/s) ^c	
			z = 76 mm ^d	z = 229 mm
148-50	CRP	IJ	0.1546	
147-50	DF	CD	0.1542	
145-50	SF	CD	0.1447	
143-50	SF	CD	0.1515	
141-50	DF	CD	0.1567	
140-50	SF	CD	0.1626	
139-50	SF	CD	0.1669	
138-50	DF	CD	0.1691	
137-50	CRP	IJ	0.1776	
136-50	CRP	IJ	0.1828	
135-50	DF	IJ	0.1886	
134-50	SF	IJ	0.1971	
133-50	SF	IJ	0.2460	
128-50	SF	IJ	0.3487	

^aSF is single fuel column, DF is double fuel column, B is blanket, R is reflector and CRP is control rod position.

^bDrawer column which designates the TLD location.

^cDose rates normalized to an estimated reactor power of 1 watt.

^dLocations 149-50 through 149-65 contain internal blanket.

Table 4.1.5-13 ZPPR-17B Axial Dose (gamma plus neutron)
Distribution in 149-60

Axial Displacement (mm)	Dose Rate (mrd/s) ^a
76.2	0.1668
127.0	0.2096
228.6	0.4365
330.2	0.4158
431.8	0.3454
584.2	0.0986
685.8	0.0626

^aNormalized to an estimated reactor power of 1 watt.

Table 4.1.5-14 ZPPR-17C Radial Dose (gamma plus neutron) Distributions

<u>Matrix Location</u>	<u>Drawer Type^a</u>	<u>In-Cell Location^b</u>	<u>Dose Rate (mrd/s)</u>
249-50	CR	JK	0.1446
249-51	DF	MN	0.1078
249-52	SF	MN	0.1240
249-53	SF	MN	0.1371
249-54	DF	MN	0.1446
249-55	DF	MN	0.1451
249-56	SF	MN	0.1506
249-57	CR	GH	0.1549
249-58	CR	GH	0.1568
249-59	SF	MN	0.1600
249-60	DF	MN	0.1621
249-62	SF	MN	0.1589
249-64	DF	MN	0.1680
249-65	SF	MN	0.1900
249-66	DF	MN	0.4012
249-67	DF	MN	0.4580
249-70	DF	MN	0.4536
249-72	DF	MN	0.3822
249-73	DF	MN	0.3133
248-50	CF	GH	0.1594
247-50	DF	MN	0.1203
245-50	SF	MN	0.1371
243-50	DF	MN	0.1450
241-50	DF	MN	0.1203
239-50	SF	MN	0.1554
238-50	DF	MN	0.1600
237-50	CR	GH	0.1595
236-50	CR	GH	0.1629
235-50	DF	MN	0.1629
234-50	DF	MN	0.1732
233-50	SF	MN	0.2095
228-50	SF	MN	0.3623
249-46	SF	CD	0.1385
249-34	SF	CD	0.2060
249-29	DF	CD	0.4709

^aSF is single fuel column, DF is double fuel column, CR is control rod.

^bDrawer column which designates the TLD location.

^cNormalized to an estimated reactor power of 1 watt.

Table 4.1.5-15 ZPPR-17C Axial Dose (gamma plus neutron) Distributions

Axial Displacement (mm)	Dose Rate (mrd/s) ^a					
	149-62	249-62	149-65	249-65	149-70	249-70
76.2	0.1864	0.1589	0.2319	0.1900	0.4971	0.4536
127.0	0.2284	0.1864	0.2726	0.2098	0.4920	0.4193
228.6	0.4265	0.3162	0.4589	0.3244	0.4843	0.3806
330.2	---	0.2941	---	0.2656	---	0.3026
431.8	0.3746	0.2322	0.3792	0.2184	0.3485	0.2213
762.0	0.0530	0.0309	0.0499	0.0257	0.0365	0.0204

^aNormalized to an estimated reactor power of 1 watt.

Table 4.1.5-16 ZPPR-17C Axial Dose (gamma plus neutron) Distributions In and Adjacent to Control Positions

Axial Displacement (mm)	Dose Rate (mrd/s) ^a					
	149-50	249-50	149-51	249-51	149-56	249-56
76.2	0.1509	0.1446	0.1455	0.1078	0.1670	0.1506
127.0		0.1721	0.1880	0.1246	0.2123	0.1683
228.6		0.1990	0.4112	0.2270	0.4083	0.3103
330.2		---	---	0.2310	---	0.2881
431.8		---	0.3803	0.1893	0.3576	0.2501
762.0		0.0320	0.0575	0.0241	0.0567	0.0373

^aNormalized to an estimated reactor power of 1 watt.

4.1.6 反応度

反応度関係の測定は、ZPPR-17A炉心においてのみ行われた。ANLのデータは参考文献(19)によっている。ここでは以下のデータについてまとめた。

項 目	記 載 図 表
(1) 測定位置 :	Fig. 4.1.6-1
(2) 測定項目 :	Table 4.1.6-1
(3) 使用データ	
① サンプル反応度	Table 4.1.6-2
② プレートシフティング	Fig. 4.1.6-2~-5
③ 膨張実験	Fig. 4.1.6-6
④ プレートカラムオシレータ	Fig. 4.1.6-7~-16
(4) 実験値	
① サンプル反応度	
軸方向トラバース	Table 4.1.6-3~-5
径方向トラバース	Table 4.1.6-6
② プレートシフティング	Table 4.1.6-7
③ 膨張実験	Table 4.1.6-8
④ プレートカラムオシレータ	Table 4.1.6-9~-21

これらの記載データについて以下に説明する。

(1) 測定位置

反応度実験はFig. 4.1.6-1 に示す各ポジションにおいて測定された。特に、膨張・湾曲反応度実験は、この17炉心で新たな装置を用いて行われたものであるが、それ以外の実験は、これまでの炉心において用いられた方法と同様である。

(2) 測定項目

反応度の測定項目をまとめて Table 4.1.6-1 に示す。この表では以下のよ

うに各測定項目が略称で示されている。

- ・ATO (軸方向 微小サンプル反応度トラバース実験)
- ・RTO (径方向 微小サンプル反応度トラバース実験)
- ・AEO (軸方向 膨張反応度実験)
- ・BO (熱膨張模擬実験)
- ・PCO (プレート・カラム・オシレーション実験)

なお、この他に静的な実験としてプレートシフティング実験が行われた。

(3) 使用データ

微小サンプルについては、各サンプルの形状、重量、元素組成を示した。またプレートシフティング実験はドロウ内のプレート配列を変化させることにより物質の移動を模擬するものであり、膨張実験およびPCO実験は、ドロウ内のプレートそのものを上下に移動させて、その反応度を測定するものである。使用データとして実験に用いられたドロウの図をそれぞれ示した。

なお、膨張・湾曲反応度については実験内容を補足説明する意味で Table-4.1.6-23, およびFig. 4.1.6-17, -18 を掲載した。

(4) 実験値

ZPPR-17A炉心で測定された反応度実験はすべて ρ 単位で表示されている。以下に各測定内容ごとに測定データの説明を加える。

① サンプル反応度

サンプル反応度は各サンプルごとに測定された位置に対応する反応度が示されている。実験ではサンプルは充分小さくし、一次摂動(FOP)で解析が行えるように配慮されているが、サンプルの大きさは有限であるため詳細にはサンプルサイズの補正が必要になる。(参考文献(1)参照)

② プレートシフティング実験

実際の炉心変更に伴う測定データはTable 4.1.6-7 に示されているが、これに基づき各種の誤差を検討した結果はTable 4.1.6-24に示されるとおり、 -6.02 ± 3.1 %である。

③ 膨張実験

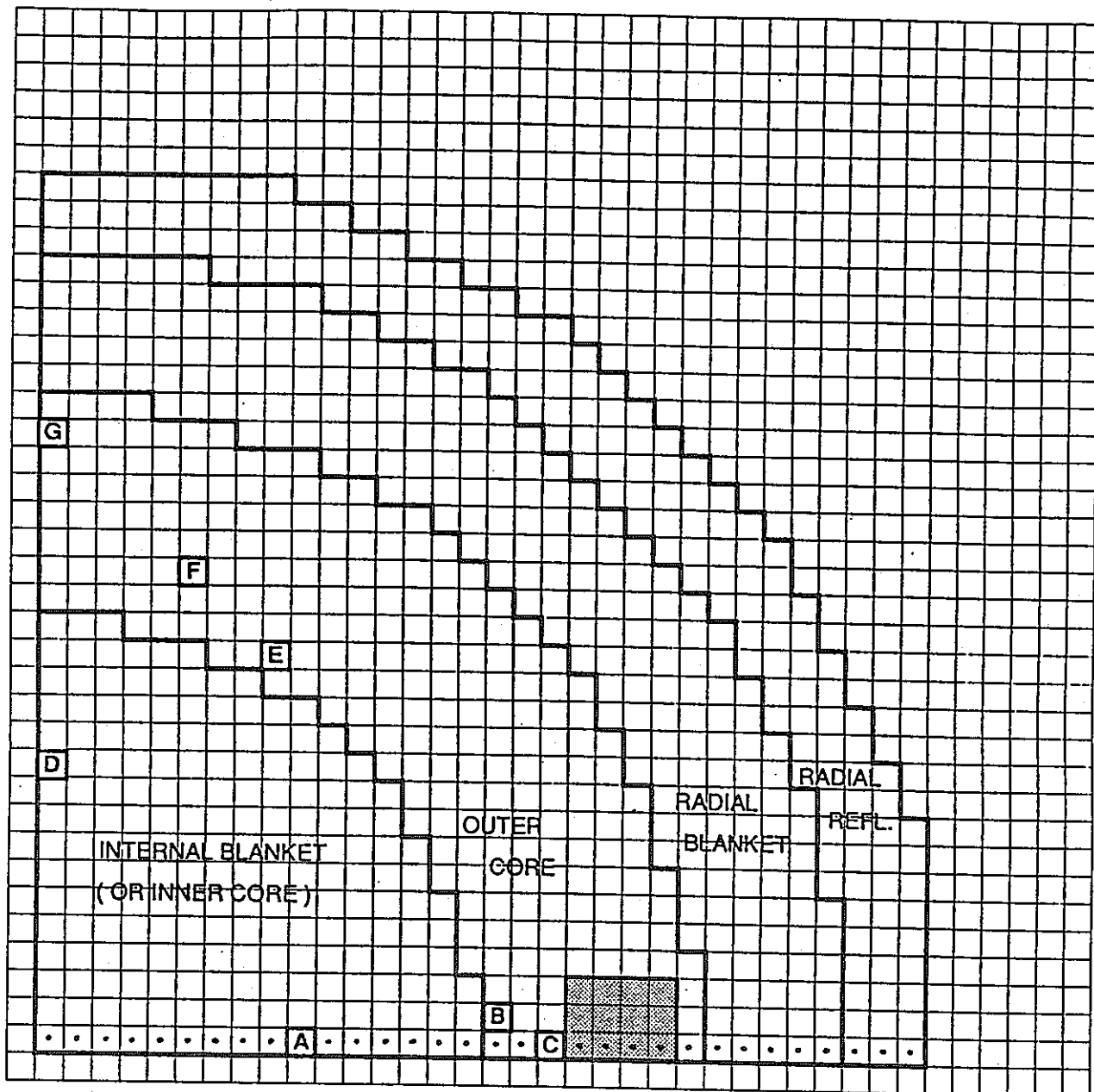
この実験についても同様にTable 4.1.6-8 に実験手順の詳細について記載しているが測定された反応度はTable 4.1.6-24に記載のとおりである。

④ プレートカラムオシレータ

各種のプレートを用いた測定データがTable 4.1.6-9 から-21に示されている。このデータもサンプル反応度と同様、プレートの位置ごとに反応度が ϕ 単位で示されている。

④ プレートカラムオシレータ

各種のプレートを用いた測定データがTable 4.1.6-9 から-21に示されている。このデータもサンプル反応度と同様、プレートの位置ごとに反応度が ϕ 単位で示されている。





- | | |
|---------------------------|---|
| A PCO-3, PCO-4 | E ATO-2, AEO-2, PCO-5 |
| B PCO-1, PCO-2 | F AEO-3 |
| C PCO-6 --- PCO-10 | G ATO-3, BO |
| D ATO-1, AEO-1 |  PLATE SHIFTING ZONE |
| |  RTO-1, RTO-2 |

Fig. 4.1.6-1 Locations of Plate Shifting Zone and Oscillators in ZPPR-17A

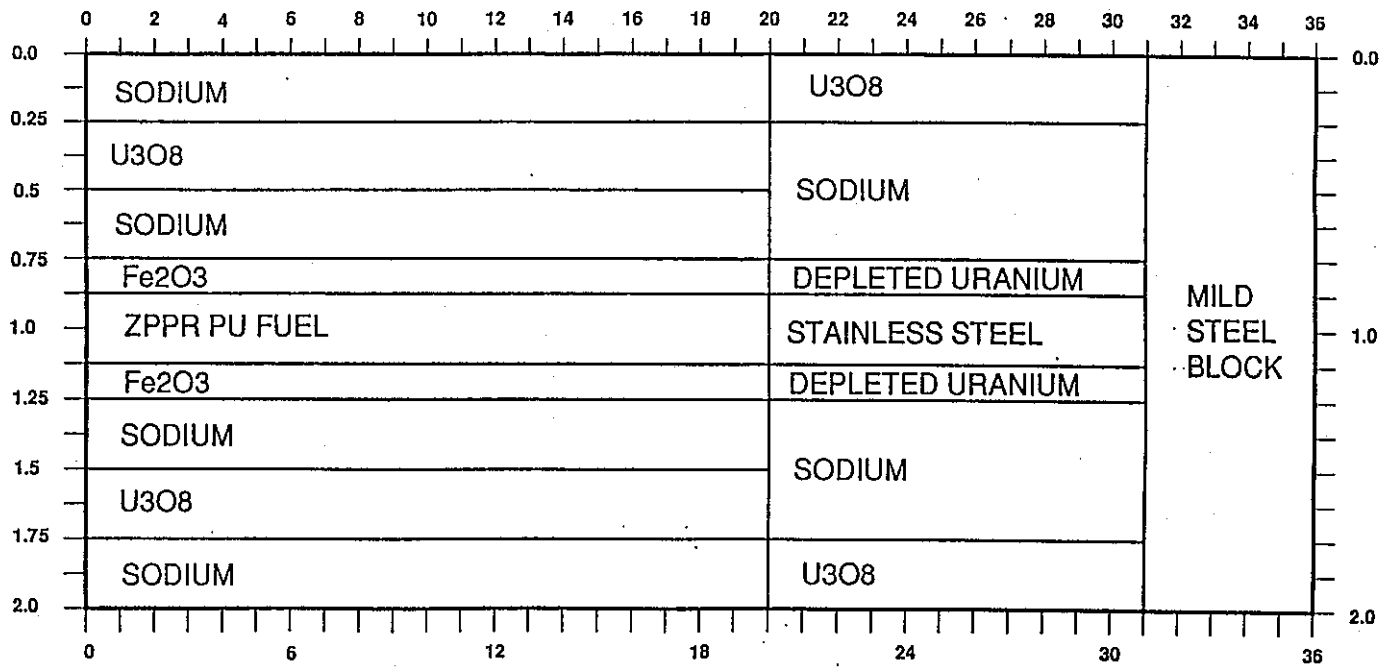


Fig. 4.1.6-2 Pre-shift Loading Pattern for SFC Drawers

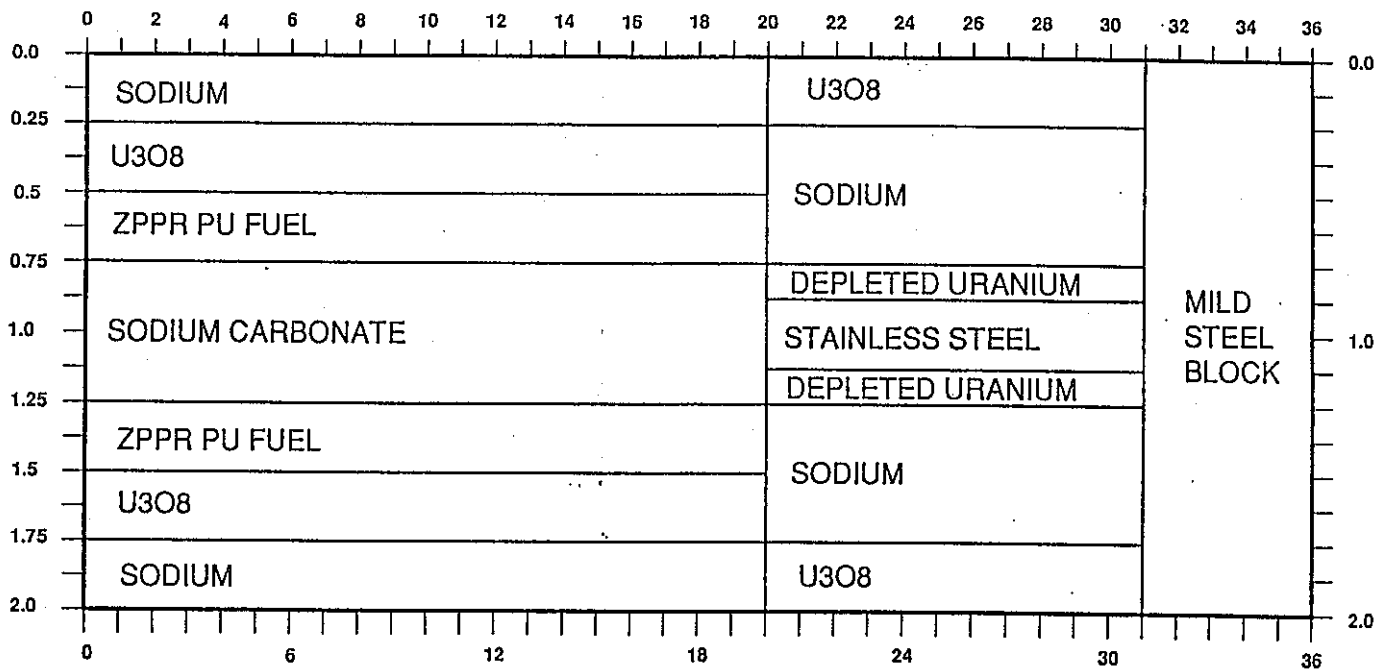


Fig. 4.1.6-3 Pre-shift Loading Pattern for DFC Drawers

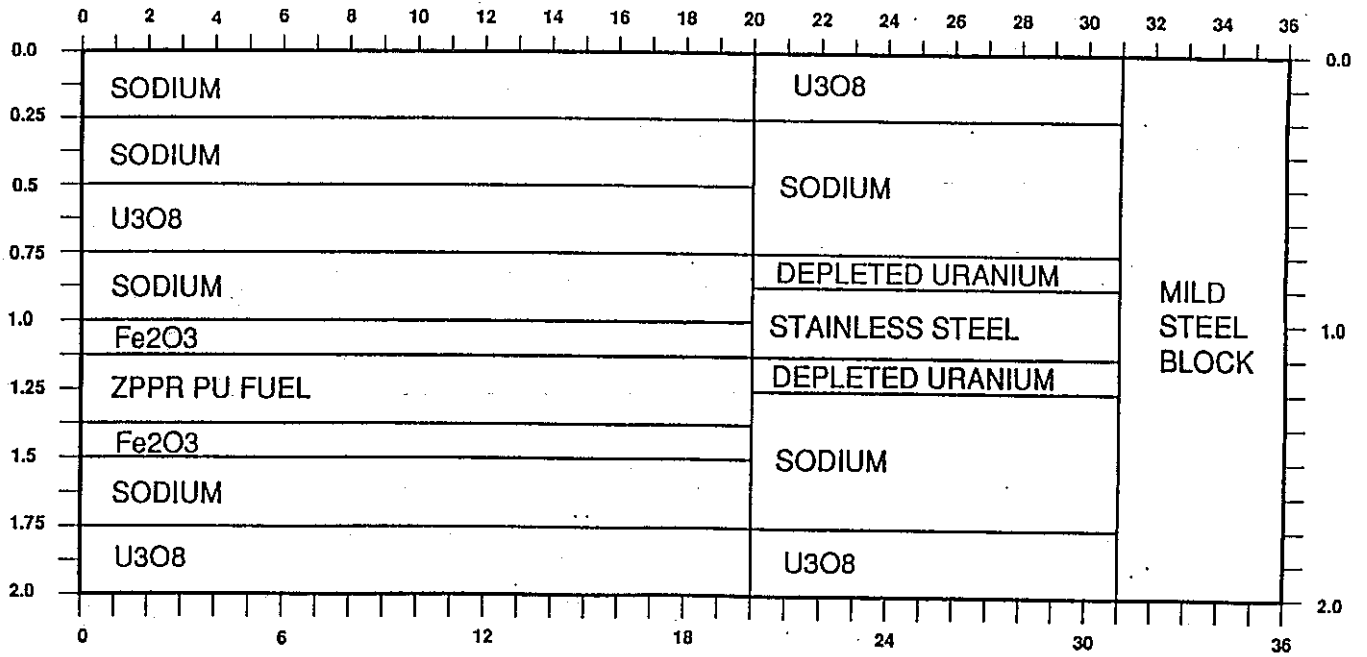


Fig. 4.1.6-4 Post-shift Loading Pattern for SFC Drawers
in Half-1 Columns 69-72 and Half-2 Columns 27-30

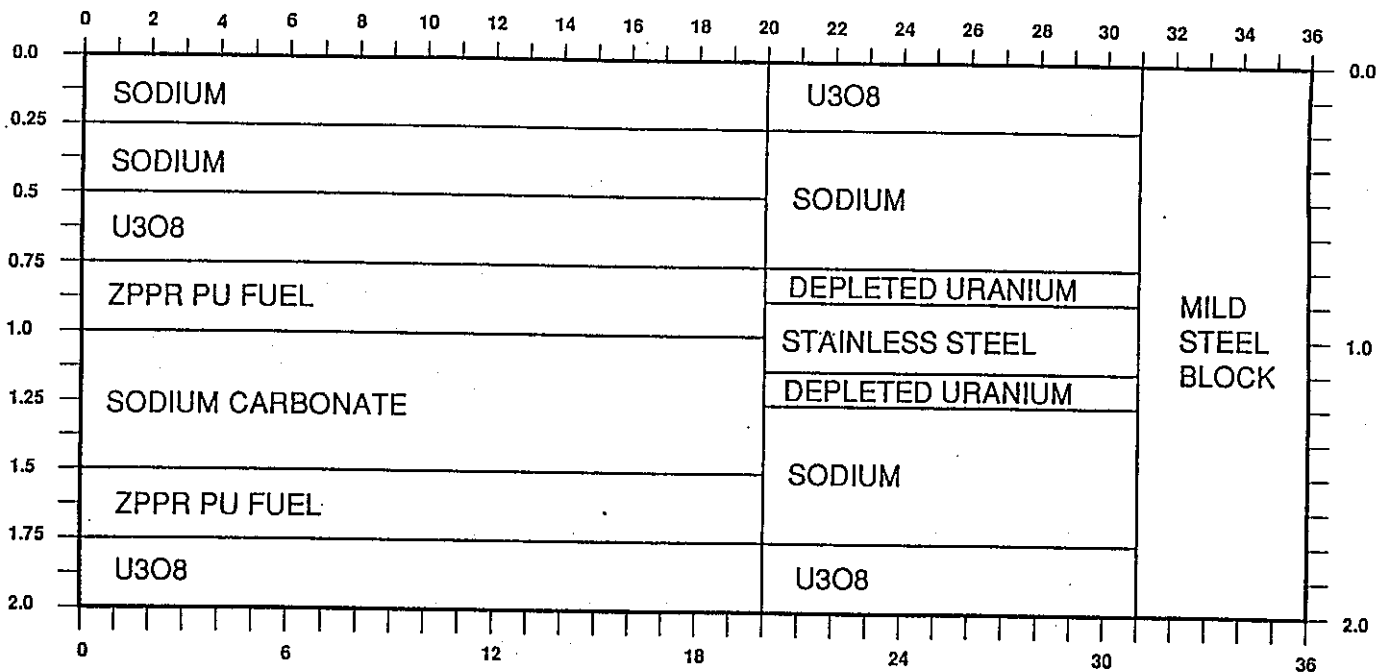
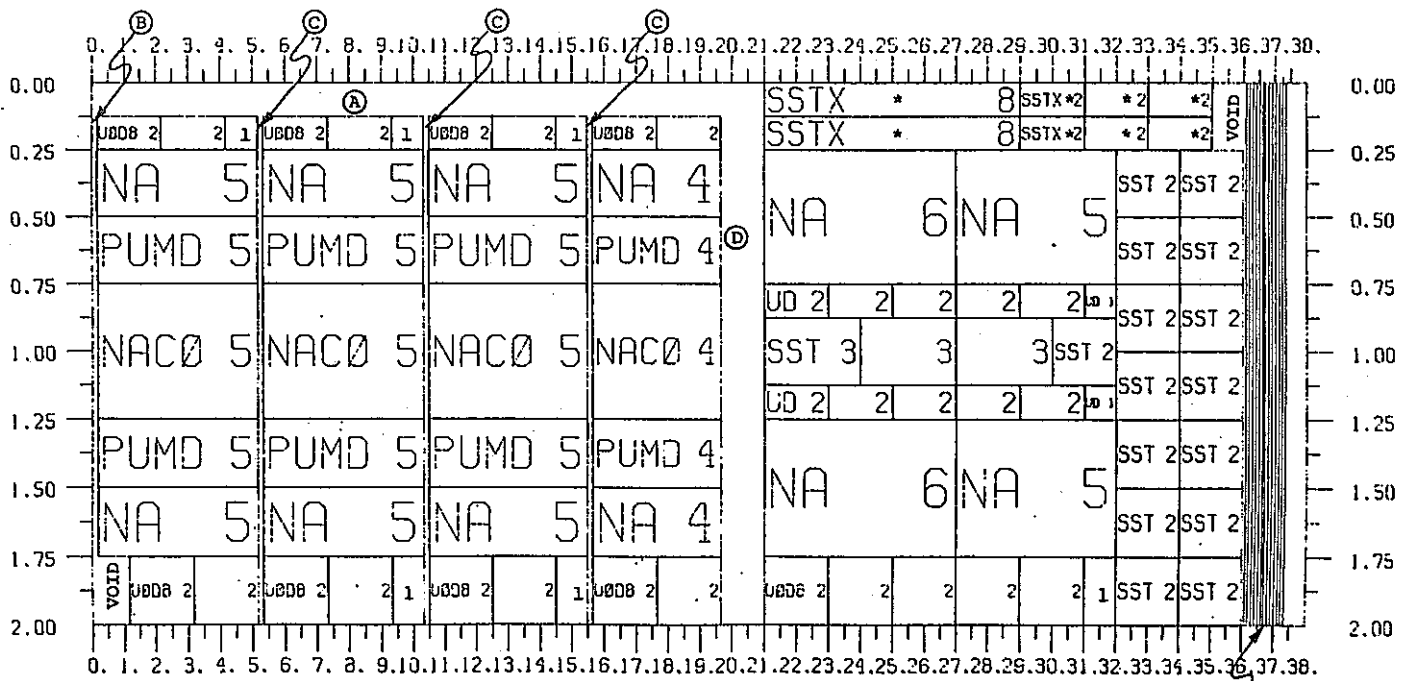


Fig. 4.1.6-5 Post-shift Loading Pattern for DFC Drawers
in Half-1 Columns 69-72 and Half-2 Columns 27-30



- * 1 Inch high for cables. 12 pieces 1/16 x 1 x 2 SSTX
1" High
- (A) Contains 477 g stainless steel, 3 g copper wire, and 2 g teflon insulation.
- (B) 0.46 cm wide gap contains 8 g stainless steel and 1.7 g plastic.
- (C) Each gap 0.41 cm wide. Gap contains 2 screws of 4 g steel.
- (D) 3.3 cm wide gap contains 36 g aluminum, 9 g stainless steel, 40 g mild steel, and 5 g plastic.

Fig. 4.1.6-6 Plate Loading in the Bowing Oscillator (Master 17-0-841)

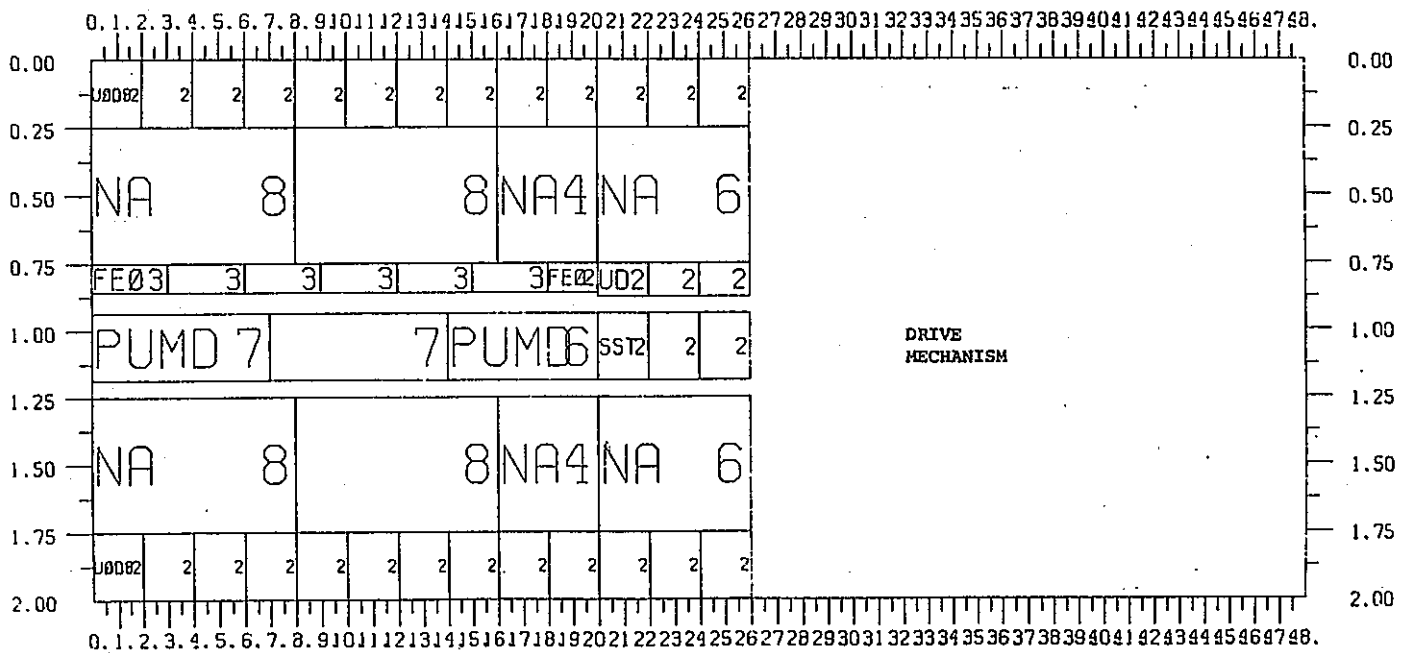


Fig. 4.1.6-7 Oscillator Plate Loading in PCO-1 (Master 17-0-840)

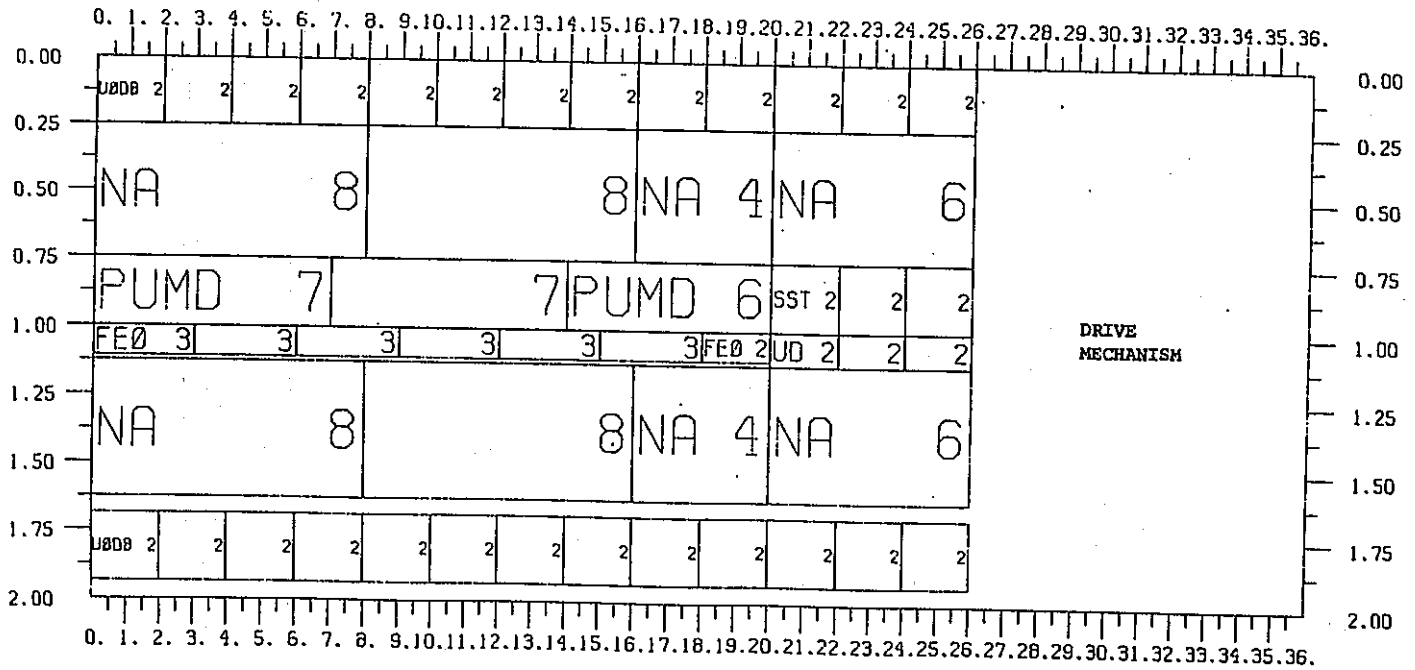


Fig. 4.1.6-8 Oscillator Plate Loading in PCO-2 (Master 17-0-842)

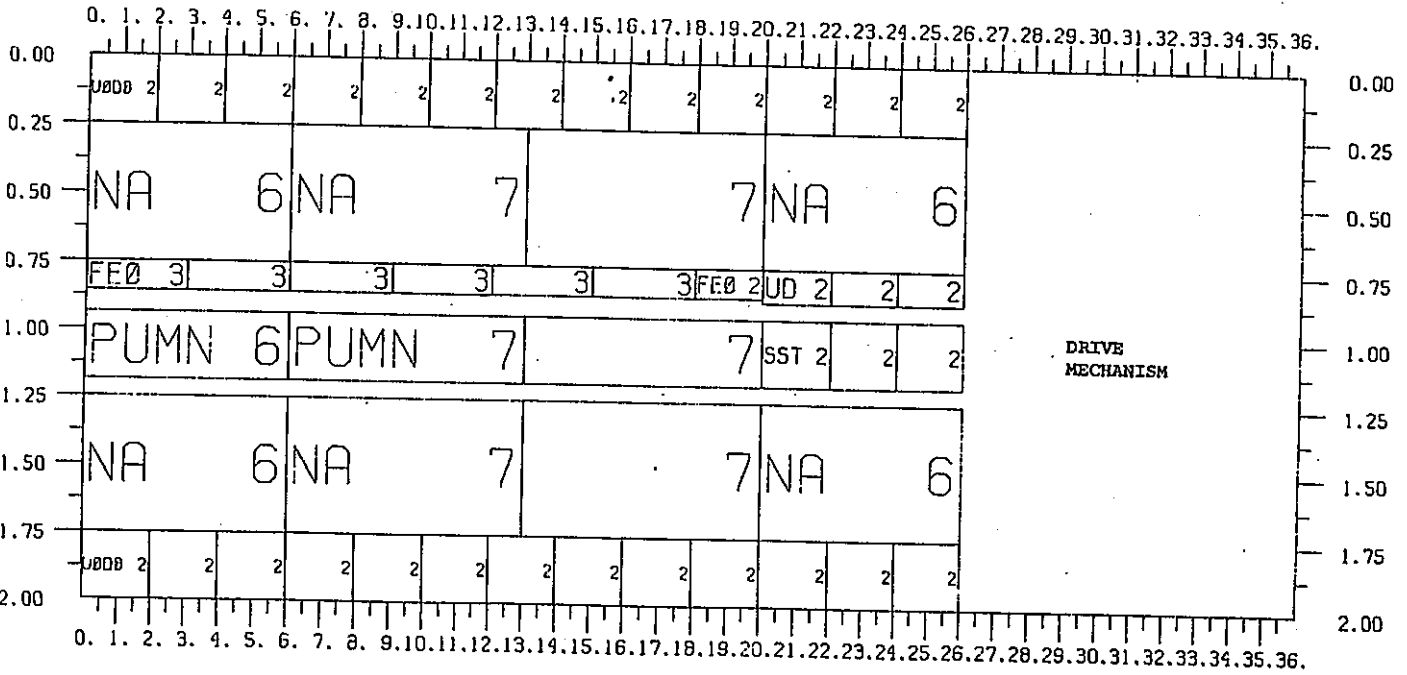


Fig. 4.1.6-9 Oscillator Plate Loading in PCO-3 (Master 17-0-836)

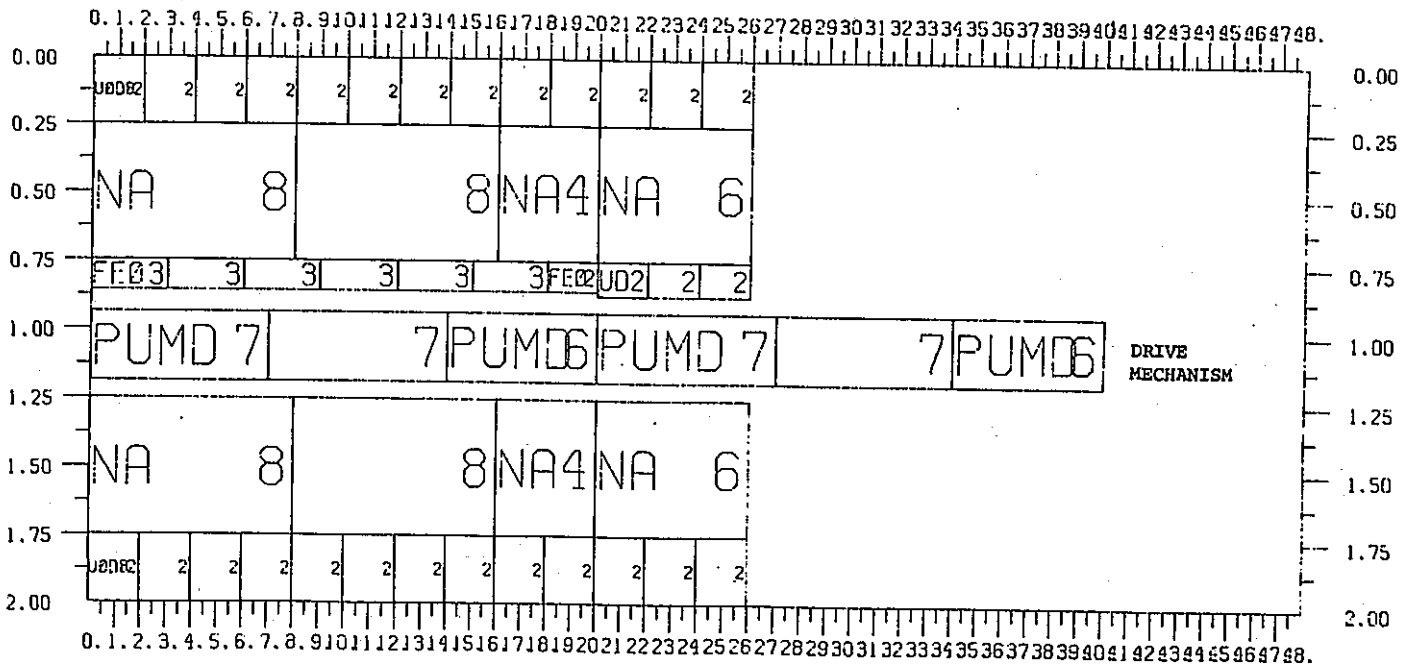


Fig. 4.1.6-12 Oscillator Plate Loading in PCO-6 (Master 17-0-844)

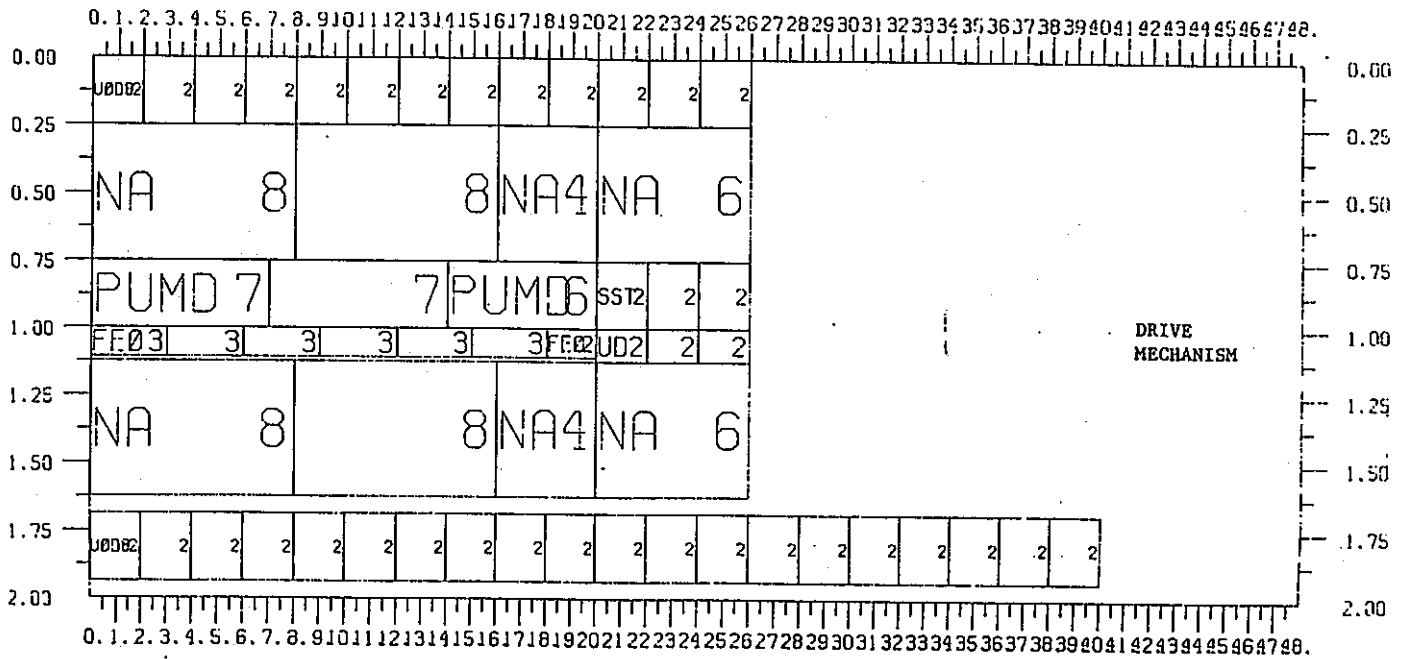


Fig. 4.1.6-13 Oscillator Plate Loading in PCO-7 (Master 17-0-846)

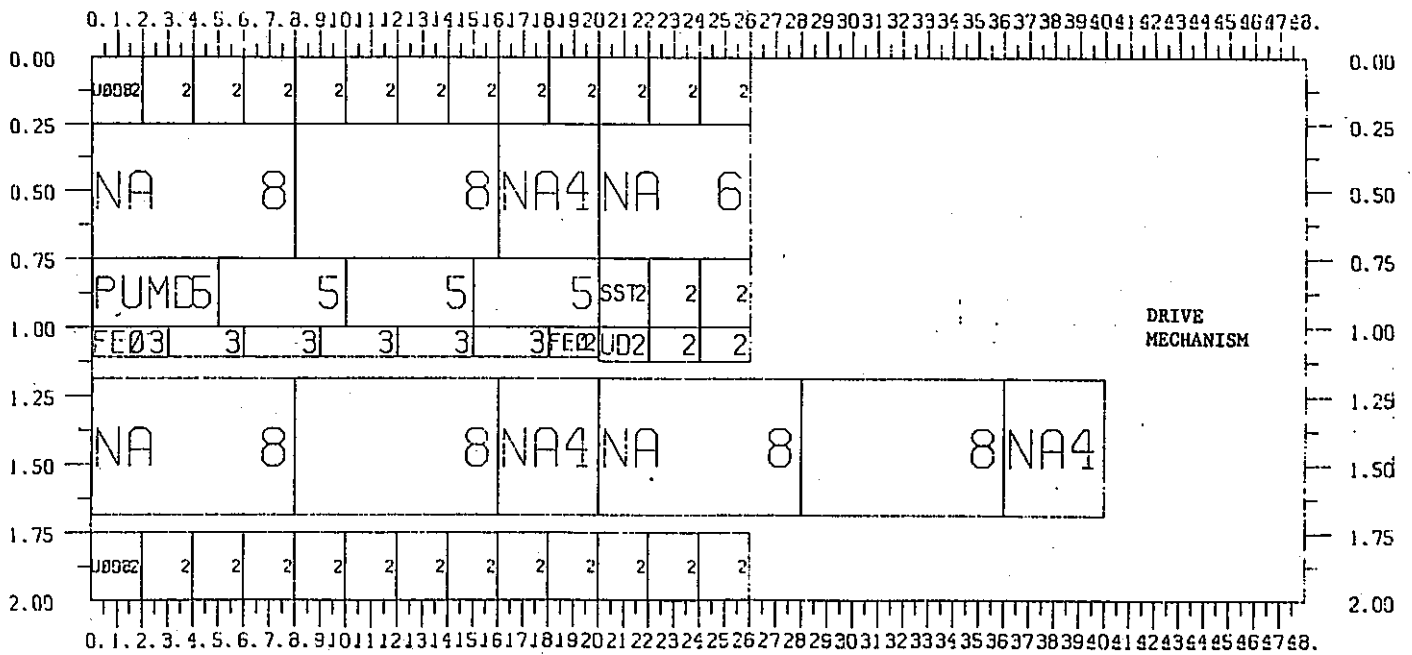


Fig. 4.1.6-14 Oscillator Plate Loading in PCO-8 (Master 17-0-847)

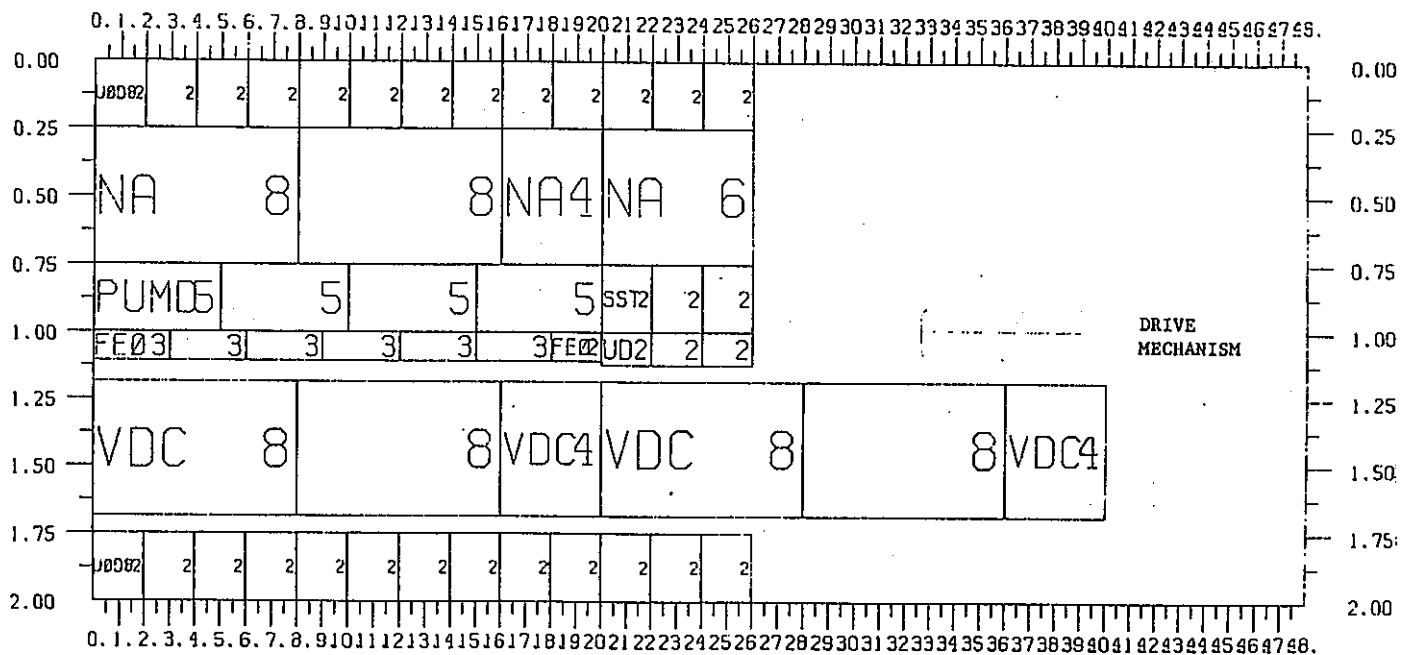


Fig. 4.1.6-15 Oscillator Plate Loading in PCO-9 (Master 17-0-848)

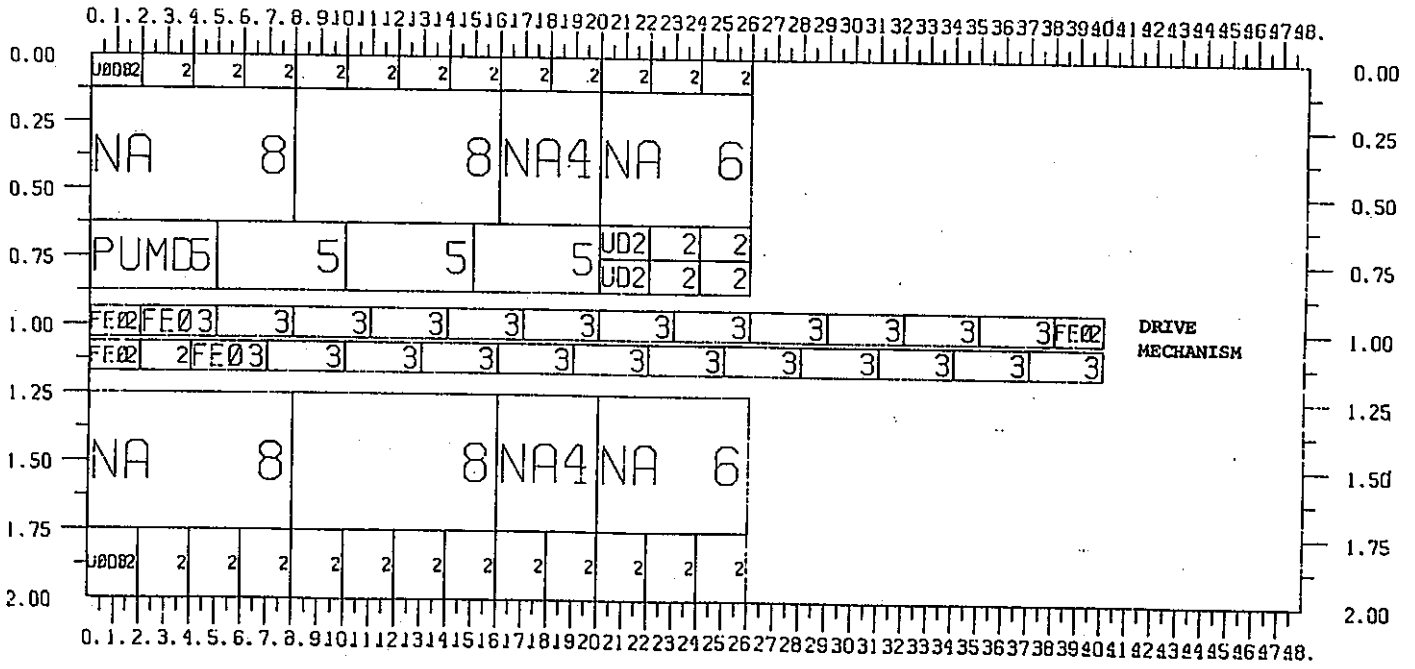
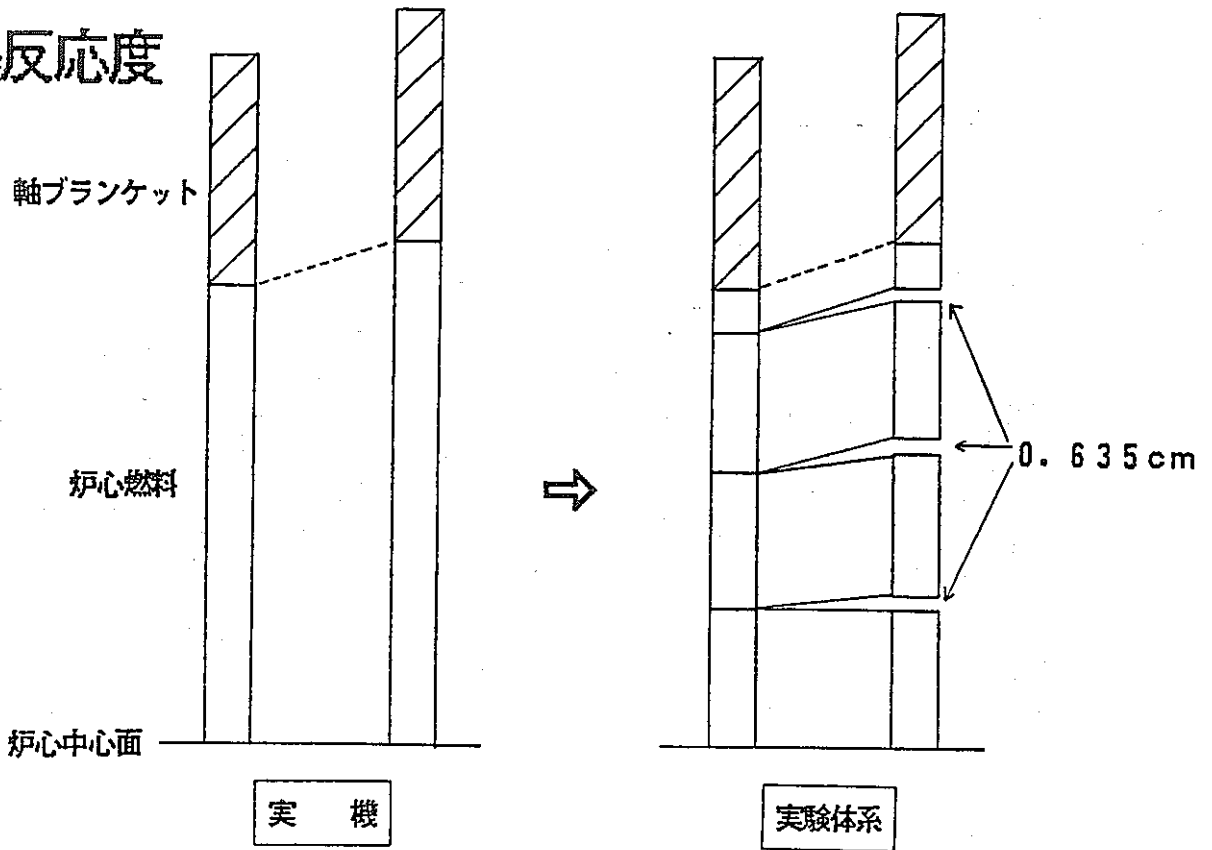


Fig. 4.1.6-16 Oscillator Plate Loading in PCO-10 (Master 17-0-849)

膨張反応度



湾曲反応度

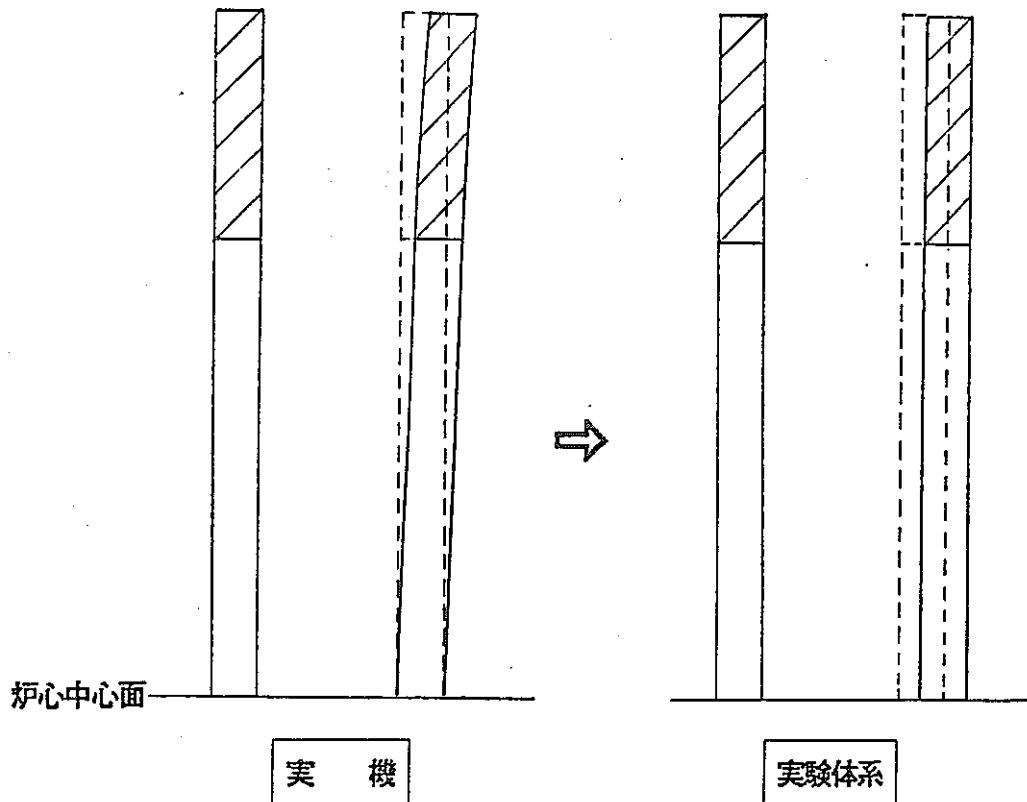
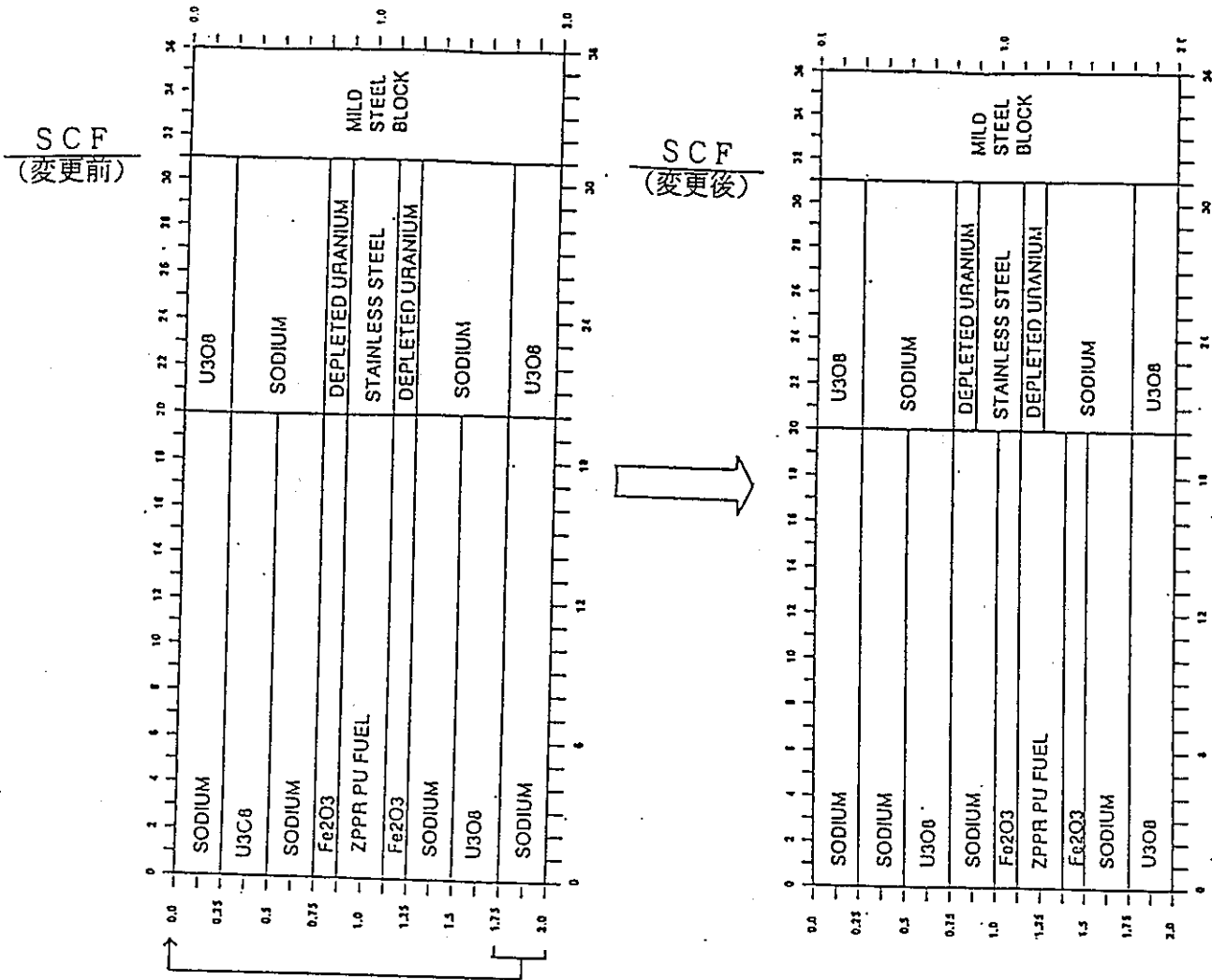


Fig. 4.1.6-17 膨張・湾曲反応度の模擬



ドロワ内のプレート配列を変更して燃料を相対的に炉心の外側へ移動
 (96ドロワ : 燃料集合体約16体に相当)

Fig. 4.1.6-18 プレート・シフティング実験

Table 4.1.6-1 Description of ZPPR-17A Oscillator Measurements

Name	Oscillator	Sample	Drawer Master	Matrix ^a Position	Reactor Loading	Reactor Run	Date	I. K. File
ATO-1	Axial Tube	PU-30	834	159-49 (D)	64	70	4/9/87	79
		DU-6						80
		B-1						81
		D-14						82
		SS-1						83
		U-6						84
ATO-2	Axial Tube	PU-30	835	163-41 (E)	65	71	4/10/87	86
		DU-6						87
		B-1						88
		D-14						89
		SS-1						90
		U-6						91
ATO-3	Axial Tube	SS-1	850	171-49 (G)	76	84	4/27/87	120
		DU-6						121
		D-14						122
		PU-30						123
		B-1						124
RTO-1	Radial Tube	PU-30	---	1,248 (.)	67	73	4/14/87	95
		DU-6						96, 100
		B-1						97
		D-14						98
		SS-1						99
RTO-2	Radial Tube	Cf @ 3 W Cf @ 80 W	---	1,248 (.)	66	72	4/13/87	93
AEO-1	Axial Expan.	I.C. DFC	838	138-49 (D)	68	74	4/15/87	101
AEO-2	Axial Expan.	O.C. DFC	845	163-41 (E)	70	76	4/17/87	110
AEO-3	Axial Expan.	O.C. DFC	845	166-55 (F)	75	82	4/24/87	119
BO	Bowling	O.C. DFC	841	126-49 (G)	69	75	4/16/87	105
		repeat						75	82	4/24/87	118
PCO-1	Plate Column	Pu-U + SS	840	147-33 (B)	68	74	4/15/87	103
PCO-2	Plate Column	U308	842	147-33 (B)	69	75	4/16/87	107
PCO-3	Plate Column	Pu-U + SS	836	149-40 (A)	65	71	4/10/87	92
PCO-4	Plate Column	U308	843	149-40 (A)	70	76	4/17/87	112
PCO-5	Plate Column	Pu-U	839	163-41 (E)	68	74	4/15/87	102
PCO-6	Plate Column	Pu-U	844	148-31 (C)	69	75	4/16/87	106
PCO-7	Plate Column	U308	846	148-31 (C)	70	76	4/17/87	113
PCO-8	Plate Column	Na	847	148-68 (C)	70	76	4/17/87	111
PCO-9	Plate Column	Void Cans	848	148-68 (C)	75	82	4/24/87	116
PCO-10	Plate Column	Fe203	849	148-31 (C)	75	82	4/24/87	117

^aLocation symbol for Figure 10.1 is in parentheses.

Table 4.1.6-2 Description of the Tube-type Samples Used in ZPPR-17A

Sample	Sample Dimensions, mm		Sample Mass, g	Capsule Mass, g ^a	Principal Composition	
	Length	O.D.			Component	wt. % ^b
U-6	55.19	7.62	46.89	11.463	²³⁴ U	0.95
					²³⁵ U	93.19
					²³⁶ U	0.26
					²³⁸ U	5.60
B-1	55.22	10.19	4.193	10.521	¹⁰ B	87.12
					¹¹ B	7.38
					O	1.43
					C	0.96
					Si	0.26
					Al	0.05
					H	0.09
Pu-30 ^c	55.19	7.62	38.091	11.600	²³⁹ Pu	97.20
					²⁴⁰ Pu	1.00
					²⁴¹ Pu	0.02
					²⁴¹ Am	0.03
					Al	0.95
SS-1					Fe	70.92
					Cr	19.20
					Ni	8.70
					Mn	1.42
					Si	0.30
					Cu	0.10
DU-6	55.19	7.62	47.427	11.417	²³⁵ U	0.21
					²³⁸ U	99.78

^aMaterial is stainless steel.

^bTotal composition less than 100% means that some impurities are not identified.

^c²⁴¹Pu decay adjusted to April, 1987.

Table 4.1.6-3 Experimental Worths From Axial Tube Measurement ATO-1

Position Region Z (cm)	Worth (cents) For Each Sample				
	PU-30	DU-6	B-1	SS-1	U-6
1 IBKT 3.99	0.2864 ± 0.0023	-0.0104 ± 0.0021	-0.2486 ± 0.0024	-0.0030 ± 0.0025	0.3138 ± 0.0024
2 IBKT 7.62	0.2872 ± 0.0024	-0.0135 ± 0.0022	-0.2718 ± 0.0026	-0.0034 ± 0.0025	0.3108 ± 0.0023
3 IBKT 12.70	0.2966 ± 0.0025	-0.0113 ± 0.0025	-0.3213 ± 0.0028	-0.0040 ± 0.0026	0.3025 ± 0.0024
4 CORE 17.78	0.3146 ± 0.0025	-0.0156 ± 0.0024	-0.3810 ± 0.0026	-0.0054 ± 0.0026	0.2920 ± 0.0026
5 CORE 22.87	0.3246 ± 0.0024	-0.0186 ± 0.0023	-0.3971 ± 0.0027	-0.0097 ± 0.0025	0.2860 ± 0.0026
6 CORE 27.95	0.3277 ± 0.0025	-0.0157 ± 0.0025	-0.3954 ± 0.0027	-0.0075 ± 0.0025	0.2813 ± 0.0027
7 CORE 33.02	0.3088 ± 0.0026	-0.0137 ± 0.0024	-0.3720 ± 0.0028	-0.0075 ± 0.0027	0.2670 ± 0.0027
8 CORE 38.10	0.2726 ± 0.0024	-0.0129 ± 0.0023	-0.3301 ± 0.0027	-0.0065 ± 0.0024	0.2335 ± 0.0026
9 CORE 43.18	0.2295 ± 0.0024	-0.0067 ± 0.0025	-0.2653 ± 0.0028	0.0035 ± 0.0027	0.2031 ± 0.0027
10 CORE 48.26	0.1782 ± 0.0029	-0.0043 ± 0.0025	-0.2023 ± 0.0029	0.0058 ± 0.0026	0.1617 ± 0.0028
11 ABKT 53.34	0.1286 ± 0.0022	0.0049 ± 0.0020	-0.1281 ± 0.0024	0.0078 ± 0.0023	0.1298 ± 0.0023
12 ABKT 58.42	0.0977 ± 0.0027	0.0021 ± 0.0024	-0.0762 ± 0.0029	0.0078 ± 0.0025	0.1010 ± 0.0026
13 ABKT 63.50	0.0664 ± 0.0026	0.0053 ± 0.0023	-0.0407 ± 0.0027	0.0060 ± 0.0024	0.0739 ± 0.0026
14 ABKT 68.58	0.0423 ± 0.0025	0.0027 ± 0.0023	-0.0272 ± 0.0027	0.0019 ± 0.0026	0.0491 ± 0.0027
15 ABKT 73.66	0.0346 ± 0.0023	0.0045 ± 0.0023	-0.0123 ± 0.0027	0.0025 ± 0.0023	0.0366 ± 0.0023
16 ABKT 78.75	0.0216 ± 0.0027	-0.0009 ± 0.0024	-0.0079 ± 0.0030	0.0036 ± 0.0027	0.0258 ± 0.0027
17 AREF 83.82	0.0149 ± 0.0023	-0.0011 ± 0.0021	-0.0031 ± 0.0025	-0.0001 ± 0.0022	0.0149 ± 0.0026

Table 4.1.6-4 Experimental Worths From Axial Tube Measurement ATO-2

Position Region Z (cm)	Worth (cents) For Each Sample				
	PU-30	DU-6	B-1	SS-1	U-6
1 CORE 3.99	0.4271 ± 0.0018	-0.0258 ± 0.0019	-0.5334 ± 0.0021	-0.0185 ± 0.0020	0.3713 ± 0.0021
2 CORE 7.62	0.4257 ± 0.0025	-0.0282 ± 0.0024	-0.5329 ± 0.0026	-0.0159 ± 0.0025	0.3720 ± 0.0025
3 CORE 12.70	0.4256 ± 0.0022	-0.0237 ± 0.0022	-0.5219 ± 0.0025	-0.0127 ± 0.0024	0.3682 ± 0.0024
4 CORE 17.78	0.4120 ± 0.0022	-0.0230 ± 0.0022	-0.5052 ± 0.0027	-0.0124 ± 0.0023	0.3523 ± 0.0023
5 CORE 22.86	0.3896 ± 0.0021	-0.0220 ± 0.0022	-0.4781 ± 0.0024	-0.0117 ± 0.0024	0.3304 ± 0.0023
6 CORE 27.94	0.3585 ± 0.0025	-0.0184 ± 0.0024	-0.4358 ± 0.0031	-0.0113 ± 0.0028	0.3015 ± 0.0026
7 CORE 33.02	0.3165 ± 0.0023	-0.0168 ± 0.0023	-0.3795 ± 0.0026	-0.0054 ± 0.0023	0.2703 ± 0.0025
8 CORE 38.10	0.2622 ± 0.0024	-0.0097 ± 0.0023	-0.3147 ± 0.0029	-0.0068 ± 0.0024	0.2249 ± 0.0023
9 CORE 43.18	0.2111 ± 0.0021	-0.0048 ± 0.0020	-0.2454 ± 0.0027	0.0023 ± 0.0024	0.1857 ± 0.0023
10 CORE 48.26	0.1535 ± 0.0024	-0.0011 ± 0.0021	-0.1754 ± 0.0028	0.0030 ± 0.0025	0.1397 ± 0.0023
11 ABKT 53.34	0.1059 ± 0.0024	0.0007 ± 0.0025	-0.1114 ± 0.0026	0.0045 ± 0.0026	0.1060 ± 0.0025
12 ABKT 58.42	0.0692 ± 0.0021	-0.0022 ± 0.0021	-0.0706 ± 0.0025	-0.0005 ± 0.0022	0.0749 ± 0.0023
13 ABKT 63.51	0.0466 ± 0.0023	-0.0034 ± 0.0021	-0.0449 ± 0.0024	-0.0026 ± 0.0022	0.0479 ± 0.0024
14 ABKT 68.58	0.0296 ± 0.0020	-0.0044 ± 0.0021	-0.0240 ± 0.0025	-0.0009 ± 0.0021	0.0357 ± 0.0023
15 ABKT 73.66	0.0175 ± 0.0019	-0.0024 ± 0.0020	-0.0142 ± 0.0024	-0.0026 ± 0.0021	0.0251 ± 0.0023
16 ABKT 78.75	0.0130 ± 0.0022	-0.0003 ± 0.0023	-0.0063 ± 0.0028	-0.0005 ± 0.0027	0.0192 ± 0.0025
17 AREF 83.82	0.0074 ± 0.0021	0.0019 ± 0.0021	-0.0020 ± 0.0023	0.0010 ± 0.0022	0.0093 ± 0.0022

Table 4.1.6-5 Experimental Worths From Axial Tube Measurement ATO-3

Position Region Z (cm)	Worth (cents) For Each Sample			
	PU-30	DU-6	B-1	SS-1
1 CORE 3.99	0.1965 ± 0.0013	-0.0032 ± 0.0013	-0.2210 ± 0.0014	0.0021 ± 0.0013
2 CORE 7.62	0.1926 ± 0.0014	-0.0043 ± 0.0013	-0.2183 ± 0.0015	0.0008 ± 0.0013
3 CORE 12.70	0.1847 ± 0.0013	-0.0025 ± 0.0014	-0.2067 ± 0.0013	0.0036 ± 0.0013
4 CORE 17.78	0.1712 ± 0.0014	-0.0026 ± 0.0013	-0.1930 ± 0.0016	0.0030 ± 0.0013
5 CORE 22.86	0.1559 ± 0.0014	-0.0013 ± 0.0014	-0.1739 ± 0.0014	0.0042 ± 0.0014
6 CORE 27.94	0.1357 ± 0.0015	-0.0015 ± 0.0014	-0.1539 ± 0.0014	0.0018 ± 0.0014
7 CORE 33.02	0.1155 ± 0.0015	-0.0008 ± 0.0016	-0.1283 ± 0.0014	0.0024 ± 0.0013
8 CORE 38.10	0.0931 ± 0.0016	0.0019 ± 0.0015	-0.1035 ± 0.0016	0.0036 ± 0.0014
9 CORE 43.18	0.0720 ± 0.0014	0.0001 ± 0.0014	-0.0761 ± 0.0015	0.0030 ± 0.0014
10 CORE 48.26	0.0523 ± 0.0015	0.0008 ± 0.0015	-0.0537 ± 0.0015	0.0028 ± 0.0015
11 ABKT 53.34	0.0349 ± 0.0014	0.0000 ± 0.0014	-0.0329 ± 0.0015	0.0043 ± 0.0014
12 ABKT 58.42	0.0274 ± 0.0015	0.0024 ± 0.0016	-0.0173 ± 0.0015	0.0042 ± 0.0015
13 ABKT 63.50	0.0151 ± 0.0014	0.0009 ± 0.0014	-0.0100 ± 0.0014	0.0018 ± 0.0013
14 ABKT 68.58	0.0110 ± 0.0016	-0.0007 ± 0.0016	-0.0057 ± 0.0015	0.0009 ± 0.0015
15 ABKT 73.66	0.0081 ± 0.0015	-0.0005 ± 0.0014	-0.0026 ± 0.0015	-0.0001 ± 0.0015
16 ABKT 78.74	0.0086 ± 0.0014	0.0007 ± 0.0014	0.0017 ± 0.0015	0.0023 ± 0.0015
17 AREF 83.82	0.0005 ± 0.0013	-0.0010 ± 0.0014	-0.0037 ± 0.0013	0.0002 ± 0.0012

Table 4.1.6-6 Experimental Results From The Radial Tube Measurements

Position Region X (cm)	Worth (cents) For Each Sample				Normalized 252Cf Importance
	PU-30	DU-6	B-1	SS-1	
1 IBKT 2.77	0.2195 ± 0.0020	-0.0121 ± 0.0009	-0.1875 ± 0 0019	-0.0059 ± 0.0010	0.631 ± 0.023
2 IBKT 8.29	0.2210 ± 0.0018	-0.0107 ± 0.0010	-0.1877 ± 0 0022	-0.0046 ± 0.0010	0.652 ± 0.027
3 IBKT 13.82	0.2259 ± 0.0018	-0.0128 ± 0.0012	-0.1898 ± 0 0025	-0.0044 ± 0.0011	0.610 ± 0.027
4 IBKT 19.34	0.2263 ± 0.0022	-0.0122 ± 0.0009	-0.1915 ± 0 0019	-0.0058 ± 0.0010	0.611 ± 0.027
5 IBKT 24.86	0.2330 ± 0.0021	-0.0107 ± 0.0011	-0.1918 ± 0 0020	-0.0064 ± 0.0011	0.633 ± 0.027
6 IBKT 30.39	0.2386 ± 0.0021	-0.0114 ± 0.0010	-0.2024 ± 0 0021	-0.0057 ± 0.0010	0.623 ± 0.027
7 IBKT 35.91	0.2512 ± 0.0022	-0.0128 ± 0.0010	-0.2084 ± 0 0019	-0.0049 ± 0.0010	0.645 ± 0.027
8 IBKT 41.44	0.2541 ± 0.0021	-0.0140 ± 0.0009	-0.2185 ± 0 0022	-0.0055 ± 0.0010	0.653 ± 0.027
9 IBKT 46.96	0.2716 ± 0.0019	-0.0142 ± 0.0011	-0.2246 ± 0 0019	-0.0059 ± 0.0010	0.688 ± 0.027
10 IBKT 52.49	0.2871 ± 0.0021	-0.0120 ± 0.0010	-0.2386 ± 0 0021	-0.0063 ± 0.0010	0.675 ± 0.027
11 IBKT 58.01	0.3007 ± 0.0017	-0.0154 ± 0.0010	-0.2597 ± 0 0024	-0.0067 ± 0.0010	0.759 ± 0.027
12 IBKT 63.53	0.3186 ± 0.0020	-0.0167 ± 0.0010	-0.2809 ± 0 0022	-0.0069 ± 0.0012	0.761 ± 0.027
13 IBKT 69.05	0.3319 ± 0.0021	-0.0174 ± 0.0011	-0.3158 ± 0 0026	-0.0086 ± 0.0010	0.722 ± 0.027
14 IBKT 74.59	0.3527 ± 0.0019	-0.0202 ± 0.0010	-0.3568 ± 0 0021	-0.0098 ± 0.0011	0.824 ± 0.027
15 IBKT 80.11	0.3728 ± 0.0021	-0.0203 ± 0.0010	-0.4054 ± 0 0019	-0.0068 ± 0.0010	0.866 ± 0.027
16 IBKT 85.63	0.3914 ± 0.0022	-0.0229 ± 0.0011	-0.4764 ± 0 0018	-0.0094 ± 0.0011	0.892 ± 0.029
17 CORE 91.15	0.4067 ± 0.0017	-0.0257 ± 0.0010	-0.5242 ± 0 0021	-0.0098 ± 0.0010	0.969 ± 0.027
18 CORE 96.68	0.4090 ± 0.0024	-0.0270 ± 0.0010	-0.5410 ± 0 0024	-0.0121 ± 0.0011	0.997 ± 0.027
19 CORE 102.21	0.3974 ± 0.0021	-0.0257 ± 0.0011	-0.5151 ± 0 0025	-0.0106 ± 0.0011	1.000 ± 0.027
20 CORE 107.73	0.3666 ± 0.0020	-0.0213 ± 0.0010	-0.4630 ± 0 0026	-0.0072 ± 0.0010	0.963 ± 0.027
21 CORE 113.26	0.3089 ± 0.0024	-0.0169 ± 0.0011	-0.3932 ± 0 0024	-0.0030 ± 0.0011	0.839 ± 0.027
22 CORE 118.78	0.2526 ± 0.0026	-0.0086 ± 0.0011	-0.3120 ± 0 0023	0.0003 ± 0.0009	0.742 ± 0.027
23 CORE 124.30	0.1903 ± 0.0022	-0.0058 ± 0.0010	-0.2292 ± 0 0022	0.0032 ± 0.0009	0.656 ± 0.027
24 CORE 129.83	0.1370 ± 0.0020	0.0015 ± 0.0010	-0.1482 ± 0 0023	0.0081 ± 0.0010	0.469 ± 0.027
25 RBKT 135.35	0.0875 ± 0.0020	0.0026 ± 0.0010	-0.0802 ± 0 0021	0.0070 ± 0.0011	0.424 ± 0.027
26 RBKT 140.88	0.0559 ± 0.0022	0.0027 ± 0.0010	-0.0337 ± 0 0021	0.0070 ± 0.0011	0.263 ± 0.027
27 RBKT 146.40	0.0312 ± 0.0021	0.0006 ± 0.0009	-0.0161 ± 0 0021	0.0014 ± 0.0011	0.203 ± 0.027
28 RBKT 151.92	0.0178 ± 0.0023	-0.0016 ± 0.0011	-0.0064 ± 0 0022	0.0016 ± 0.0011	0.081 ± 0.027
29 RBKT 157.45	0.0072 ± 0.0020	-0.0019 ± 0.0011	-0.0010 ± 0 0024	-0.0014 ± 0.0011	0.117 ± 0.027
30 RREF 162.97	0.0071 ± 0.0021	0.0006 ± 0.0011	-0.0015 ± 0 0023	0.0009 ± 0.0010	0.085 ± 0.027

Table 4.1.6-7 ZPPR-17A All-plate Shifting Experiment Description

Step	Reactor Loading	Reactor Run	Date	SIXTY4 File	Reactivity (cents)	Reactivity Change (cents)	χ^2
1	71	77	4/20	78	-28.75 ± 0.28	----	...
2	72	78	4/21	79	-28.56 ± 0.28	0.1 ± 0.03	0.83
3	73	79	4/22	80	-34.59 ± 0.34	-5.8 ± 0.07	1.47
4	74	80	4/23	81	-28.57 ± 0.28	0.1 ± 0.03	0.99

Table 4.1.6-8 Radial Motion of The Bowing Oscillator in the Second Measurement

Axial Location	Motion (cm)		
	Left	Right	Average
front (0.33 cm)	0.147	0.133	0.140
back (51.03 cm)	0.122	0.127	0.125

Table 4.1.6-9 Experimental Worths From PCO-1, Pu-U + SS

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
2.539	-0.16343 ± 0.00267 (± 1.6%)
12.698	-0.94930 ± 0.00281 (± 0.3%)
15.239	-1.16530 ± 0.00289 (± 0.2%)
17.779	-1.38052 ± 0.00260 (± 0.2%)
48.259	-3.49558 ± 0.00181 (± 0.1%)
65.412	-3.94417 ± 0.00179 (± 0.0%)

Table 4.1.6-10 Experimental Worths From PCO-2, U₃O₈

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
2.546	0.03686 ± 0.00086 (± 2.3%)
12.706	0.17834 ± 0.00085 (± 0.5%)
15.246	0.21546 ± 0.00100 (± 0.5%)
17.786	0.25146 ± 0.00097 (± 0.4%)
48.266	0.49441 ± 0.00096 (± 0.2%)
62.871	0.47861 ± 0.00087 (± 0.2%)

Table 4.1.6-11 Experimental Worths From PCO-3, Pu-U + SS

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
2.540	-0.10088 ± 0.00295 (± 2.9%)
12.699	-0.59346 ± 0.00285 (± 0.5%)
15.240	-0.73734 ± 0.00353 (± 0.5%)
17.780	-0.88299 ± 0.00286 (± 0.3%)
48.260	-2.72093 ± 0.00301 (± 0.1%)
65.412	-3.23761 ± 0.00282 (± 0.1%)

Table 4.1.6-12 Experimental Worths From PCO-4, U₃O₈

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
2.550	0.02710 ± 0.00046 (± 1.7%)
12.710	0.12713 ± 0.00050 (± 0.4%)
15.250	0.15187 ± 0.00053 (± 0.4%)
17.790	0.17595 ± 0.00052 (± 0.3%)
30.490	0.30859 ± 0.00048 (± 0.2%)

Table 4.1.6-13 Experimental Worths From PCO-5, Pu-U @ 35.6 cm

Withdrawal (cm)	Reactivity (cents)	Gradient (cents/cm)
0.000	0.00000 ± 0.00000 (± 0.0%)	
0.252	-0.01572 ± 0.00075 (± 4.8%)	-0.06249 ± 0.00300
0.634	-0.04417 ± 0.00081 (± 1.8%)	-0.06964 ± 0.00128
1.270	-0.08814 ± 0.00077 (± 0.9%)	-0.06940 ± 0.00061
1.904	-0.13191 ± 0.00075 (± 0.6%)	-0.06927 ± 0.00039
2.539	-0.17509 ± 0.00086 (± 0.5%)	-0.06896 ± 0.00034
3.175	-0.21521 ± 0.00082 (± 0.4%)	-0.06778 ± 0.00026
3.810	-0.25710 ± 0.00077 (± 0.3%)	-0.06748 ± 0.00020
5.091	-0.33528 ± 0.00071 (± 0.2%)	-0.06586 ± 0.00014
7.626	-0.48187 ± 0.00077 (± 0.2%)	-0.06318 ± 0.00010

Table 4.1.6-14 Experimental Worths From PCO-6, Pu-U

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
0.381	-0.03489 ± 0.00296 (± 8.5%)
1.015	-0.09919 ± 0.00266 (± 2.7%)
1.651	-0.16187 ± 0.00292 (± 1.8%)
2.285	-0.21904 ± 0.00305 (± 1.4%)
4.826	-0.47124 ± 0.00300 (± 0.6%)
14.986	-1.42977 ± 0.00309 (± 0.2%)
29.788	-2.63774 ± 0.00212 (± 0.1%)

Table 4.1.6-15 Experimental Worths From PCO-7, U₃O₈

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
0.645	0.00858 ± 0.00059 (± 6.9%)
1.279	0.01769 ± 0.00063 (± 3.6%)
2.550	0.03537 ± 0.00058 (± 1.6%)
5.089	0.07148 ± 0.00057 (± 0.8%)
15.250	0.20647 ± 0.00065 (± 0.3%)
30.012	0.36187 ± 0.00062 (± 0.2%)

Table 4.1.6-16 Experimental Worths From PCO-8, Clad Na

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
0.667	0.00220 ± 0.00056 (±25.4%)
1.302	0.00501 ± 0.00057 (±11.4%)
2.572	0.00871 ± 0.00056 (± 6.4%)
5.112	0.01917 ± 0.00057 (± 2.9%)
15.272	0.05510 ± 0.00058 (± 1.1%)
30.039	0.08655 ± 0.00049 (± 0.6%)

Table 4.1.6-17 Experimental Worths From PCO-9, Void Cans

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
0.632	0.00078 ± 0.00060 (±77.2%)
1.266	0.00138 ± 0.00069 (±50.0%)
2.537	0.00308 ± 0.00063 (±20.4%)
5.077	0.00572 ± 0.00062 (±10.9%)
15.238	0.01719 ± 0.00065 (± 3.8%)
30.485	0.03219 ± 0.00061 (± 1.9%)

Table 4.1.6-18 Experimental Worths From PCO-8 Minus PCO-9, Na

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
0.667	0.00142 ± 0.00082 (±58.0%)
1.302	0.00364 ± 0.00089 (±24.6%)
2.572	0.00563 ± 0.00084 (±14.9%)
5.112	0.01346 ± 0.00084 (± 6.2%)
15.272	0.03790 ± 0.00087 (± 2.3%)
30.039	0.05483 ± 0.00078 (± 1.4%)

Table 4.1.6-19 Experimental Worths From PCO-10, Fe₂O₃

Withdrawal (cm)	Reactivity (cents)
0.000	0.00000 ± 0.00000 (± 0.0%)
0.645	0.00418 ± 0.00049 (±11.8%)
1.280	0.00689 ± 0.00048 (± 7.0%)
2.550	0.01446 ± 0.00045 (± 3.1%)
5.090	0.03118 ± 0.00040 (± 1.3%)
15.250	0.09257 ± 0.00040 (± 0.4%)
30.490	0.15896 ± 0.00050 (± 0.3%)

Table 4.1.6-20 Description of Moving Plates in the Plate Column Oscillator Experiments^a

Pu-U in PCO-1,3 Serial #	U O ₂ in PCO ^a -2,4,7 Mass (g)	Pu-U in PCO-5,6 Serial #	Na in PCO-8 Mass (g)	Clad in PCO-8 Mass (g)	Void Cans in PCO-9 Mass (g)	Fe O ₂ in PCO ^{2,3} -10 Mass (g)	
						left	right
370-23	119.55	416-21 ^b	110.34	79.21	79.34	34.40	34.75
273-22	121.65	427-32 ^b	111.56	80.39	80.28	51.88	33.60
336-22	116.22	333-10	54.84	43.39	43.04	50.61	51.35
	119.86	211-22	110.84	79.21	79.25	50.50	50.90
	120.77	208-24	108.32	80.74	80.79	51.18	51.20
	118.45	403-06	54.51	43.64	43.66	51.39	51.88
	119.69					51.16	49.66
	120.60					51.36	51.40
	117.36					51.26	51.59
	118.75					52.28	49.31
	119.82					50.63	51.31
	119.96					52.02	51.61
	119.98					51.66	50.19
	121.00					34.15	51.50
	119.16						
	119.35						
	118.70						
	121.44						
	117.94						
	117.42						

^aListed in order from the front of the column.

^bStationary in PCO-5.

Table 4.1.6-21 PCO Drive Reactivity For 66.0 cm-long Column

From IK File 30		From IK File 31	
Withdrawal (cm)	Reactivity (cents)	Withdrawal (cm)	Reactivity (cents)
0.000	0.00000	0.000	0.00000
2.538	-0.00128	2.548	-0.00114
12.698	-0.00522	12.708	-0.00486
15.238	-0.00594	15.248	-0.00560
17.779	-0.00656	17.788	-0.00627
35.564	-0.00869	35.568	-0.00930
35.817	-0.00869	35.822	-0.00933
36.199	-0.00870	36.203	-0.00937
36.834	-0.00872	36.838	-0.00943
38.104	-0.00874	38.108	-0.00954
40.644	-0.00876	40.648	-0.00974
50.804	-0.00850	50.808	-0.01021
65.408	-0.00780	65.412	-0.01033

Table 4.1.6-22 PCO Drive Reactivity For 101.6 cm-long Column

From IK File 30		From IK File 31	
Withdrawal (cm)	Reactivity (cents)	Withdrawal (cm)	Reactivity (cents)
0.000	0.00000	0.000	0.00000
0.253	-0.00001	0.254	-0.00003
0.635	-0.00002	0.635	-0.00006
1.270	-0.00004	1.270	-0.00012
2.540	-0.00006	2.540	-0.00024
5.080	-0.00007	5.080	-0.00044
15.240	0.00019	15.240	-0.00091
29.844	0.00089	29.844	-0.00103

Table 4.1.6-23 熱膨張・湾曲反応度実験の概要

実験項目	実験方法	測定結果
熱膨張反応度模擬実験 (Expansion 実験)	3ヶ所のギャップによる模擬 (逆時間方程式による反応度測定)	-0.05¢ ~ 0.11¢ (測定誤差 ± 3%)
湾曲反応度模擬実験 (Bowing 実験)	最外周の燃料を約0.13cm移動 (逆時間方程式による反応度測定)	-0.013¢ (測定誤差 ± 3.5%)
プレートシフティング 実験	プレートの配列を変更し相対的に移動 (MSM法による反応度測定)	-6.02¢ (測定誤差 ± 3.1%)

Table 4.1.6-24 膨張・湾曲反応度実験結果

実験項目	測定位置*	実験値 (ϕ)
熱膨張反応度	D	-0.04977 ±0.8%
	E	-0.10437 ±0.7%
	F	-0.11061 ±0.6%
湾曲反応度	G	-0.01392 ±3.5%
プレート・シフティング実験	外側炉心領域 (96ドロワ)	-6.02 ±3.1%

* 測定位置は Fig. 4.1.6-1 参照

4.2 ZPPR-18・19炉心

4.2.1 臨界性

(1) ZPPR-18炉心

ZPPR-18A, B, C炉心の臨界性に関して、以下のデータをまとめた。
ANLのデータは参考文献(22), (24), によっている。

項 目	ZPPR-18A	-18B	-18C
a ドロワ装填図	Fig. 4.2.1-1~6	同 左	同 左
b 炉心構成図			
①基準体系	Fig. 4.2.1-7,-8	-11,-12	-15,-16
②AMM体系	Fig. 4.2.1-9,-10	-13,-14	-17,-18
c 基準体系モデルデータ			
①ドロワ本数	Table 4.2.1-1	-9	-16
②領域別炉心装荷重金属重量			
ANLデータ	Table 4.2.1-2	-10	-17
日本側データ	Table 4.2.1-3	-11	-18
③領域別原子数密度			
ANLデータ	Table 4.2.1-4	-12	-19
日本側データ	Table 4.2.1-5	-13	-20
④ドロワ別原子数密度			
AMMモデル用	Table 4.2.1-6	同 左	同 左
d ドロワマスタの種類	Table 4.2.1-7	-14	
e k_{eff} 実験値	Table 4.2.1-8	-15	-21
f 解析モデル			
①RZモデル	Fig. 4.2.1-27,28	-29,-30	-29,-30
②XYZモデル	Fig. 4.2.1-31,33	-32,-33	-32,-33

各図表の説明は 4.1節でZPPR-17について示した内容を参照されたい。

(2) ZPPR-19 炉心

ZPPR-19 A, B 炉心の臨界性に関して、以下のデータをまとめた。ANLのデータは参考文献(22), (24), (26)によっている。

項 目	Z P P R - 1 9 A	- 1 9 B
a ドロワ装填図	ZPPR-18 に同じ	同 左
b 炉心構成図		
①基準体系	Fig. 4.2.1-19,20	-23, -24
②AMM体系	Fig. 4.2.1-21,22	-25, -26
c 基準体系モデルデータ		
①ドロワ本数	Table 4.2.1-22	-28
②領域別炉心装荷重金属重量		
ANLデータ	Table 4.2.1-23	-29
日本側データ	Table 4.2.1-24	-30
③領域別原子数密度		
ANLデータ	Table 4.2.1-25	-31
日本側データ	Table 4.2.1-26	-32
④ドロワ別原子数密度		
AMMモデル用	ZPPR-18 に同じ	同 左
d ドロワマスクの種類	ZPPR-18 に同じ	同 左
e k_{eff} 実験値	Table 4.2.1-27	-33
f 解析モデル		
①RZモデル	未臨界炉心であり	-27, -28
②XYZモデル	解析を行ってない	-33

(3) 解析モデルについて

ZPPR-18, 19 炉心は、炉心の対象性に応じてXYZモデルを作成する際に以下のように設定する必要がある。

- ・ 18A, 19B : 1/8 炉心 (XY方向 1/4 炉心, Z方向 1/2 炉心)
- ・ 18B : 1/4 炉心 (XY方向 1/4 炉心, Z方向 1/1 炉心)
- ・ 18C : 1/1 炉心 (XY方向 1/1 炉心, Z方向 1/1 炉心)

実際の計算を行う際には、計算機のメモリー制限等があり、解析モデルを工夫する必要がある。JUPITER W/Gの解析ではZ方向のメッシュ分割を解析モデルの大きさに応じて Fig. 4.2.1-33に示すように増減して解析を行った。

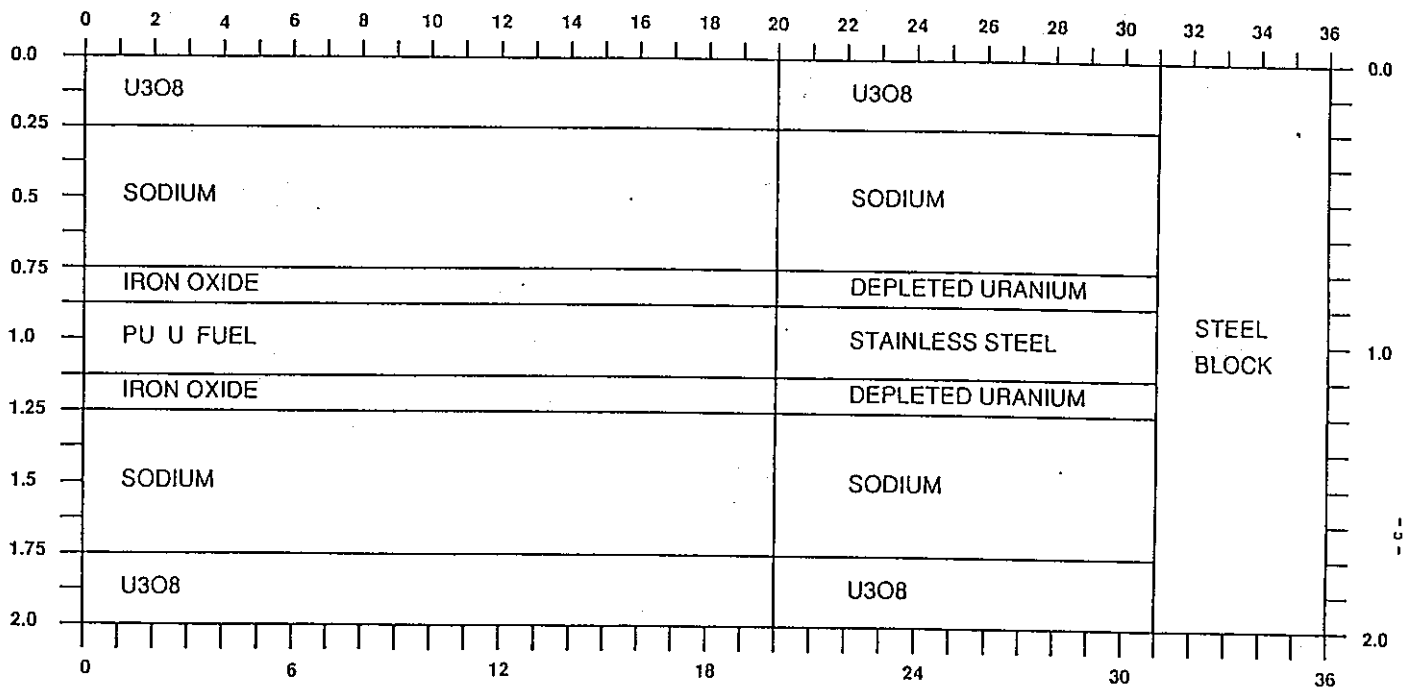


Fig. 4.2.1-1 Loading Pattern for Single-Column-Plutonium Fuel Drawers with Iron Oxide in ZPPR-18

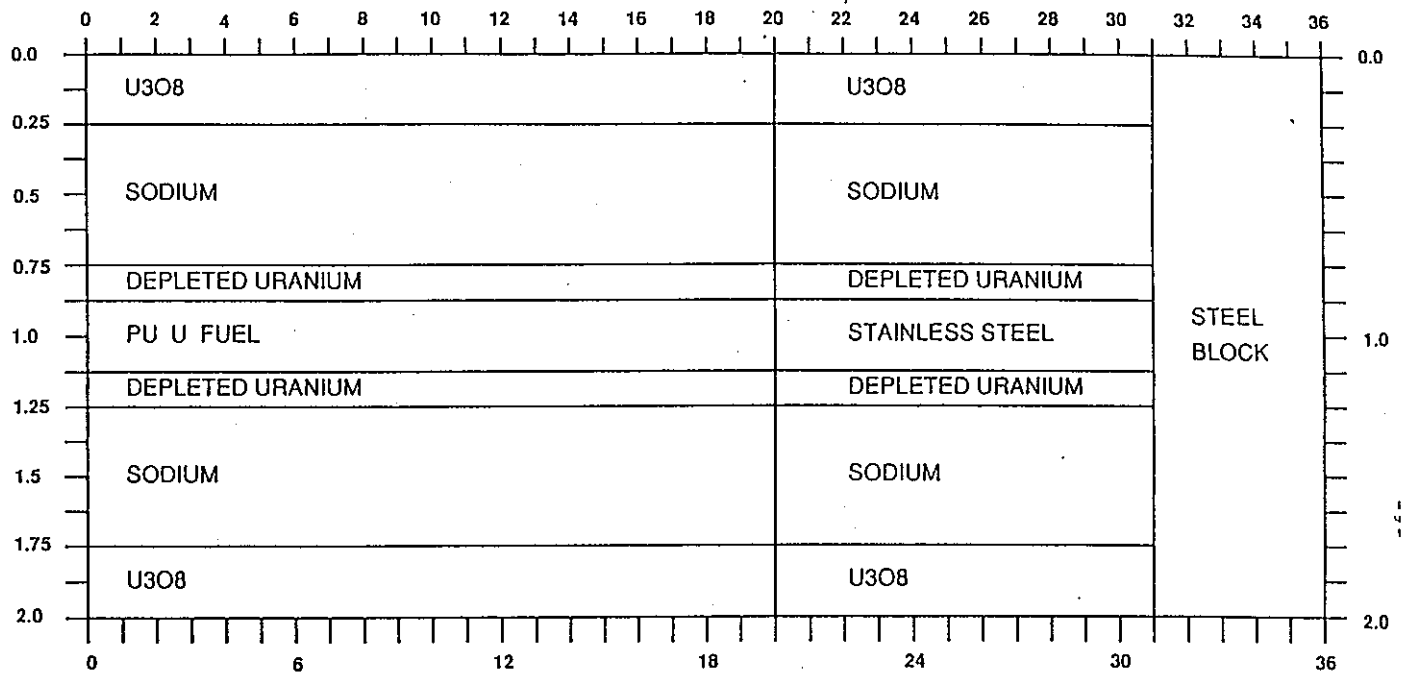


Fig. 4.2.1-2 Loading Pattern for Single-Column-Plutonium Fuel Drawers with Depleted Uranium Metal in ZPPR-18

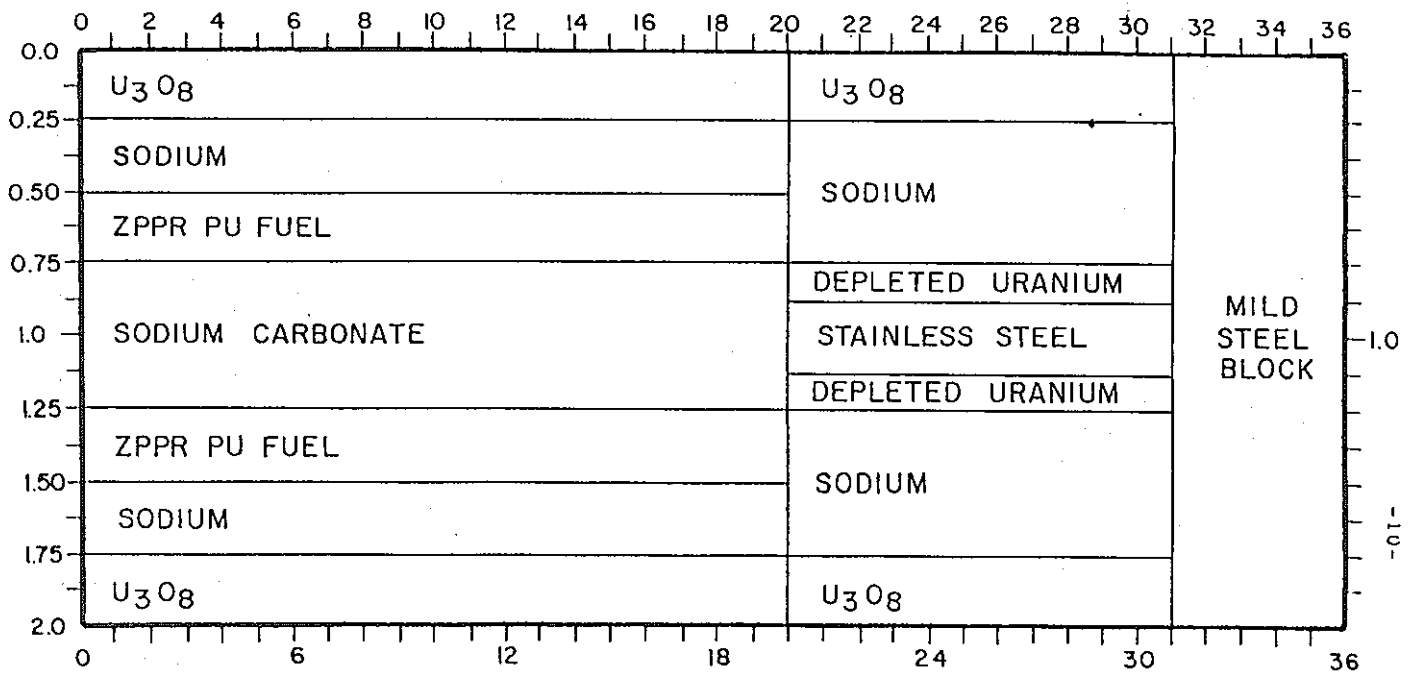


Fig. 4.2.1-3 Loading Pattern for Double-Column-Plutonium Fuel Drawers in ZPPR-18

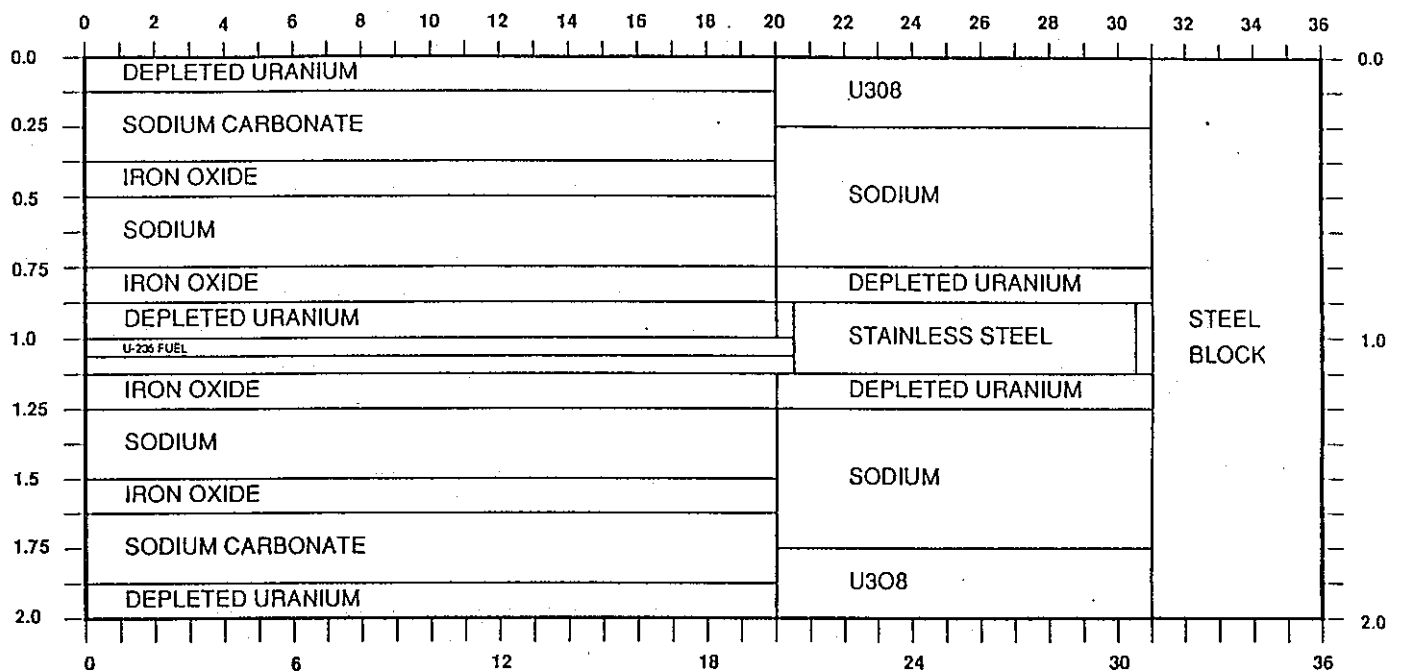


Fig. 4.2.1-4 Loading Pattern for Single-Column-Uranium Fuel Drawers in ZPPR-18

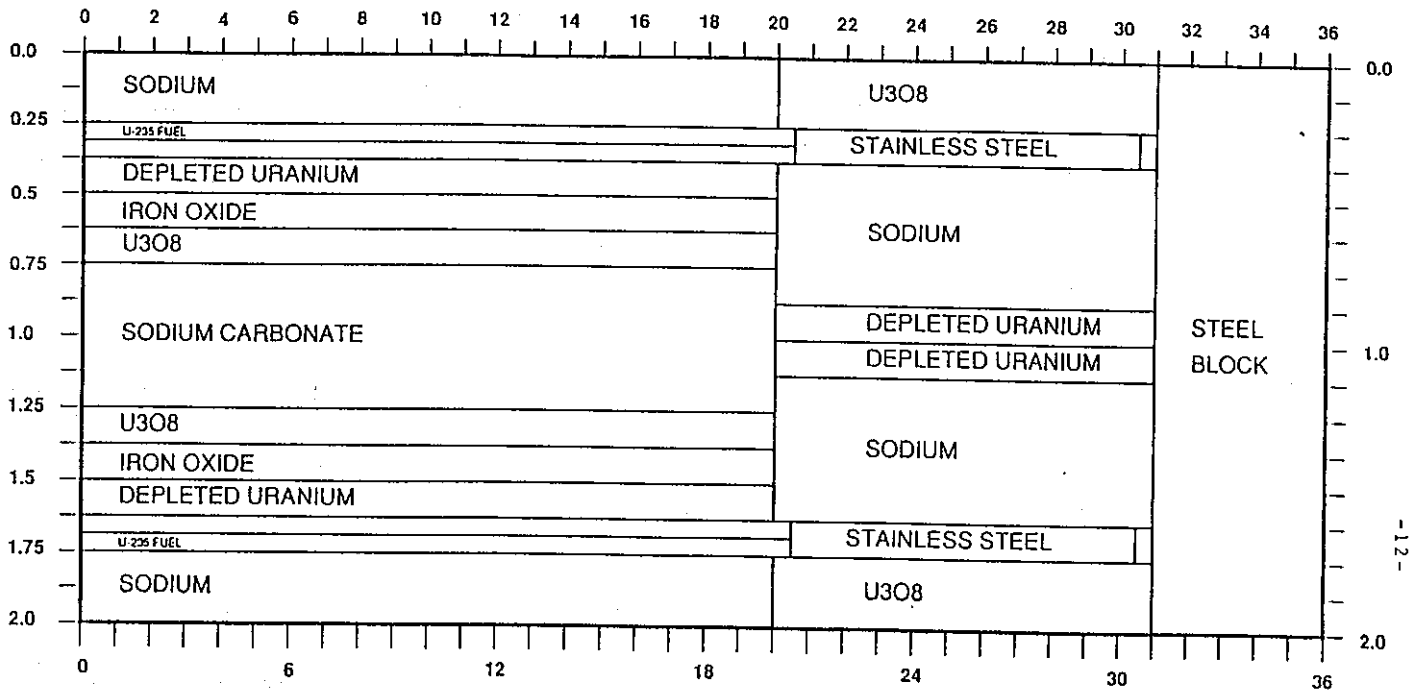


Fig. 4.2.1-5 Loading Pattern for Double-Column Uranium Fuel Drawers in ZPPR-18

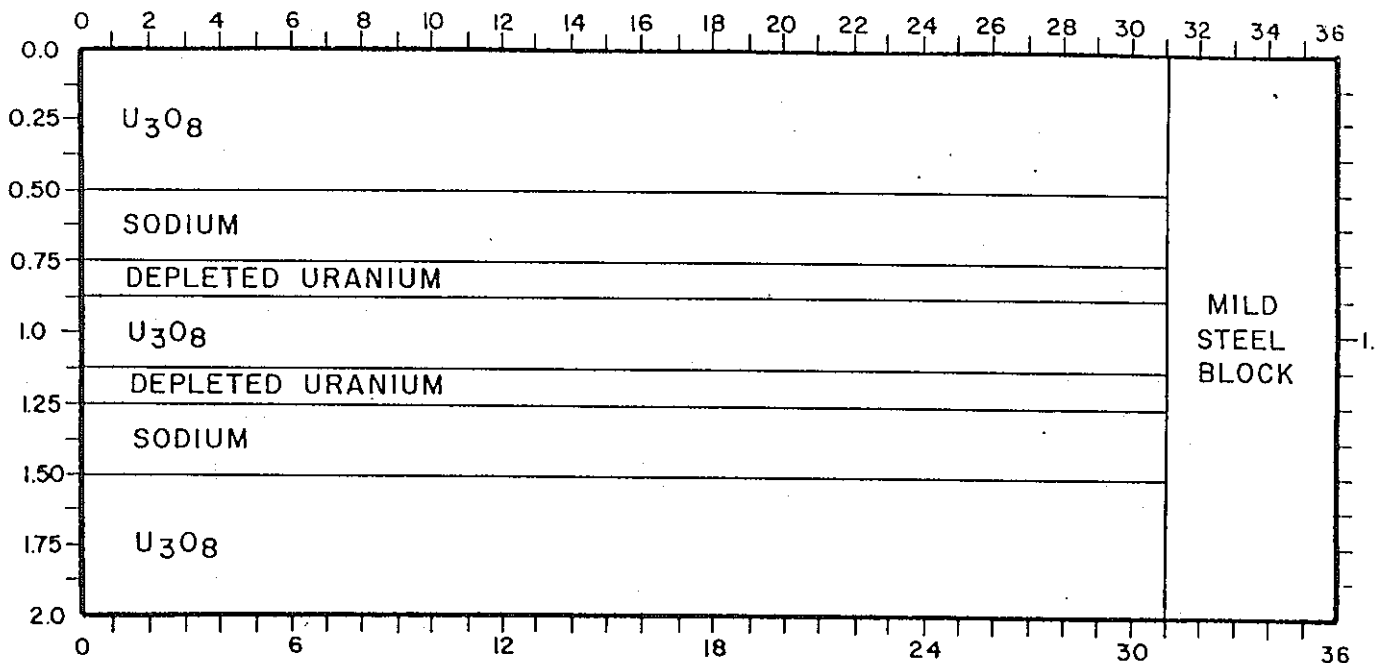
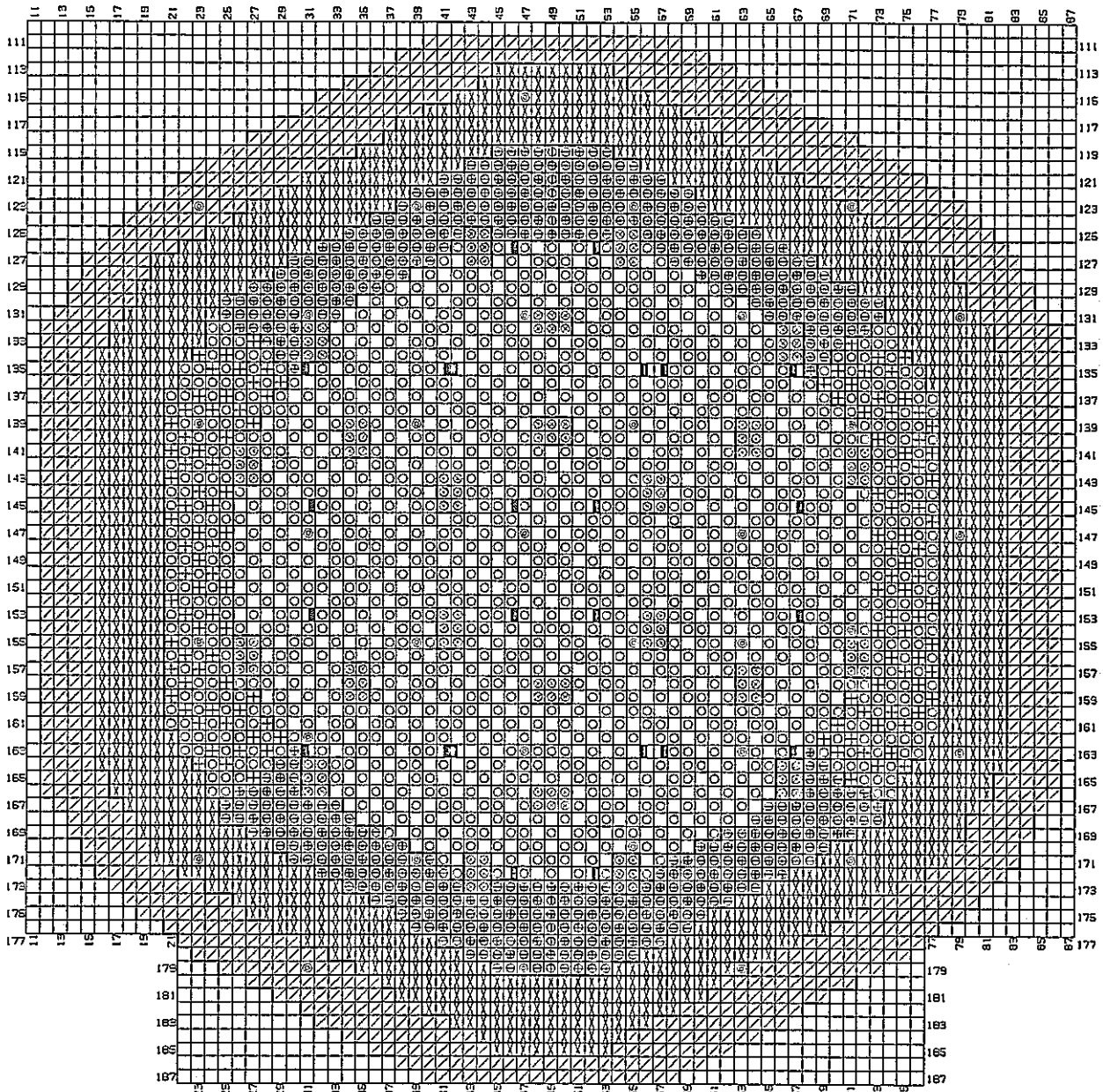


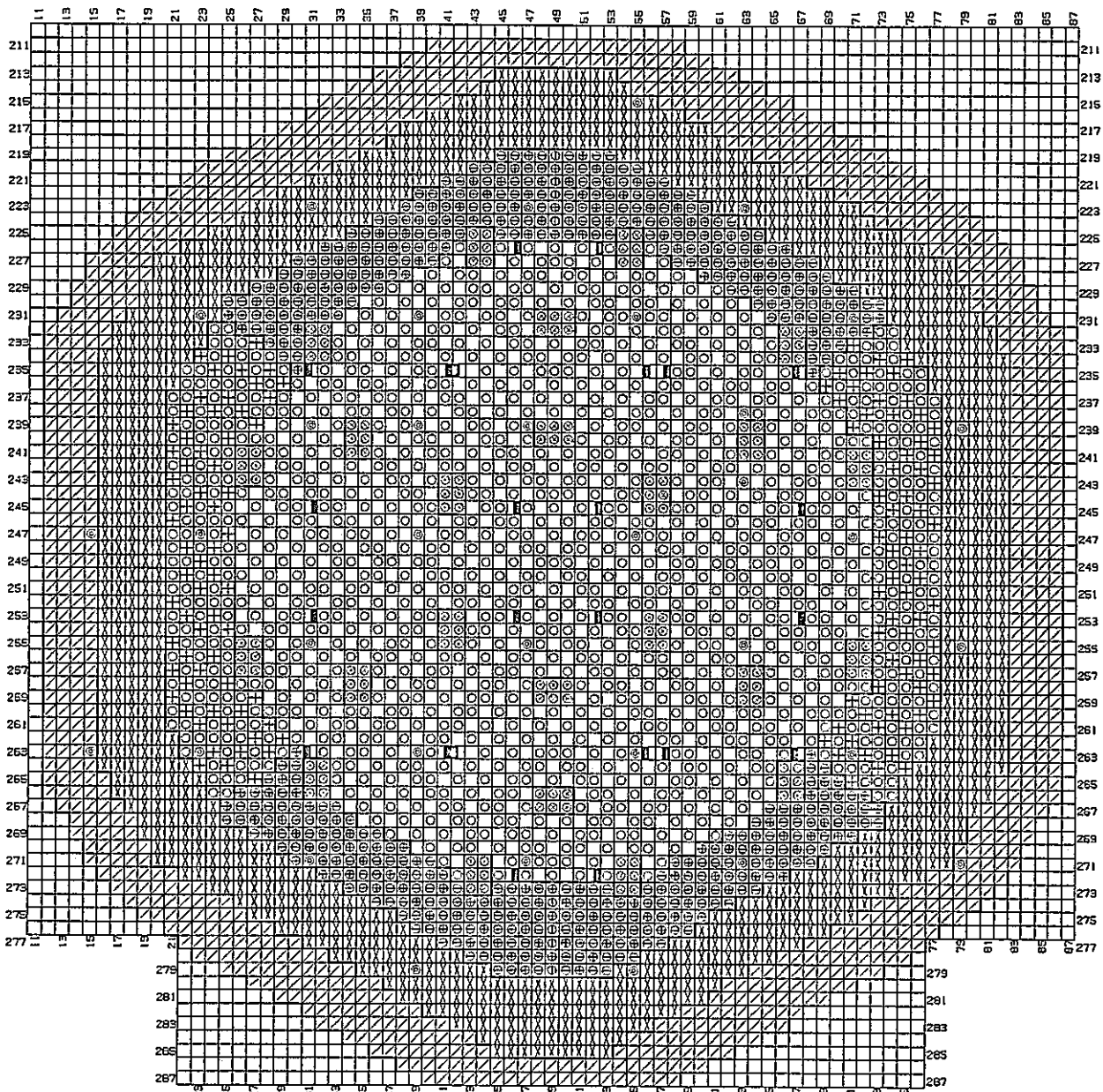
Fig. 4.2.1-6 Loading Pattern for the Principal Radial Blanket Drawers in ZPPR-18



- | | | | |
|--|---------------------------------|--|-------------------------|
| | SINGLE COLUMN FUEL DRAWER (DUM) | | RADIAL BLANKET (RDB) |
| | SINGLE COLUMN FUEL DRAWER (DUF) | | RADIAL REFLECTOR (RDR) |
| | DOUBLE COLUMN FUEL DRAWER (DCF) | | DUM NARROW DRAWER (DUM) |
| | DOUBLE DRIVER FUEL DRAWER (UDC) | | DUF NARROW DRAWER (DUF) |
| | SINGLE DRIVER FUEL DRAWER (UAC) | | COUNTER |
| | SINGLE DRIVER FUEL DRAWER (USC) | | CONTROL ROD POSITION |
| | | | CONTROL RODS |

ZPPR-18A HALF-1

Fig. 4.2.1-7 CRITICAL REFERENCE CONFIGURATION



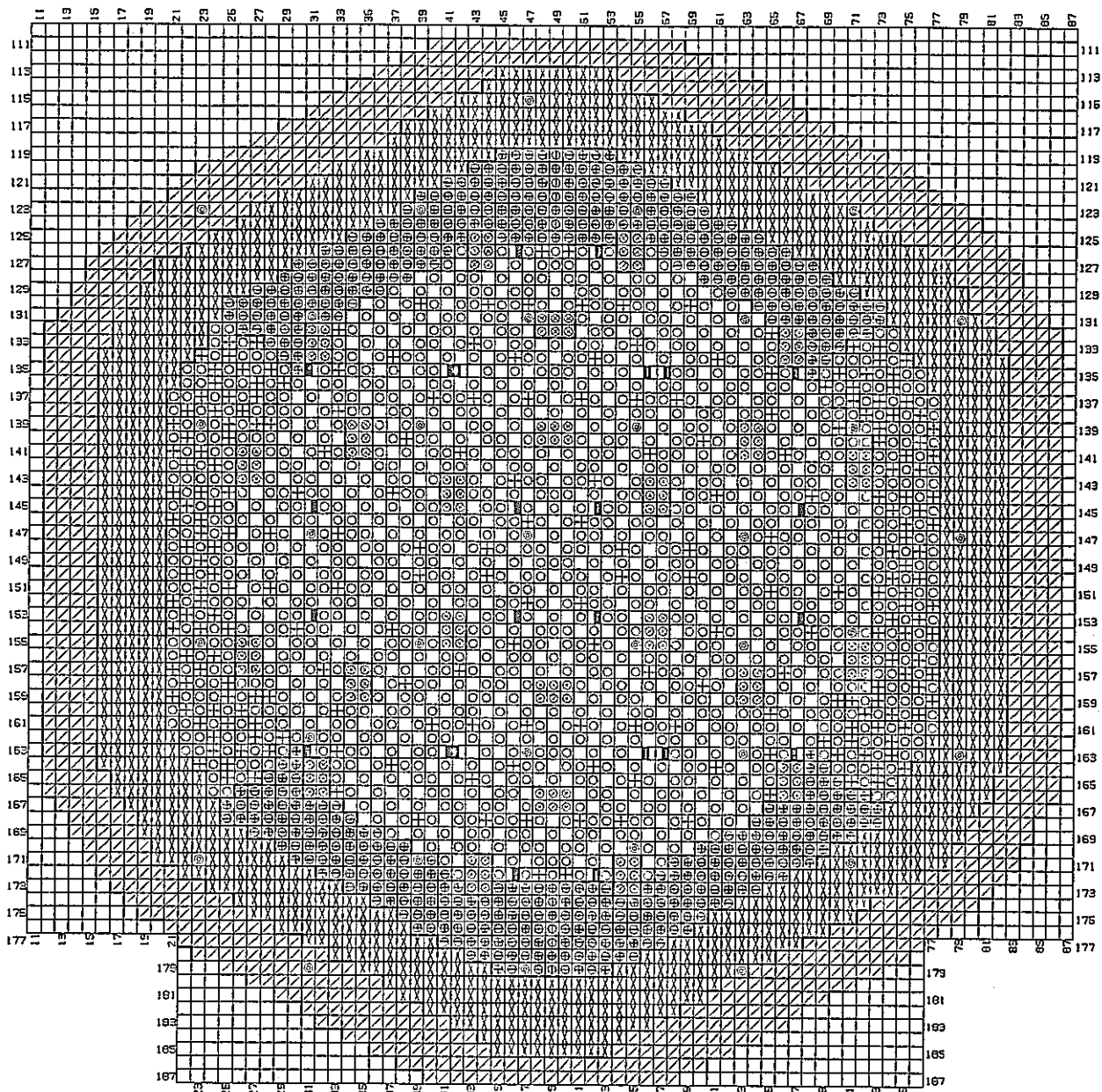
- | | | | |
|--|---------------------------------|--|-------------------------|
| | SINGLE COLUMN FUEL DRAWER (DUM) | | RADIAL BLANKET (RDB) |
| | SINGLE COLUMN FUEL DRAWER (DUF) | | RADIAL REFLECTOR (RDR) |
| | DOUBLE COLUMN FUEL DRAWER (DCF) | | DUM NARROW DRAWER (DUM) |
| | DOUBLE DRIVER FUEL DRAWER (UDC) | | DUF NARROW DRAWER (DUF) |
| | SINGLE DRIVER FUEL DRAWER (UAC) | | COUNTER |
| | SINGLE DRIVER FUEL DRAWER (USC) | | CONTROL ROD POSITION |
| | | | CONTROL RODS |














ZPPR-18A HALF-2

Fig. 4.2.1-8 CRITICAL REFERENCE CONFIGURATION

Table with 48 columns and 48 rows, containing numerical data and text labels for the XYZ Calculation Model for ZPPR-18A (Half 2).

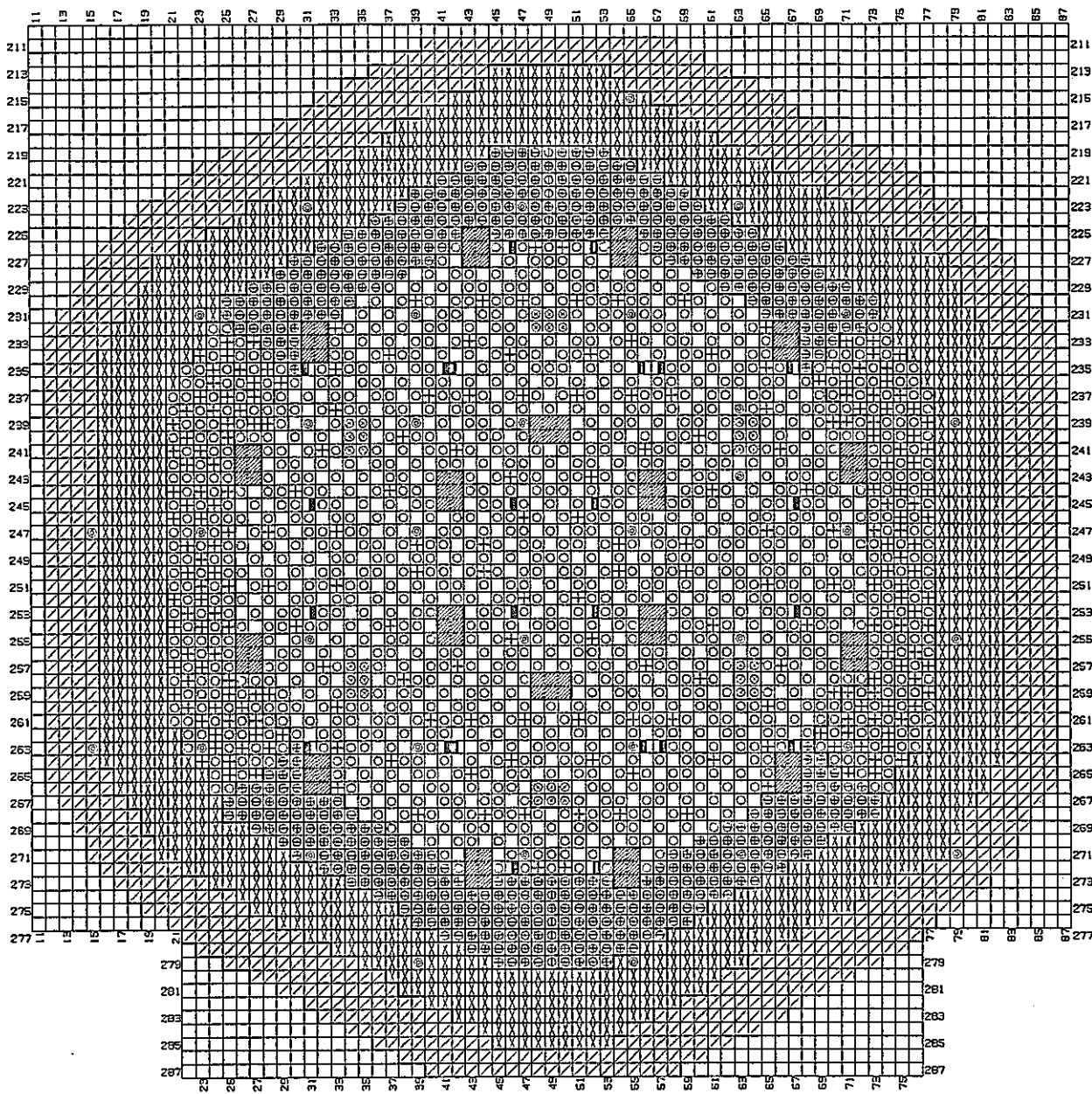
Fig. 4.2.1-10 The XYZ Calculation Model for ZPPR-18A (Half 2)
















- | | | | |
|---|---------------------------------|---|-------------------------|
|  | SINGLE COLUMN FUEL DRAWER (DUM) |  | RADIAL BLANKET (RDB) |
|  | SINGLE COLUMN FUEL DRAWER (DUF) |  | RADIAL REFLECTOR (RDR) |
|  | DOUBLE COLUMN FUEL DRAWER (DCF) |  | DUM NARROW DRAWER (DUM) |
|  | DOUBLE DRIVER FUEL DRAWER (UDC) |  | DUF NARROW DRAWER (DUF) |
|  | SINGLE DRIVER FUEL DRAWER (UAC) |  | COUNTER |
|  | SINGLE DRIVER FUEL DRAWER (USC) |  | CONTROL ROD POSITION |
| | |  | CONTROL RODS |

ZPPR-18B HALF-1

Fig. 4.2.1-11 CRITICAL REFERENCE CONFIGURATION



- | | | | |
|---|---------------------------------|---|-------------------------|
|  | SINGLE COLUMN FUEL DRAWER (DUM) |  | RADIAL BLANKET (RDB) |
|  | SINGLE COLUMN FUEL DRAWER (DUF) |  | RADIAL REFLECTOR (RDR) |
|  | DOUBLE COLUMN FUEL DRAWER (DCF) |  | DUM NARROW DRAWER (DUM) |
|  | DOUBLE DRIVER FUEL DRAWER (UDC) |  | DUF NARROW DRAWER (DUF) |
|  | SINGLE DRIVER FUEL DRAWER (UAC) |  | COUNTER |
|  | SINGLE DRIVER FUEL DRAWER (USC) |  | CONTROL ROD POSITION |
| | |  | CONTROL RODS |

ZPPR-18B HALF-2

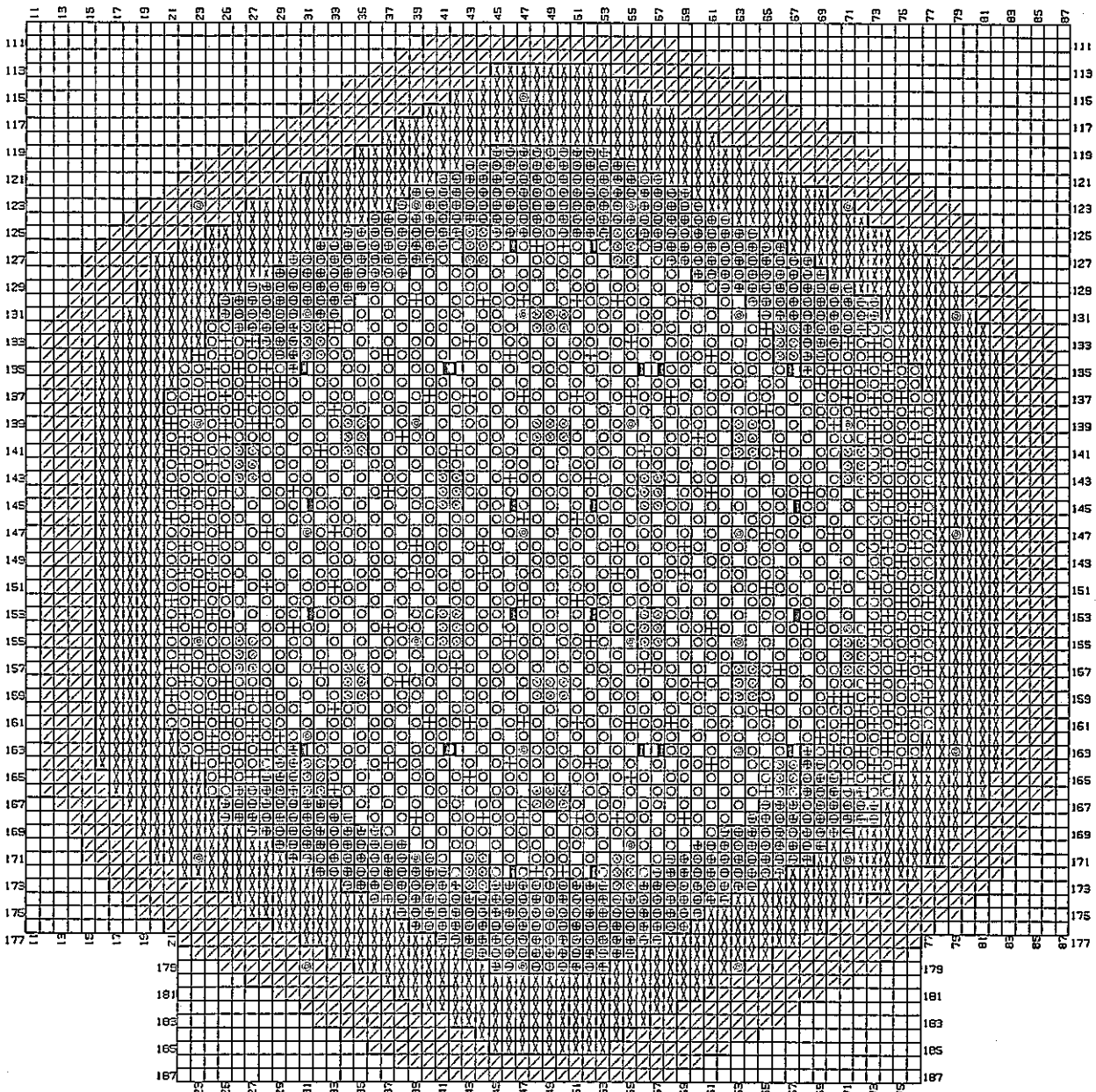
Fig. 4.2.1-12 CRITICAL REFERENCE CONFIGURATION

Table with columns 11-32 and rows 111-327. The table contains a grid of numerical values, likely representing a calculation model for ZPPR-18B. The values are organized in a regular grid pattern across the rows and columns.

Fig. 4.2.1-13 The XYZ Calculation Model for ZPPR-18B (Half 1)

Table with 80 columns and 80 rows, containing numerical data for the XYZ Calculation Model for ZPPR-18B (Half 2). The data is organized into a grid with various numerical values and some text labels.

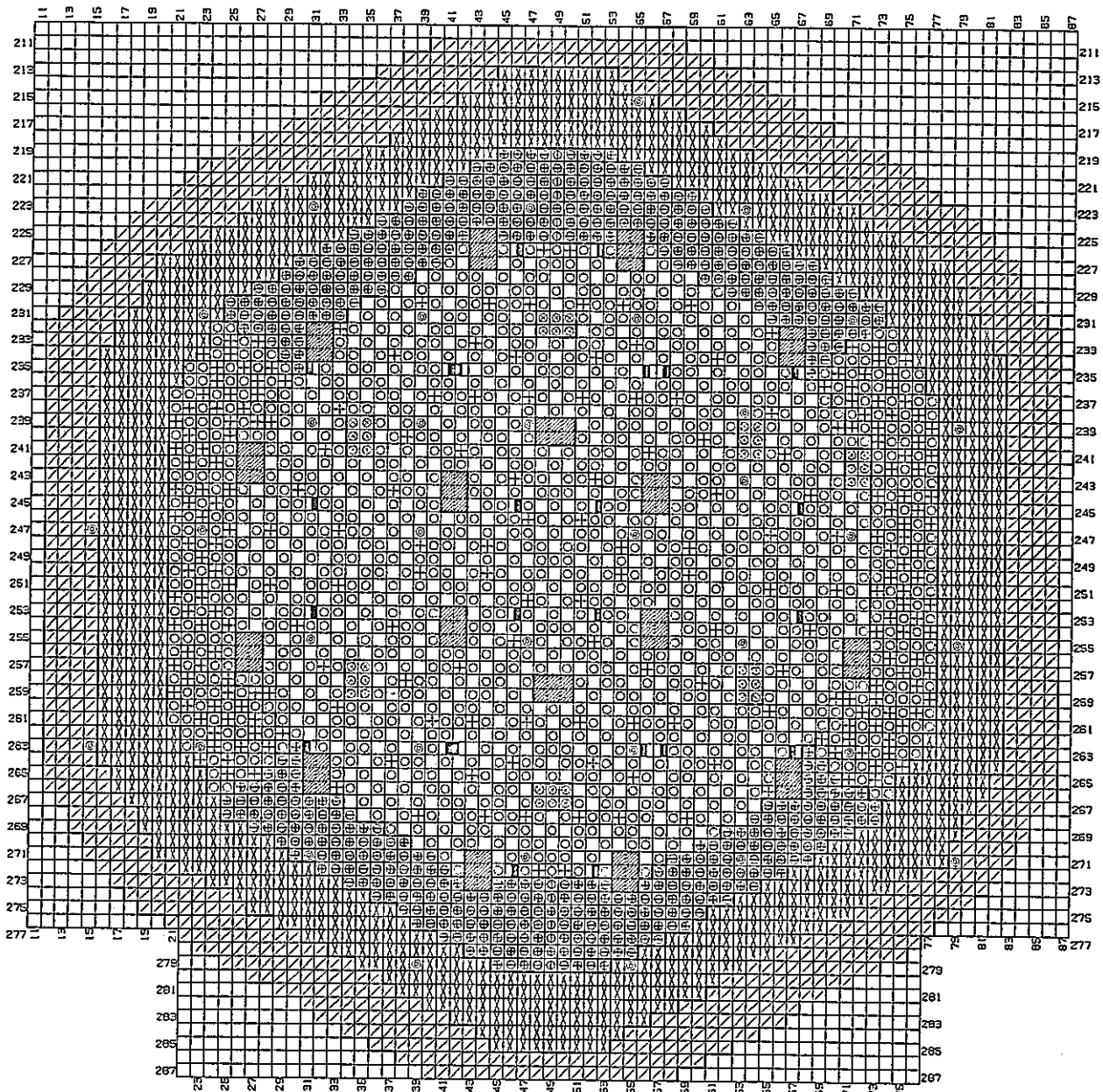
Fig. 4.2.1-14 The XYZ Calculation Model for ZPPR-18B (Half 2)



- | | |
|---------------------------------|-------------------------|
| SINGLE COLUMN FUEL DRAWER (OCM) | RADIAL BLANKET (ROB) |
| SINGLE COLUMN FUEL DRAWER (OCF) | RADIAL REFLECTOR (RDR) |
| DOUBLE COLUMN FUEL DRAWER (OCF) | DUM NARROW DRAWER (DUM) |
| DOUBLE DRIVER FUEL DRAWER (OUC) | DUF NARROW DRAWER (DUF) |
| SINGLE DRIVER FUEL DRAWER (UAC) | COUNTER |
| SINGLE DRIVER FUEL DRAWER (USC) | CONTROL ROD POSITION |
| | CONTROL RODS |

ZPPR-18C HALF-1

Fig. 4.2.1-15 CRITICAL REFERENCE CONFIGURATION



- | | |
|---------------------------------|-------------------------|
| SINGLE COLUMN FUEL DRAWER (DUM) | RADIAL BLANKET (ROB) |
| SINGLE COLUMN FUEL DRAWER (DUF) | RADIAL REFLECTOR (RDR) |
| DOUBLE COLUMN FUEL DRAWER (DCF) | DUM NARROW DRAWER (DUM) |
| DOUBLE DRIVER FUEL DRAWER (UDC) | DUF NARROW DRAWER (DUF) |
| SINGLE DRIVER FUEL DRAWER (UAC) | COUNTER |
| SINGLE DRIVER FUEL DRAWER (USC) | CONTROL ROD POSITION |
| | CONTROL RODS |

ZPPR-18C HALF-2

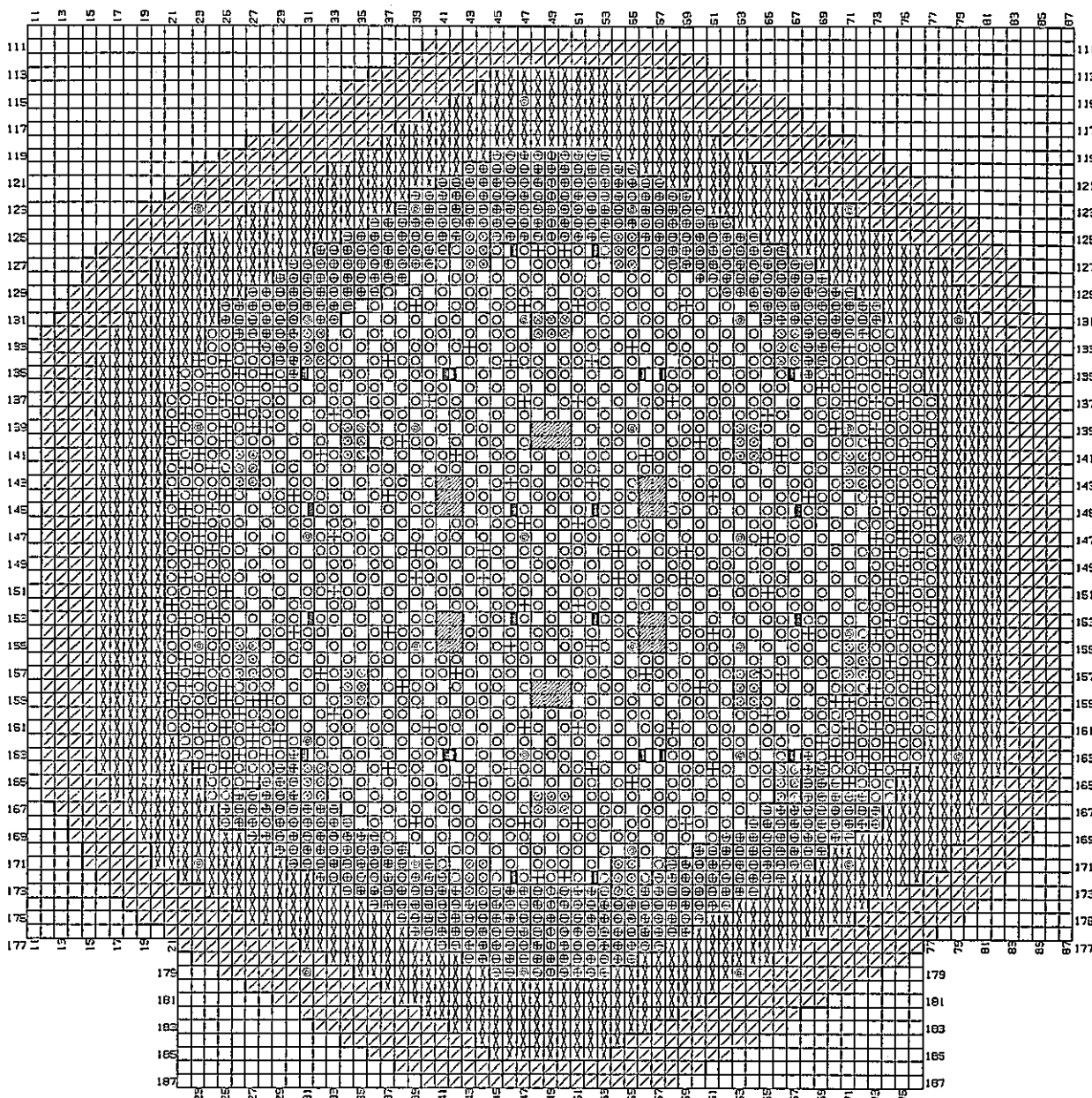
Fig. 4.2.1-16 CRITICAL REFERENCE CONFIGURATION

Table with columns 11-82 and rows 111-887. The table contains a dense grid of numerical data points, likely representing the XYZ Calculation Model for ZPPR-18C (Half I). Each row and column represents a specific coordinate or parameter in the model.

Fig. 4.2.1-17 The XYZ Calculation Model for ZPPR-18C (Half I)

Table with 32 columns and 32 rows. Each cell contains a sequence of numbers, often with a '#' symbol, representing data points for a calculation model. The numbers are arranged in a grid-like pattern across the entire page.

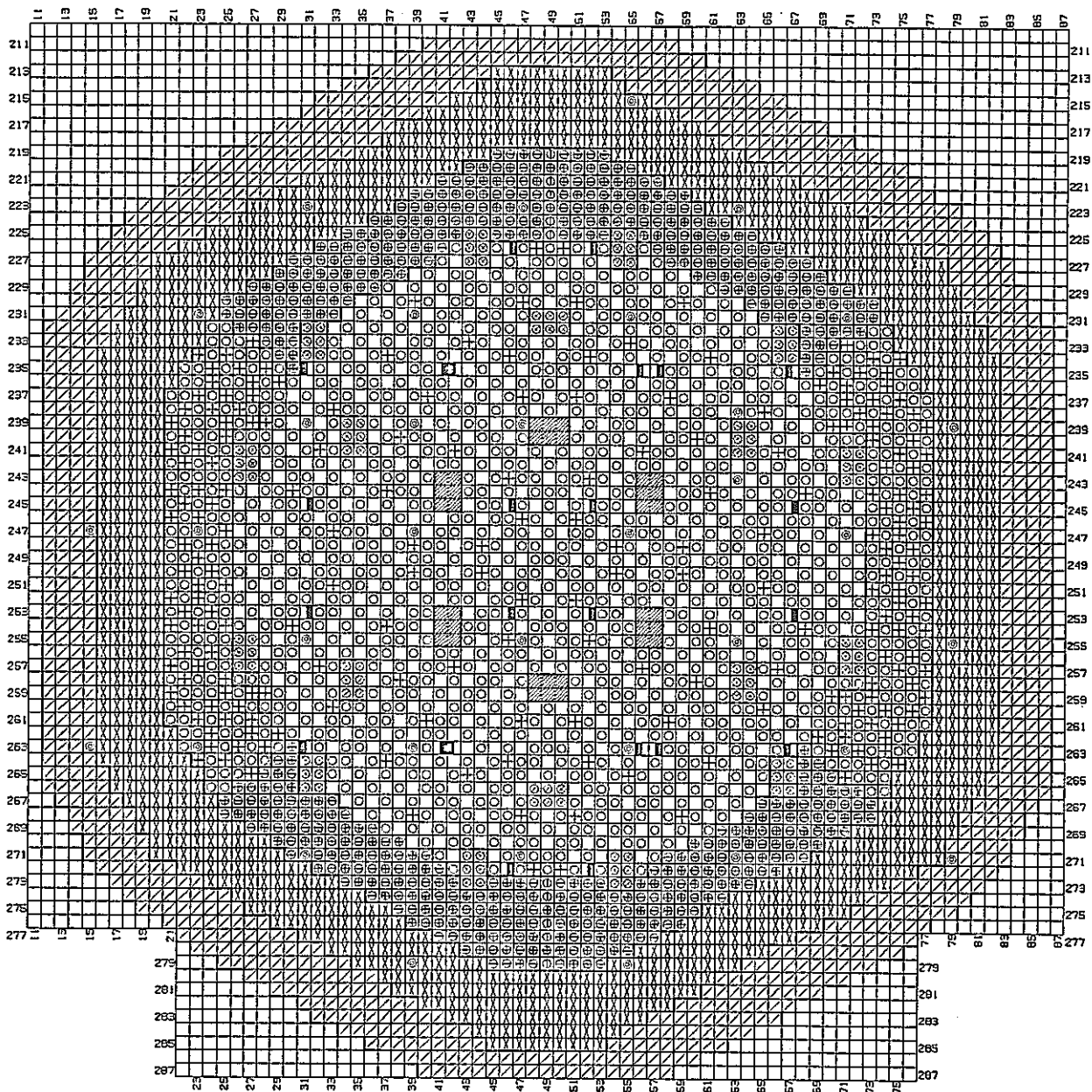
Fig. 4.2.1-18 The XYZ Calculation Model for ZPPR-18C (Half 2) -369-



- | | | | |
|--|---------------------------------|--|-------------------------|
| | SINGLE COLUMN FUEL DRAWER (DUM) | | RADIAL BLANKET (RDB) |
| | SINGLE COLUMN FUEL DRAWER (DUF) | | RADIAL REFLECTOR (RDR) |
| | DOUBLE COLUMN FUEL DRAWER (DCF) | | DUM NARROW DRAWER (DUM) |
| | DOUBLE DRIVER FUEL DRAWER (UDC) | | DUF NARROW DRAWER (DUF) |
| | SINGLE DRIVER FUEL DRAWER (UAC) | | COUNTER |
| | SINGLE DRIVER FUEL DRAWER (USC) | | CONTROL ROD POSITION |
| | | | CONTROL RODS |

ZPPR-19A HALF-1

Fig. 4.2.1-19 CRITICAL REFERENCE CONFIGURATION



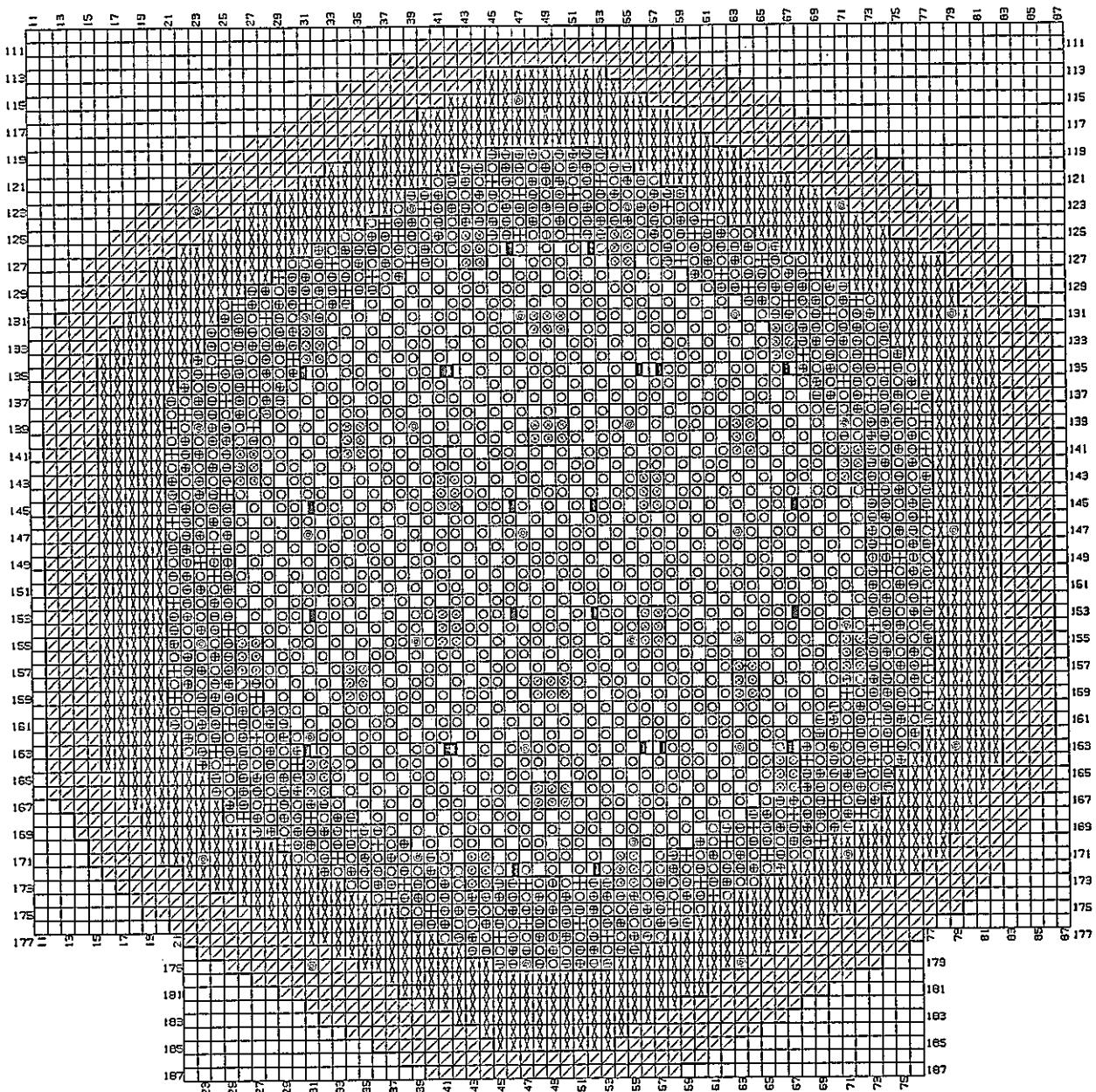
- | | |
|---------------------------------|-------------------------|
| SINGLE COLUMN FUEL DRAWER (DUM) | RADIAL BLANKET (ROB) |
| SINGLE COLUMN FUEL DRAWER (DUF) | RADIAL REFLECTOR (ROR) |
| DOUBLE COLUMN FUEL DRAWER (DCF) | DUM NARROW DRAWER (DUM) |
| DOUBLE DRIVER FUEL DRAWER (UDC) | DUF NARROW DRAWER (DUF) |
| SINGLE DRIVER FUEL DRAWER (UAC) | COUNTER |
| SINGLE DRIVER FUEL DRAWER (USC) | CONTROL ROD POSITION |
| | CONTROL RODS |

ZPPR-19A HALF-2

Fig. 4.2.1-20 CRITICAL REFERENCE CONFIGURATION

111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500

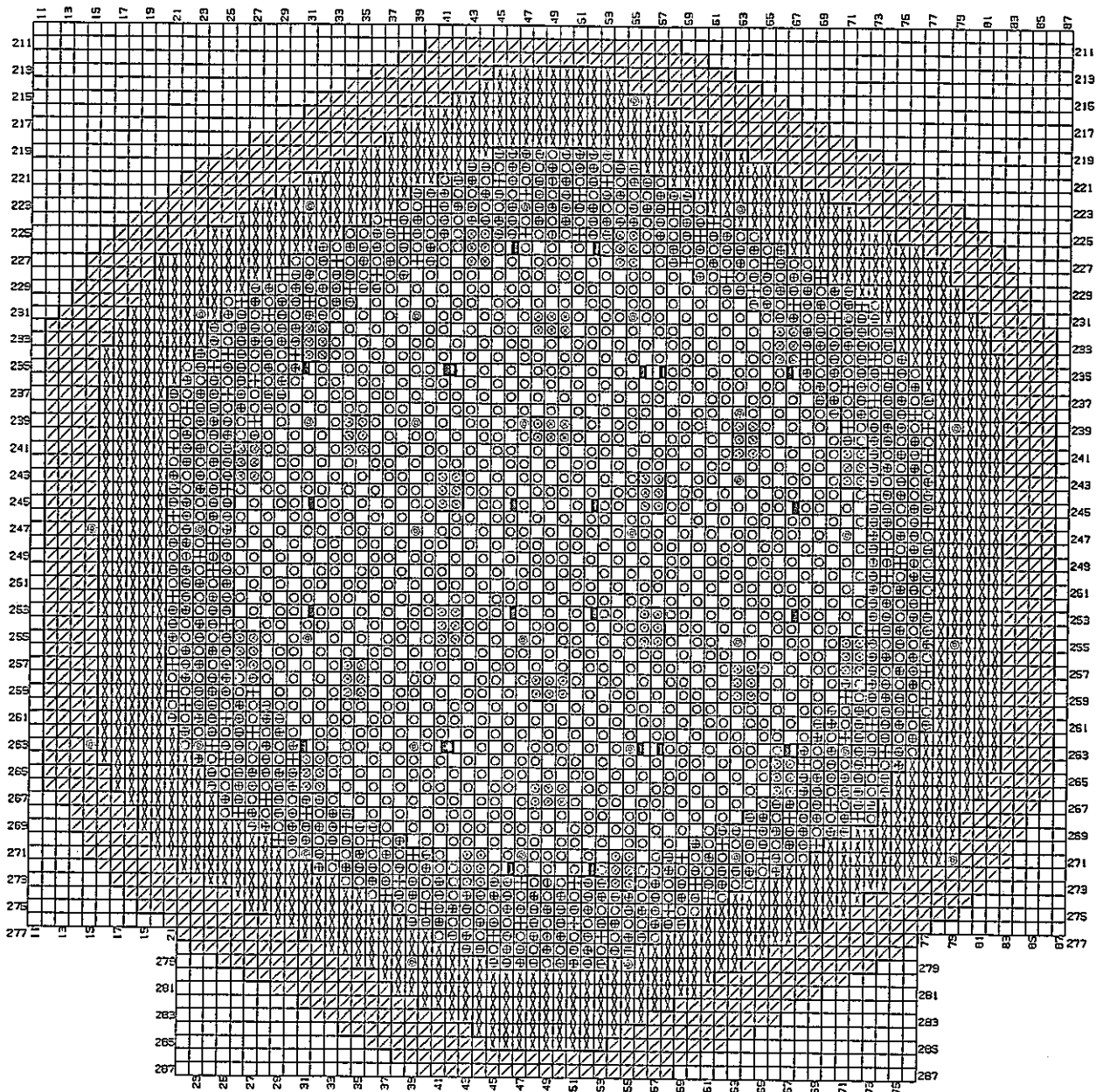
Fig. 4.2.1-21 The XYZ Calculation Model for ZPPR-19A (Half 1)
















- | | | | |
|--|---------------------------------|--|-------------------------|
| | SINGLE COLUMN FUEL DRAWER (DUM) | | RADIAL BLANKET (RDB) |
| | SINGLE COLUMN FUEL DRAWER (DUF) | | RADIAL REFLECTOR (RDR) |
| | DOUBLE COLUMN FUEL DRAWER (DCF) | | DUM NARROW DRAWER (DUM) |
| | DOUBLE DRIVER FUEL DRAWER (UDC) | | DUF NARROW DRAWER (DUF) |
| | SINGLE DRIVER FUEL DRAWER (UAC) | | COUNTER |
| | SINGLE DRIVER FUEL DRAWER (USC) | | CONTROL ROD POSITION |
| | | | CONTROL RODS |

ZPPR-19B HALF-1

Fig. 4.2.1-23 CRITICAL REFERENCE CONFIGURATION



- | | | | |
|---|---------------------------------|---|-------------------------|
|  | SINGLE COLUMN FUEL DRAWER (OUM) |  | RADIAL BLANKET (RDB) |
|  | SINGLE COLUMN FUEL DRAWER (OUF) |  | RADIAL REFLECTOR (ROR) |
|  | DOUBLE COLUMN FUEL DRAWER (DCF) |  | OUM NARROW DRAWER (OUM) |
|  | DOUBLE DRIVER FUEL DRAWER (UDC) |  | OUF NARROW DRAWER (OUF) |
|  | SINGLE DRIVER FUEL DRAWER (UAC) |  | COUNTER |
|  | SINGLE DRIVER FUEL DRAWER (USC) |  | CONTROL ROD POSITION |
| | |  | CONTROL RODS |

ZPPR-19B HALF-2

Fig. 4.2.1-24 CRITICAL REFERENCE CONFIGURATION

Table with 32 columns and 32 rows, containing numerical data and labels. The table is organized into a grid with row and column indices. The content includes numerical values and various symbols such as asterisks and dashes. The table is titled 'Fig. 4.2.1-26 The XYZ Calculation Model for ZPPR-19B (Half 2)'.

Fig. 4.2.1-26 The XYZ Calculation Model for ZPPR-19B (Half 2)

- ① : Inner-Core ② : Outer-Core ③ : Radial Blanket
- ④ : Axial Blanket ⑤ : Radial Reflector ⑥, ⑦ : Axial Reflector
- ⑧ : Matrix

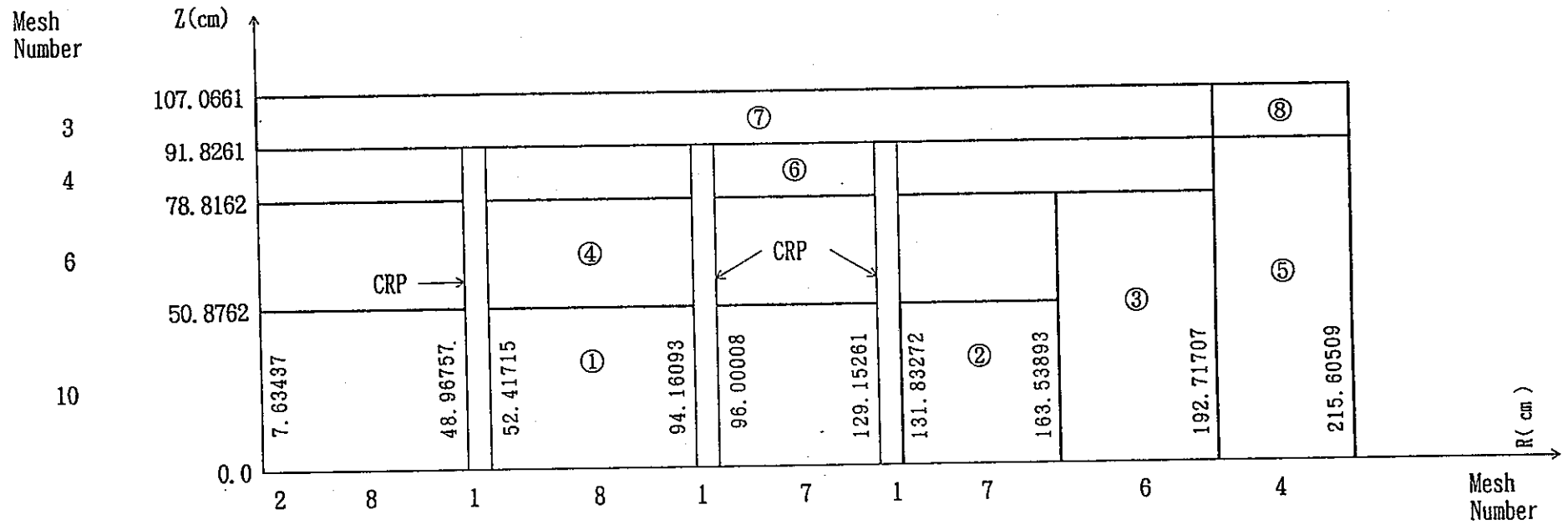
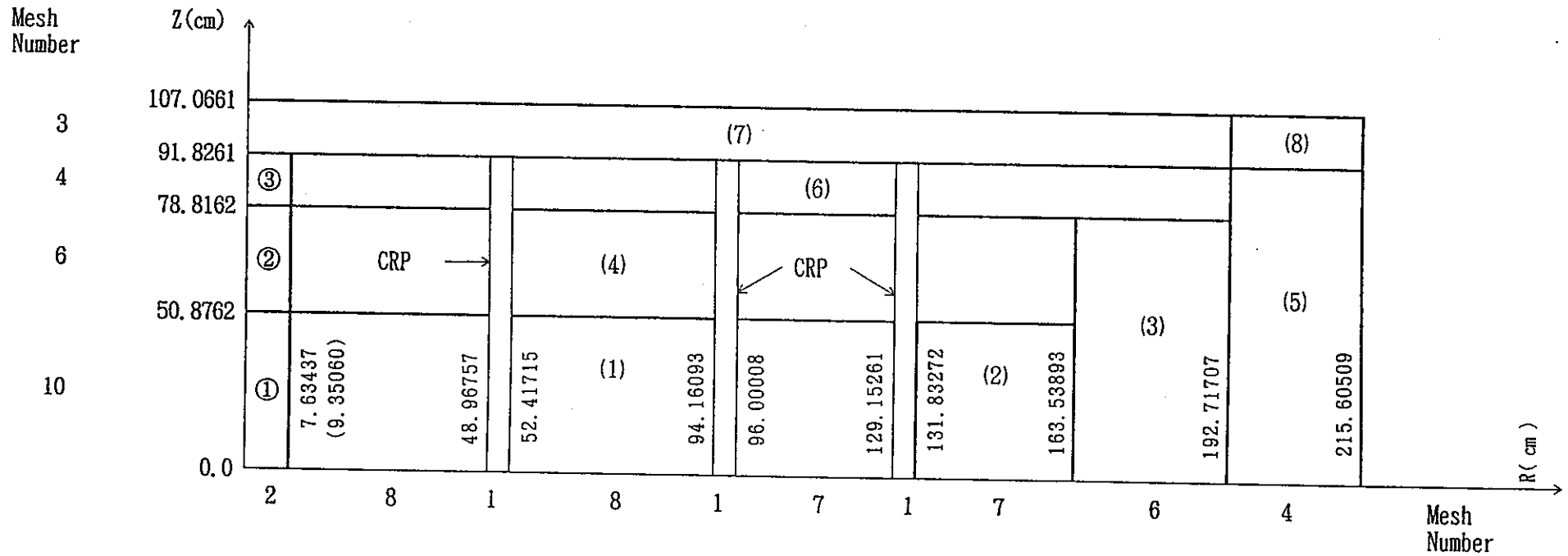


Fig. 4.2.1-27 RZ Calculational Model for ZPPR-18A, -19B Critical Reference Core
(except for CRP, CR)

① : CRP or CR (I)-Core Height ② : CRP or CR (II) -Axial Blanket

③ : CRP or CR (III)-Axial Reflector

(1) : Inner-Core (2) : Outer-Core (3) : Radial Blanket
 (4) : Axial Blanket (5) : Radial Reflector (6), (7) : Axial Reflector
 (8) : Matrix



* () : 3x3 Drawers CRP or CR

Fig. 4.2.1-28 RZ Calculational Model for ZPPR-18A, -19B Critical Reference Core
 (for CRP, CR)

- ①, ② : Inner-Core
- ③, ④ : Outer-Core
- ⑤, ⑥ : Radial Blanket
- ⑦, ⑧ : Axial Blanket
- ⑨ : Radial Reflector
- ⑩-⑬ : Axial Reflector
- ⑭ : Matrix
- ▨ : B₄C Region

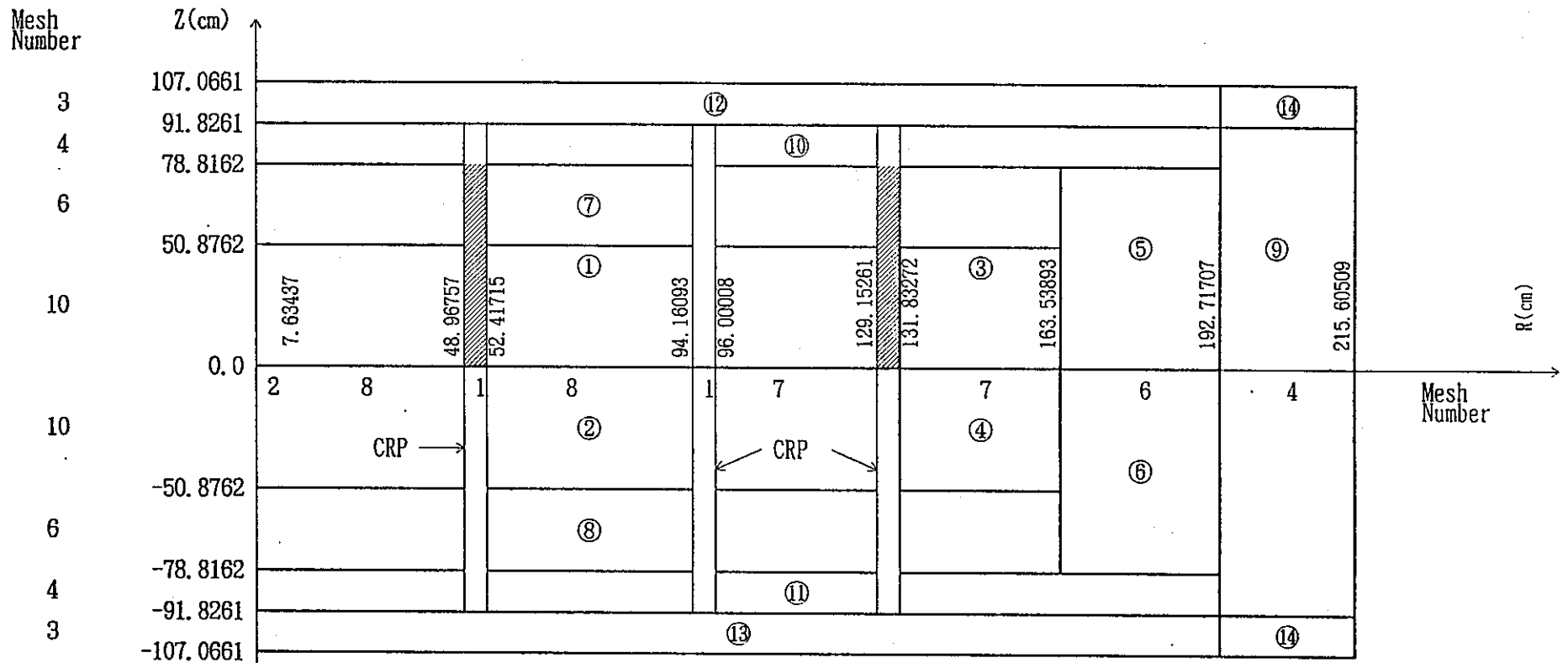


Fig. 4.2.1-29 RZ Calculational Model for ZPPR-18B, -18C Critical Reference Core
(except for CRP, CR)

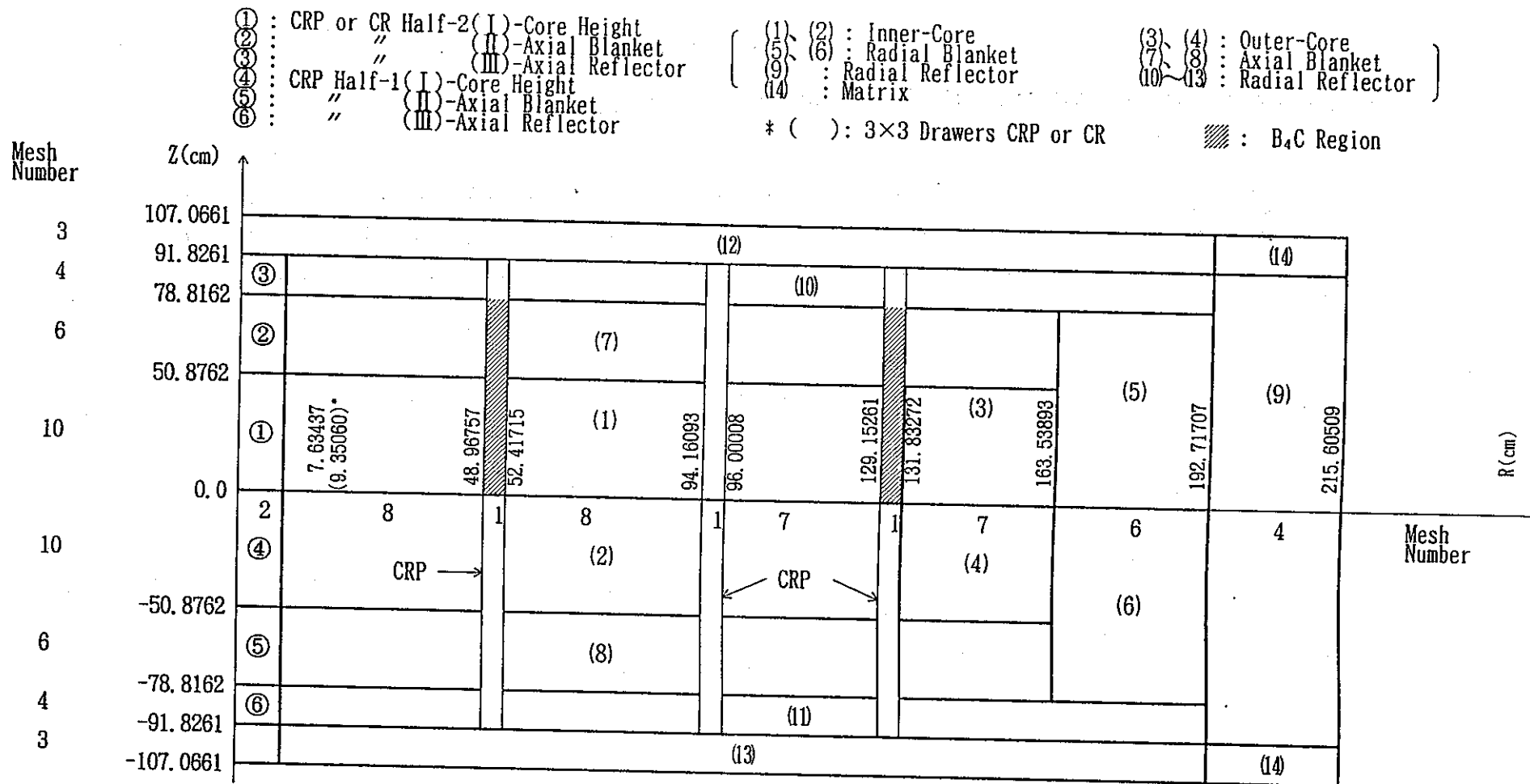
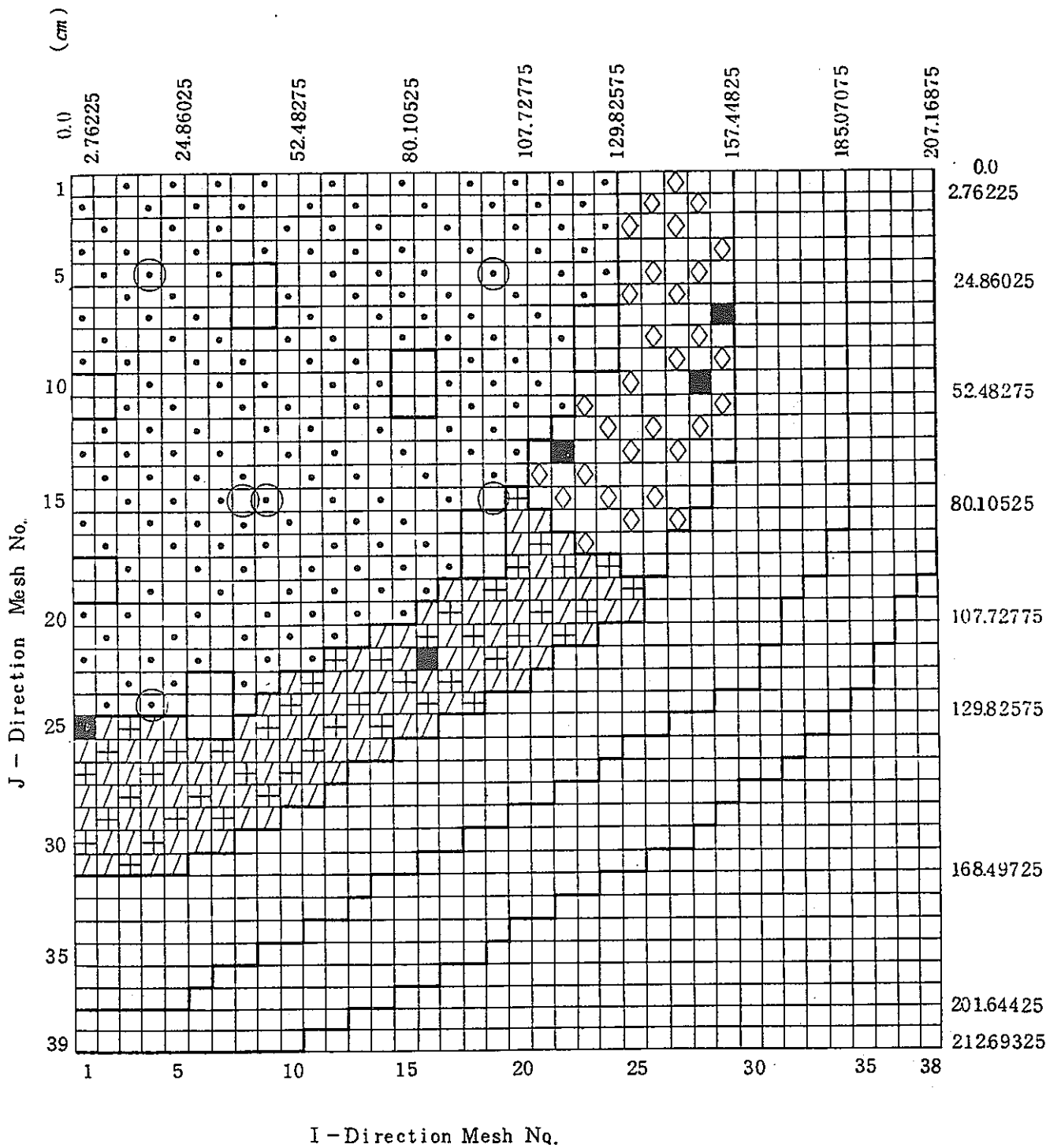


Fig. 4.2.1-30 RZ Calculational Model for ZPPR-18B, -18C Critical Reference Core (for CRP, CR)



Mesh Interval : 5.5245 cm

Fig. 4.2.1-31 XYZ Calculational Model (XY Cross Section)
for ZPPR-18A Critical Reference Core

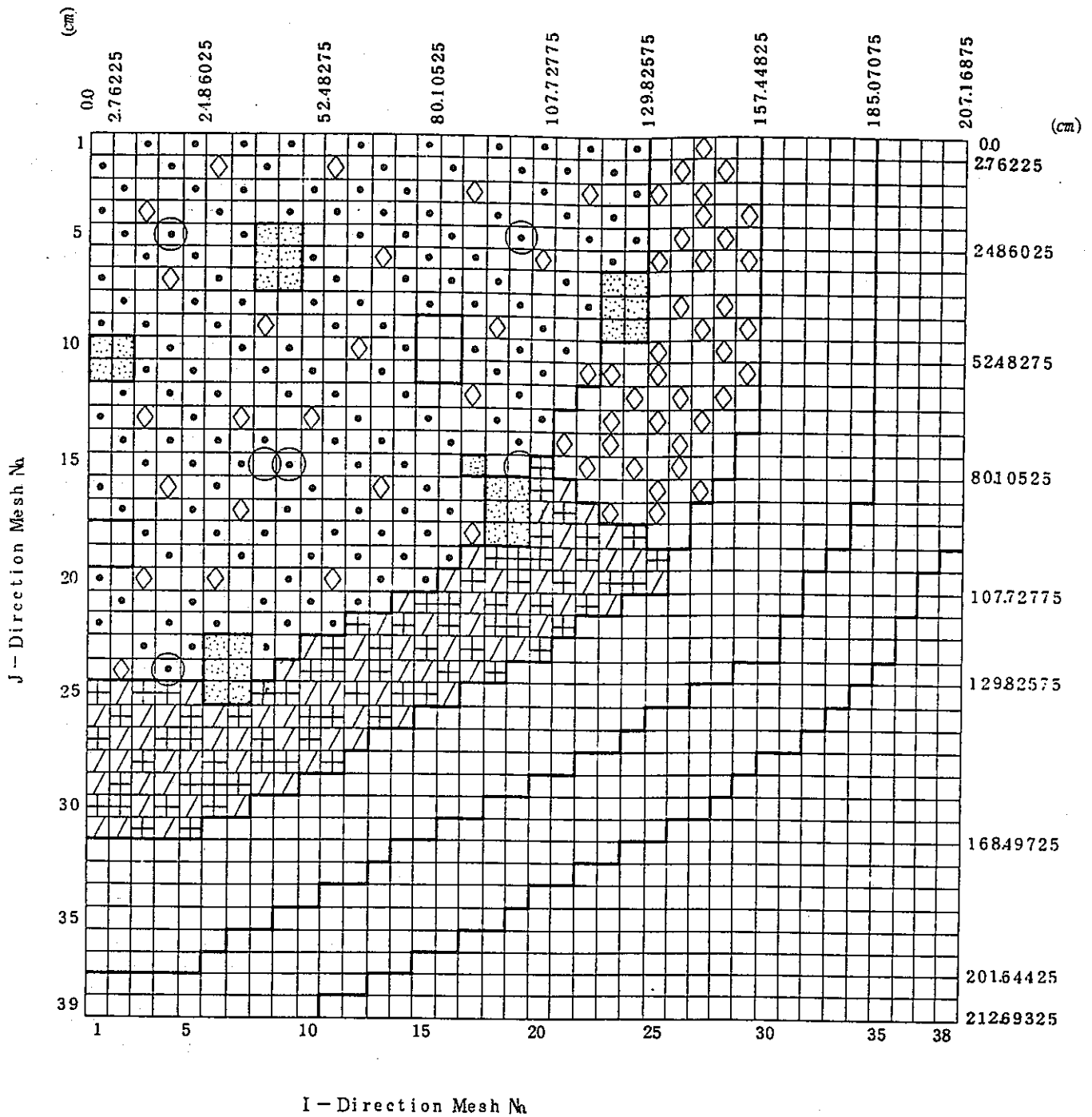


Fig. 4.2.1-32 XYZ Calculational Model (XY Cross Section)
for ZPPR-18B Critical Reference Core

Mesh Number	Z (cm)
	107.0661
3	A/R (D) 91.8261
4	A/R (I) 78.8162
6	A/B
1	51.9938
	50.8762
10	I/C O/C
	0.0

(a) ZPPR-18A
(d) ZPPR-19B

Mesh Number	Z (cm)	メッシュ数
	107.0661	
1	A/B (D) 91.8261	1
2	A/B (I) 78.8162	2
6	A/B	3
1	51.9938	1
	50.8762	
10	I/C O/C	7
	0.0	



(Half - 2)

10

I/C O/C

7

1

-50.8762

1

-51.9938

6

A/B

(Half - 1)

3

-78.8162

2

A/R (I)

2

-91.8261

1

A/R (D)

1

-107.0661

(合計40メッシュ)

(合計28メッシュ)

(b) ZPPR-18B

(c) ZPPR-18C

Fig. 4.2.1-33 Mesh Point Distribution along Z-axis

Table 4.2.1-1 Drawer Loading Summary for the ZPPR-18A
Critical Reference

<u>Inner Core - Drawers with 1 Column of Plutonium Fuel</u>	
Drawers with iron oxide (Includes 20 drawers with fission chambers, 2 drawers with thermocouples and 16 narrow drawers adjacent to PSRs)	1930
Drawers with depleted uranium metal (Includes 9 drawers with fission chambers and 32 narrow drawers adjacent to PSRs)	1360
<u>Outer Core</u>	
Drawers with 1 column of plutonium fuel (Includes 4 drawers with fission chambers)	552
Drawers with 2 columns of plutonium fuel (Includes 2 drawers with fission chambers)	260
Drawers with 1 column of uranium fuel (Includes 5 drawers with fission chambers)	752
Drawers with 2 columns of uranium fuel (Includes 4 drawers with fission chambers)	364
<u>Control Rod Positions</u>	
Drawers filled with sodium cans	288
<u>Radial Blanket</u>	
Drawers containing uranium oxide (Includes 12 drawers with fission chambers)	1840
Drawers containing uranium metal (Includes 4 drawers with fission chambers)	300
<u>Radial Reflector</u>	
Stainless-steel-filled drawers (Includes 5 drawers with fission chambers)	1860
Mild-steel-filled drawers	64

Table 4.2.1-2 Mass Summary for Various Regions in the ZPPR-18A Critical Reference

Material	Mass, kg ^b					
	Inner Core	Outer Core Plutonium	Outer Core Uranium	Radial Blanket	Axial Blanket	Control Position
Total Pu	2050.087	669.945	---	---	---	---
Fissile Pu	1807.201	590.493	---	---	---	---
Total Fissile	1841.334	597.625	1024.982	47.881	31.162	---
²³⁸ Pu	0.885	0.331	---	---	---	---
²³⁹ Pu	1793.302	585.702	---	---	---	---
²⁴⁰ Pu	238.309	77.827	---	---	---	---
²⁴¹ Pu ^a	13.898	4.791	---	---	---	---
²⁴² Pu	3.692	1.294	---	---	---	---
Americium ^a	21.893	7.244	---	---	---	---
²³⁵ U	34.134	7.131	1024.982	47.881	31.162	---
²³⁸ U	15779.550	3307.774	4861.559	22092.750	14345.780	---
Total Heavy Metal	17885.630	3992.093	5901.238	22140.620	14376.950	---
O	1588.895	480.641	780.342	1704.949	1042.820	0.016
Na	1793.584	438.321	559.665	460.208	1734.845	312.267
Mo	194.636	62.806	4.314	6.974	24.027	1.238
Steel ^c	7315.277	1925.778	3315.814	3487.283	8893.488	614.63

^aMasses for all isotopes decayed to 10/22/87.

^bMasses are based on the average masses for plates types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe and Ni.

Table 4.2.1-3 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 18A CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE(URAN)	OUTER CORE(PLU)	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	2050.708	670.180	15.158	---	---
FISSILE PU	1807.053	590.470	---	---	---
TOTAL FISSILE	1841.734	597.781	1024.883	74.171	31.160
PU-239	1793.148	585.676	---	---	---
PU-240	238.389	77.856	---	---	---
PU-241	13.905	4.794	---	---	---
PU-242	5.266	1.855	15.158	---	---
AM-241	21.884	7.241	---	---	---
U-235	34.681	7.311	1024.883	74.171	31.160
U-238	15777.961	3307.616	4861.102	34222.555	14344.590
TOTAL HEAVY METAL	17863.348	3985.108	5901.141	34296.723	14375.746
O	1588.759	480.623	780.275	2641.046	1042.733
NA	1793.431	438.305	559.616	712.884	1561.836
MO	194.607	62.804	4.314	10.803	23.340
STEEL	7303.383	1925.559	3316.220	5402.059	8541.348

Table 4.2.1-4 (1) Atom Densities by Zone and Drawer Type in ZPPR-18A

Isotope	Inner Core Average 0-20	Axial Blanket (IC) 20-31	Reflector Iron Block (IC) 31-36	Inner Core (ICSF) 0-20	Inner Core (ICFM) 0-20
C	0.0000335	0.0000532	0.0005869	0.0000335	0.0000336
O	0.0117067	0.0088210	0.0	0.0137453	0.0088141
Na	0.0092276	0.0091887	0.0	0.0092715	0.0091653
Si	0.0001588	0.0001923	0.0001243	0.0001581	0.0001598
Al	0.0000040	0.0000029	0.0	0.0000040	0.0000040
Mn	0.0002306	0.0003421	0.0006799	0.0002304	0.0002308
Cr	0.0026920	0.0041655	0.0020863	0.0026879	0.0026978
Fe	0.0115464	0.0148016	0.0756023	0.0129235	0.0095924
Ni	0.0011811	0.0017641	0.0008466	0.0011756	0.0011888
Cu	0.0000303	0.0000439	0.0000264	0.0000296	0.0000314
Mo	0.0002393	0.0000345	0.0000133	0.0002399	0.0002384
U4	0.0	0.0	0.0	0.0	0.0
U5	0.0000171	0.0000179	0.0	0.0000127	0.0000234
U6	0.0	0.0	0.0	0.0	0.0
U8	0.0078140	0.0081561	0.0	0.0058158	0.0106494
P8	0.0000004	0.0	0.0	0.0000004	0.0000005
P9	0.0008843	0.0	0.0	0.0008878	0.0008794
P0	0.0001170	0.0	0.0	0.0001176	0.0001162
P1	0.0000068	0.0	0.0	0.0000066	0.0000070
P2	0.0000018	0.0	0.0	0.0000017	0.0000019
A1	0.0000107	0.0	0.0	0.0000107	0.0000107
P	0.0000052	0.0000102	0.0000236	0.0000053	0.0000051
S	0.0000010	0.0000081	0.0000312	0.0000010	0.0000011
Cl	0.0000003	0.0000003	0.0	0.0000003	0.0000003
Ca	0.0000021	0.0000021	0.0	0.0000021	0.0000021
Co	0.0000014	0.0000014	0.0000007	0.0000008	0.0000023

Table 4.2.1-4 (2) (contd)

Isotope	Outer Core Average 0-20	Outer Core Average 20-20.44	Axial Blanket (OC) 20.44-31	Reflector Iron Block (OC) 31-36	Outer Core Pu Fuel 0-20
C	0.0015795	0.0000429	0.0000544	0.0005918	0.0007626
O	0.0158687	0.0088280	0.0088212	0.0	0.0143579
Na	0.0087587	0.0093058	0.0092565	0.0	0.0091344
Si	0.0001680	0.0001697	0.0001999	0.0001149	0.0001662
Al	0.0000043	0.0000028	0.0000029	0.0	0.0000047
Mn	0.0002404	0.0002666	0.0003436	0.0006713	0.0002419
Cr	0.0028508	0.0031905	0.0041048	0.0019290	0.0028375
Fe	0.0147503	0.0113577	0.0146022	0.0759608	0.0123535
Ni	0.0012577	0.0013653	0.0017546	0.0007803	0.0012570
Cu	0.0000317	0.0000359	0.0000414	0.0000272	0.0000319
Mo	0.0001408	0.0000231	0.0000304	0.0000136	0.0003128
U4	0.0000083	0.0000070	0.0	0.0	0.0
U5	0.0008677	0.0007292	0.0000179	0.0	0.0000145
U6	0.0000040	0.0000033	0.0	0.0	0.0
U8	0.0069024	0.0081979	0.0081563	0.0	0.0066366
P8	0.0000003	0.0	0.0	0.0	0.0000007
P9	0.0004929	0.0	0.0	0.0	0.0011702
P0	0.0000652	0.0	0.0	0.0	0.0001549
P1	0.0000040	0.0	0.0	0.0	0.0000095
P2	0.0000011	0.0	0.0	0.0	0.0000025
A1	0.0000060	0.0	0.0	0.0	0.0000144
P	0.0000053	0.0000074	0.0000102	0.0000233	0.0000051
S	0.0000014	0.0000039	0.0000067	0.0000314	0.0000012
Cl	0.0000043	0.0000003	0.0000003	0.0	0.0000022
Ca	0.0000013	0.0000021	0.0000021	0.0	0.0000017
Co	0.0000022	0.0000022	0.0000020	0.0000014	0.0000020

Table 4.2.1-4 (3) (contd)

Isotope	Axial Blanket (OC-Pu) 20-31	Reflector Iron Block (OC-Pu) 31-36	Outer Core Double Pu (OCD) 0-20	Outer Core Single Pu (OCSF) 0-20	Outer Core U Fuel 0-20	Outer Core U Fuel 20-20.44
C	0.0000531	0.0005923	0.0023106	0.0000335	0.0021738	0.0000343
O	0.0088210	0.0	0.0156589	0.0137451	0.0169673	0.0088278
Na	0.0092558	0.0	0.0087859	0.0092985	0.0084851	0.0093011
Si	0.0001927	0.0001149	0.0001831	0.0001582	0.0001693	0.0001530
Al	0.0000029	0.0	0.0000060	0.0000041	0.0000041	0.0000029
Mn	0.0003418	0.0006718	0.0002667	0.0002302	0.0002393	0.0002117
Cr	0.0041639	0.0019290	0.0031592	0.0026860	0.0028604	0.0024804
Fe	0.0147909	0.0760409	0.0111571	0.0129170	0.0164938	0.0088522
Ni	0.0017670	0.0007803	0.0014319	0.0011747	0.0012581	0.0010726
Cu	0.0000445	0.0000271	0.0000367	0.0000296	0.0000316	0.0000295
Mo	0.0000348	0.0000136	0.0004690	0.0002392	0.0000157	0.0000145
U4	0.0	0.0	0.0	0.0	0.0000144	0.0000120
U5	0.0000179	0.0	0.0000183	0.0000127	0.0014885	0.0012466
U6	0.0	0.0	0.0	0.0	0.0000069	0.0000057
U8	0.0081561	0.0	0.0083531	0.0058281	0.0070956	0.0082277
P8	0.0	0.0	0.0000010	0.0000005	0.0	0.0
P9	0.0	0.0	0.0017747	0.0008855	0.0	0.0
P0	0.0	0.0	0.0002348	0.0001172	0.0	0.0
P1	0.0	0.0	0.0000143	0.0000072	0.0	0.0
P2	0.0	0.0	0.0000039	0.0000019	0.0	0.0
A1	0.0	0.0	0.0000217	0.0000109	0.0	0.0
P	0.0000101	0.0000233	0.0000047	0.0000053	0.0000054	0.0000054
S	0.0000081	0.0000314	0.0000016	0.0000010	0.0000016	0.0000012
Cl	0.0000003	0.0	0.0000062	0.0000003	0.0000058	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000020	0.0000014	0.0000045	0.0000008	0.0000023	0.0000023

Table 4.2.1-4 (4) (contd)

Isotope	Axial Blanket (OC-U) 20.44-31	Reflector Iron Block (OC-U) 31-36	Outer Core Single U (OCUS) 0-20	Outer Core Single U (OCUS) 20-20.44	Outer Core Double U (OCUD) 0-20	Outer Core Double U (OCUD) 20-20.44
C	0.0000552	0.0005914	0.0021067	0.0000340	0.0023125	0.0000349
O	0.0088210	0.0	0.0171003	0.0088279	0.0166930	0.0088278
Na	0.0092567	0.0	0.0083662	0.0092905	0.0087307	0.0093232
Si	0.0002052	0.0001149	0.0001696	0.0001481	0.0001687	0.0001631
Al	0.0000029	0.0	0.0000043	0.0000029	0.0000036	0.0000028
Mn	0.0003449	0.0006709	0.0002431	0.0002105	0.0002315	0.0002144
Cr	0.0040616	0.0019289	0.0029092	0.0024577	0.0027596	0.0025273
Fe	0.0144644	0.0758999	0.0178576	0.0087816	0.0136764	0.0089981
Ni	0.0017456	0.0007804	0.0012775	0.0010564	0.0012180	0.0011063
Cu	0.0000392	0.0000272	0.0000305	0.0000281	0.0000340	0.0000325
Mo	0.0000272	0.0000136	0.0000148	0.0000133	0.0000176	0.0000169
U4	0.0	0.0	0.0000109	0.0000082	0.0000217	0.0000200
U5	0.0000179	0.0	0.0011314	0.0008546	0.0022262	0.0020565
U6	0.0	0.0	0.0000052	0.0000039	0.0000104	0.0000096
U8	0.0081561	0.0	0.0073446	0.0082051	0.0065812	0.0082747
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000102	0.0000233	0.0000055	0.0000054	0.0000051	0.0000052
S	0.0000056	0.0000314	0.0000015	0.0000011	0.0000019	0.0000015
Cl	0.0000003	0.0	0.0000056	0.0000003	0.0000062	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000020	0.0000014	0.0000010	0.0000010	0.0000050	0.0000050

Table 4.2.1-4 (5) (contd)

Isotope	Radial Blanket 0-20	Radial Blanket 20-31	Radial Blanket 31-36	Radial Reflector 0-36	Axial Reflector 36-42	Empty Matrix 0-42
C	0.0000321	0.0000319	0.0005924	0.0002497	0.0002143	0.0000188
O	0.0193179	0.0193406	0.0	0.0	0.0	0.0
Na	0.0036444	0.0036359	0.0	0.0	0.0	0.0
Si	0.0001364	0.0001355	0.0001147	0.0008687	0.0008629	0.0000683
Al	0.0000021	0.0000021	0.0	0.0	0.0	0.0
Mn	0.0001956	0.0001941	0.0006720	0.0014138	0.0015241	0.0001059
Cr	0.0022640	0.0022455	0.0019301	0.0153709	0.0150441	0.0011891
Fe	0.0080983	0.0080330	0.0760500	0.0564101	0.0531084	0.0042791
Ni	0.0009669	0.0009588	0.0007787	0.0066710	0.0066621	0.0004802
Cu	0.0000282	0.0000280	0.0000267	0.0000389	0.0000172	0.0000172
Mo	0.0000133	0.0000131	0.0000134	0.0000323	0.0000083	0.0000083
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0000369	0.0000370	0.0	0.0	0.0	0.0
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0168314	0.0168695	0.0	0.0	0.0	0.0
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000050	0.0000050	0.0000234	0.0000466	0.0	0.0000028
S	0.0000010	0.0000010	0.0000314	0.0000335	0.0	0.0000007
Cl	0.0000001	0.0000001	0.0	0.0	0.0	0.0
Ca	0.0000009	0.0000009	0.0	0.0	0.0	0.0
Co	0.0000015	0.0000015	0.0000010	0.0	0.0	0.0

Table 4.2.1-4 (6) (contd)

Isotope	Inner Ring Control Position 0-20	Inner Ring Control Position 20-36	Middle Ring Control Position 0-20	Middle Ring Control Position 20-36	Outer Ring Control Position 0-20	Outer Ring Control Position 20-36
C	0.0000312	0.0000309	0.0000312	0.0000309	0.0000311	0.0000309
O	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013
Na	0.0182904	0.0184405	0.0182904	0.0184405	0.0182904	0.0184405
Si	0.0001661	0.0001649	0.0001661	0.0001649	0.0001657	0.0001649
Al	0.0000047	0.0000049	0.0000047	0.0000049	0.0000047	0.0000049
Mn	0.0002451	0.0002443	0.0002451	0.0002443	0.0002448	0.0002443
Cr	0.0029778	0.0029657	0.0029778	0.0029657	0.0029723	0.0029657
Fe	0.0105129	0.0104697	0.0105129	0.0104697	0.0104937	0.0104697
Ni	0.0013332	0.0013281	0.0013332	0.0013281	0.0013307	0.0013281
Cu	0.0000357	0.0000353	0.0000357	0.0000353	0.0000357	0.0000353
Mo	0.0000176	0.0000174	0.0000176	0.0000174	0.0000175	0.0000174
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0	0.0	0.0	0.0	0.0	0.0
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0	0.0	0.0	0.0	0.0	0.0
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000040	0.0000040	0.0000040	0.0000040	0.0000040	0.0000040
S	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012
Cl	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006
Ca	0.0000042	0.0000042	0.0000042	0.0000042	0.0000042	0.0000042
Co	0.0000038	0.0000037	0.0000038	0.0000037	0.0000038	0.0000037

Table 4.2.1-4 (7) (contd)

Isotope	Radial Blanket Master 501 0-31	Radial Blanket Master 502 0-31	Radial Blanket Master 503 0-31
C	0.0000325	0.0000324	0.0000294
O	0.0226351	0.0220579	0.0
Na	0.0042352	0.0042350	0.0
Si	0.0001398	0.0001417	0.0001099
Al	0.0000024	0.0000024	0.0
Mn	0.0002005	0.0001984	0.0001648
Cr	0.0023279	0.0023140	0.0018487
Fe	0.0083268	0.0082484	0.0066628
Ni	0.0009950	0.0010098	0.0007495
Cu	0.0000275	0.0000317	0.0000249
Mo	0.0000127	0.0000150	0.0000124
U4	0.0	0.0	0.0
U5	0.0000290	0.0000285	0.0000865
U6	0.0	0.0	0.0
U8	0.0133322	0.0131212	0.0387435
P8	0.0	0.0	0.0
P9	0.0	0.0	0.0
P0	0.0	0.0	0.0
P1	0.0	0.0	0.0
P2	0.0	0.0	0.0
A1	0.0	0.0	0.0
P	0.0000052	0.0000047	0.0000046
S	0.0000010	0.0000012	0.0000010
Cl	0.0000001	0.0000001	0.0
Ca	0.0000010	0.0000010	0.0
Co	0.0000007	0.0000045	0.0

Table 4.2.1-5 ZPPR ASSEMBLY 18A:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER CORE DUF	INNER CORE DUM	INNER-RZ AVERAGE DUM&DUM	OUTER CORE DUF	OUTER CORE DCF	OUTER CORE USC(UAC)	OUTER CORE UDC	OUTER-RZ AVERAGE U-DRIV&PU	RADIAL BLANKET	AXIAL BLANKET	RADIAL REFLECTOR	AXIAL REFLECTOR
	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	0.0008878	0.0008794	0.0008843	0.0008855	0.0017747	---	---	0.0004928	---	---	---	---
PU-240	0.0001176	0.0001162	0.0001170	0.0001172	0.0002348	---	---	0.0000652	---	---	---	---
PU-241	0.0000066	0.0000070	0.0000068	0.0000072	0.0000143	---	---	0.0000040	---	---	---	---
PU-242	0.0000025	0.0000027	0.0000026	0.0000028	0.0000055	0.0000164	0.0000327	0.0000141	---	---	---	---
AM-241	0.0000107	0.0000107	0.0000107	0.0000109	0.0000217	---	---	0.0000060	---	---	---	---
U-235	0.0000129	0.0000237	0.0000174	0.0000130	0.0000189	0.0011497	0.0022710	0.0008834	0.0000369	0.0000179	---	0.0000000
U-238	0.0058157	0.0106495	0.0078138	0.0058281	0.0083530	0.0073455	0.0065837	0.0069031	0.0168192	0.0081560	---	0.0000003
H-1	---	---	---	---	0.0000191	0.0000192	0.0000191	0.0000137	---	---	---	---
C	0.0000348	0.0000348	0.0000348	0.0000348	0.0022942	0.0021079	0.0022955	0.0015749	0.0000330	0.0000552	0.0002508	0.0005872
O	0.0137452	0.0088144	0.0117069	0.0137453	0.0156292	0.0171004	0.0166387	0.0158542	0.0193126	0.0088214	---	---
NA	0.0092346	0.0091425	0.0091965	0.0092735	0.0087507	0.0083464	0.0086942	0.0087320	0.0036278	0.0091950	---	---
AL	0.0000043	0.0000040	0.0000042	0.0000041	0.0000060	0.0000042	0.0000036	0.0000043	0.0000021	0.0000029	0.0000000	---
SI	0.0001571	0.0001584	0.0001576	0.0001571	0.0001818	0.0001685	0.0001680	0.0001669	0.0001352	0.0001947	0.0008534	0.0001253
CR	0.0026709	0.0026731	0.0026718	0.0026683	0.0031409	0.0028911	0.0027471	0.0028338	0.0022444	0.0041321	0.0153020	0.0021256
MN	0.0002289	0.0002287	0.0002288	0.0002286	0.0002651	0.0002415	0.0002303	0.0002389	0.0001938	0.0003417	0.0014011	0.0006825
FE	0.0128621	0.0095039	0.0114739	0.0128533	0.0111070	0.0177925	0.0136311	0.0146911	0.0080277	0.0146893	0.0562948	0.0757272
NI	0.0011687	0.0011785	0.0011728	0.0011677	0.0014242	0.0012701	0.0012130	0.0012508	0.0009592	0.0017559	0.0066348	0.0008628
CU	0.0000401	0.0000431	0.0000414	0.0000401	0.0000552	0.0000457	0.0000537	0.0000469	0.0000374	0.0000661	0.0001206	0.0000837
MO	0.0002398	0.0002382	0.0002391	0.0002391	0.0004689	0.0000147	0.0000175	0.00001407	0.0000132	0.0000329	0.0000364	0.0000141

Table 4.2.1-6 (3) ZPPR 18 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

ADEN NO. & NUMBER OF PLATE	211 DCF		701 DUF		702 DUF		703 DUF		704 DUF		705 DUF		706 DUF		707 DUF		708 DUF		709 DUF		710 DUM		711 DUM		
	8	2.00	8	2.00	3	1.00	3	2.00	1	1.00	1	3.00	2	4.00	8	2.00	8	2.00	8	2.00	8	2.00	13	1.00	8	2.00
9	4.00	11	1.00	4	2.00	5	1.00	5	2.00	5	1.00	8	2.00	13	1.00	13	1.00	13	1.00	13	1.00	13	1.00	13	1.00
18	20.00	15	2.00	8	2.00	8	2.00	8	2.00	8	2.00	11	1.00	14	2.00	14	2.00	14	2.00	14	2.00	14	2.00	14	2.00
31	1.00	18	20.00	11	1.00	11	1.00	11	1.00	11	1.00	15	2.00	18	20.00	18	20.00	18	20.00	18	20.00	18	20.00	18	20.00
35	2.00	51	2.00	15	2.00	15	2.00	15	2.00	15	2.00	18	20.00	51	2.00	51	2.00	51	2.00	51	2.00	40	2.00	40	2.00
93	2.00	52	12.00	18	20.00	18	20.00	18	20.00	18	20.00	18	20.00	52	12.00	52	12.00	52	12.00	52	12.00	42	2.00	42	2.00
94	4.00	92	4.00	51	2.00	51	2.00	51	2.00	51	2.00	52	12.00	93	1.00	93	1.00	93	2.00	93	2.00	43	2.00	43	2.00
97	20.03	110	2.00	52	12.00	52	12.00	52	12.00	52	12.00	110	2.00	94	2.00	94	2.00	95	1.00	95	1.00	91	3.00	92	4.00
226	1.00	187	1.00	110	2.00	110	2.00	110	2.00	110	2.00	187	1.00	110	2.00	110	2.00	110	2.00	110	2.00	95	1.00	110	2.00
227	19.03	205	2.00	187	1.00	187	1.00	187	1.00	187	1.00	205	2.00	187	1.00	187	1.00	187	1.00	187	1.00	110	2.00	187	1.00
273	1.00	226	1.00	205	2.00	205	2.00	205	2.00	205	2.00	226	1.00	226	1.00	226	1.00	226	1.00	226	1.00	205	2.00	226	1.00
-	--	227	19.03	226	1.00	226	1.00	226	1.00	226	1.00	227	19.03	227	19.03	227	19.03	227	19.03	227	19.03	226	1.00	227	19.03
-	--	228	1.00	227	19.03	227	19.03	227	19.03	227	19.03	228	1.00	228	1.00	228	1.00	228	1.00	228	1.00	227	19.03	228	1.00
-	--	229	20.03	228	1.00	228	1.00	228	1.00	228	1.00	229	20.03	228	1.00	228	1.00	228	1.00	228	1.00	229	20.03	228	1.00
-	--	242	2.00	229	20.03	229	20.03	229	20.03	229	20.03	242	2.00	229	20.03	229	20.03	229	20.03	229	20.03	228	1.00	229	20.03
-	--	-	--	242	2.00	242	2.00	242	2.00	242	2.00	-	--	242	2.00	242	2.00	242	2.00	242	2.00	229	20.03	242	2.00
-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	242	2.00	-	--
-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--
PU-239	0.0017709	0.0008782	0.0008925	0.0008931	0.0008948	0.0008847	0.0008857	0.0008855	0.0008855	0.0008870	0.0008774	0.0008782									0.0001160	0.0001159			
PU-240	0.0002343	0.0001159	0.0001183	0.0001185	0.0001187	0.0001174	0.0001174	0.0001172	0.0001172	0.0001174	0.0000071	0.0000070									0.0000072	0.0000071	0.0000070		
PU-241	0.0000144	0.0000070	0.0000063	0.0000066	0.0000063	0.0000063	0.0000059	0.0000072	0.0000072	0.0000072	0.0000027	0.0000027									0.0000028	0.0000027	0.0000027		
PU-242	0.0000056	0.0000027	0.0000023	0.0000024	0.0000023	0.0000023	0.0000020	0.0000028	0.0000028	0.0000109	0.0000107	0.0000106									0.0000109	0.0000108	0.0000107	0.0000106	
AM-241	0.0000218	0.0000106	0.0000107	0.0000110	0.0000106	0.0000107	0.0000103	0.0000109	0.0000109	0.0000109	0.0000108	0.0000106									0.0000130	0.0000130	0.0000130	0.0000237	
U-235	0.0000189	0.0000129	0.0000129	0.0000130	0.0000129	0.0000129	0.0000129	0.0000129	0.0000129	0.0000130	0.0000130	0.0000237									0.0000130	0.0000130	0.0000130	0.0000237	
U-238	0.0083457	0.0058049	0.0058173	0.0058221	0.0058211	0.0057928	0.0057904	0.0058281	0.0058281	0.0058311	0.0106450	0.0106467									0.0058311	0.0106450	0.0106467		
H-1	0.0000192	---	---	---	---	---	---	---	---	---	---	---									---	---	---	---	
C	0.0023115	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417	0.0000417									0.0000417	0.0000417	0.0000417	0.0000417	
O	0.0156592	0.0137451	0.0137451	0.0137451	0.0137451	0.0137451	0.0137451	0.0137451	0.0137451	0.0137451	0.0137451	0.0088144									0.0137451	0.0137451	0.0088144	0.0088144	
NA	0.0087306	0.0058778	0.0058778	0.0058778	0.0058778	0.0058778	0.0058778	0.0058689	0.0058689	0.0058689	0.0058689	0.0058689									0.0058689	0.0058689	0.0058689	0.0058689	
AL	0.0000062	0.0000037	0.0000038	0.0000038	0.0000037	0.0000038	0.0000037	0.0000039	0.0000039	0.0000039	0.0000039	0.0000037									0.0000039	0.0000039	0.0000037	0.0000037	
SI	0.0001808	0.0001754	0.0001748	0.0001749	0.0001750	0.0001756	0.0001754	0.0001749	0.0001749	0.0001751	0.0001757	0.0001756									0.0001749	0.0001749	0.0001751	0.0001756	
CR	0.0031246	0.0031463	0.0031360	0.0031386	0.0031390	0.0031533	0.0031489	0.0031358	0.0031358	0.0031367	0.0031528	0.0031487									0.0031358	0.0031358	0.0031367	0.0031487	
MN	0.0002637	0.0002702	0.0002693	0.0002695	0.0002696	0.0002708	0.0002705	0.0002692	0.0002692	0.0002693	0.0002708	0.0002704									0.0002692	0.0002693	0.0002693	0.0002704	
FE	0.0110340	0.0145490	0.0145135	0.0145218	0.0145234	0.0145726	0.0145573	0.0145123	0.0145123	0.0145156	0.0112177	0.0112027									0.0145123	0.0145156	0.0112177	0.0112027	
NI	0.0014164	0.0013679	0.0013628	0.0013640	0.0013642	0.0013713	0.0013692	0.0013626	0.0013626	0.0013631	0.0013713	0.0013691									0.0013626	0.0013631	0.0013713	0.0013691	
CU	0.0000550	0.0000692	0.0000691	0.0000691	0.0000691	0.0000691	0.0000692	0.0000692	0.0000692	0.0000691	0.0000693	0.0000693									0.0000691	0.0000691	0.0000691	0.0000693	
MO	0.0004683	0.0002408	0.0002442	0.0002465	0.0002469	0.0002437	0.0002413	0.0002429	0.0002429	0.0002432	0.0002406	0.0002408									0.0002429	0.0002432	0.0002406	0.0002408	

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Table 4.2.1-6 (4) ZPPR 18 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

ADEN NO. & NUMBER OF PLATE	712 DUM		713 DUM		719 DUF		720 DUF		725 DUF		801 DUF		802 DUF		803 DUM		804 DUM		901 USC		902 USC		903 USC		
	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03
8	2.00		8	2.00	1	3.00	1	3.00	1	1.00	1	3.00	1	3.00	3	1.00	3	1.00	7	8.00	7	8.00	6	4.00	
13	1.00		13	1.00	5	1.00	5	1.00	5	1.00	5	1.00	5	1.00	4	2.00	4	2.00	27	2.00	27	2.00	8	4.00	
14	2.00		14	2.00	13	1.00	8	1.00	11	2.00	13	2.00	13	2.00	13	2.00	13	2.00	29	2.00	29	2.00	27	2.00	
18	20.00		18	20.00	14	2.00	13	1.00	15	4.00	15	1.00	15	1.00	15	1.00	15	1.00	30	2.00	30	2.00	29	2.00	
40	2.00		40	2.00	18	20.00	14	2.00	18	20.00	18	20.00	18	20.00	18	20.00	18	20.00	37	3.00	37	3.00	30	2.00	
42	2.00		42	2.00	51	2.00	18	20.00	51	2.00	51	2.00	51	2.00	40	2.00	40	2.00	38	18.00	38	18.00	37	3.00	
43	2.00		43	2.00	52	12.00	51	2.00	52	12.00	52	12.00	52	12.00	42	2.00	42	2.00	49	4.00	49	4.00	38	18.00	
91	5.00		93	2.00	110	2.00	52	12.00	218	1.00	226	1.00	226	1.00	43	2.00	43	2.00	50	24.00	50	24.00	49	4.00	
110	2.00		95	1.00	181	2.00	110	2.00	226	1.00	227	19.04	227	19.04	226	1.00	226	1.00	226	1.00	226	1.00	50	24.00	
187	1.00		110	2.00	187	1.00	181	3.00	227	19.03	231	22.26	231	22.26	227	19.04	227	19.04	227	19.03	227	19.03	226	1.00	
205	2.00		187	1.00	205	1.00	205	1.00	228	1.00	232	1.58	232	1.58	231	22.26	231	22.26	228	1.00	228	1.00	227	19.03	
226	1.00		205	2.00	226	1.00	226	1.00	229	20.03	-	-	-	-	232	1.58	232	1.58	229	20.03	229	20.03	228	1.00	
227	19.03		226	1.00	227	19.03	227	19.03	-	-	-	-	-	-	-	-	-	-	281	2.00	281	2.00	229	20.03	
228	1.00		227	19.03	228	1.00	228	1.00	-	-	-	-	-	-	-	-	-	-	282	1.00	282	1.00	281	2.00	
229	20.03		228	1.00	229	20.03	229	20.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	282	1.00	
242	2.00		229	20.03	242	2.00	242	2.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-		242	2.00	334	6.00	334	6.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PU-239	0.0008674		0.0008870		0.0008847		0.0008847		0.0008849		0.0008845		0.0008845		0.0008923		0.0008923	-	-	-	-	-	-	-	
PU-240	0.0001146		0.0001174		0.0001174		0.0001174		0.0001171		0.0001173		0.0001173		0.0001183		0.0001183	-	-	-	-	-	-	-	
PU-241	0.0000069		0.0000072		0.0000063		0.0000063		0.0000066		0.0000063		0.0000063		0.0000063		0.0000063	-	-	-	-	-	-	-	
PU-242	0.0000027		0.0000028		0.0000023		0.0000023		0.0000025		0.0000023		0.0000023		0.0000023		0.0000023	-	-	-	-	-	-	-	
AM-241	0.0000105		0.0000108		0.0000107		0.0000107		0.0000106		0.0000107		0.0000107		0.0000107		0.0000107	0.0000164	0.0000164	0.0000164	0.0000164	0.0000164	0.0000164	0.0000164	
U-235	0.0000237		0.0000238		0.0000129		0.0000129		0.0000129		0.0000129		0.0000129		0.0000238		0.0000238	0.0011497	0.0011497	0.0011497	0.0011497	0.0011497	0.0011497	0.0011497	
U-238	0.0106165		0.0106729		0.0057928		0.0057928		0.0058060		0.0057914		0.0057914		0.0106564		0.0106564	0.0073454	0.0073454	0.0073454	0.0073454	0.0073454	0.0073454	0.0073454	
H-1	-		-		-		-		-		-		-		-		-	0.0000192	0.0000192	0.0000192	0.0000192	0.0000192	0.0000192	0.0000192	
C	0.0000417		0.0000417		0.0000412		0.0000417		0.0000347		0.0000324		0.0000324		0.0000324		0.0000324	0.0021078	0.0021078	0.0021078	0.0021078	0.0021078	0.0021078	0.0021078	
O	0.0088144		0.0088144		0.0137450		0.0137450		0.0137453		0.0137415		0.0137415		0.0088122		0.0088122	0.0171004	0.0171004	0.0171004	0.0171004	0.0171004	0.0171004	0.0171004	
NA	0.0058689		0.0058689		0.0046492		0.0052591		0.0093161		0.0046534		0.0046534		0.0046534		0.0046534	0.0083768	0.0083768	0.0083768	0.0083768	0.0083768	0.0083768	0.0083768	
AL	0.0000040		0.0000039		0.0002943		0.0002946		0.0000035		0.0000027		0.0000027		0.0000027		0.0000027	0.0000043	0.0000043	0.0000043	0.0000043	0.0000043	0.0000043	0.0000043	
SI	0.0001763		0.0001751		0.0001738		0.0001769		0.0001517		0.0001415		0.0001415		0.0001407		0.0001407	0.0001685	0.0001685	0.0001685	0.0001685	0.0001685	0.0001685	0.0001685	
CR	0.0031673		0.0031367		0.0031211		0.0031701		0.0026691		0.0024290		0.0024290		0.0024118		0.0024118	0.0028896	0.0028896	0.0028896	0.0028896	0.0028896	0.0028896	0.0028896	
MN	0.0002722		0.0002693		0.0002682		0.0002719		0.0002288		0.0002124		0.0002124		0.0002109		0.0002109	0.0002413	0.0002413	0.0002413	0.0002413	0.0002413	0.0002413	0.0002413	
FE	0.0112685		0.0111610		0.0144594		0.0146295		0.0128555		0.0120236		0.0120236		0.0086108		0.0086108	0.0177867	0.0177867	0.0177867	0.0177867	0.0177867	0.0177867	0.0177867	
NI	0.0013787		0.0013631		0.0013556		0.0013807		0.0011683		0.0010425		0.0010425		0.0010339		0.0010339	0.0012696	0.0012696	0.0012696	0.0012696	0.0012696	0.0012696	0.0012696	
CU	0.0000694		0.0000691		0.0000686		0.0000693		0.0000392		0.0000363		0.0000363		0.0000362		0.0000362	0.0000456	0.0000456	0.0000456	0.0000456	0.0000456	0.0000456	0.0000456	
MO	0.0002382		0.0002432		0.0002437		0.0002437		0.0002391		0.0002398		0.0002398		0.0002403		0.0002403	0.0000147	0.0000147	0.0000147	0.0000147	0.0000147	0.0000147	0.0000147	

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Table 4.2.1-6 (5) ZPPR 18 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

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ADEN NO. & NUMBER OF PLATE	904 USC		905 USC		920 UDC		921 UDC		922 UDC		923 UDC		721 USC		722 USC		723 UDC		724 UDC		107 DUF		201 DCF	
	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03
6	4.00		7	8.00	8	2.00	8	2.00	7	8.00	6	4.00	8	2.00	8	2.00	8	2.00	8	2.00	13	2.00	7	8.00
8	4.00		27	2.00	9	4.00	9	4.00	16	20.00	8	4.00	27	2.00	27	2.00	9	4.00	9	4.00	14	4.00	18	20.00
27	2.00		29	2.00	16	20.00	16	20.00	27	2.00	16	20.00	29	2.00	29	2.00	16	20.00	16	20.00	18	20.00	31	1.00
29	2.00		30	2.00	32	1.00	32	1.00	29	2.00	27	2.00	30	2.00	30	2.00	27	1.00	27	1.00	51	2.00	35	2.00
30	2.00		37	2.00	34	1.00	34	1.00	30	2.00	29	2.00	37	3.00	37	3.00	29	1.00	29	1.00	52	12.00	91	2.00
37	3.00		38	12.00	35	1.00	35	1.00	37	2.00	30	2.00	38	18.00	38	18.00	37	2.00	37	2.00	93	1.00	95	4.00
38	18.00		49	4.00	37	2.00	37	2.00	38	12.00	37	2.00	49	4.00	49	4.00	38	12.00	38	12.00	94	2.00	97	20.03
49	4.00		50	24.00	38	12.00	38	12.00	49	2.00	38	12.00	50	24.00	50	24.00	49	20.00	49	20.00	226	1.00	226	1.00
50	24.00		226	1.00	49	20.00	49	20.00	50	12.00	49	2.00	110	2.00	110	2.00	97	20.03	97	20.03	227	19.03	227	19.03
226	1.00		227	19.03	97	20.03	97	20.03	97	20.03	50	12.00	187	1.00	187	1.00	110	6.00	110	6.00	228	1.00	273	1.00
227	19.03		228	1.00	226	1.00	226	1.00	226	1.00	97	20.03	205	2.00	205	2.00	187	1.00	187	1.00	229	20.03	-	--
228	1.00		229	20.03	227	19.03	227	19.03	227	19.03	226	1.00	226	1.00	226	1.00	205	2.00	205	2.00	-	--	-	--
229	20.03		281	2.00	273	1.00	273	1.00	273	1.00	227	19.03	227	19.03	227	19.03	226	1.00	226	1.00	-	--	-	--
281	2.00		282	1.00	280	4.00	280	4.00	281	4.00	273	1.00	228	1.00	228	1.00	227	19.03	227	19.03	-	--	-	--
282	1.00		292	12.00	283	4.00	282	2.00	282	2.00	281	4.00	229	20.03	229	20.03	263	1.00	263	1.00	-	--	-	--
-	--		297	2.00	-	--	-	--	-	--	282	2.00	242	2.00	242	2.00	280	4.00	280	4.00	-	--	-	--
-	--		-	--	-	--	-	--	-	--	-	--	281	2.00	281	2.00	283	4.00	282	2.00	-	--	-	--
-	--		-	--	-	--	-	--	-	--	-	--	282	1.00	282	1.00	-	--	-	--	-	--	-	--
PU-239	---		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0008855	0.0017747		
PU-240	---		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0001172	0.0002348		
PU-241	---		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000072	0.0000143		
PU-242	0.0000164		0.0000164		0.0000327		0.0000328		0.0000329		0.0000329		0.0000164		0.0000164		0.0000327		0.0000328		0.0000028	0.0000055		
AM-241	---		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000109	0.0000217		
U-235	0.0011497		0.0011495		0.0022696		0.0022742		0.0022812		0.0022812		0.0011497		0.0011497		0.0022696		0.0022742		0.0000130	0.0000189		
U-238	0.0073454		0.0073522		0.0065837		0.0065839		0.0065844		0.0065844		0.0073454		0.0073454		0.0065837		0.0065839		0.0058281	0.0083531		
H-1	0.0000192		0.0000192		0.0000192		0.0000192		0.0000192		0.0000192		0.0000192		0.0000192		0.0000058		0.0000058		---	0.0000192		
C	0.0021078		0.0021078		0.0023136		0.0023136		0.0021087		0.0021086		0.0021129		0.0021129		0.0006666		0.0006666		0.0000348	0.0023117		
O	0.0171004		0.0171004		0.0166933		0.0166933		0.0159074		0.0159074		0.0171002		0.0171002		0.0117234		0.0117234		0.0137453	0.0156592		
NA	0.0082506		0.0083768		0.0087306		0.0087306		0.0083763		0.0082502		0.0053703		0.0053703		0.0054191		0.0054191		0.0092984	0.0087873		
AL	0.0000042		0.0000043		0.0000036		0.0000036		0.0000043		0.0000042		0.0000029		0.0000029		0.0000033		0.0000033		0.0000041	0.0000060		
SI	0.0001684		0.0001685		0.0001693		0.0001643		0.0001755		0.0001754		0.0001733		0.0001733		0.0001837		0.0001787		0.0001570	0.0001819		
CR	0.0028879		0.0028896		0.0027427		0.0027394		0.0029558		0.0029542		0.0031489		0.0031489		0.0032379		0.0032347		0.0026649	0.0031403		
MN	0.0002412		0.0002413		0.0002299		0.0002299		0.0002455		0.0002454		0.0002665		0.0002665		0.0002693		0.0002694		0.0002283	0.0002650		
FE	0.0177810		0.0177867		0.0136151		0.0136040		0.0142302		0.0142245		0.0187234		0.0187234		0.0153722		0.0153610		0.0128412	0.0110889		
NI	0.0012688		0.0012696		0.0012115		0.0012092		0.0013173		0.0013165		0.0013576		0.0013576		0.0014135		0.0014112		0.0011662	0.0014245		
CU	0.0000454		0.0000456		0.0000537		0.0000536		0.0000542		0.0000541		0.0000728		0.0000728		0.0000575		0.0000574		0.0000399	0.0000552		
MD	0.0000147		0.0000147		0.0000176		0.0000172		0.0000177		0.0000177		0.0000183		0.0000183		0.0000235		0.0000231		0.0002391	0.0004688		

Table 4.2.1-6 (6) ZPPR 18 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	202		203		707		717		718		601		602		608		401		402		403		404		
	DCF		DCF		DUF		DCF		DCF		CRP		CRP		CRP		RDR		RDR		RDR		RDR		
	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-20.03	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-36.15	
ADEN NO.	6	2.00	8	2.00	8	2.00	7	8.00	6	2.00	97	20.03	97	20.03	97	20.03	79	6.00	78	12.00	108	1.00	108	1.00	
& NUMBER	10	4.00	9	4.00	13	1.00	18	20.00	10	4.00	226	1.00	226	1.00	140	2.00	108	1.00	108	1.00	203	24.00	226	1.00	
OF PLATE	18	20.00	18	20.00	14	2.00	51	12.00	18	20.00	227	19.03	227	19.03	142	2.00	226	1.00	226	1.00	226	1.00	227	35.15	
	31	1.00	22	2.00	18	20.00	91	2.00	51	12.00	266	6.86	263	1.00	143	2.00	227	35.15	227	35.15	227	35.15	228	1.00	
	35	2.00	24	2.00	51	2.00	95	4.00	91	2.00	267	4.00	266	6.86	226	1.00	228	1.00	228	1.00	228	1.00	229	36.15	
	91	2.00	25	2.00	52	12.00	110	6.00	95	4.00	273	1.00	267	4.00	227	19.03	229	36.15	229	36.15	229	36.15	230	1.00	
	95	4.00	31	1.00	93	1.00	187	1.00	110	6.00	-	--	-	--	263	1.00	230	1.00	230	1.00	230	1.00	274	3.00	
	97	20.03	35	2.00	94	2.00	205	2.00	187	1.00	-	--	-	--	265	1.00	-	--	-	--	-	--	-	--	
	226	1.00	226	1.00	110	2.00	226	1.00	205	2.00	-	--	-	--	267	2.00	-	--	-	--	-	--	-	--	
	227	19.03	227	19.03	187	1.00	227	19.03	226	1.00	-	--	-	--	350	2.00	-	--	-	--	-	--	-	--	
	273	1.00	228	1.00	205	2.00	228	1.00	227	19.03	-	--	-	--	352	4.00	-	--	-	--	-	--	-	--	
	-	--	229	20.03	226	1.00	229	20.03	228	1.00	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
	-	--	-	--	227	19.03	-	--	229	20.03	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
	-	--	-	--	228	1.00	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
	-	--	-	--	229	20.03	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
	-	--	-	--	242	2.00	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	-	--	
PU-239	0.0017747		0.0016842		0.0008855		0.0008855		0.0008855		---		---		---		---		---		---		---		---
PU-240	0.0002348		0.0006462		0.0001172		0.0001172		0.0001172		---		---		---		---		---		---		---		---
PU-241	0.0000143		0.0000493		0.0000072		0.0000072		0.0000072		---		---		---		---		---		---		---		---
PU-242	0.0000055		0.0000394		0.0000028		0.0000028		0.0000028		---		---		---		---		---		---		---		---
AM-241	0.0000217		0.0000869		0.0000109		0.0000109		0.0000109		---		---		---		---		---		---		---		---
U-235	0.0000189		0.0000174		0.0000130		0.0000130		0.0000130		---		---		---		---		---		---		---		---
U-238	0.0083531		0.0079000		0.0058281		0.0058281		0.0058281		---		---		---		---		---		---		---		---
H-1	0.0000192		0.0000192		---		---		---		---		---		---		---		---		---		---		---
C	0.0023116		0.0023117		0.0000417		0.0000417		0.0000417		0.0000308		0.0000307		0.0094050		0.0002258		0.0002518		0.0002574		0.0002232		
O	0.0156592		0.0156600		0.0137451		0.0137451		0.0137451		0.0000013		0.0000013		0.0000006		---		---		---		---		---
NA	0.0087823		0.0087310		0.0058689		0.0058689		0.0058689		0.0182947		0.0182947		0.0087469		---		---		---		---		---
AL	0.0000059		0.0000059		0.0000039		0.0000039		0.0000039		0.0000047		0.0000047		0.0000053		---		---		---		---		---
SI	0.0001815		0.0001789		0.0001749		0.0001749		0.0001749		0.0001649		0.0001646		0.0002035		0.0009013		0.0010395		0.0008570		0.0005787		
CR	0.0031328		0.0031353		0.0031358		0.0031358		0.0031358		0.0029570		0.0029515		0.0031764		0.0156462		0.0157129		0.0155069		0.0157632		
MN	0.0002644		0.0002657		0.0002692		0.0002692		0.0002692		0.0002433		0.0002430		0.0002604		0.0015771		0.0015124		0.0014307		0.0011462		
FE	0.0110626		0.0111013		0.0145123		0.0145123		0.0145123		0.0104380		0.0104188		0.0112389		0.0553276		0.0552289		0.0554727		0.0560726		
NI	0.0014206		0.0014002		0.0013626		0.0013626		0.0013626		0.0013248		0.0013224		0.0014420		0.0069057		0.0068888		0.0067975		0.0065916		
CU	0.0000551		0.0000473		0.0000691		0.0000691		0.0000691		0.0000492		0.0000491		0.0000473		0.0001052		0.0001097		0.0001070		0.0001669		
MO	0.0004688		0.0004665		0.0002429		0.0002429		0.0002429		0.0000174		0.0000173		0.0000178		0.0000124		0.0000124		0.0000124		0.0001256		

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Table 4.2.1-6 (7) ZPPR 18 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

	405 RDR		406 RDR		407 RDR		408 RDR		409 RDR		410 RDR		411 RDR		714 RDR		501 RDB		502 RDB		503 RDB		715 RDB					
	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-36.15	0.0	-31.03	0.0	-31.03	0.0	-31.03	0.0	-31.03				
ADEN NO.	108	1.00	108	1.00	108	1.00	78	12.00	108	1.00	108	1.00	53	2.00	84	3.00	10	5.00	10	5.00	48	4.00	10	1.50				
& NUMBER	111	4.00	201	5.00	202	10.00	108	1.00	226	1.00	137	2.00	58	7.00	108	1.00	18	10.00	18	50.00	226	1.00	16	20.00				
OF PLATE	201	7.00	226	1.00	226	1.00	226	1.00	227	35.15	138	3.00	108	1.00	110	3.00	20	20.00	37	20.00	227	19.03	18	40.00				
	226	1.00	227	35.15	227	35.15	227	35.15	228	1.00	226	1.00	226	1.00	111	2.00	37	20.00	97	20.03	228	1.00	37	20.00				
	227	35.15	228	1.00	228	1.00	228	1.00	229	36.15	227	35.15	227	35.15	113	1.00	226	1.00	226	1.00	229	20.03	97	20.03				
	228	1.00	229	36.15	229	36.15	229	36.15	230	1.00	228	1.00	228	1.00	119	1.00	227	19.03	227	19.03	-	--	187	1.00				
	229	36.15	230	1.00	230	1.00	230	1.00	275	1.00	229	36.15	229	36.15	187	1.00	228	1.00	255	1.00	-	--	205	2.00				
	230	1.00	275	1.00	275	1.00	-	--	276	20.00	230	1.00	230	1.00	203	17.00	229	20.03	-	--	-	--	226	1.00				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	226	1.00	-	--	-	--	-	--	227	19.03				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	227	35.15	-	--	-	--	-	--	242	3.00				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	228	1.00	-	--	-	--	-	--	255	1.00				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	229	36.15	-	--	-	--	-	--	-	--				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	230	1.00	-	--	-	--	-	--	-	--				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	242	3.00	-	--	-	--	-	--	-	--				
	-	--	-	--	-	--	-	--	-	--	-	--	-	--	278	4.00	-	--	-	--	-	--	-	--				
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PU-239	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
PU-240	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PU-241	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PU-242	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
AM-241	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
U-235	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000290	---	0.0000285	---	0.0000864	---	0.0000285	---	---	---	---
U-238	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0133272	---	0.0131087	---	0.0386895	---	0.0130538	---	---		
H-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---		
C	0.0002291	0.0002281	0.0002442	0.0002518	0.0002007	0.0006281	0.0005919	0.0002336	0.0000337	0.0000335	0.0000291	0.0000395	---	---	---	---	---	---	---	---	---	---	---	---				
O	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0226317	---	0.0220342	---	0.0218707	---	---				
NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0042387	---	0.0042384	---	0.0012715	---	---				
AL	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000002	---	0.0000024	---	0.0000012	---	0.0000012	---	---				
SI	0.0009074	0.0008154	0.0009036	0.0010395	0.0006664	0.0001437	0.0001100	0.0007847	0.0001389	0.0001408	0.0001090	0.0001490	---	---	---	---	---	---	---	---	---	---						
CR	0.0159605	0.0159033	0.0158024	0.0157129	0.0163639	0.0018497	0.0018726	0.0145257	0.0023139	0.0022976	0.0018351	0.0025537	---	---	---	---	---	---	---	---	---	---						
MN	0.0015995	0.0014681	0.0014077	0.0015124	0.0011532	0.0006547	0.0006770	0.0013214	0.0001992	0.0001970	0.0001635	0.0002237	---	---	---	---	---	---	---	---	---	---						
FE	0.0564373	0.0563356	0.0557464	0.0552289	0.0558052	0.0765967	0.0769983	0.0518070	0.0082761	0.0081890	0.0066131	0.0091162	---	---	---	---	---	---	---	---	---	---						
NI	0.0070327	0.0069085	0.0068308	0.0068888	0.0068130	0.0007499	0.0007499	0.0063156	0.0009896	0.0010033	0.0007442	0.0010942	---	---	---	---	---	---	---	---	---	---						
CU	0.0001108	0.0001252	0.0001276	0.0001097	0.0001531	0.0000765	0.0000806	0.0001381	0.0000362	0.0000439	0.0000302	0.0000823	---	---	---	---	---	---	---	---	---	---						
MO	0.0000172	0.0000470	0.0000470	0.0000124	0.0000806	0.0000124	0.0000124	0.0000324	0.0000127	0.0000149	0.0000124	0.0000173	---	---	---	---	---	---	---	---	---	---						

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Table 4.2.1-6 (8) ZPPR 18 : ATOM DENSITIES BY DRAWER (CONT.)

(1.0E24/CM**3)

716
RDB
0.0 -31.03

ADEN NO. 36 12.00
& NUMBER 37 132.00
OF PLATE 187 1.00
205 2.00
226 1.00
227 19.03
228 1.00
229 20.03
- -
- -
- -
- -
- -
- -
- -
- -
- -

PU-239 ---
PU-240 ---
PU-241 ---
PU-242 ---
AM-241 ---
U-235 0.0000750
U-238 0.0333631
H-1 ---
C 0.0000302
O ---
NA ---
AL 0.0000004
SI 0.0001156
CR 0.0019437
MN 0.0001722
FE 0.0069932
NI 0.0007984
CU 0.0000312
MO 0.0000124

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Table 4.2.1-7 (1)- Drawer Masters in ZPPR-18A

Zone	Master	Description
Core	101	Pu Fuel-SC-DUF
	102	Pu Fuel-SC-DUF
	103	Pu Fuel-SC-DUF
	104	Pu Fuel-SC-DUF
	105	Pu Fuel-SC-DUF
	106	Pu Fuel-SC-DUF
	107	Pu Fuel-SC-DUF
	108	Pu Fuel-SC-DUF
	109	Pu Fuel-SC-DUF
	701	Pu Fuel-SC-DUF-FC
	702	Pu Fuel-SC-DUF-FC
	703	Pu Fuel-SC-DUF-FC
	704	Pu Fuel-SC-DUF-FC
	705	Pu Fuel-SC-DUF-FC
	706	Pu Fuel-SC-DUF-FC
	707	Pu Fuel-SC-DUF-FC
	708	Pu Fuel-SC-DUF-FC
	709	Pu Fuel-SC-DUF-FC
	719	Pu Fuel-SC-DUF-FC
	720	Pu Fuel-SC-DUF-FC
	725	Pu-Fuel-SC-DUF, Thermocouple
	801	Pu Fuel-SC-DUF-PSR
	802	Pu Fuel-SC-DUF-PSR
	110	Pu Fuel-SC-DUM
	111	Pu Fuel-SC-DUM
	112	Pu Fuel-SC-DUM
	113	Pu Fuel-SC-DUM
	114	Pu Fuel-SC-DUM
	115	Pu Fuel-SC-DUM
	116	Pu Fuel-SC-DUM
	710	Pu Fuel-SC-DUM-FC
	711	Pu Fuel-SC-DUM-FC
	712	Pu Fuel-SC-DUM-FC
	713	Pu Fuel-SC-DUM-FC
803	Pu Fuel-SC-DUM-PSR	
804	Pu Fuel-SC-DUM-PSR	
	201	Pu Fuel-DC
	202	Pu Fuel-DC
	717	Pu Fuel-DC-FC
	718	Pu Fuel-DC-FC

Table 4.2.1-7 (2) (contd)

Zone	Master	Description
Core	901	U Fuel-SC-Asymmetric
	902	U Fuel-SC-Asymmetric
	903	U Fuel-SC-Asymmetric
	904	U Fuel-SC-Asymmetric
	721	U Fuel-SC-FC-Asymmetric
	722	U Fuel-SC-FC-Asymmetric
	905	U Fuel-SC-Symmetric
	920	U Fuel-DC
	921	U Fuel-DC
	723	U Fuel-DC-FC
	724	U Fuel-DC-FC
	Radial Blanket	501	DU-O
502		DU-O
715		DU-O-FC
503		DU-M
716		DU-M-FC
Radial Reflector	401	SS
	402	SS
	403	SS
	404	SS
	405	SS
	406	SS
	407	SS
	408	SS
	409	SS
	714	SS-FC
	410	FE
411	FE	
Control Rod Position	601	NA
	602	NA

^aSC is single column, DUF is iron oxide diluent, FC is fission chamber, PSR is adjacent to poison safety rod, DUM is depleted uranium metal diluent, DU-O is depleted uranium oxide, DU-M is depleted uranium metal, SS is stainless steel and FE is mild steel.

Table 4.2.1-8 Experimental and Calculated k-effective Results for ZPPR-18A

	<u>Critical Reference</u>	<u>Subcritical Reference</u>
Date	10/16/87	10/14/87
Reactor Run Number	18	15
Temperature, K	299.9	303.4
Interface Gap, mil ^a	54.5	53.8
Measured Excess Reactivity, ϕ	+13.6 \pm 0.1	-27.4 \pm 0.2
Adjustment to 293K, ϕ ^b	+8.6 \pm 0.8	+13.0 \pm 1.1
Adjustment fo 54.5 mil ^c , ϕ	---	-0.06 \pm 0.01
Adjustment to 10.16.87 ^d	---	-0.04 \pm 0.01
Adjusted Reactivity, ϕ	+22.2 \pm 0.8 ϕ	-14.5 \pm 1.16
Experimental K-effective (E) ^e	1.000836 \pm 0.000030	0.999451 \pm 0.000044
Calculation, 21G XYZ NDT (C)	0.991191	---
C/E for k-effective	0.990363	---

^aOn a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.25 \pm 0.11\phi K^{-1}$.

^cUsing measured gap coefficient $-0.09 \pm 0.01\phi \text{ mil}^{-1}$.

^dUsing calculated ²⁴¹Pu decay coefficient $-0.02184\phi \text{ day}^{-1}$.

^eUsing calculated β -effective 0.003786.

Table 4.2.1-9 Drawer Loading Summary for the ZPPR-18B
Critical Reference

<u>Inner Core</u>	
Drawers with one column of plutonium fuel and iron oxide (Includes 20 drawers with fission chambers, two drawers with thermocouples and 16 narrow drawers adjacent to PSRs)	1930
Drawers with one column of plutonium fuel and depleted uranium metal (Includes nine drawers with fission chambers and 32 narrow drawers adjacent to PSRs)	1160
Drawers with two columns of plutonium fuel	200
<u>Outer Core</u>	
Drawers with one column of plutonium fuel (Includes four drawers with fission chambers)	520
Drawers with two columns of plutonium fuel (Includes two drawers with fission chambers)	292
Drawers with one column of uranium fuel (Includes five drawers with fission chambers)	560
Drawers with two columns of uranium fuel (Includes four drawers with fission chambers)	556
<u>Control Rod Positions</u>	
Drawers filled with sodium cans	180
Drawers with sodium and natural B ₁ C	108
<u>Radial Blanket</u>	
Drawers containing uranium oxide (Includes twelve drawers with fission chambers)	1840
Drawers containing uranium metal (Includes four drawers with fission chambers)	300
<u>Radial Reflector</u>	
Stainless-steel-filled drawers (Includes five drawers with fission chambers)	1860
Mild-steel-filled drawers	64

Table 4.2.1-10 Mass Summary for Various Regions in the ZPPR-18B Critical Reference

Material	Mass, kg ^b						
	Inner Core	Outer core Plutonium	Outer Core Uranium	Radial Blanket	Axial Blanket	Control Rod	Control Position
Total Pu	2175.053	703.438	- - -	- - -	- - -	- - -	- - -
Fissile Pu	1917.339	606.222	- - -	- - -	- - -	- - -	- - -
Total Fissile	1950.842	613.414	1156.661	47.881	31.156	- - -	- - -
²³⁸ Pu	0.945	0.373	- - -	- - -	- - -	- - -	- - -
²³⁹ Pu	1902.647	600.112	- - -	- - -	- - -	- - -	- - -
²⁴⁰ Pu	252.838	94.414	- - -	- - -	- - -	- - -	- - -
²⁴¹ Pu	14.692	6.109	- - -	- - -	- - -	- - -	- - -
²⁴² Pu	3.932	2.429	- - -	- - -	- - -	- - -	- - -
Americium ^a	23.331	9.765	- - -	- - -	- - -	- - -	- - -
²³⁵ U	33.503	7.192	1156.661	47.881	31.156	- - -	- - -
²³⁸ U	15494.430	3341.788	4771.910	22092.750	14343.030	- - -	- - -
Total Heavy Metal	17726.290	4062.180	5945.180	22140.620	14374.190	- - -	- - -
O	1645.372	483.168	770.899	1704.949	1042.633	0.003	0.010
Na	1787.037	437.171	559.665	460.208	1700.424	56.001	195.167
Mo	205.974	64.593	4.458	6.974	23.616	0.476	0.774
Steel ^c	7381.492	1921.148	3220.721	3487.283	8895.662	248.358	383.922
¹⁰ B	- - -	- - -	- - -	- - -	- - -	19.961	- - -
¹¹ B	- - -	- - -	- - -	- - -	- - -	88.990	- - -
C	17.494	21.287	74.926	2.111	22.407	31.459	0.172

^aMasses for all isotopes decayed to 12/9/87.

^bMasses are based on the average masses for plates types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe and Ni.

Table 4.2.1-11 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 18B CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE(URAN)	OUTER CORE(PLU)	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	2175.805	703.785	17.129	---	---
FISSILE PU	1917.272	606.241	---	---	---
TOTAL FISSILE	1951.356	613.617	1156.539	74.171	31.160
PU-239	1902.481	600.090	---	---	---
PU-240	252.924	94.452	---	---	---
PU-241	14.792	6.151	---	---	---
PU-242	5.609	3.093	17.129	---	---
AM-241	23.233	9.725	---	---	---
U-235	34.084	7.376	1156.539	74.171	31.160
U-238	15492.832	3341.634	4771.426	34222.555	14344.570
TOTAL HEAVY METAL	17702.719	4052.796	5945.090	34296.723	14375.727
O	1645.221	483.151	770.826	2641.046	1042.729
NA	1786.879	437.156	559.612	712.884	1561.829
MO	205.943	64.590	4.458	10.803	22.929
STEEL	7369.754	1920.898	3221.360	5402.059	8537.680

Table 4.2.1-12 (1) Atom Densities by Zone and Drawer Type for ZPPR-18B

Isotope	Inner Core Average 0-20	Axial Blanket (IC) 20-31	Reflector Iron Block (IC) 31-36	Inner Core (ICSF) 0-20	Inner Core (ICSM) 0-20	Inner Core Single Pu 0-20
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0001716	0.0000532	0.0005873	0.0000332	0.0000332	0.0000332
O	0.0121223	0.0088206	0.0	0.0137453	0.0087984	0.0118940
Na	0.0091937	0.0091882	0.0	0.0092715	0.0091268	0.0092233
Si	0.0001591	0.0001924	0.0001260	0.0001570	0.0001584	0.0001576
Al	0.0000041	0.0000029	0.0	0.0000040	0.0000040	0.0000040
Mn	0.0002309	0.0003419	0.0006822	0.0002287	0.0002285	0.0002288
Cr	0.0027000	0.0041649	0.0021126	0.0026684	0.0026726	0.0026718
Fe	0.0115689	0.0147980	0.0756914	0.0128536	0.0095006	0.0116011
Ni	0.0011881	0.0017649	0.0008584	0.0011678	0.0011793	0.0011729
Cu	0.0000304	0.0000441	0.0000271	0.0000293	0.0000312	0.0000300
Mo	0.0002530	0.0000346	0.0000136	0.0002397	0.0002378	0.0002392
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0000168	0.0000179	0.0	0.0000127	0.0000234	0.0000167
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0076724	0.0081558	0.0	0.0058158	0.0106293	0.0076300
P8	0.0000005	0.0	0.0	0.0000004	0.0000005	0.0000004
P9	0.0009382	0.0	0.0	0.0008878	0.0008775	0.0008845
P0	0.0001241	0.0	0.0	0.0001176	0.0001159	0.0001171
P1	0.0000072	0.0	0.0	0.0000066	0.0000069	0.0000067
P2	0.0000019	0.0	0.0	0.0000017	0.0000019	0.0000018
A1	0.0000114	0.0	0.0	0.0000108	0.0000107	0.0000108
P	0.0000052	0.0000102	0.0000237	0.0000053	0.0000051	0.0000052
S	0.0000011	0.0000081	0.0000312	0.0000010	0.0000011	0.0000010
Cl	0.0000007	0.0000003	0.0	0.0000003	0.0000003	0.0000003
Ca	0.0000020	0.0000021	0.0	0.0000021	0.0000021	0.0000021
Co	0.0000016	0.0000016	0.0000009	0.0000008	0.0000024	0.0000014

Table 4.2.1-12 (2) (contd)

Isotope	Inner Core Double Pu 0-20	Outer Core Average 0-20	Outer Core Average 20-20.44	Axial Blanket (OC) 20.44-31	Reflector Iron Block (OC) 31-36	Outer Core Pu Fuel 0-20
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0023102	0.0016171	0.0000430	0.0000551	0.0005923	0.0008521
O	0.0156589	0.0157816	0.0088280	0.0088212	0.0	0.0144334
Na	0.0087410	0.0087491	0.0093061	0.0092565	0.0	0.0091105
Si	0.0001815	0.0001678	0.0001703	0.0002046	0.0001167	0.0001657
Al	0.0000061	0.0000044	0.0000028	0.0000029	0.0	0.0000048
Mn	0.0002648	0.0002396	0.0002669	0.0003462	0.0006737	0.0002415
Cr	0.0031374	0.0028441	0.0031957	0.0040968	0.0019565	0.0028351
Fe	0.0110787	0.0142917	0.0113732	0.0145816	0.0760544	0.0122104
Ni	0.0014229	0.0012575	0.0013692	0.0017594	0.0007935	0.0012572
Cu	0.0000364	0.0000319	0.0000363	0.0000403	0.0000280	0.0000315
Mo	0.0004674	0.0001447	0.0000234	0.0000286	0.0000141	0.0003215
U4	0.0	0.0000094	0.0000078	0.0	0.0	0.0
U5	0.0000183	0.0009786	0.0008125	0.0000179	0.0	0.0000146
U6	0.0	0.0000045	0.0000037	0.0	0.0	0.0
U8	0.0083334	0.0068553	0.0082027	0.0081563	0.0	0.0067049
P8	0.0000010	0.0000003	0.0	0.0	0.0	0.0000007
P9	0.0017683	0.0005050	0.0	0.0	0.0	0.0011990
P0	0.0002339	0.0000791	0.0	0.0	0.0	0.0001879
P1	0.0000141	0.0000051	0.0	0.0	0.0	0.0000121
P2	0.0000038	0.0000020	0.0	0.0	0.0	0.0000048
A1	0.0000217	0.0000082	0.0	0.0	0.0	0.0000194
P	0.0000044	0.0000052	0.0000073	0.0000102	0.0000233	0.0000051
S	0.0000016	0.0000015	0.0000039	0.0000063	0.0000314	0.0000012
Cl	0.0000062	0.0000044	0.0000003	0.0000003	0.0	0.0000024
Ca	0.0000010	0.0000013	0.0000021	0.0000021	0.0	0.0000017
Co	0.0000045	0.0000025	0.0000025	0.0000023	0.0000018	0.0000019

Table 4.2.1-12 (3) (contd)

Isotope	Axial Blanket (OC) Pu Fuel 20-31	Reflector Iron Block (OC) Pu Fuel 31-36	Outer Core Double Pu 0-20	Outer Core Single Pu 0-20	Outer Core U Fuel 0-20	Outer Core U Fuel 20-20.44
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0000531	0.0005928	0.0023103	0.0000332	0.0021737	0.0000344
O	0.0088210	0.0	0.0156591	0.0137451	0.0167619	0.0088277
Na	0.0092557	0.0	0.0087757	0.0092985	0.0084858	0.0093008
Si	0.0001926	0.0001164	0.0001813	0.0001570	0.0001693	0.0001539
Al	0.0000029	0.0	0.0000060	0.0000041	0.0000041	0.0000029
Mn	0.0003418	0.0006745	0.0002650	0.0002283	0.0002381	0.0002122
Cr	0.0041642	0.0019579	0.0031381	0.0026649	0.0028506	0.0024891
Fe	0.0147930	0.0761469	0.0110869	0.0128413	0.0158054	0.0088781
Ni	0.0017665	0.0007913	0.0014192	0.0011662	0.0012577	0.0010798
Cu	0.0000444	0.0000274	0.0000355	0.0000293	0.0000321	0.0000303
Mo	0.0000348	0.0000138	0.00004684	0.00002391	0.0000161	0.0000150
U4	0.0	0.0	0.0	0.0	0.0000163	0.0000134
U5	0.0000179	0.0	0.0000180	0.0000127	0.0016800	0.0013905
U6	0.0	0.0	0.0	0.0	0.0000078	0.0000064
U8	0.0081561	0.0	0.0082662	0.0058281	0.0069644	0.0082360
P8	0.0	0.0	0.0000012	0.0000005	0.0	0.0
P9	0.0	0.0	0.0017573	0.0008855	0.0	0.0
P0	0.0	0.0	0.0003137	0.0001172	0.0	0.0
P1	0.0	0.0	0.0000209	0.0000072	0.0	0.0
P2	0.0	0.0	0.0000099	0.0000019	0.0	0.0
A1	0.0	0.0	0.0000343	0.0000110	0.0	0.0
P	0.0000102	0.0000234	0.0000048	0.0000053	0.0000052	0.0000053
S	0.0000081	0.0000314	0.0000015	0.0000010	0.0000017	0.0000013
Cl	0.0000003	0.0	0.0000062	0.0000003	0.0000058	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000019	0.0000012	0.0000038	0.0000008	0.0000030	0.0000030

Table 4.2.1-12 (A) (contd)

Isotope	Axial Blanket (OC) U Fuel 20.44-31	Reflector Iron Block (OC) U Fuel 31-36	Outer Core Single U (OCUS) 0-20	Outer Core Single U (OCUS) 20-20.44	Outer Core Double U (OCUD) 0-20	Outer Core Double U (OCUD) 20-20.44
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0000565	0.0005918	0.0021064	0.0000340	0.0022414	0.0000349
O	0.0088209	0.0	0.0170999	0.0088277	0.0164216	0.0088278
Na	0.0092566	0.0	0.0083660	0.0092904	0.0086066	0.0093114
Si	0.0002133	0.0001169	0.0001684	0.0001481	0.0001702	0.0001599
Al	0.0000029	0.0	0.0000043	0.0000029	0.0000038	0.0000028
Mn	0.0003493	0.0006730	0.0002412	0.0002105	0.0002350	0.0002140
Cr	0.0040475	0.0019553	0.0028881	0.0024577	0.0028128	0.0025209
Fe	0.0144271	0.0759838	0.0177815	0.0087814	0.0138151	0.0089755
Ni	0.0017541	0.0007952	0.0012690	0.0010563	0.0012464	0.0011034
Cu	0.0000374	0.0000284	0.0000302	0.0000281	0.0000341	0.0000324
Mo	0.0000241	0.0000143	0.0000147	0.0000133	0.0000175	0.0000167
U4	0.0	0.0	0.0000109	0.0000082	0.0000217	0.0000187
U5	0.0000179	0.0	0.0011314	0.0008546	0.0022325	0.0019304
U6	0.0	0.0	0.0000052	0.0000039	0.0000105	0.0000090
U8	0.0081560	0.0	0.0073445	0.0082049	0.0065816	0.0082674
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000102	0.0000233	0.0000054	0.0000054	0.0000051	0.0000052
S	0.0000050	0.0000314	0.0000015	0.0000011	0.0000018	0.0000015
Cl	0.0000003	0.0	0.0000056	0.0000003	0.0000060	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000026	0.0000021	0.0000010	0.0000010	0.0000050	0.0000049

Table 4.2.1-12 (5)

<u>Isotope</u>	<u>Control Rod 0-20</u>	<u>Control Rod 20-31</u>
B0	0.0071583	0.0072759
B1	0.0290256	0.0295024
C	0.0094051	0.0095480
O	0.0000006	0.0000068
Na	0.0087470	0.0087131
Si	0.0002035	0.0002034
Al	0.0000054	0.0000048
Mn	0.0002605	0.0002578
Cr	0.0031765	0.0031389
Fe	0.0112393	0.0111169
Ni	0.0014421	0.0014216
Cu	0.0000361	0.0000359
Mo	0.0000178	0.0000177
U4	0.0	0.0
U5	0.0	0.0
U6	0.0	0.0
U8	0.0	0.0
P8	0.0	0.0
P9	0.0	0.0
P0	0.0	0.0
P1	0.0	0.0
P2	0.0	0.0
A1	0.0	0.0
P	0.0000040	0.0000040
S	0.0000012	0.0000012
Cl	0.0000003	0.0000003
Ca	0.0000020	0.0000020
Co	0.0000038	0.0000037

Table 4.2.1-13 ZPPR ASSEMBLY 18B:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER CORE DUF	INNER CORE DUM	INNER-RZ AVERAGE DUM&DUM	OUTER CORE DUF	OUTER CORE DCF	OUTER CORE USC(UAC)	OUTER CORE UDC	OUTER-RZ AVERAGE U-DRIV&PU	RADIAL BLANKET	AXIAL BLANKET	RADIAL REFLECTOR	AXIAL REFLECTOR
	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	0.0008878	0.0008790	0.0009382	0.0008855	0.0017573	---	---	0.0005050	---	---	---	---
PU-240	0.0001176	0.0001161	0.0001242	0.0001172	0.0003137	---	---	0.0000791	---	---	---	---
PU-241	0.0000066	0.0000070	0.0000072	0.0000072	0.0000210	---	---	0.0000051	---	---	---	---
PU-242	0.0000025	0.0000027	0.0000027	0.0000028	0.0000120	0.0000164	0.0000328	0.0000168	---	---	---	---
AM-241	0.0000107	0.0000107	0.0000114	0.0000109	0.0000342	---	---	0.0000081	---	---	---	---
U-235	0.0000129	0.0000237	0.0000171	0.0000130	0.0000186	0.0011497	0.0022745	0.0009962	0.0000369	0.0000179	---	0.0000000
U-238	0.0058157	0.0106484	0.0076726	0.0058281	0.0082662	0.0073456	0.0065839	0.0068561	0.0168192	0.0081560	---	0.0000003
H-1	---	---	0.0000012	---	0.0000191	0.0000192	0.0000191	0.0000140	---	---	---	---
C	0.0000348	0.0000348	0.0001732	0.0000349	0.0022961	0.0021079	0.0022310	0.0016128	0.0000330	0.0000554	0.0002508	0.0005872
O	0.0137452	0.0088144	0.0121230	0.0137453	0.0156327	0.0171004	0.0163861	0.0157672	0.0193126	0.0088214	---	---
NA	0.0092346	0.0091165	0.0091629	0.0092720	0.0087443	0.0083395	0.0085808	0.0087219	0.0036278	0.0091950	---	---
AL	0.0000043	0.0000040	0.0000043	0.0000041	0.0000059	0.0000042	0.0000038	0.0000043	0.0000021	0.0000029	0.0000000	---
SI	0.0001571	0.0001585	0.0001591	0.0001571	0.0001813	0.0001685	0.0001706	0.0001680	0.0001352	0.0001964	0.0008534	0.0001254
CR	0.0026709	0.0026731	0.0027000	0.0026685	0.0031405	0.0028917	0.0028192	0.0028483	0.0022444	0.0041290	0.0153020	0.0021250
MN	0.0002289	0.0002287	0.0002310	0.0002286	0.0002653	0.0002415	0.0002355	0.0002399	0.0001938	0.0003426	0.0014011	0.0006824
FE	0.0128621	0.0095029	0.0115692	0.0128541	0.0111096	0.0177946	0.0138378	0.0143085	0.0080277	0.0146799	0.0562948	0.0757221
NI	0.0011687	0.0011794	0.0011879	0.0011677	0.0014199	0.0012703	0.0012490	0.0012592	0.0009592	0.0017581	0.0066348	0.0008637
CU	0.0000401	0.0000435	0.0000422	0.0000401	0.0000536	0.0000458	0.0000539	0.0000478	0.0000374	0.0000659	0.0001206	0.0000841
MO	0.0002398	0.0002382	0.0002531	0.0002391	0.0004684	0.0000147	0.0000176	0.0001448	0.0000132	0.0000323	0.0000364	0.0000143

Table 4.2.1-14 New Drawer Masters Introduced in ZPPR-18B

Zone	Master	Description
Core	203	Pu Fuel-DC-H240
	204	Pu Fuel-DC
	205	Pu Fuel-DC
	206	Pu Fuel-DC
	207	Pu Fuel-DC
	208	Pu Fuel-DC
	209	Pu Fuel-DC
	210	Pu Fuel-DC
	211	Pu Fuel-DC
	922	U Fuel-DC
	923	U Fuel-DC

^aDC is double fuel column, H240 contains fuel high in ²⁴⁰Pu.

Table 4.2.1-15 Experimental and Calculated k-effective Results for ZPPR-18B

	Critical Reference	Subcritical Reference
Date	12/7/87	12/3/87
Reactor Run Number	98	93
Temperature, K	301.9	301.5
Interface Gap, mil ^a	54.8	54.2
Measured Excess Reactivity, ϕ	+7.3 \pm 0.1	-33.2 \pm 0.2
Adjustment to 293K, ϕ ^b	+11.1 \pm 1.0	+10.6 \pm 0.9
Adjustment to 54.8 mil ^c , ϕ	---	-0.05 \pm 0.01
Adjustment to 12/7/87 ^d , ϕ	---	-0.09 \pm 0.01
Adjusted Reactivity, ϕ	+18.4 \pm 1.0	-22.7 \pm 1.0
Experimental K-effective (E) ^e	1.000699 \pm 0.000038	0.999137 \pm 0.000038
Calculation, 21G XYZ NDT (C)	0.992015	---
C/E for k-effective	0.991322	---

^aOn a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.25 \pm 0.11 \phi K^{-1}$. (ZPPR-18A)

^cUsing measured gap coefficient $-0.09 \pm 0.01 \phi \text{ mil}^{-1}$. (ZPPR-18A)

^dUsing calculated ²⁴¹Pu decay coefficient $-0.02184 \phi \text{ day}^{-1}$. (ZPPR-18A)

^eUsing calculated β -effective 0.003801.

Table 4.2.1-16 Drawer Loading Summary for the ZPPR-18C Critical Reference

Inner Core

Drawers with 1 column of plutonium fuel and iron oxide (Includes 20 drawers with fission chambers, 2 thermocouples and 16 narrow drawers adjacent to PSRs) 1930

Drawers with 1 column of plutonium fuel and depleted uranium metal (Includes 9 drawers with fission chambers and 32 narrow drawers adjacent to PSRs) 1168

Drawers with 2 columns of plutonium fuel 192

Outer Core

Drawers with 1 column of plutonium fuel (Includes 4 drawers with fission chambers) 520

Drawers with 2 columns of plutonium fuel (Includes 2 drawers with fission chambers) 292

Drawers with 1 column of uranium, fuel (Includes 5 drawers with fission chambers) 572

Drawers with 2 columns of uranium fuel (Includes 4 drawers with fission chambers) 544

Control Rod Position

Drawers filled with sodium cans 186

Drawers with sodium and natural B₄C 102

Radial Blanket

Drawers containing uranium oxide (Includes 12 drawers with fission chambers) 1840

Drawers containing uranium metal (Includes four drawers with fission chambers) 300

Radial Reflector

Stainless-steel-filled drawers (Includes 5 drawers with fission chambers) 1860

Mild-steel-filled drawers 64

Table 4.2.1-17 Mass Summary for Various Regions in the ZPPR-18C Critical Reference

Material	Mass, kg ^b						
	Inner Core	Outer Core Plutonium	Outer Core Uranium	Radial Blanket	Axial Blanket	Control Rod	Control Position
Total Pu	2169.908	703.428	---	---	---	---	---
Fissile Pu	1912.803	606.212	---	---	---	---	---
Total Fissile	1946.331	613.404	1148.447	47.881	31.162	---	---
²³⁸ Pu	0.942	0.373	---	---	---	---	---
²³⁹ Pu	1898.171	600.112	---	---	---	---	---
²⁴⁰ Pu	252.241	94.414	---	---	---	---	---
²⁴¹ Pu ^a	14.632	6.100	---	---	---	---	---
²⁴² Pu	3.922	2.429	---	---	---	---	---
Americium ^a	23.297	9.774	---	---	---	---	---
²³⁵ U	33.528	7.192	1148.447	47.881	31.162	---	---
²³⁸ U	15505.540	3341.788	4777.531	22092.750	14345.780	---	---
Total Heavy Metal	17732.250	4062.179	5942.469	22140.620	14376.950	---	---
O	1643.113	483.168	771.360	1704.949	1042.820	0.003	0.010
Na	1787.290	437.171	559.521	460.208	1731.240	52.890	201.673
Mo	205.510	64.593	4.450	6.974	23.628	0.449	0.800
Steel ^c	6786.667	1921.149	3227.211	3487.283	8882.948	234.560	396.705
¹⁰ B	---	---	---	---	---	18.852	---
¹¹ B	---	---	---	---	---	84.046	---
C	16.930	21.287	74.900	2.111	4.922	29.711	0.177

^aMasses for all isotopes decayed to 12/21/87.

^bMasses are based on the average masses for plate types.

^cSteel mass is the sum of the masses of the elements Cr, Mn, Fe and Ni.

ANL-ZPR-485のTable 11.2より修正

Table 4.2.1-18 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 18C CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE(URAN)	OUTER CORE(PLU)	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	2170.685	703.785	17.006	---	---
FISSILE PU	1912.763	606.241	---	---	---
TOTAL FISSILE	1946.870	613.617	1148.327	74.171	31.160
PU-239	1898.008	600.090	---	---	---
PU-240	252.329	94.452	---	---	---
PU-241	14.755	6.151	---	---	---
PU-242	5.594	3.093	17.006	---	---
AM-241	23.177	9.725	---	---	---
U-235	34.107	7.376	1148.327	74.171	31.160
U-238	15503.945	3341.634	4777.047	34222.555	14344.570
TOTAL HEAVY METAL	17708.734	4052.796	5942.379	34296.723	14375.727
O	1642.963	483.151	771.287	2641.046	1042.729
NA	1787.129	437.156	559.468	712.884	1561.829
MO	205.479	64.590	4.449	10.803	22.955
STEEL	7367.230	1920.898	3227.828	5402.059	8537.906

Table 4.2.1-19 (1) Atom Densities by Zone and Drawer Type for ZPPR-18C

Isotope	Inner Core Average 0-20	Axial Blanket (IC) 20-31	Reflector Iron Block (IC) 31-36	Inner Core (ICSF) 0-20	Inner Core (ICSM) 0-20	Inner Core Single Pu 0-20
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0001660	0.0000532	0.0005873	0.0000332	0.0000333	0.0000332
O	0.0121057	0.0088206	0.0	0.0137453	0.0088142	0.0118860
Na	0.0091950	0.0091882	0.0	0.0092715	0.0091444	0.0092235
Si	0.0001590	0.0001924	0.0001260	0.0001570	0.0001587	0.0001576
Al	0.0000041	0.0000029	0.0	0.0000040	0.0000040	0.0000040
Mn	0.0002309	0.0003420	0.0006822	0.0002287	0.0002290	0.0002288
Cr	0.0026989	0.0041649	0.0021127	0.0026684	0.0026775	0.0026718
Fe	0.0115653	0.0147981	0.0756916	0.0128536	0.0095180	0.0115958
Ni	0.0011875	0.0017649	0.0008584	0.0011678	0.0011814	0.0011729
Cu	0.0000304	0.0000441	0.0000270	0.0000293	0.0000313	0.0000300
Mo	0.0002525	0.0000346	0.0000136	0.0002397	0.0002382	0.0002392
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0000168	0.0000179	0.0	0.0000127	0.0000234	0.0000167
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0076779	0.0081558	0.0	0.0058158	0.0106481	0.0076376
P8	0.0000005	0.0	0.0	0.0000004	0.0000005	0.0000004
P9	0.0009360	0.0	0.0	0.0008878	0.0008790	0.0008844
P0	0.0001239	0.0	0.0	0.0001176	0.0001161	0.0001170
P1	0.0000071	0.0	0.0	0.0000066	0.0000069	0.0000067
P2	0.0000019	0.0	0.0	0.0000017	0.0000019	0.0000018
A1	0.0000114	0.0	0.0	0.0000108	0.0000107	0.0000108
P	0.0000052	0.0000102	0.0000237	0.0000053	0.0000051	0.0000052
S	0.0000011	0.0000081	0.0000312	0.0000010	0.0000011	0.0000010
Cl	0.0000006	0.0000003	0.0	0.0000003	0.0000003	0.0000003
Ca	0.0000020	0.0000021	0.0	0.0000021	0.0000021	0.0000021
Co	0.0000016	0.0000016	0.0000009	0.0000008	0.0000024	0.0000014

Table 4.2.1-19 (2) (contd)

Isotope	Inner Core Double Pu 0-20	Outer Core Average 0-20	Outer Core Average 20-20.44	Axial Blanket (OC) 20.44-31	Reflector Iron Block (OC) 31-36	Outer Core Pu Fuel 0-20
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0023102	0.0016223	0.0000431	0.0000552	0.0005939	0.0008521
O	0.0156589	0.0158334	0.0088517	0.0088449	0.0	0.0144334
Na	0.0087393	0.0087699	0.0093313	0.0092814	0.0	0.0091105
Si	0.0001815	0.0001682	0.0001706	0.0002048	0.0001170	0.0001657
Al	0.0000061	0.0000044	0.0000029	0.0000029	0.0	0.0000048
Mn	0.0002648	0.0002402	0.0002675	0.0003469	0.0006755	0.0002415
Cr	0.0031376	0.0028519	0.0032019	0.0041083	0.0019618	0.0028351
Fe	0.0110793	0.0143629	0.0113958	0.0146221	0.0762602	0.0122104
Ni	0.0014230	0.0012609	0.0013717	0.0017637	0.0007955	0.0012572
Cu	0.0000364	0.0000319	0.0000363	0.0000405	0.0000280	0.0000315
Mo	0.0004673	0.0001448	0.0000234	0.0000288	0.0000141	0.00003215
U4	0.0	0.0000094	0.0000078	0.0	0.0	0.0
U5	0.0000183	0.0009747	0.0008096	0.0000179	0.0	0.0000146
U6	0.0	0.0000045	0.0000037	0.0	0.0	0.0
U8	0.0083326	0.0068798	0.0082245	0.0081782	0.0	0.0067049
P8	0.0000010	0.0000003	0.0	0.0	0.0	0.0000007
P9	0.0017680	0.0005050	0.0	0.0	0.0	0.0011990
P0	0.0002339	0.0000791	0.0	0.0	0.0	0.0001879
P1	0.0000141	0.0000051	0.0	0.0	0.0	0.0000121
P2	0.0000038	0.0000020	0.0	0.0	0.0	0.0000048
A1	0.0000217	0.0000082	0.0	0.0	0.0	0.0000194
P	0.0000046	0.0000052	0.0000074	0.0000102	0.0000234	0.0000051
S	0.0000016	0.0000015	0.0000039	0.0000063	0.0000315	0.0000012
Cl	0.0000062	0.0000044	0.0000003	0.0000003	0.0	0.0000024
Ca	0.0000010	0.0000013	0.0000021	0.0000021	0.0	0.0000017
Co	0.0000045	0.0000025	0.0000025	0.0000023	0.0000017	0.0000019

Table 4.2.1-19 (3) (contd)

Isotope	Axial Blanket (OC) Pu Fuel 20-31	Reflector Iron Block (OC) Pu Fuel 31-36	Outer Core Double Pu 0-20	Outer Core Single Pu 0-20	Outer Core U Fuel 0-20	Outer Core U Fuel 20-20.44
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0000531	0.0005928	0.0023103	0.0000332	0.0021729	0.0000344
O	0.0088210	0.0	0.0156591	0.0137451	0.0167721	0.0088278
Na	0.0092557	0.0	0.0087757	0.0092985	0.0084828	0.0093013
Si	0.0001926	0.0001164	0.0001813	0.0001570	0.0001692	0.0001539
Al	0.0000029	0.0	0.0000060	0.0000041	0.0000041	0.0000029
Mn	0.0003418	0.0006745	0.0002650	0.0002283	0.0002381	0.0002122
Cr	0.0041642	0.0019579	0.0031381	0.0026649	0.0028506	0.0024885
Fe	0.0147930	0.0761469	0.0110869	0.0128413	0.0158460	0.0088763
Ni	0.0017665	0.0007913	0.0014192	0.0011662	0.0012576	0.0010793
Cu	0.0000444	0.0000274	0.0000355	0.0000293	0.0000321	0.0000302
Mo	0.0000348	0.0000138	0.0004684	0.0002391	0.0000161	0.0000149
U4	0.0	0.0	0.0	0.0	0.0000162	0.0000134
U5	0.0000179	0.0	0.0000180	0.0000127	0.0016680	0.0013816
U6	0.0	0.0	0.0	0.0	0.0000078	0.0000064
U8	0.0081561	0.0	0.0082662	0.0058281	0.0069727	0.0082355
P8	0.0	0.0	0.0000012	0.0000005	0.0	0.0
P9	0.0	0.0	0.0017573	0.0008855	0.0	0.0
P0	0.0	0.0	0.0003137	0.0001172	0.0	0.0
P1	0.0	0.0	0.0000209	0.0000072	0.0	0.0
P2	0.0	0.0	0.0000099	0.0000019	0.0	0.0
A1	0.0	0.0	0.0000343	0.0000110	0.0	0.0
P	0.0000102	0.0000234	0.0000048	0.0000053	0.0000052	0.0000053
S	0.0000081	0.0000314	0.0000015	0.0000010	0.0000017	0.0000013
Cl	0.0000003	0.0	0.0000062	0.0000003	0.0000058	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000019	0.0000012	0.0000038	0.0000008	0.0000029	0.0000029

Table 4.2.1-19 (4) (contd)

Isotope	Axial Blanket (OC) U Fuel 20.44-31	Reflector Iron Block (OC) U Fuel 31-36	Outer Core Single U (OCUS) 0-20	Outer Core Single U (OCUS) 20-20.44	Outer Core Double U (OCUD) 0-20	Outer Core Double U (OCUD) 20-20.44
	BO	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0000564	0.0005919	0.0021064	0.0000340	0.0022429	0.0000349
O	0.0088210	0.0	0.0171001	0.0088278	0.0164272	0.0088278
Na	0.0092567	0.0	0.0083645	0.0092909	0.0086072	0.0093121
Si	0.0002127	0.0001169	0.0001684	0.0001481	0.0001701	0.0001600
Al	0.0000029	0.0	0.0000043	0.0000029	0.0000038	0.0000028
Mn	0.0003491	0.0006731	0.0002412	0.0002105	0.0002349	0.0002140
Cr	0.0040484	0.0019555	0.0028881	0.0024576	0.0028112	0.0025211
Fe	0.0144297	0.0759863	0.0177816	0.0087813	0.0138107	0.0089762
Ni	0.0017536	0.0007950	0.0012690	0.0010563	0.0012456	0.0011035
Cu	0.0000375	0.0000283	0.0000302	0.0000281	0.0000341	0.0000324
Mo	0.0000243	0.0000143	0.0000147	0.0000133	0.0000175	0.0000167
U4	0.0	0.0	0.0000109	0.0000082	0.0000217	0.0000188
U5	0.0000179	0.0	0.0011314	0.0008546	0.0022323	0.0019357
U6	0.0	0.0	0.0000052	0.0000039	0.0000105	0.0000090
U8	0.0081561	0.0	0.0073446	0.0082050	0.0065816	0.0082677
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000102	0.0000233	0.0000054	0.0000054	0.0000051	0.0000052
S	0.0000050	0.0000314	0.0000015	0.0000011	0.0000018	0.0000015
Cl	0.0000003	0.0	0.0000056	0.0000003	0.0000060	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000026	0.0000021	0.0000010	0.0000010	0.0000050	0.0000049

Table 4.2.1-19 (5)

Isotope	Control Rod	Control Rod
	0-20	20-31
B0	0.0071583	0.0072759
B1	0.0290256	0.0295024
C	0.0094051	0.0095480
O	0.0000006	0.0000068
Na	0.0087470	0.0087131
Si	0.0002035	0.0002034
Al	0.0000054	0.0000048
Mn	0.0002605	0.0002578
Cr	0.0031765	0.0031389
Fe	0.0112393	0.0111169
Ni	0.0014421	0.0014216
Cu	0.0000361	0.0000359
Mo	0.0000178	0.0000177
U4	0.0	0.0
U5	0.0	0.0
U6	0.0	0.0
U8	0.0	0.0
P8	0.0	0.0
P9	0.0	0.0
P0	0.0	0.0
P1	0.0	0.0
P2	0.0	0.0
A1	0.0	0.0
P	0.0000040	0.0000040
S	0.0000012	0.0000012
Cl	0.0000003	0.0000003
Ca	0.0000020	0.0000020
Co	0.0000038	0.0000037

Table 4.2.1-20 ZPPR ASSEMBLY 18C:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER CORE DUF	INNER CORE DUM	INNER-RZ AVERAGE DUM&DUM	OUTER CORE DUF	OUTER CORE DCF	OUTER CORE USC(UAC)	OUTER CORE UDC	OUTER-RZ AVERAGE U-DRIV&PU	RADIAL BLANKET	AXIAL BLANKET	RADIAL REFLECTOR	AXIAL REFLECTOR
	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	0.0008878	0.0008790	0.0009360	0.0008855	0.0017573	---	---	0.0005050	---	---	---	---
PU-240	0.0001176	0.0001161	0.0001239	0.0001172	0.0003137	---	---	0.0000791	---	---	---	---
PU-241	0.0000066	0.0000070	0.0000072	0.0000072	0.0000210	---	---	0.0000051	---	---	---	---
PU-242	0.0000025	0.0000027	0.0000027	0.0000028	0.0000120	0.0000164	0.0000328	0.0000167	---	---	---	---
AM-241	0.0000107	0.0000107	0.0000113	0.0000109	0.0000342	---	---	0.0000081	---	---	---	---
U-235	0.0000129	0.0000237	0.0000171	0.0000130	0.0000186	0.0011497	0.0022744	0.0009891	0.0000369	0.0000179	---	0.0000000
U-238	0.0058157	0.0106481	0.0076781	0.0058281	0.0082662	0.0073456	0.0065839	0.0068608	0.0168192	0.0081560	---	0.0000003
H-1	---	---	0.0000011	---	0.0000191	0.0000192	0.0000191	0.0000140	---	---	---	---
C	0.0000348	0.0000348	0.0001677	0.0000349	0.0022961	0.0021079	0.0022322	0.0016123	0.0000330	0.0000554	0.0002508	0.0005872
O	0.0137452	0.0088144	0.0121063	0.0137453	0.0156327	0.0171004	0.0163909	0.0157730	0.0193126	0.0088214	---	---
NA	0.0092346	0.0091178	0.0091642	0.0092720	0.0087443	0.0083386	0.0085827	0.0087206	0.0036278	0.0091950	---	---
AL	0.0000043	0.0000040	0.0000043	0.0000041	0.0000059	0.0000042	0.0000038	0.0000043	0.0000021	0.0000029	0.0000000	---
SI	0.0001571	0.0001585	0.0001590	0.0001571	0.0001813	0.0001685	0.0001705	0.0001679	0.0001352	0.0001963	0.0008534	0.0001254
CR	0.0026709	0.0026733	0.0026990	0.0026685	0.0031405	0.0028917	0.0028177	0.0028483	0.0022444	0.0041292	0.0153020	0.0021250
MN	0.0002289	0.0002287	0.0002309	0.0002286	0.0002653	0.0002415	0.0002354	0.0002399	0.0001938	0.0003425	0.0014011	0.0006824
FE	0.0128621	0.0095034	0.0115656	0.0128541	0.0111096	0.0177943	0.0138338	0.0143319	0.0080277	0.0146805	0.0562948	0.0757226
NI	0.0011687	0.0011794	0.0011873	0.0011677	0.0014199	0.0012703	0.0012483	0.0012591	0.0009592	0.0017580	0.0066348	0.0008636
CU	0.0000401	0.0000435	0.0000422	0.0000401	0.0000536	0.0000458	0.0000539	0.0000477	0.0000374	0.0000659	0.0001206	0.0000840
MO	0.0002398	0.0002382	0.0002525	0.0002391	0.0004684	0.0000147	0.0000176	0.0001448	0.0000132	0.0000324	0.0000364	0.0000143

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Table 4.2.1-21 Experimental k-effective Result for ZPPR-18C

	<u>Critical Reference</u>
Date	12/18/87
Reactor Run Number	110
Temperature, K	301.7
Interface Gap, mil ^a	54.2
Measured Excess Reactivity, ϕ	+17.1 \pm 0.1
Adjustment to 293K, ϕ ^b	+10.8 \pm 1.0
Adjusted Reactivity, ϕ	+27.9 \pm 1.0
Experimental K-effective (E) ^c	1.001060 \pm 0.000038

^aOn a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.25 \pm 0.11 \phi \text{ K}^{-1}$. (ZPPR-18A)

^cUsing calculated β -effective 0.003801. (ZPPR-18B)

Table 4.2.1-22 Drawer Loading Summary for the ZPPR-19A Almost
Critical Reference

<u>Inner Core</u>	
Drawers with one column of plutonium fuel and iron oxide (Includes 20 drawers with fission chambers, two drawers with thermocouples and 16 narrow drawers adjacent to PSRs)	1930
Drawers with one column of plutonium fuel and depleted uranium metal (Includes nine drawers with fission chambers and 32 narrow drawers adjacent to PSRs)	1200
Drawers with two columns of plutonium fuel	160
<u>Outer Core</u>	
Drawers with one column of plutonium fuel (Includes four drawers with fission chambers)	528
Drawers with two columns of plutonium fuel (Includes two drawers with fission chambers)	284
Drawers with one column of uranium fuel (Includes five drawers with fission chambers)	588
Drawers with two columns of uranium fuel (Includes four drawers with fission chambers)	528
<u>Control Rod Positions</u>	
Drawers filled with sodium cans	288
<u>Radial Blanket</u>	
Drawers containing uranium oxide (Includes 12 drawers with fission chambers)	1840
Drawers containing uranium metal (Includes four drawers with fission chambers)	300
<u>Radial Reflector</u>	
Stainless-steel-filled drawers (Includes five drawers with fission chambers)	1860
Mild-steel-filled drawers	64

Table 4.2.1-23 Mass Summary for Various Regions in the ZPPR-19A "Almost Critical" Reference

Material	Mass, kg ^b						
	Inner Core	Outer core Plutonium	Outer Core Uranium	Radial Blanket	Axial Blanket	Control Rod	Control Position
Total Pu	2150.063	694.548	- - -	- - -	- - -	- - -	- - -
Fissile Pu	1895.307	602.324	- - -	- - -	- - -	- - -	- - -
Total Fissile	1928.937	609.502	1137.474	47.881	31.162	- - -	- - -
²³⁸ Pu	0.932	0.361	- - -	- - -	- - -	- - -	- - -
²³⁹ Pu	1880.853	596.619	- - -	- - -	- - -	- - -	- - -
²⁴⁰ Pu	249.439	89.757	- - -	- - -	- - -	- - -	- - -
²⁴¹ Pu ^a	14.454	5.704	- - -	- - -	- - -	- - -	- - -
²⁴² Pu	3.885	2.106	- - -	- - -	- - -	- - -	- - -
Americium ^a	23.120	9.084	- - -	- - -	- - -	- - -	- - -
²³⁵ U	33.630	7.179	1137.474	47.881	31.162	- - -	- - -
²³⁸ U	15551.750	3333.841	4785.004	22092.750	14345.780	- - -	- - -
Total Heavy Metal	17758.530	4044.650	5938.809	22140.620	14376.940	- - -	- - -
O	1634.076	482.536	772.147	1704.949	1042.820	0.234	0.012
Na	1788.324	437.464	559.521	460.208	1734.130	37.334	234.200
Mo	203.719	64.147	4.438	6.974	23.679	0.297	0.928
Steel ^c	7368.048	1922.300	3235.135	3487.283	8890.004	137.924	460.481
¹⁰ B	- - -	- - -	- - -	- - -	- - -	15.882	- - -
¹¹ B	- - -	- - -	- - -	- - -	- - -	70.825	- - -
C	14.673	20.723	74.900	2.111	4.924	24.630	0.206

^aMasses for all isotopes decayed to 1/11/88.

^bMasses are based on the average masses for plate types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe, and Ni.

Table 4.2.1-24 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 19A CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE(URAN)	OUTER CORE(PLU)	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	2150.879	694.901	16.841	---	---
FISSILE PU	1895.311	602.367	---	---	---
TOTAL FISSILE	1929.514	609.728	1137.355	74.171	31.160
PU-239	1880.694	596.598	---	---	---
PU-240	250.027	89.793	---	---	---
PU-241	14.616	5.769	---	---	---
PU-242	5.541	2.741	16.841	---	---
AM-241	22.964	9.023	---	---	---
U-235	34.204	7.361	1137.355	74.171	31.160
U-238	15550.160	3333.687	4784.520	34222.555	14344.570
TOTAL HEAVY METAL	17735.242	4035.949	5938.715	34296.723	14375.727
O	1633.928	482.520	772.075	2641.046	1042.729
NA	1788.164	437.449	559.469	712.884	1561.831
MO	203.688	64.145	4.437	10.803	22.990
STEEL	7356.289	1922.060	3235.734	5402.059	8538.180

Table 4.2.1-25 (I) Atom Densities by Zone and Drawer Type in ZPPR-19A

Isotope	Inner Core Average 0-20	Axial Blanket (IC) 20-31	Reflector Iron Block (IC) 31-36	Inner Core (ICSF) 0-20	Inner Core (ICSM) 0-20	Inner Core Single Pu 0-20
C	0.0001439	0.0000532	0.0005894	0.0000332	0.0000333	0.0000332
O	0.0120392	0.0088207	0.0	0.0137453	0.0088143	0.0118548
Na	0.0092004	0.0091883	0.0	0.0092715	0.0091481	0.0092241
Si	0.0001588	0.0001924	0.0001264	0.0001570	0.0001587	0.0001577
Al	0.0000041	0.0000029	0.0	0.0000040	0.0000040	0.0000040
Mn	0.0002305	0.0003420	0.0006847	0.0002287	0.0002289	0.0002288
Cr	0.0026943	0.0041649	0.0021198	0.0026684	0.0026773	0.0026718
Fe	0.0115495	0.0147985	0.0759668	0.0128536	0.0095173	0.0115745
Ni	0.0011851	0.0017648	0.0008612	0.0011678	0.0011814	0.0011730
Cu	0.0000304	0.0000440	0.0000271	0.0000293	0.0000313	0.0000301
Mo	0.0002503	0.0000346	0.0000136	0.0002397	0.0002383	0.0002392
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0000169	0.0000179	0.0	0.0000127	0.0000234	0.0000168
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0077009	0.0081559	0.0	0.0058158	0.0106485	0.0076686
P8	0.0000005	0.0	0.0	0.0000004	0.0000005	0.0000004
P9	0.0009274	0.0	0.0	0.0008878	0.0008791	0.0008844
P0	0.0001227	0.0	0.0	0.0001176	0.0001161	0.0001170
P1	0.0000071	0.0	0.0	0.0000065	0.0000069	0.0000067
P2	0.0000019	0.0	0.0	0.0000017	0.0000019	0.0000018
A1	0.0000113	0.0	0.0	0.0000108	0.0000107	0.0000108
P	0.0000052	0.0000102	0.0000238	0.0000053	0.0000051	0.0000052
S	0.0000011	0.0000081	0.0000314	0.0000010	0.0000011	0.0000010
Cl	0.0000006	0.0000003	0.0	0.0000003	0.0000003	0.0000003
Ca	0.0000020	0.0000021	0.0	0.0000021	0.0000021	0.0000021
Co	0.0000016	0.0000016	0.0000009	0.0000008	0.0000024	0.0000014

Table 4.2.1-25 (2)

Isotope	Inner Core Double Pu 0-20.	Outer Core Average 0-20.	Outer Core Average 20-20.44	Axial Blanket (OC) 20.44-31	Reflector Iron Block (OC) 31-36.	Outer Core Pu Fuel 0-20.
C	0.0023102	0.0016072	0.0000430	0.0000550	0.0005923	0.0008296
O	0.0156589	0.0157892	0.0088279	0.0088211	0.0	0.0144145
Na	0.0087410	0.0087498	0.0093061	0.0092564	0.0	0.0091166
Si	0.0001814	0.0001676	0.0001702	0.0002039	0.0001167	0.0001656
Al	0.0000061	0.0000044	0.0000028	0.0000029	0.0	0.0000048
Mn	0.0002646	0.0002394	0.0002669	0.0003458	0.0006737	0.0002411
Cr	0.0031355	0.0028416	0.0031949	0.0040979	0.0019566	0.0028304
Fe	0.0110721	0.0143516	0.0113707	0.0145844	0.0760551	0.0122272
Ni	0.0014220	0.0012562	0.0013686	0.0017587	0.0007933	0.0012551
Cu	0.0000364	0.0000318	0.0000362	0.0000405	0.0000279	0.0000316
Mo	0.0004677	0.0001438	0.0000233	0.0000289	0.0000140	0.0003193
U4	0.0	0.0000093	0.0000077	0.0	0.0	0.0
U5	0.0000183	0.0009624	0.0008004	0.0000179	0.0	0.0000146
U6	0.0	0.0000044	0.0000037	0.0	0.0	0.0
U8	0.0083377	0.0068596	0.0082019	0.0081562	0.0	0.0066889
P8	0.0000010	0.0000003	0.0	0.0	0.0	0.0000007
P9	0.0017696	0.0005021	0.0	0.0	0.0	0.0011920
P0	0.0002341	0.0000752	0.0	0.0	0.0	0.0001786
P1	0.0000141	0.0000048	0.0	0.0	0.0	0.0000113
P2	0.0000039	0.0000017	0.0	0.0	0.0	0.0000041
A1	0.0000217	0.0000076	0.0	0.0	0.0	0.0000180
P	0.0000046	0.0000052	0.0000073	0.0000102	0.0000233	0.0000051
S	0.0000016	0.0000015	0.0000039	0.0000063	0.0000314	0.0000012
Cl	0.0000062	0.0000043	0.0000003	0.0000003	0.0	0.0000024
Ca	0.0000010	0.0000013	0.0000021	0.0000021	0.0	0.0000017
Co	0.0000045	0.0000025	0.0000025	0.0000023	0.0000017	0.0000019

Table 4.2.1-25 (3)

Isotope	Axial Blanket (OC) Pu Fuel 20-31	Reflector Iron Block (OC) Pu Fuel 31-36	Outer Core (OC) Pu Fuel 0-20	Outer Core Single Pu 0-20	Outer Core U Fuel 0-20	Outer Core U Fuel 20-20.44
C	0.0000531	0.0005928	0.0023796	0.0000332	0.0012578	0.0000199
O	0.0088210	0.0	0.0161289	0.0137451	0.0097183	0.0051099
Na	0.0092557	0.0	0.0090421	0.0092985	0.0049102	0.0053839
Si	0.0001926	0.0001165	0.0001869	0.0001570	0.0000979	0.0000890
Al	0.0000029	0.0	0.0000061	0.0000041	0.0000024	0.0000017
Mn	0.0003418	0.0006744	0.0002729	0.0002283	0.0001378	0.0001228
Cr	0.0041641	0.0019578	0.0032323	0.0026649	0.0016495	0.0014400
Fe	0.0147923	0.0761458	0.0114182	0.0128413	0.0092018	0.0051367
Ni	0.0017667	0.0007914	0.0014630	0.0011662	0.0007276	0.0006244
Cu	0.0000444	0.0000274	0.0000369	0.0000293	0.0000185	0.0000175
Mo	0.0000348	0.0000138	0.0004825	0.0002391	0.0000093	0.0000086
U4	0.0	0.0	0.0	0.0	0.0000093	0.0000077
U5	0.0000179	0.0	0.0000187	0.0000127	0.0009563	0.0007928
U6	0.0	0.0	0.0	0.0	0.0000044	0.0000037
U8	0.0081561	0.0	0.0085400	0.0058281	0.0040424	0.0047667
P8	0.0	0.0	0.0000012	0.0000005	0.0	0.0
P9	0.0	0.0	0.0018152	0.0008855	0.0	0.0
P0	0.0	0.0	0.0002998	0.0001172	0.0	0.0
P1	0.0	0.0	0.0000195	0.0000071	0.0	0.0
P2	0.0	0.0	0.0000084	0.0000019	0.0	0.0
A1	0.0	0.0	0.0000317	0.0000110	0.0	0.0
P	0.0000101	0.0000234	0.0000049	0.0000053	0.0000030	0.0000031
S	0.0000081	0.0000314	0.0000016	0.0000010	0.0000010	0.0000007
Cl	0.0000003	0.0	0.0000064	0.0000003	0.0000034	0.0000002
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000006	0.0000012
Co	0.0000019	0.0000013	0.0000041	0.0000008	0.0000017	0.0000017

Table 4.2.1-25 (4)

Isotope	Axial Blanket (OC) U Fuel 20.44-31	Reflector Iron Block (OC) U Fuel 31-36	Outer Core Single U (OCUS) 0-20	Outer Core Single U (OCUS) 20-20.44	Outer Core Double U (OCUD) 0-20	Outer Core Double U (OCUD) 20-20.44
C	0.0000326	0.0003426	0.0021064	0.0000340	0.0022470	0.0000349
O	0.0051059	0.0	0.0171001	0.0088278	0.0164429	0.0088278
Na	0.0053581	0.0	0.0083649	0.0092908	0.0086142	0.0093129
Si	0.0001228	0.0000676	0.0001684	0.0001481	0.0001700	0.0001602
Al	0.0000017	0.0	0.0000043	0.0000029	0.0000038	0.0000028
Mn	0.0002018	0.0003896	0.0002412	0.0002105	0.0002346	0.0002141
Cr	0.0023441	0.0011320	0.0028881	0.0024576	0.0028069	0.0025214
Fe	0.0083543	0.0439848	0.0177817	0.0087813	0.0137983	0.0089775
Ni	0.0010146	0.0004600	0.0012690	0.0010563	0.0012435	0.0011037
Cu	0.0000218	0.0000164	0.0000302	0.0000281	0.0000340	0.0000324
Mo	0.0000142	0.0000082	0.0000147	0.0000133	0.0000175	0.0000167
U4	0.0	0.0	0.0000109	0.0000082	0.0000217	0.0000189
U5	0.0000104	0.0	0.0011314	0.0008546	0.0022319	0.0019431
U6	0.0	0.0	0.0000052	0.0000039	0.0000105	0.0000090
U8	0.0047211	0.0	0.0073446	0.0082050	0.0065815	0.0082681
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000059	0.0000135	0.0000054	0.0000054	0.0000051	0.0000052
S	0.0000029	0.0000182	0.0000015	0.0000011	0.0000018	0.0000015
Cl	0.0000002	0.0	0.0000056	0.0000003	0.0000060	0.0000003
Ca	0.0000012	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000015	0.0000012	0.0000010	0.0000010	0.0000050	0.0000049

Table 4.2.1-25 (5)

Isotope	Radial Blanket 0-20	Radial Blanket 20-31	Radial Blanket 31-36	Radial Reflector 0-36	Axial Reflector 36-42	Empty Matrix 0-42
C	0.0000318	0.0000319	0.0005928	0.0002493	0.0002143	0.0000188
O	0.0193179	0.0193406	0.0	0.0	0.0	0.0
Na	0.0036444	0.0036359	0.0	0.0	0.0	0.0
Si	0.0001352	0.0001355	0.0001163	0.0008675	0.0008629	0.0000683
Al	0.0000021	0.0000021	0.0	0.0	0.0	0.0
Mn	0.0001937	0.0001941	0.0006746	0.0014119	0.0015241	0.0001059
Cr	0.0022430	0.0022455	0.0019586	0.0153499	0.0150441	0.0011891
Fe	0.0080226	0.0080330	0.0761527	0.0563344	0.0531084	0.0042791
Ni	0.0009584	0.0009588	0.0007902	0.0066625	0.0066621	0.0004802
Cu	0.0000279	0.0000280	0.0000271	0.0000386	0.0000172	0.0000172
Mo	0.0000132	0.0000131	0.0000136	0.0000322	0.0000083	0.0000083
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0000369	0.0000370	0.0	0.0	0.0	0.0
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0168314	0.0168695	0.0	0.0	0.0	0.0
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000050	0.0000050	0.0000235	0.0000465	0.0	0.0000028
S	0.0000010	0.0000010	0.0000314	0.0000335	0.0	0.0000007
Cl	0.0000001	0.0000001	0.0	0.0	0.0	0.0
Ca	0.0000009	0.0000009	0.0	0.0	0.0	0.0
Co	0.0000015	0.0000015	0.0000010	0.0	0.0	0.0

Table 4.2.1-25 (6)

Isotope	Inner Ring Control Position 0-20	Inner Ring Control Position 20-36	Middle Ring Control Position 0-20	Middle Ring Control Position 20-36	Outer Ring Control Position 0-20	Outer Ring Control Position 20-36
C	0.0000312	0.0000309	0.0000312	0.0000309	0.0000311	0.0000309
O	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013
Na	0.0182904	0.0184405	0.0182904	0.0184405	0.0182904	0.0184405
Si	0.0001661	0.0001649	0.0001661	0.0001649	0.0001657	0.0001649
Al	0.0000047	0.0000049	0.0000047	0.0000049	0.0000047	0.0000049
Mn	0.0002451	0.0002443	0.0002451	0.0002443	0.0002448	0.0002443
Cr	0.0029778	0.0029657	0.0029778	0.0029657	0.0029723	0.0029657
Fe	0.0105129	0.0104697	0.0105129	0.0104697	0.0104937	0.0104697
Ni	0.0013332	0.0013281	0.0013332	0.0013281	0.0013307	0.0013281
Cu	0.0000357	0.0000353	0.0000357	0.0000353	0.0000357	0.0000353
Mo	0.0000176	0.0000174	0.0000176	0.0000174	0.0000175	0.0000174
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0	0.0	0.0	0.0	0.0	0.0
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0	0.0	0.0	0.0	0.0	0.0
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000040	0.0000040	0.0000040	0.0000040	0.0000040	0.0000040
S	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012	0.0000012
Cl	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006
Ca	0.0000042	0.0000042	0.0000042	0.0000042	0.0000042	0.0000042
Co	0.0000038	0.0000037	0.0000038	0.0000037	0.0000038	0.0000037

Table 4.2.1-25 (7)

Isotope	Radial	Radial	Radial
	Blanket	Blanket	Blanket
	Master 501	Master 502	Master 503
	0-31	0-31	0-31
C	0.0000294	0.0000325	0.0000324
O	0.0	0.0226351	0.0220579
Na	0.0	0.0042352	0.0042350
Si	0.0001099	0.0001398	0.0001417
Al	0.0	0.0000024	0.0000024
Mn	0.0001648	0.0002005	0.0001984
Cr	0.0018487	0.0023279	0.0023140
Fe	0.0066628	0.0083268	0.0082484
Ni	0.0007495	0.0009950	0.0010098
Cu	0.0000249	0.0000275	0.0000317
Mo	0.0000124	0.0000127	0.0000150
U4	0.0	0.0	0.0
U5	0.0000865	0.0000290	0.0000285
U6	0.0	0.0	0.0
U8	0.0387435	0.0133322	0.0131212
P8	0.0	0.0	0.0
P9	0.0	0.0	0.0
P0	0.0	0.0	0.0
P1	0.0	0.0	0.0
P2	0.0	0.0	0.0
A1	0.0	0.0	0.0
P	0.0000046	0.0000052	0.0000047
S	0.0000010	0.0000010	0.0000012
Cl	0.0	0.0000001	0.0000001
Ca	0.0	0.0000010	0.0000010
Co	0.0	0.0000007	0.0000045

Table 4.2.1-26 ZPPR ASSEMBLY 19A:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER CORE DUF	INNER CORE DUM	INNER-RZ AVERAGE DUM&DUM	OUTER CORE DUF	OUTER CORE DCF	OUTER CORE USC(UAC)	OUTER CORE UDC	OUTER-RZ AVERAGE U-DRIV&PU	RADIAL BLANKET	AXIAL BLANKET	RADIAL REFLECTOR	AXIAL REFLECTOR
	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	0.0008878	0.0008791	0.0009275	0.0008855	0.0017619	---	---	0.0005020	---	---	---	---
PU-240	0.0001176	0.0001162	0.0001227	0.0001172	0.0002928	---	---	0.0000752	---	---	---	---
PU-241	0.0000066	0.0000070	0.0000071	0.0000072	0.0000193	---	---	0.0000048	---	---	---	---
PU-242	0.0000025	0.0000027	0.0000027	0.0000028	0.0000103	0.0000164	0.0000328	0.0000163	---	---	---	---
AM-241	0.0000107	0.0000107	0.0000112	0.0000109	0.0000308	---	---	0.0000075	---	---	---	---
U-235	0.0000129	0.0000237	0.0000172	0.0000130	0.0000187	0.0011497	0.0022742	0.0009797	0.0000369	0.0000179	---	0.0000000
U-238	0.0058157	0.0106484	0.0077010	0.0058281	0.0082892	0.0073456	0.0065839	0.0068604	0.0168192	0.0081560	---	0.0000003
H-1	---	---	0.0000009	---	0.0000191	0.0000192	0.0000191	0.0000139	---	---	---	---
C	0.0000348	0.0000348	0.0001455	0.0000348	0.0022957	0.0021079	0.0022359	0.0016029	0.0000330	0.0000554	0.0002508	0.0005872
O	0.0137452	0.0088144	0.0120397	0.0137453	0.0156319	0.0171004	0.0164056	0.0157749	0.0193126	0.0088214	---	---
NA	0.0092346	0.0091221	0.0091695	0.0092724	0.0087462	0.0083396	0.0085890	0.0087232	0.0036278	0.0091950	---	---
AL	0.0000043	0.0000040	0.0000043	0.0000041	0.0000060	0.0000042	0.0000038	0.0000043	0.0000021	0.0000029	0.0000000	---
SI	0.0001571	0.0001585	0.0001588	0.0001571	0.0001814	0.0001685	0.0001704	0.0001678	0.0001352	0.0001962	0.0008534	0.0001254
CR	0.0026709	0.0026732	0.0026943	0.0026685	0.0031406	0.0028916	0.0028136	0.0028458	0.0022444	0.0041294	0.0153020	0.0021250
MN	0.0002289	0.0002287	0.0002306	0.0002286	0.0002652	0.0002415	0.0002351	0.0002397	0.0001938	0.0003425	0.0014011	0.0006824
FE	0.0128621	0.0095030	0.0115498	0.0128539	0.0111087	0.0177941	0.0138218	0.0143685	0.0080277	0.0146812	0.0562948	0.0757229
NI	0.0011687	0.0011794	0.0011849	0.0011677	0.0014211	0.0012703	0.0012462	0.0012578	0.0009592	0.0017578	0.0066348	0.0008636
CU	0.0000401	0.0000435	0.0000421	0.0000401	0.0000540	0.0000458	0.0000539	0.0000477	0.0000374	0.0000659	0.0001206	0.0000840
MO	0.0002398	0.0002382	0.0002503	0.0002391	0.0004685	0.0000147	0.0000176	0.0001438	0.0000132	0.0000324	0.0000364	0.0000143

Table 4.2.1-27 Experimental k-effective Values for ZPPR-19A

	Almost Critical Reference	Subcritical Reference
Date	1/8/88	1/8/88
Loading	6	4
Reactor Run Number	8	6
Temperature, K	301.4	300.8
Interface Gap, mil ^a	53.8	54.7
Measured Excess Reactivity, ϕ	-0.43 ± 0.02	-24.0 ± 0.1
Adjustment to 293K, ϕ ^b	$+10.50 \pm 0.92$	$+9.75 \pm 0.86$
Adjustment to 53.8 mil, ϕ ^c	---	$+0.08 \pm 0.01$
Adjustment to 1/8/88, ϕ ^d	---	---
Adjusted Reactivity, ϕ	$+10.1 \pm 0.9$	-14.7 ± 0.9
Experimental K-effective ^e	1.000410 ± 0.000037	0.999403 ± 0.000037

^aOn a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.25 \pm 0.11\phi K^{-1}$.

^cUsing measured gap coefficient $-0.09 \pm 0.01\phi \text{ mil}^{-1}$.

^dUsing calculated ²³⁹Pu decay coefficient $-0.02143\phi \text{ day}^{-1}$.

^eUsing calculated β -effective 0.004062.

Table 4.2.1-28 Drawer Loading Summary for the ZPPR-19B Critical Reference

Inner Core

Drawers with one column of plutonium fuel.

Drawers with iron oxide (Includes 20 drawers with fission chambers and 16 narrow drawers adjacent to PSRs and two drawers with thermocouples) 1930

Drawers with depleted uranium metal (Includes nine drawers with fission chambers and 32 narrow drawers adjacent to PSRs) 1360

Outer Core

Drawers with one column of plutonium fuel (Includes 4 drawers with fission chambers) 600

Drawers with two columns of plutonium fuel (Includes two drawers with fission chambers) 212

Drawers with one column of uranium fuel (Includes five drawers with fission chambers) 676

Drawers with two columns of uranium fuel (Includes four drawers with fission chambers) 440

Control Rod Positions

Drawers filled with sodium cans 288

Radial Blanket

Drawers containing uranium oxide (Includes 12 drawers with fission chambers) 1840

Drawers containing uranium metal (Includes four drawers with fission chambers) 300

Radial Reflector

Stainless-steel-filled drawers (Includes five drawers with fission chambers) 1860

Mild-steel-filled drawers 64

Table 4.2.1-29 Mass Summary for Various Regions in the ZPPR-19B Critical Reference

Material	Mass, kg ^b				
	Inner Core	Outer Core	Radial Blanket	Axial Blanket	Control Position
Total Pu	2049.885	639.658	- - -	- - -	- - -
Fissile Pu	1807.007	563.796	- - -	- - -	- - -
Total Fissile	1841.140	1648.030	47.881	31.162	- - -
²³⁵ Pu	0.883	0.315	- - -	- - -	- - -
²³⁹ Pu	1793.288	559.279	- - -	- - -	- - -
²⁴⁰ Pu	238.302	74.311	- - -	- - -	- - -
²⁴¹ Pu ^a	13.718	4.516	- - -	- - -	- - -
²⁴² Pu	3.692	1.236	- - -	- - -	- - -
Americium ^a	22.064	6.975	- - -	- - -	- - -
²³⁵ U	34.134	1084.235	47.881	31.162	- - -
²³⁸ U	15779.550	8059.129	22092.750	14345.780	- - -
Total Heavy Metal	17885.580	9805.449	22140.620	14376.950	- - -
O	1588.896	1252.546	1704.949	1042.820	0.016
Na	1793.584	998.886	460.208	1734.844	312.267
Mo	194.636	64.439	6.974	23.832	1.38
Steel ^c	7315.277	5215.006	3487.283	8892.470	614.163

^aMasses for all isotopes decayed to 1/29/88.

^bMasses are based on the average for plate types.

^cSteel mass is the sum of masses of elements Cr, Mn, Fe, and Ni.

Table 4.2.1-30 MASS SUMMARY FOR VARIOUS REGIONS IN
THE ZPPR ASSEMBLY 19B CRITICAL REFERENCE

(UNIT:KG)

MATERIAL	INNER CORE	OUTER CORE(URAN)	OUTER CORE(PLU)	RADIAL BLANKET	AXIAL BLANKET
TOTAL PU	2050.708	639.951	15.940	---	---
FISSILE PU	1807.053	563.839	---	---	---
TOTAL FISSILE	1841.734	570.976	1077.160	74.171	31.160
PU-239	1793.148	559.261	---	---	---
PU-240	238.389	74.341	---	---	---
PU-241	13.905	4.578	---	---	---
PU-242	5.266	1.771	15.940	---	---
AM-241	21.884	6.916	---	---	---
U-235	34.681	7.137	1077.160	74.171	31.160
U-238	15778.020	3232.888	4825.633	34222.555	14344.590
TOTAL HEAVY METAL	17863.406	3879.976	5918.730	34296.723	14375.746
O	1588.759	476.833	775.627	2641.046	1042.732
NA	1793.431	439.794	559.027	712.884	1561.833
HO	194.607	60.063	4.373	10.803	23.145
STEEL	7303.383	1932.740	3282.473	5402.059	8540.270

Table 4.2.1-31 (1) Atom Densities by Zone and Drawer Type in ZPPR-19B

Isotope	Inner Core Average 0-20	Axial Blanket (IC) 20-31	Reflector Iron Block (IC) 31-36	Inner Core (ICSF) 0-20	Inner Core (ICSM) 0-20	Inner Core Single Pu 0-20
C	0.0000332	0.0000532	0.0005873	0.0000332	0.0000332	0.0000332
O	0.0117067	0.0088210	0.0	0.0137453	0.0088141	0.0117067
Na	0.0092276	0.0091887	0.0	0.0092715	0.0091653	0.0092276
Si	0.0001577	0.0001923	0.0001258	0.0001570	0.0001586	0.0001577
Al	0.0000040	0.0000029	0.0	0.0000040	0.0000040	0.0000040
Mn	0.0002288	0.0003421	0.0006824	0.0002287	0.0002289	0.0002288
Cr	0.0026718	0.0041655	0.0021133	0.0026684	0.0026767	0.0026718
Fe	0.0114739	0.0148016	0.0756998	0.0128536	0.0095163	0.0114739
Ni	0.0011730	0.0017641	0.0008575	0.0011678	0.0011803	0.0011730
Cu	0.0000300	0.0000439	0.0000268	0.0000293	0.0000311	0.0000300
Mo	0.0002391	0.0000345	0.0000134	0.0002397	0.0002383	0.0002391
U4	0.0	0.0	0.0	0.0	0.0	0.0
U5	0.0000171	0.0000179	0.0	0.0000127	0.0000234	0.0000171
U6	0.0	0.0	0.0	0.0	0.0	0.0
U8	0.0078140	0.0081561	0.0	0.0058158	0.0106494	0.0078140
P8	0.0000004	0.0	0.0	0.0000004	0.0000005	0.0000004
P9	0.0008843	0.0	0.0	0.0008878	0.0008794	0.0008843
P0	0.0001170	0.0	0.0	0.0001176	0.0001162	0.0001170
P1	0.0000067	0.0	0.0	0.0000065	0.0000069	0.0000067
P2	0.0000018	0.0	0.0	0.0000017	0.0000019	0.0000018
A1	0.0000108	0.0	0.0	0.0000108	0.0000107	0.0000108
P	0.0000052	0.0000102	0.0000237	0.0000053	0.0000051	0.0000052
S	0.0000010	0.0000081	0.0000312	0.0000010	0.0000011	0.0000010
Cl	0.0000003	0.0000003	0.0	0.0000003	0.0000003	0.0000003
Ca	0.0000021	0.0000021	0.0	0.0000021	0.0000021	0.0000021
Co	0.0000014	0.0000014	0.0000007	0.0000008	0.0000023	0.0000014

Table 4.2.1-31 (2) (contd)

Isotope	Outer Core Average 0-20	Outer Core Average 20-20.44	Axial Blanket (OC) 20.44-31	Reflector Iron Block (OC) 31-36	Outer Core Pu Fuel 0-20
C	0.0015216	0.0000430	0.0000547	0.0005929	0.0006277
O	0.0157793	0.0088366	0.0088298	0.0	0.0142449
Na	0.0087748	0.0093153	0.0092655	0.0	0.0091654
Si	0.0001667	0.0001699	0.0002019	0.0001167	0.0001635
Al	0.0000043	0.0000029	0.0000029	0.0	0.0000046
Mn	0.0002382	0.0002670	0.0003450	0.0006745	0.0002379
Cr	0.0028267	0.0031948	0.0041058	0.0019593	0.0027889
Fe	0.0146052	0.0113725	0.0146096	0.0761394	0.0123834
Ni	0.0012475	0.0013673	0.0017579	0.0007929	0.0012336
Cu	0.0000315	0.0000360	0.0000410	0.0000276	0.0000312
Mo	0.0001351	0.0000232	0.0000297	0.0000139	0.0002990
U4	0.0000088	0.0000073	0.0	0.0	0.0
U5	0.0009128	0.0007587	0.0000179	0.0	0.0000142
U6	0.0000042	0.0000035	0.0	0.0	0.0
U8	0.0068164	0.0082076	0.0081643	0.0	0.0064867
P8	0.0000003	0.0	0.0	0.0	0.0000006
P9	0.0004706	0.0	0.0	0.0	0.0011175
P0	0.0000623	0.0	0.0	0.0	0.0001479
P1	0.0000038	0.0	0.0	0.0	0.0000089
P2	0.0000010	0.0	0.0	0.0	0.0000024
A1	0.0000058	0.0	0.0	0.0	0.0000138
P	0.0000052	0.0000074	0.0000102	0.0000234	0.0000051
S	0.0000014	0.0000039	0.0000065	0.0000314	0.0000012
Cl	0.0000041	0.0000003	0.0000003	0.0	0.0000018
Ca	0.0000013	0.0000021	0.0000021	0.0	0.0000018
Co	0.0000022	0.0000022	0.0000021	0.0000015	0.0000018

Table 4.2.1-31 (3) (contd)

Isotope	Axial Blanket (OC) Pu Fuel 20-31	Reflector Iron Block (OC) Pu Fuel 31-36	Outer Core (OC) Pu Fuel 0-20	Outer Core Single Pu 0-20	Outer Core U Fuel 0-20	Outer Core U Fuel 20-20.44
C	0.0000531	0.0005928	0.0023103	0.0000332	0.0021684	0.0000343
O	0.0088211	0.0	0.0156589	0.0137451	0.0168662	0.0088277
Na	0.0092557	0.0	0.0087864	0.0092992	0.0084761	0.0093001
Si	0.0001926	0.0001164	0.0001819	0.0001570	0.0001688	0.0001532
Al	0.0000029	0.0	0.0000060	0.0000041	0.0000041	0.0000029
Mn	0.0003419	0.0006746	0.0002649	0.0002283	0.0002381	0.0002119
Cr	0.0041646	0.0019583	0.0031388	0.0026652	0.0028492	0.0024835
Fe	0.0147953	0.0761507	0.0110838	0.0128424	0.0161911	0.0088611
Ni	0.0017661	0.0007907	0.0014237	0.0011664	0.0012555	0.0010753
Cu	0.0000443	0.0000273	0.0000364	0.0000293	0.0000317	0.0000298
Mo	0.0000347	0.0000137	0.0004688	0.0002390	0.0000158	0.0000147
U4	0.0	0.0	0.0	0.0	0.0000152	0.0000125
U5	0.0000179	0.0	0.0000183	0.0000127	0.0015647	0.0012962
U6	0.0	0.0	0.0	0.0	0.0000073	0.0000060
U8	0.0081562	0.0	0.0083531	0.0058272	0.0070436	0.0082305
P8	0.0	0.0	0.0000010	0.0000005	0.0	0.0
P9	0.0	0.0	0.0017747	0.0008852	0.0	0.0
P0	0.0	0.0	0.0002348	0.0001171	0.0	0.0
P1	0.0	0.0	0.0000141	0.0000071	0.0	0.0
P2	0.0	0.0	0.0000039	0.0000019	0.0	0.0
A1	0.0	0.0	0.0000218	0.0000110	0.0	0.0
P	0.0000102	0.0000234	0.0000047	0.0000053	0.0000053	0.0000053
S	0.0000081	0.0000314	0.0000016	0.0000010	0.0000016	0.0000013
Cl	0.0000003	0.0	0.0000062	0.0000003	0.0000058	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000018	0.0000011	0.0000045	0.0000008	0.0000026	0.0000026

Table 4.2.1-31 (4) (contd)

Isotope	Axial Blanket (OC) Pu Fuel 20.44-31	Reflector Iron Block (OC) U Fuel 31-36	Outer Core Single U (OCUS) 0-20	Outer Core Single U (OCUS) 20-20.44	Outer Core Double U (OCUD) 0-20	Outer Core Double U (OCUD) 20-20.44
	C	0.0000557	0.0005919	0.0021064	0.0000340	0.0022637	0.0000349
O	0.0088209	0.0	0.0171001	0.0088278	0.0165071	0.0088277
Na	0.0092567	0.0	0.0083664	0.0092904	0.0086446	0.0093153
Si	0.0002084	0.0001167	0.0001684	0.0001481	0.0001694	0.0001610
Al	0.0000029	0.0	0.0000043	0.0000029	0.0000038	0.0000028
Mn	0.0003466	0.0006733	0.0002412	0.0002105	0.0002333	0.0002142
Cr	0.0040559	0.0019566	0.0028882	0.0024577	0.0027894	0.0025231
Fe	0.0144494	0.0759994	0.0177817	0.0087816	0.0137475	0.0089833
Ni	0.0017489	0.0007932	0.0012690	0.0010564	0.0012347	0.0011044
Cu	0.0000385	0.0000279	0.0000302	0.0000281	0.0000340	0.0000325
Mo	0.0000260	0.0000140	0.0000147	0.0000133	0.0000175	0.0000167
U4	0.0	0.0	0.0000109	0.0000082	0.0000217	0.0000192
U5	0.0000179	0.0	0.0011314	0.0008546	0.0022303	0.0019746
U6	0.0	0.0	0.0000052	0.0000039	0.0000104	0.0000092
U8	0.0081560	0.0	0.0073446	0.0082050	0.0065814	0.0082698
P8	0.0	0.0	0.0	0.0	0.0	0.0
P9	0.0	0.0	0.0	0.0	0.0	0.0
P0	0.0	0.0	0.0	0.0	0.0	0.0
P1	0.0	0.0	0.0	0.0	0.0	0.0
P2	0.0	0.0	0.0	0.0	0.0	0.0
A1	0.0	0.0	0.0	0.0	0.0	0.0
P	0.0000102	0.0000233	0.0000054	0.0000054	0.0000051	0.0000052
S	0.0000054	0.0000314	0.0000015	0.0000011	0.0000019	0.0000015
Cl	0.0000003	0.0	0.0000056	0.0000003	0.0000061	0.0000003
Ca	0.0000021	0.0	0.0000010	0.0000021	0.0000010	0.0000021
Co	0.0000023	0.0000017	0.0000010	0.0000010	0.0000050	0.0000050

Table 4.2.1-32 ZPPR ASSEMBLY 19B:ATOM DENSITIES BY ZONE

(UNIT:1.0E24/CM**3)

NUCLIDE	INNER CORE	INNER CORE	INNER-RZ AVERAGE	OUTER CORE	OUTER CORE	OUTER CORE	OUTER CORE	OUTER-RZ AVERAGE	RADIAL BLANKET	AXIAL BLANKET	RADIAL REFLECTOR	AXIAL REFLECTOR
	DUF 0-20(IN)	DUM 0-20(IN)	DUM&DUM 0-20(IN)	DUF 0-20(IN)	DCF 0-20(IN)	USC(UAC) 0-20(IN)	UDC 0-20(IN)	U-DRIV&PU 0-20(IN)	0-31(IN)	20-31(IN)	0-36(IN)	31-36(IN)
PU-239	0.0008878	0.0008794	0.0008843	0.0008852	0.0017747	---	---	0.0004706	---	---	---	---
PU-240	0.0001176	0.0001162	0.0001170	0.0001171	0.0002348	---	---	0.0000623	---	---	---	---
PU-241	0.0000066	0.0000070	0.0000068	0.0000072	0.0000143	---	---	0.0000038	---	---	---	---
PU-242	0.0000025	0.0000027	0.0000026	0.0000028	0.0000055	0.0000164	0.0000328	0.0000147	---	---	---	---
AM-241	0.0000107	0.0000107	0.0000107	0.0000109	0.0000217	---	---	0.0000058	---	---	---	---
U-235	0.0000129	0.0000237	0.0000174	0.0000130	0.0000189	0.0011497	0.0022733	0.0009280	0.0000369	0.0000179	---	0.0000000
U-238	0.0058157	0.0106495	0.0078138	0.0058272	0.0083530	0.0073456	0.0065839	0.0068100	0.0168192	0.0081560	---	0.0000003
H-1	---	---	---	---	0.0000191	0.0000192	0.0000191	0.0000132	---	---	---	---
C	0.0000348	0.0000348	0.0000348	0.0000348	0.0022902	0.0021079	0.0022502	0.0015153	0.0000330	0.0000553	0.0002508	0.0005872
O	0.0137452	0.0088144	0.0117069	0.0137453	0.0156224	0.0171004	0.0164624	0.0157481	0.0193126	0.0088214	---	---
NA	0.0092346	0.0091425	0.0091965	0.0092762	0.0087432	0.0083444	0.0086145	0.0087398	0.0036278	0.0091950	---	---
AL	0.0000043	0.0000040	0.0000042	0.0000041	0.0000060	0.0000042	0.0000038	0.0000043	0.0000021	0.0000029	0.0000000	---
SI	0.0001571	0.0001584	0.0001576	0.0001571	0.0001819	0.0001685	0.0001698	0.0001667	0.0001352	0.0001953	0.0008534	0.0001253
CR	0.0026709	0.0026731	0.0026718	0.0026684	0.0031422	0.0028913	0.0027968	0.0028280	0.0022444	0.0041310	0.0153020	0.0021255
MN	0.0002289	0.0002287	0.0002288	0.0002286	0.0002652	0.0002415	0.0002339	0.0002384	0.0001938	0.0003421	0.0014011	0.0006825
FE	0.0128621	0.0095039	0.0114739	0.0128535	0.0111151	0.0177932	0.0137739	0.0146043	0.0080277	0.0146868	0.0562948	0.0757275
NI	0.0011687	0.0011785	0.0011728	0.0011677	0.0014248	0.0012702	0.0012378	0.0012479	0.0009592	0.0017564	0.0066348	0.0008629
CU	0.0000401	0.0000431	0.0000414	0.0000400	0.0000552	0.0000458	0.0000538	0.0000469	0.0000374	0.0000658	0.0001206	0.0000837
MO	0.0002398	0.0002382	0.0002391	0.0002390	0.0004689	0.0000147	0.0000176	0.0001351	0.0000132	0.0000327	0.0000364	0.0000142

Table 4.2.1-33 Experimental k-effective Values for ZPPR-19B

	Almost Critical Reference	Subcritical Reference
Date	1/29/88	2/8/88
Loading	21	28
Reactor Run Number	18	25
Temperature, K	299.2	300.5
Interface Gap, mil ^a	54.5	54.9
Measured Excess Reactivity, ϕ	13.0 ± 0.1	-27.4 ± 0.2
Adjustment to 293K, ϕ	$+7.75 \pm 0.68$	$+9.38 \pm 0.83$
Adjustment to 54.5 mil, ϕ ^c	---	$+0.04 \pm 0.004$
Adjustment to 1/29/88, ϕ ^d	---	$+0.21 \pm 0.02$
Adjusted Reactivity, ϕ	$+20.8 \pm 0.7$	-17.8 ± 0.8
Experimental K-effective ^e	1.000804 ± 0.000027	0.999312 ± 0.000031

^aOn a scale with arbitrary zero.

^bUsing measured temperature coefficient $-1.25 \pm 0.11 \phi K^{-1}$. (ZPPR-18A)

^cUsing measured gap coefficient $-0.09 \pm 0.01 \phi \text{ mil}^{-1}$. (ZPPR-18A)

^dUsing calculated ^{239}Pu decay coefficient $-0.02143 \phi \text{ day}^{-1}$.

^eUsing calculated β -effective 0.003866.

4.2.2 制御棒反応度

(1) ZPPR-18A

ZPPR-18A体系での制御棒価値の測定は、大別して、実機炉心の制御棒配置での種々の挿入パターンを組合せたバンクロッドワース測定と、制御棒価値の半径方向分布を系統的に測定する半径方向測定とからなっている。

a 炉心体系と制御棒位置

実験は、ZPPR-18Aの未臨界基準体系に置いて、その燃料ドロワあるいはNaドロワを制御棒ドロワで置換した体系で実施された。Fig. 4.2.2-1に、制御棒挿入位置を示す。本図におけるA~G, b~gの制御棒ドロワは、ZPPR-18Aにおいてのみ、X方向の制御棒価値の分布を測定するために特別に設置されたものであり、以後のZPPR-18B、18C、19A、19Bにおいては設置されていない。

b 制御棒の構成

実験に用いた模擬制御棒は、全てプレートタイプの模擬制御棒が用いられた。制御棒ドロワのB₄Cの割合は、100%天然B₄Cおよび50%天然B₄Cの2種類であり、以下に各種模擬制御棒で用いたドロワマスタタイプを示す。

100%天然B₄C : ドロワマスタ 603,604

50%天然B₄C : ドロワマスタ 605,606,607,608

Table 4.2.2-1 各模擬制御棒の軸方向位置の原子数密度を示す。

c 測定結果

(a) 100%天然B₄C制御棒の制御棒価値

各リングごとに3ケースのバンクロッドワースが測定された。

各制御棒挿入位置で用いたドロワマスタ番号を以下に示す。

Rod 1~6,7~12,13,14,17,18,19,20,23,24 : ドロワマスタ 603

Rod 15,16,21,22 : ドロワマスタ 604

測定結果を、Table 4.2.2-2 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(b) 制御棒価値の半径方向分布

実験では、ドロワマスタ 606 タイプの模擬制御棒が用いられた。測定結果を、Table 4.2.2-3 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(c) 50%天然B₄C制御棒の制御棒価値

測定結果を、Table 4.2.2-4 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(c) 半挿入制御棒価値

半挿入制御棒として、ドロワマスタ 608 タイプの模擬制御棒を用いた。また、Rod 24の全挿入制御棒としては、ドロワマスタ 608 タイプの模擬制御棒を用いた。

測定結果を、Table 4.2.2-5 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(2) ZPPR-18B

a 炉心体系と制御棒位置

制御棒リング1 (Rod 1~6) 及び制御棒リング3 (Rod 13~24) の半挿入状態が基準状態であるZPPR-18B体系において、制御棒リング2 (Rod7~12) の全制御棒バンク価値が測定された。

模擬制御棒の挿入位置 (1~24) は、ZPPR-18Aと同じである。

b 制御棒の構成

リング2のバンク挿入制御棒には、ドロワマスタ 606 タイプの模擬制御棒を用いた (Table 4.2.2-1)。

c 測定結果

測定結果を、Table 4.2.2-6 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(3) Z P P R - 1 9 A

a 模擬制御棒挿入位置

制御棒リング1 (Rod 1~6) の全挿入状態が基準状態である Z P P R - 1 9 B 体系において、Rod 13 および Rod 24 の2本合計の制御棒価値が測定された。

模擬制御棒の挿入位置 (1~24) は、Z P P R - 1 8 A と同じである。

b 模擬制御棒の組成

Rod 13 および Rod 24 の制御棒には、ドロワマスタ 608 タイプの模擬制御棒を用いた (Table 4.2.2-1)。

c 測定結果

測定結果を、Table 4.2.2-7 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(4) Z P P R - 1 9 B

a 炉心体系と制御棒位置

Z P P R - 1 8 A 体系の外側炉心のウランセクタ部の濃縮ウランドロワを外側炉心全体にほぼ均一に分布させた Z P P R - 1 9 B では、X 軸方向 (Z P P R - 1 8 A でのプルトニウムセクタ方向) 及び Y 軸方向 (Z P P R - 1 8 A でのウランセクタ方向) 両方向それぞれでの 2 本または、4 本組の制御棒価値が測定された。また、各 3 リングの単一リングの制御棒価値が測定された。

模擬制御棒の挿入位置 (1~24) は、Z P P R - 1 8 A と同じである。

b 制御棒の構成

制御棒には、マスタドロワ 605, 606, 608 タイプの模擬制御棒を用いた (Table 4.2.2-1)。

c 測定結果

測定結果を、Table 4.2.2-8 に示す。解析値と比較すべき測定値をアンダーラインで示す。

(5)測定結果のまとめ

Z P P R - 1 8 A、1 9 Bにおける制御棒価値測定パターンをまとめてTable 4.2.2-9、10、11に示す。また、上記の測定結果を解析結果とともにまとめて以下の表に示す。

Table 4.2.2-12は、Z P P R - 1 8 Aにおける各種の制御棒パターンでの制御棒価値、Table 4.2.2-13は、X軸方向の制御棒価値の分布、Table 4.2.2-14はZ P P R - 1 8 Bにおける第2リングでの制御棒価値、Table 4.2.2-15は、Z P P R - 1 9 Bにおける各種制御棒パターンでの制御棒価値である。

Table 4.2.2-1 Atom Densities for the Control Rods in ZPPR-18
(atoms/barn-cm)

Isotopes	Control Position Master 601	Control Position Master 601	Control Position Master 601	Control Position Master 602	Control Position Master 602	Control Position Master 602
	0-20	20-31	31-36	0-20	20-31	31-36
B0	0.0	0.0	0.0	0.0	0.0	0.0
B1	0.0	0.0	0.0	0.0	0.0	0.0
C	0.0000308	0.0000309	0.0000447	0.0000307	0.0000309	0.0000447
O	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013	0.0000013
Na	0.0182904	0.0184405	0.0179925	0.0182904	0.0184405	0.0179925
Si	0.0001649	0.0001649	0.0001705	0.0001645	0.0001649	0.0001705
Al	0.0000047	0.0000049	0.0000048	0.0000047	0.0000049	0.0000048
Mn	0.0002433	0.0002443	0.0002511	0.0002430	0.0002443	0.0002511
Cr	0.0029568	0.0029657	0.0030388	0.0029514	0.0029657	0.0030388
Fe	0.0104374	0.0104697	0.0110018	0.0104182	0.0104697	0.0110018
Ni	0.0013247	0.0013281	0.0013586	0.0013223	0.0013281	0.0013586
Cu	0.0000354	0.0000353	0.0000370	0.0000353	0.0000353	0.0000370
Mo	0.0000174	0.0000174	0.0000183	0.0000173	0.0000174	0.0000183
P	0.0000040	0.0000040	0.0000042	0.0000040	0.0000040	0.0000042
S	0.0000012	0.0000012	0.0000013	0.0000012	0.0000012	0.0000013
Cl	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006	0.0000006
Ca	0.0000042	0.0000042	0.0000041	0.0000042	0.0000042	0.0000041
Co	0.0000038	0.0000037	0.0000043	0.0000038	0.0000037	0.0000043

Table 4.2.2-1 (Contd)

Isotopes	Control Rod Master 603	Control Rod Master 603	Control Rod Master 603	Control Rod Master 604	Control Rod Master 604	Control Rod Master 604
	0-20	20-31	31-36	0-20	20-31	31-36
B0	0.0153857	0.0	0.0	0.0152058	0.0	0.0
B1	0.0623918	0.0	0.0	0.0616654	0.0	0.0
C	0.0199484	0.0000309	0.0000447	0.0098260	0.0000309	0.0000447
O	0.0000781	0.0000013	0.0000013	0.0000651	0.0000013	0.0000013
Na	0.0	0.0181363	0.0179925	0.0	0.0181363	0.0179925
Si	0.0002321	0.0001651	0.0001705	0.0001961	0.0001651	0.0001705
Al	0.0000026	0.0000043	0.0000048	0.0000012	0.0000043	0.0000048
Mn	0.0002144	0.0002432	0.0002512	0.0001950	0.0002432	0.0002512
Cr	0.0025322	0.0029562	0.0030388	0.0022743	0.0029562	0.0030388
Fe	0.0090962	0.0104363	0.0110018	0.0082314	0.0104363	0.0110018
Ni	0.0011231	0.0013233	0.0013586	0.0009914	0.0013233	0.0013586
Cu	0.0000322	0.0000357	0.0000370	0.0000309	0.0000357	0.0000370
Mo	0.0000161	0.0000174	0.0000183	0.0000155	0.0000174	0.0000183
P	0.0000040	0.0000040	0.0000042	0.0000040	0.0000040	0.0000042
S	0.0000012	0.0000012	0.0000013	0.0000012	0.0000012	0.0000013
Cl	0.0	0.0000006	0.0000006	0.0	0.0000006	0.0000006
Ca	0.0	0.0000042	0.0000041	0.0	0.0000042	0.0000041
Co	0.0000038	0.0000037	0.0000043	0.0000038	0.0000037	0.0000043

Ref. : PNC SA0765 ANL-ZPR-491

Table 4.2.2-1 (Contd)

Isotopes	Control Rod	Control Rod	Control Rod	Control Rod	Control Rod	Control Rod
	Master 605 0-20	Master 605 20-31	Master 605 31-36	Master 606 0-20	Master 606 20-31	Master 606 31-36
BO	0.0071583	0.0	0.0	0.0085434	0.0	0.0
B1	0.0290256	0.0	0.0	0.0346512	0.0	0.0
C	0.0094051	0.0000309	0.0000447	0.0110453	0.0000309	0.0000447
O	0.0000006	0.0000013	0.0000013	0.0000787	0.0000013	0.0000013
Na	0.0087470	0.0181363	0.0179925	0.0087470	0.0181363	0.0179925
Si	0.0002035	0.0001651	0.0001705	0.0001999	0.0001651	0.0001705
Al	0.0000054	0.0000043	0.0000048	0.0000033	0.0000043	0.0000048
Mn	0.0002605	0.0002432	0.0002512	0.0002198	0.0002432	0.0002512
Cr	0.0031765	0.0029562	0.0030388	0.0026312	0.0029562	0.0030388
Fe	0.0112393	0.0104363	0.0110018	0.0094141	0.0104363	0.0110018
Ni	0.0014421	0.0013233	0.0013586	0.0011628	0.0013233	0.0013586
Cu	0.0000361	0.0000357	0.0000370	0.0000336	0.0000357	0.0000370
Mo	0.0000178	0.0000174	0.0000183	0.0000167	0.0000174	0.0000183
P	0.0000040	0.0000040	0.0000042	0.0000040	0.0000040	0.0000042
S	0.0000012	0.0000012	0.0000013	0.0000012	0.0000012	0.0000013
Cl	0.0000003	0.0000006	0.0000006	0.0000003	0.0000005	0.0000006
Ca	0.0000020	0.0000042	0.0000041	0.0000020	0.0000042	0.0000041
Co	0.0000038	0.0000037	0.0000043	0.0000038	0.0000037	0.0000043

Table 4.2.2-1 (Contd)

Isotopes	Control Rod	Control Rod	Control Rod	Control Rod	Control Rod	Control Rod
	Master 607 0-20	Master 607 20-31	Master 607 31-36	Master 608 0-20	Master 608 20-31	Master 608 31-36
BO	0.0071436	0.0	0.0	0.0071583	0.0072759	0.0
B1	0.0289671	0.0	0.0	0.0290256	0.0295024	0.0
C	0.0093870	0.0000309	0.0000447	0.0094051	0.0095480	0.0000479
O	0.0000006	0.0000013	0.0000013	0.0000006	0.0000068	0.0000013
Na	0.0087470	0.0181363	0.0179925	0.0087470	0.0087131	0.0175023
Si	0.0002043	0.0001651	0.0001705	0.0002035	0.0002034	0.0001905
Al	0.0000051	0.0000043	0.0000048	0.0000054	0.0000048	0.0000060
Mn	0.0002613	0.0002432	0.0002512	0.0002605	0.0002578	0.0002692
Cr	0.0031882	0.0029562	0.0030388	0.0031765	0.0031389	0.0032725
Fe	0.0112792	0.0104363	0.0110018	0.0112393	0.0111169	0.0118247
Ni	0.0014482	0.0013233	0.0013586	0.0014421	0.0014216	0.0014830
Cu	0.0000361	0.0000357	0.0000370	0.0000361	0.0000359	0.0000384
Mo	0.0000178	0.0000174	0.0000183	0.0000178	0.0000177	0.0000189
P	0.0000040	0.0000040	0.0000042	0.0000040	0.0000040	0.0000050
S	0.0000012	0.0000012	0.0000013	0.0000012	0.0000012	0.0000013
Cl	0.0000003	0.0000006	0.0000006	0.0000003	0.0000003	0.0000006
Ca	0.0000020	0.0000042	0.0000041	0.0000020	0.0000020	0.0000040
Co	0.0000038	0.0000037	0.0000043	0.0000038	0.0000037	0.0000051

Ref. : PNC SA0765 ANL-ZPR-491

Table 4.2.2-2 Data Processing for ZPPR-18A 100% Natural B, C Control Rod Measurements

Control Rods	Reactor Loading Number	Data File Number	Number of FCs	χ^2	Source Ratio	Measured Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
1-6	46	43	61	1.279	1.0036	<u>8.444</u>	0.152	0.869
7-12	47	44	60	1.340	0.9851	<u>7.997</u>	0.136	0.868
13-24	48	45	61	1.472	0.8521	<u>7.408</u>	0.146	1.029

Table 4.2.2-3 Data Processing for Control Rods on the X-Axis in ZPPR-18A

Control Rods	Reactor Loading Number	Data File Number	Number of FCs	χ^2	Source Ratio	Measured Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
A	49	46	64	1.438	1.0153	<u>2.224</u>	0.111	0.873
B	50	47	63	1.295	0.9994	<u>1.985</u>	0.0973	0.873
B+b	51	48	63	1.469	1.0128	<u>3.982</u>	0.108	0.866
C	52	49	64	1.418	0.9732	<u>1.575</u>	0.0958	0.876
C+c	53	50	64	1.445	0.9945	<u>3.805</u>	0.133	0.871
D	54	51	64	1.190	0.9614	<u>1.198</u>	0.0968	0.882
D+d	55	52	63	1.054	0.9601	<u>2.951</u>	0.0999	0.869
E	56	53	63	1.133	0.9645	<u>0.809</u>	0.0809	0.894
E+e	57	54	63	1.470	0.9471	<u>1.892</u>	0.104	0.874
F	58	55	64	1.112	0.9761	<u>0.532</u>	0.101	0.919
F+f	59	56	64	1.470	0.9578	<u>1.178</u>	0.0930	0.885
G	60	57	64	0.865	0.9872	<u>0.282</u>	0.113	0.990
G+g	61	58	64	1.277	0.9744	<u>0.591</u>	0.108	0.916
CRP A	91	88	64	1.436	1.0019	<u>0.496</u>	0.118	0.928
CRP F+f	92	89	64	1.034	0.9877	<u>0.359</u>	0.139	0.957

Table 4.2.2-4 Data Processing for ZPPR-18A 50% Natural B,C Control Rod-Bank Measurements

Control Rod Pattern	Drawer Master	Reactor Loading Number	Data File Number	Number of FCs	χ^2	Source Ratio	Measured Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
6	606	63	60	64	1.094	1.0000	<u>1.286</u>	0.0937	0.881
5	606	64	61	63	1.299	1.0024	<u>1.204</u>	0.0880	0.882
12	606	65	62	63	1.334	0.9840	<u>0.842</u>	0.0875	0.894
11	606	66	63	63	1.169	0.9924	<u>0.737</u>	0.0927	0.900
21	606	67	64	64	1.362	0.9944	<u>0.407</u>	0.116	0.945
23	606	68	65	64	1.306	0.9881	<u>0.470</u>	0.113	0.932
24	606	69	66	63	1.235	0.9814	<u>0.514</u>	0.123	0.925
14,18,20,24	605								
16,22	607	70	67	63	0.974	0.9533	<u>3.050</u>	0.0825	0.872
13,14,17,18,19,20,23,24	605								
15,16,21,22	604	71	68	61	1.475	0.9013	<u>5.745</u>	0.117	0.916
13,14,17,18,19,20,23	605								
15,16,21,22	607	72	69	61	1.287	0.9140	<u>5.176</u>	0.113	0.892
13,14,17,18,19,23	605								
15,16,21,22	607	73	70	57	1.359	0.8970	<u>10.979</u>	0.155	0.923
and 7-12	606								
13,14,17,18,19,20,23,24	605								
15,16,21,22	607	74	71	59	1.464	0.8766	<u>10.221</u>	0.200	0.977
and 7-11	606								
13,14,17,18,19,23,24	605								
15,16,21,22	607	75	72	59	1.361	0.8790	<u>11.458</u>	0.141	0.960
and 7-12	606								
13,14,17,18,19,20,23,24	605								
15,16,21,22	607	76	73	58	1.514	0.9837	<u>14.996</u>	0.179	0.874
and 1-5	606								

Ref. : PNC SA0765 ANL-ZPR-491

Table 4.2.2-4 (contd)

Control Rod Pattern	Drawer Master	Reactor Loading Number	Data File Number	Number of FCs	χ^2	Source Ratio	Measured Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
13,14,17,18,19,20,23,24 15,16,21,22 and 1-6	605 607 606	77	74	57	1.472	1.0048	<u>17.026</u>	0.188	0.875
13,14,17,18,19,20,23 15,16,21,22 and 1-6	605 607 606	78	75	59	1.468	0.9919	<u>15.547</u>	0.151	0.868
1-6	606	79	76	61	1.179	1.0174	<u>7.119</u>	0.135	0.867
1-5	606	80	77	62	1.288	1.0113	<u>5.958</u>	0.130	0.867
1-5 and 7-12	606 605	81	78	59	1.486	1.0093	<u>11.980</u>	0.163	0.870
1-6 and 7-11	606 605	82	79	61	1.494	0.9827	<u>11.472</u>	0.155	0.870
1-6 and 7-12	606 605	83	80	59	1.523	1.0113	<u>13.114</u>	0.181	0.873
7-11	606	84	81	63	1.122	0.9735	<u>4.772</u>	0.100	0.866
7-12	606	85	82	62	1.308	0.9909	<u>6.264</u>	0.120	0.866
13,24	606	86	83	63	1.274	0.9571	<u>0.910</u>	0.127	0.897
13,18,19,24	606	87	84	63	1.316	0.9344	<u>2.180</u>	0.103	0.878
15,16	606	88	85	63	1.216	0.9845	<u>0.705</u>	0.108	0.906
15,16,21,22	606	89	86	63	0.839	0.9826	<u>1.593</u>	0.0834	0.877

Ref. : PNC SA0765 ANL-ZPR-491

Table 4.2.2-5 Data Processing for Half Inserted 50% B₁C Control Rods in ZPPR-18A

<u>Control Rods</u>	<u>Reactor Loading Number</u>	<u>Data File Number</u>	<u>Number of FCs</u>	<u>χ^2</u>	<u>Source Ratio</u>	<u>Measured Worth, \$</u>	<u>Statistical Uncertainty, %</u>	<u>Total Uncertainty, %</u>
1-6	94	91	59	1.354	1.0217	<u>3.912</u>	0.163	0.877
1-6 and 13-22, 24	95	92	57	1.388	1.0023	<u>7.874</u>	0.188	0.877
1-6 and 13-23	96	93	57	1.508	1.0042	<u>7.793</u>	0.162	0.872
1-6 and 13-23 and 24 Full In	97	94	56	1.481	0.9981	<u>8.577</u>	0.155	0.870
1-6 and 13-24	98	95	54	1.501	1.0032	<u>8.278</u>	0.158	0.871

Ref. : PNC SA0765 ANL-ZPR-491

Table 4.2.2-6 Data Processing for the Measurement of the Worth of the Middle Bank of Control Rods in ZPPR-18B

	Mean using all Detectors	Mean with Rejection >3.6 σ	Least Squares Fit (LSFIT)	LSFIT with Adjusted Source Ratio
Number of Detectors	64	60	63	63
Reduced chi-square	5.95	1.78	1.28	1.28
Source Ratio	0.9977	0.9977	0.9977	0.9974
Worth, \$	6.175	6.157	6.183	<u>6.181</u>
Statistical Uncertainty, 1 σ ,%	0.20	0.17	0.10	0.10
Correlated Uncertainty, 1 σ ,%	0.92	0.92	0.92	0.92
Total Uncertainty 1 σ ,%	0.94	0.93	0.92	0.92

Ref. : PNC SA0765 ANL-ZPR-491

Table 4.2.2-7 Data Processing for the Measurement of the Worth of Control Rods 13 and 24 in ZPPR-19A

	Mean using all Detectors	Mean with Rejection 3.6 σ	Least Squares Fit (LSFIT)	LSFIT with Adjusted Source Ratio
Number of Detectors	64	37	62	62
Reduced chi-square	28.3	3.45	1.42	1.42
Source Ratio	0.9350	0.9350	0.9350	0.9280
Worth, \$	0.9304	0.9276	0.9269	<u>0.9182</u>
Statistical Uncertainty, 1 σ ,%	0.33	0.33	0.08	0.08
Correlated Uncertainty, 1 σ ,%	1.22	1.22	1.22	0.98
Total Uncertainty 1 σ ,%	1.26	1.26	1.22	0.99

Ref. : PNC SA0765 ANL-ZPR-492

Table 4.2.2-8 Data Processing for Control Rod Measurements in ZPPR-19B

Control Rod	Drawer Master	Reactor Loading Number	Data File Number	Number of FCs	χ^2	Source Ratio	Measured Worth, \$	Statistical Uncertainty, %	Total Uncertainty, %
15,16	607	29	34	63	1.356	0.9771	<u>0.7466</u>	0.0801	0.893
21,22	607	30	35	64	1.441	0.9759	<u>0.7538</u>	0.0782	0.894
15,16,21,22 (Y)	607	31	36	63	1.189	0.9668	<u>1.709</u>	0.0969	0.878
13,24	605	32	37	63	1.158	0.9741	<u>0.7891</u>	0.0744	0.892
13,12	605	33	38	62	1.295	0.9550	<u>1.334</u>	0.0978	0.882
13,24,18,19,12	605	34	39	62	1.333	0.9561	<u>2.548</u>	0.103	0.875
13,24,18,19 (X)	605	35	40	63	0.930	0.9656	<u>1.832</u>	0.0786	0.876
1-6 (R1)	606	36	41	62	1.369	1.0147	<u>7.285</u>	0.131	0.867
1-6 and 12	606 605	37	42	61	1.284	0.9908	<u>7.959</u>	0.118	0.867
13,14,17,18,19,20,23,24 15,16,21,22 and 1-6	605 607 606	38	43	59	1.505	1.0070	<u>17.303</u>	0.199	0.879
13,14,17,18,19,20,23,24	605	39	44	61	1.503	0.9066	<u>5.828</u>	0.102	0.906
15,16,21,22 (R3)	607								
7-12 (R2)	606	40	45	62	1.036	0.9873	<u>6.350</u>	0.0913	0.865

Table 4.2.2-9 Z P P R - 1 8 A の制御棒価値の測定パターン

CRパターン	CR位置 棒	第1リング						第2リング						第3リング											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
100XB,C バンク・オフ	1	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C 単一制御棒	4	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	7	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	8	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	9	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	10	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C 第3リング バンク・オフ	11	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	12	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	13	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C バンク・オフ リング間干渉 第3-第1、2	14	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	15	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	16	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	17	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	18	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C 第1リング	20	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	21	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C バンク・オフ リング間干渉	22	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	23	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	24	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C 第2リング	25	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	26	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C第3リング Puセクタ側	27	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	28	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C第3リング Uセクタ側	29	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	30	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C 半挿入 No. 24 ワース	31	⊗	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	32	⊗	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	33	⊗	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	34	⊗	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	35	⊗	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

● : 100XB,C 全挿入
 ○ : 50XB,C 全挿入
 ⊗ : 50XB,C 半挿入
 ○ : CRP

Table 4.2.2-10 ZPPR-18A の半径方向制御棒価値分布測定ケース

位置 ケース	A	B	b	C	c	D	d	E	e	F	f	G	g
1	⊗												
2		⊗											
3		⊗	⊗										
4				⊗									
5				⊗	⊗								
6						⊗							
7						⊗	⊗						
8								⊗					
9								⊗	⊗				
10										⊗ ^{*2}			
11 ^{*1}										⊗ ^{*2}	⊗ ^{*2}		
12												⊗ ^{*2}	
13												⊗ ^{*2}	⊗ ^{*2}

⊗ : 50%天然B,C 全挿入

*1 CRPの置換反応度も測定。

*2 2×3ドロワ。(他は全て3×3ドロワ)

Table 4.2.2-11 ZPPR-19Bの制御棒価値の測定パターン

CR位置 ケース	第1リング						第2リング						第3リング											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
50XB,C Y軸方向 第3リング ペア、カルテット	1	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	3	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C X軸方向 第3リング ペア、カルテット	4	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	7	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
50XB,C 単一リング バウ・オフ	8	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	9	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	10	⊗	⊗	⊗	⊗	⊗	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	11	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	12	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

⊗ : 50XB,C 全挿入

○ : CRP

Table 4.2.2-12 ZPPR-18Aの制御棒価値の実験結果と解析結果のまとめ
(単一制御棒パターン、バンク制御棒パターン)

NO	CR 1)	BASE (\$ 2)	CORRECTION FACTOR 3)					CAL. (\$)	EXP. (\$)	C/E
			FG	FM	FT	FA	TOT F			
1	R1(100%B4C)	7.827	0.971	1.072	0.967	(0.983)	0.989	7.743	8.444	0.917
2	R2(100%B4C)	7.564	0.966	1.101	0.965	(0.997)	1.023	7.740	7.997	0.967
3	R3(100%B4C)	7.375	0.963	1.072	0.983	(1.014)	1.029	7.589	7.408	1.024
4	NO. 6 CR	1.215	(0.975)	(1.052)	(0.966)	(0.983)	0.974	1.183	1.286	0.920
5	NO. 5 CR	1.150	(0.975)	(1.052)	(0.966)	(0.983)	0.974	1.120	1.204	0.930
6	NO.12 CR	0.808	(0.971)	(1.064)	(0.957)	(0.997)	0.986	0.797	0.842	0.946
7	NO.11 CR	0.727	(0.971)	(1.064)	(0.957)	(0.997)	0.986	0.718	0.737	0.973
8	NO.21 CR	0.416	(0.963)	(1.055)	(0.972)	(1.013)	1.000	0.416	0.407	1.021
9	NO.23 CR	0.465	(0.963)	(1.055)	(0.972)	(1.013)	1.000	0.465	0.470	0.988
10	NO.24 CR	0.492	(0.972)	(1.037)	(0.995)	(1.011)	1.014	0.499	0.514	0.970
11	R3(EVEN CR)	3.061	(0.967)	(1.046)	(0.984)	(1.014)	1.010	3.091	3.050	1.013
12	R3	5.800	0.967	1.042	0.984	1.014	1.006	5.833	5.745	1.015
13	R3-S24	5.224	(0.967)	(1.046)	(0.984)	(1.014)	1.010	5.274	5.176	1.018
14	R2,R3-S24	10.842	(0.969)	(1.055)	(0.971)	(1.006)	0.998	10.822	10.979	0.985
15	R2,R3-S12	10.176	(0.969)	(1.055)	(0.971)	(1.006)	0.998	10.156	10.221	0.993
16	R2,R3	11.389	(0.969)	(1.053)	(0.971)	(1.006)	0.996	11.344	11.458	0.990
17	R1,R3-S6	14.474	(0.971)	(1.049)	(0.975)	(0.999)	0.992	14.352	14.996	0.957
18	R1,R3	16.354	(0.971)	(1.047)	(0.975)	(0.999)	0.990	16.189	17.026	0.950
19	R1,R3-S24	15.037	(0.971)	(1.049)	(0.975)	(0.999)	0.992	14.910	15.547	0.959
20	R1	6.690	0.975	1.052	0.966	0.983	0.974	6.516	7.119	0.915
21	R1-S6	5.625	(0.975)	(1.052)	(0.966)	(0.983)	0.974	5.476	5.958	0.919
22	R1,R2-S6	11.408	(0.973)	(1.058)	(0.962)	(0.990)	0.980	11.181	11.980	0.933
23	R1,R2-S12	10.916	(0.973)	(1.058)	(0.962)	(0.990)	0.980	10.698	11.472	0.932
24	R1,R2	12.456	(0.973)	(1.058)	(0.962)	(0.990)	0.980	12.208	13.114	0.930
25	R2-S12	4.632	(0.971)	(1.064)	(0.957)	(0.997)	0.986	4.570	4.772	0.957
26	R2	6.047	0.971	1.064	0.957	0.997	0.986	5.963	6.264	0.952
27	R3(PU-2)	0.876	(0.972)	(1.037)	(0.995)	(1.011)	1.014	0.889	0.910	0.976
28	R3(PU-4)	2.096	0.972	1.037	0.995	1.011	1.014	2.125	2.180	0.974
29	R3(U -2)	0.724	(0.963)	(1.055)	(0.972)	(1.013)	1.000	0.724	0.705	1.027
30	R3(U -4)	1.652	0.963	1.055	0.972	1.013	1.000	1.651	1.593	1.036
31	R1H	3.642	(0.975)	(1.052)	(0.966)	(0.983)	0.974	3.546	3.912	0.906
32	R1H,R3H-S23	7.389	(0.971)	(1.049)	(0.975)	(0.999)	0.992	7.327	7.874	0.930
33	R1H,R3H-S24	7.354	(0.971)	(1.049)	(0.975)	(0.999)	0.992	7.292	7.793	0.935
34	R1H,R3H-24F	8.087	(0.971)	(1.049)	(0.975)	(0.999)	0.992	8.019	8.574	0.935
35	R1H,R3H	7.781	(0.971)	(1.049)	(0.975)	(0.999)	0.992	7.716	8.278	0.932

1) C : CENTRAL CR, R1,R2, AND R3 : RING 1, RING 2, AND RING 3 CRS,
EVEN : EVEN NUMBER CRS, S : STUCK ROD, H : HALF-INSERTED CRS,
PU : PU SECTOR REGION CRS, U : U SECTOR REGION CRS

2) BEFF=0.3980 %

3) FG : ENERGY GROUP, FM : MESH SIZE, FT : TRANSPORT, FA : AMM MODEL

THE VALUE OF PARENTHESES ARE EXTRAPORATED FROM CORR. FACTORS FOR TYPICAL CASES

Table 4.2.2-13 ZPPR-18Aの制御棒値の実験結果と解析結果のまとめ
(X軸方向の制御棒値分布, 燃料との置換ワース)

NO	CR 1)	BASE (\$ 2)	CORRECTION FACTOR 3)					CAL. (\$)	EXP. (\$)	C/E
			FG	FM	FT	FA	TOT F			
1	A CR	2.122	0.976	1.045	0.962	0.983	0.964	2.046	2.224	0.920
2	B CR	1.912	(0.977)	(1.045)	(0.964)	(0.985)	0.969	1.854	1.985	0.933
3	B+B CR	3.786	0.977	-1.045	(0.964)	0.985	0.969	3.670	3.982	0.921
4	C CR	1.521	(0.978)	(1.044)	(0.966)	(0.988)	0.974	1.482	1.575	0.940
5	C+C CR	3.641	0.978	1.044	0.966	0.988	0.974	3.547	3.805	0.932
6	D CR	1.161	(0.978)	(1.035)	(0.976)	(0.998)	0.987	1.145	1.198	0.955
7	D+D CR	2.843	0.978	1.035	(0.976)	0.998	0.987	2.805	2.951	0.950
8	E CR	0.782	(0.978)	(1.026)	(0.987)	(1.008)	0.999	0.781	0.809	0.965
9	E+E CR	1.829	0.978	1.026	0.987	1.008	0.999	1.827	1.892	0.965
10	F CR	0.510	(0.977)	(1.017)	(0.984)	(1.014)	0.991	0.505	0.532	0.950
11	F+F CR	1.134	0.977	1.017	(0.984)	1.014	0.991	1.124	1.178	0.954
12	G CR	0.258	(0.977)	(1.036)	(0.981)	(1.037)	1.030	0.266	0.282	0.942
13	G+G CR	0.553	0.977	1.036	0.981	1.037	1.030	0.570	0.591	0.964
14	A CRP	0.513	0.987	1.026	0.935	0.983	0.931	0.477	0.496	0.962
15	F+F CRP	0.364	1.005	1.009	0.962	1.014	0.990	0.360	0.359	1.003

1) CONTROL ROD POSITION ON X-AXIS

2) BEFF=0.3980 %

3) FG : ENERGY GROUP, FM : MESH SIZE, FT : TRANSPORT, FA : AMM MODEL

THE VALUE OF PARENTHESES ARE EXTRAPORATED FROM CORR. FACTORS FOR TYPICAL CASES

Table 4.2.2-14 ZPPR-18Bの制御棒値の実験結果と解析結果
(制御棒リング1及び3半挿入状態でのリング2の制御棒値)

ケースNo. 制御棒パターン 実験値 (\$) 解析値 (\$) C/E値

1	R2	6.181	5.687	0.920
(参考) *1	R2(R1,R3全引抜)	6.264	5.963	0.952

R2 : リング2制御棒 *1 ZPPR-18A

Table 4.2.2-15 ZPPR-19Bの制御棒値の実験結果と解析結果のまとめ
(バンク制御棒パターン)

CR 1)	BASE (\$ 2)	CORRECTION FACTOR 3)					CAL. (\$)	EXP. (\$)	C/E
		FG	FM	FT	FA	TOT F			
R1 CR	6.530	0.976	1.051	0.973	0.989	0.987	6.447	7.285	0.884
R2 CR	5.946	0.972	1.063	0.971	0.997	1.000	5.949	6.350	0.936
R3 CR	5.746	0.966	1.044	0.991	1.007	1.006	5.781	5.828	0.991
R3X CR	1.784	0.967	1.042	1.000	1.007	1.015	1.810	1.832	0.988
R3Y CR	1.668	0.967	1.044	0.996	1.007	1.012	1.688	1.710	0.987

1) C : CENTRAL CR, R1,R2, AND R3 : RING 1, RING 2, AND RING 3 CRS,

2) BEFF=0.40515 %

3) FG : ENERGY GROUP, FM : MESH SIZE, FT : TRANSPORT, FA : AMM MODEL

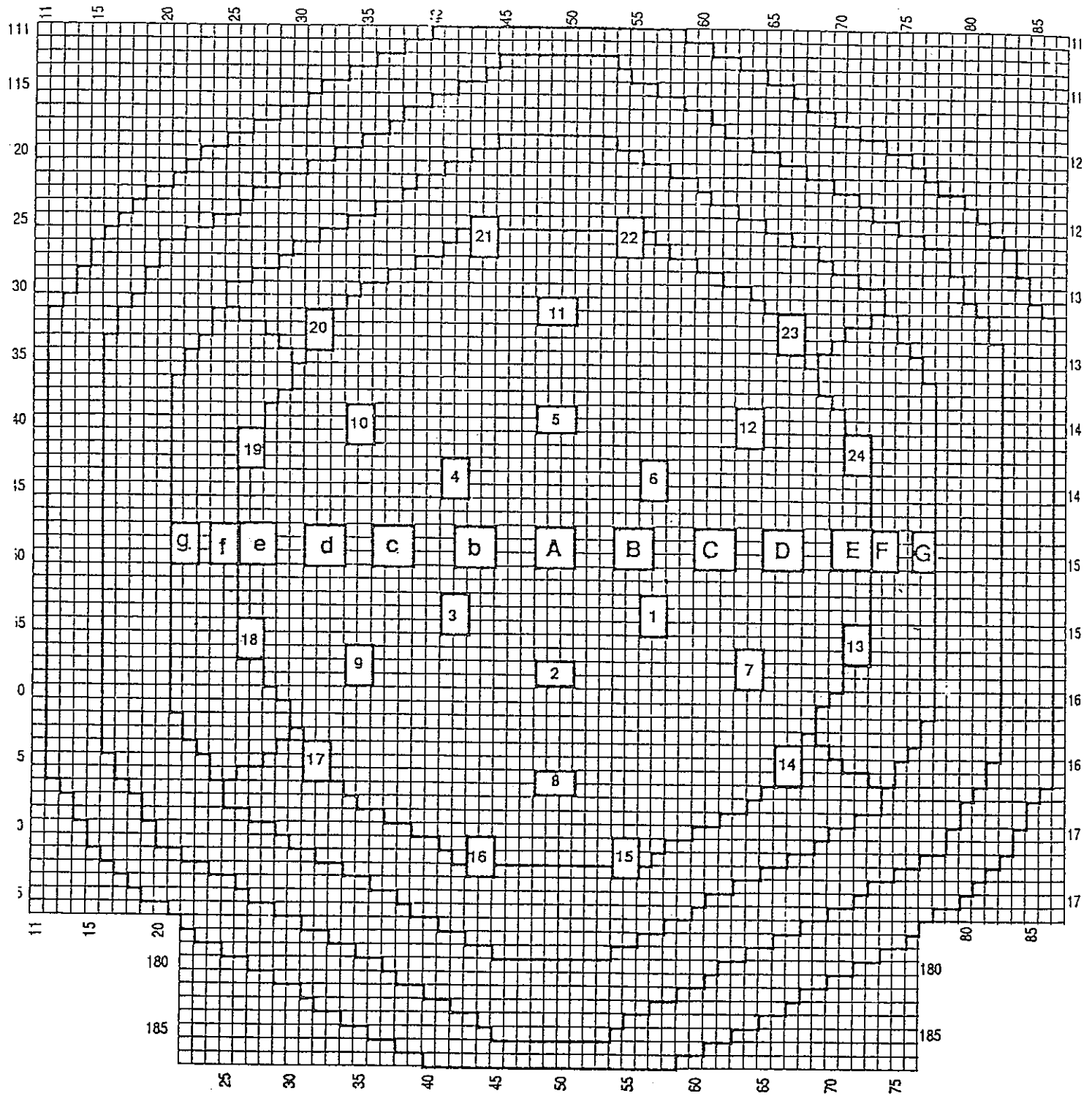


Fig. 4.2.2-1 Control Rod Locations in ZPPR-18

Ref. : PNC SA0765 ANL-ZPR-491

4. 2. 3 反応率分布

(1) 測定概要

ZPPR-18/19体系における反応率分布はZPPR-17 体系における測定法と同一の手
法で測定処理されている。4.1.3 節を参考とすることとしここでは説明を繰返さ
ない。

(2) ZPPR-18体系の測定データ

a. 測定体系のまとめ

項目	ZPPR-18A	ZPPR-18B	ZPPR-18C
体系の特徴	サイクル末期模擬 24CRP チャンネル	サイクル初期模擬 6CRP チャンネル 18模擬制御棒半挿入	サイクル初期模擬 7CRP チャンネル 17模擬制御棒半挿入
測定日	1987-10-21	1987-12-10	1987-12-21
測定炉心	loading #38 run #23	loading #112/115 run #102/105	loading #121 run #111
測定体系	臨界基準体系	同左	同左
PSR 位置	(135-67)と対称位置	同左	同左
深度	炉心中心面より 368 mm	428.0/432.0mm	296.0mm
反応度	11.8%	6.08/5.83%	15.5%

ZPPR-18Bは軸方向分布RUN#102 と径方向分布RUN#103 に別けて測定された。

項目	ZPPR-19B
体系の特徴	サイクル末期模擬 24CRP チャンネル

測定日	1988-02-02
測定炉心	loading #24 run #31
測定体系	臨界基準体系
PSR 位置	(135-67)と対称位置
深度	炉心中心面より 387 mm
反応度	10.1¢

b. 測定結果

Z P P R - 1 8 A (出典ZPR-TM-489, 491, 492[ref. 24, 26, 27])

Fig. 4.2.3-1 ZPR-18Aの箔配置位置

Table 4.2.3-1 ~3 炉心 x/y軸方向分布

Table 4.2.3-4/5 炉心15° 方向分布

Table 4.2.3-6/7 炉心30° 方向分布

Table 4.2.3-8 ~10 Z軸方向分布

Table 4.2.3-11 炉心 x/y軸方向分布(Revised data)

Table 4.2.3-12 炉心15° / 30° 方向分布(Revised data)

Table 4.2.3-13/14 反応率比径方向分布

Table 4.2.3-15 反応率比径方向分布(Revised data)

Table 4.2.3-16 反応率比軸方向分布

Table 4.2.3-17~19 basic data (上記の基本データ集)

Z P P R - 1 8 B (出典ZPR-TM-491[ref. 26])

Table 4.2.3-20~25 径方向分布 x/y軸

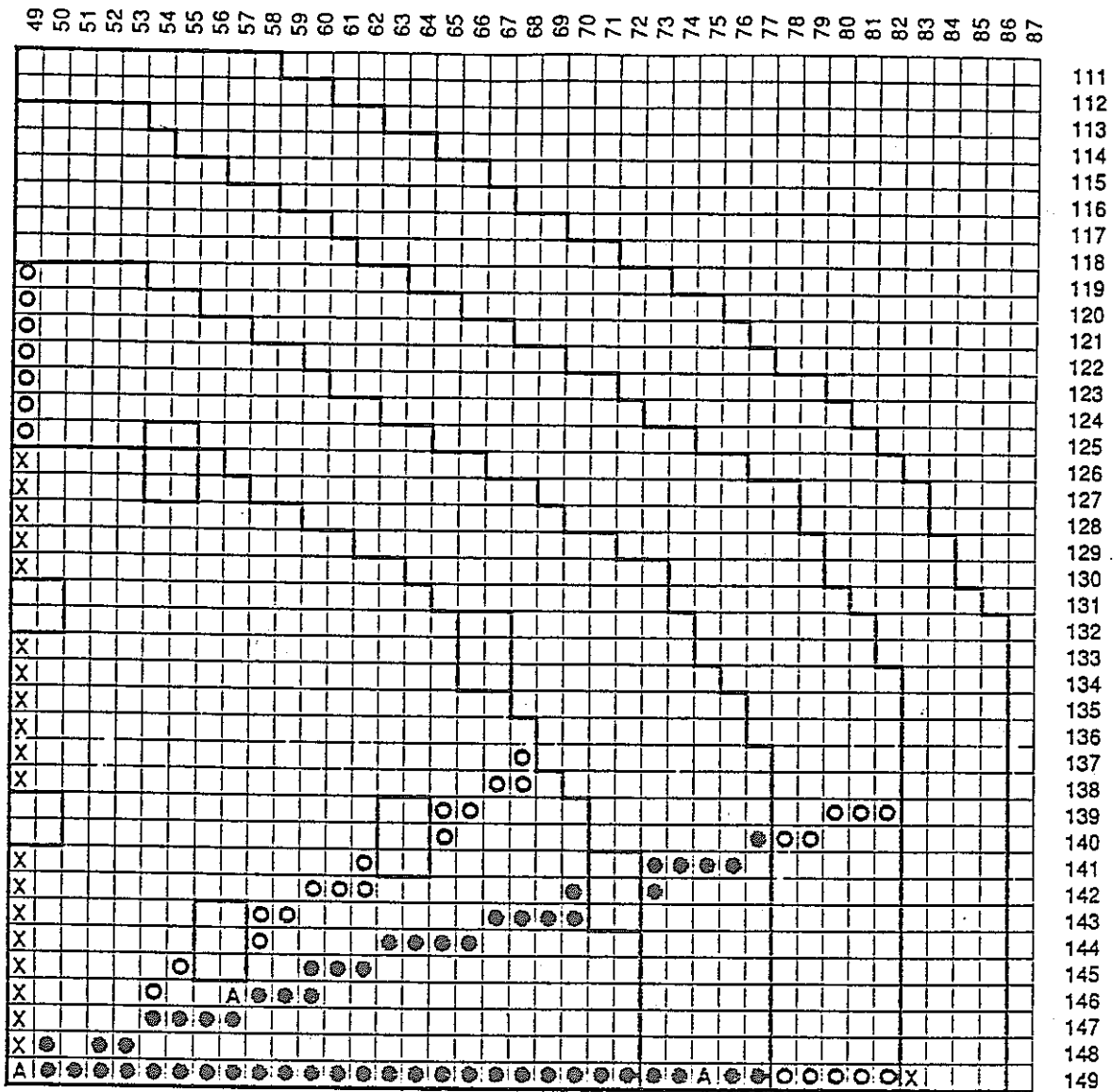
Table 4.2.3-26 炉心15° 方向分布

Table 4.2.3-27 炉心30° 方向分布

Table 4.2.3-28~33 Z軸方向分布

Table 4.2.3-34~36 反応率比径方向分布

Table 4.2.3-37~41	basic data (上記の基本データ集)
Table 4.1.3-42/43	cell factor 評価用basic data
Table 4.1.2-44	セルファクター評価結果
Z P P R - 1 8 C (出典ZPR-TM-492[ref. 27])	
Fig.4.2.3-2	ZPPR-18Cのfoil装荷位置
Table 4.2.3-45~48	径方向分布 x軸 half-1/-2サイド
Table 4.1.3-49~53	炉心15° 方向分布 half-1/-2サイド
Table 4.1.3-54~57	Z軸方向分布
Table 4.1.3-58	反応率比径方向分布
Table 4.1.3-59~61	basic data (上記の基本データ集)
Z P P R - 1 9 B (出典ZPR-TM-492[ref. 27])	
Fig.4.2.3-3	ZPPR-18Cのfoil装荷位置
Table 4.2.3-62~64	径方向分布 x/y軸
Table 4.2.3-65/66	炉心15° 方向分布
Table 4.2.3-67/68	炉心30° 方向分布
Table 4.2.3-69~71	Z軸方向分布
Table 4.2.3-72/73	反応率比径方向分布
Table 4.2.3-74	反応率比軸方向分布
Table 4.2.3-75~77	basic data (上記の基本データ集)
Table 4.1.3-78	cell factor 評価用basic data
Table 4.1.2-79/80	セルファクター評価結果



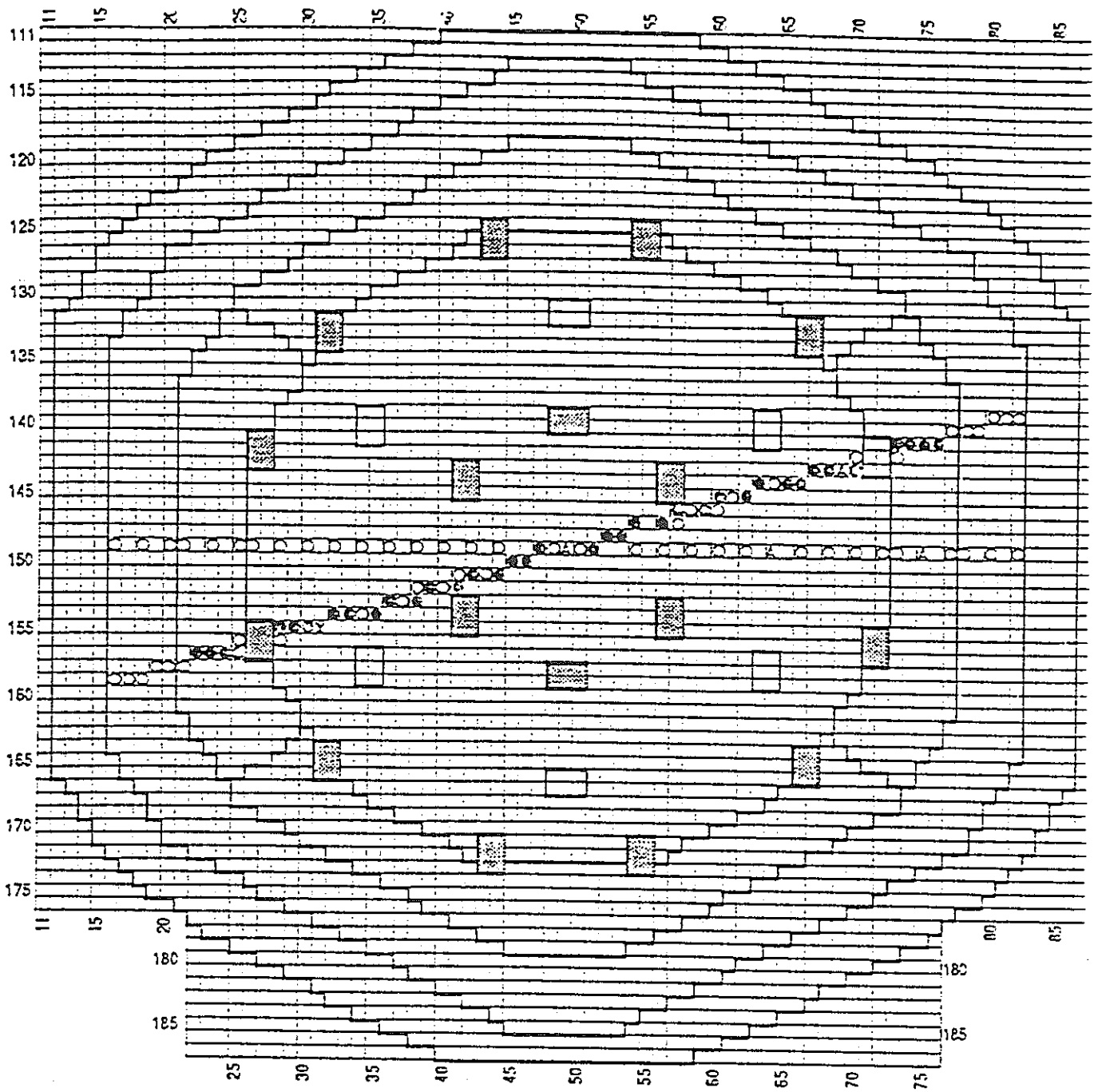
A - AXIAL TRAVERSE

X - 235 U ONLY

● - 235 U , 238 U , 239 PU

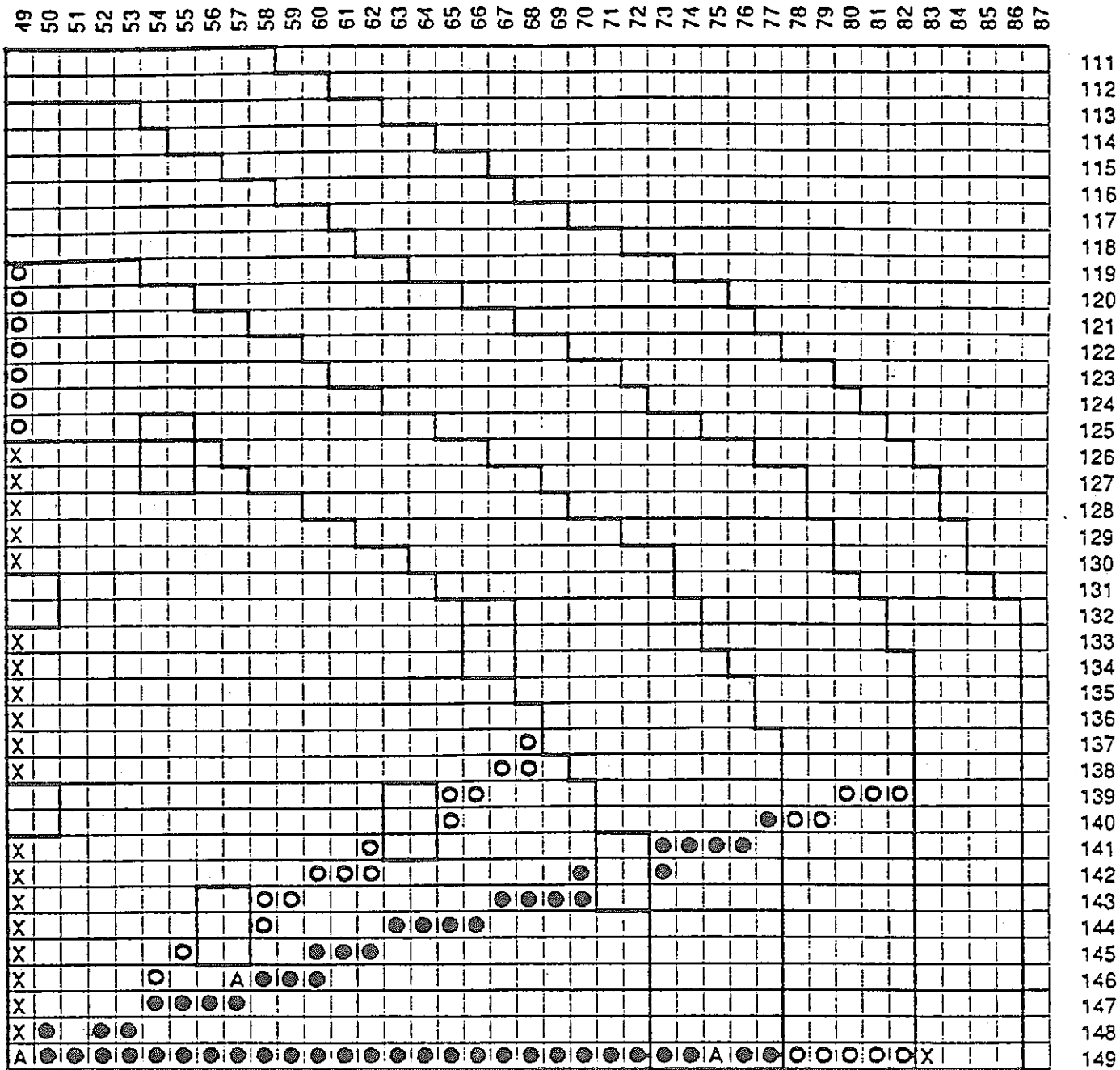
○ - 235 U , 238 U , ONLY

Fig. 4.2.3-1 Foil Locations in ZPPR-18A in the xy Plane



- 235U, 238U Half-2, 5 cm
235U Half-2, 28 cm, Half-1, 5 cm
- 235U, 238U Half-2, 5 cm
235U Half-2, 28 cm
- X 235U Half-1, 5 cm
- A Axial Traverse
- ▨ Half-inserted control rods

Fig. 4.2.3-2 Foil Locations in ZPPR-18C in the xy Plane.



A - AXIAL TRAVERSE

● - 235 U, 238 U, 239 PU

X - 235 U ONLY

○ - 235 U, 238 U, ONLY

Fig. 4.2.3-3 Foil Locations in ZPPR-19B in the xy Plane

Table 4.2.3-1 ZPPR-18A: Radial Reaction Rate Distributions along the X-axis at Z = 5.16 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
149 49	IC SF	8.793	0.997	9.283	1.012	1.2370	1.044	0.2071	1.008
149 50	IC SF	8.749	1.001	9.276	1.012	1.2210	1.058	0.2147	0.973
149 51	IC SM	8.459	1.024	9.100	1.018	1.1490	1.053	0.2083	0.990
149 52	IC SF	8.611	1.001	9.185	1.002	1.2050	1.050	0.2099	0.975
149 53	IC SM	8.459	1.005	8.984	1.010	1.1230	1.055	0.2045	0.985
149 54	IC SF	8.434	1.003	9.229	0.979	1.1750	1.057	0.2052	0.974
149 55	IC SM	8.283	1.008	8.843	1.011	1.1030	1.057	0.1996	0.984
149 56	IC SF	8.331	0.998	8.932	0.999	1.1700	1.048	0.2044	0.954
149 57	IC SM	8.219	1.001	8.745	1.012	1.0890	1.059	0.2002	0.964
149 58	IC SF	8.282	0.991	8.843	0.999	1.1650	1.043	0.1984	0.976
149 59	IC SF	8.063	1.005	8.673	1.002	1.1480	1.040	0.1930	0.993
149 60	IC SM	7.842	1.015	8.342	1.020	1.0540	1.054	0.1888	0.998
149 61	IC SF	7.848	1.008	8.426	1.004	1.1140	1.045	0.1826	1.029
149 62	IC SF	7.796	1.006	8.363	1.005	1.1070	1.045	0.1862	1.003
149 63	IC SM	7.594	1.012	8.178	1.006	1.0330	1.040	0.1823	1.003
149 64	IC SF	7.574	1.002	8.078	1.005	1.0720	1.042	0.1822	0.992
149 65	IC SF	7.405	1.007	7.915	1.009	1.0570	1.040	0.1734	1.027
149 66	IC SM	7.103	1.018	7.558	1.023	0.9500	1.063	0.1719	1.003
149 67	IC SF	7.019	1.004	7.452	1.008	0.9777	1.056	0.1740	0.966
149 68	IC SM	6.732	1.010	7.146	1.012	0.8983	1.051	0.1565	1.036
149 69	IC SF	6.549	1.007	6.995	1.001	0.9164	1.049	0.1588	0.994
149 70	IC SM	6.262	1.012	6.653	1.009	0.7640	1.049	0.1435	1.015
149 71	IC SF	6.064	1.009	6.479	0.999	0.8386	1.056	0.1510	0.985
149 72	IC SM	5.747	1.017	6.115	1.009	0.7640	1.049	0.1435	1.015
149 73	OC SF	5.549	1.009	5.872	1.004	0.7645	1.051	0.1417	1.033
149 74	OC SF	5.200	1.007	5.476	1.001	0.7128	1.046	0.1423	1.023
149 75	OC D	4.683	1.005	4.919	1.009	0.6335	1.049	0.1411	0.964
149 76	OC SF	4.109	0.998	4.409	0.990	0.5698	1.044	0.1070	1.044
149 77	OC SF	3.466	0.995	3.805	1.002	0.4882	1.073	0.0881	0.910
149 78	RB	--	--	3.234	1.016	0.4030	1.046	0.0366	1.108
149 79	RB	--	--	2.641	1.013	0.3192	1.059	0.0202	1.035
149 80	RB	--	--	2.121	1.009	0.2535	1.036	0.0120	0.955
149 81	RB	--	--	1.730	1.009	0.1968	1.024	0.0059	1.092
149 82	RB	--	--	1.455	1.072	0.1608	0.992	0.0041	0.898
149 83	RR	--	--	1.550	1.103	--	--	--	--

Table 4.2.3-2 ZPPR-18A: Radial Reaction Rate Distributions along the X-axis at Z = 28.02 cm

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
149 49	IC SF	7.708	1.002	1.0270	1.036	0.1669	1.013
149 50	IC SF	7.787	0.992	1.0380	1.025	0.1658	1.021
149 51	IC SM	7.549	1.010	0.9544	1.042	0.1644	1.015
149 52	IC SF	7.630	0.993	1.0070	1.034	0.1686	0.984
149 53	IC SM	7.419	1.007	0.9377	1.040	0.1625	1.005
149 54	IC SF	7.493	0.993	0.9866	1.037	0.1609	1.007
149 55	IC SM	7.417	0.993	0.9194	1.044	0.1543	1.032
149 56	IC SF	7.346	1.002	0.9856	1.026	0.1616	0.979
149 57	IC SM	7.285	1.002	0.9150	1.039	0.1589	0.985
149 58	IC SF	7.382	0.987	0.9715	1.031	0.1556	1.009
149 59	IC SF	7.165	0.999	0.9504	1.036	0.1573	0.988
149 60	IC SM	6.957	1.008	0.8821	1.037	0.1480	1.032
149 61	IC SF	6.961	1.001	0.9097	1.053	0.1558	0.977
149 62	IC SF	6.961	0.993	0.9171	1.038	0.1509	1.002
149 63	IC SM	6.749	1.003	0.8454	1.044	0.1468	1.008
149 64	IC SF	6.695	0.997	0.8757	1.049	0.1550	0.944
149 65	IC SF	6.660	0.986	0.8788	1.029	0.1429	1.007
149 66	IC SM	6.324	1.005	0.7943	1.044	0.1367	1.020
149 67	IC SF	6.197	0.996	0.8134	1.043	0.1395	0.973
149 68	IC SM	5.906	1.005	0.7347	1.054	0.1315	0.996
149 69	IC SF	5.751	0.999	0.7518	1.050	0.1362	0.936
149 70	IC SM	5.466	1.007	0.6876	1.043	0.1212	1.014
149 71	IC SF	5.301	1.000	0.7029	1.033	0.1183	1.014
149 72	IC SM	4.982	1.013	0.6294	1.042	0.1150	1.021
149 73	OC SF	4.844	0.994	0.6304	1.042	0.1179	1.000
149 74	OC SF	4.486	0.997	--	--	--	--
149 75	OC D	4.039	1.001	0.5176	1.047	0.1141	0.959
149 76	OC SF	3.582	0.992	--	--	--	--
149 77	OC SF	3.103	1.001	0.4030	1.059	0.0704	0.915
149 78	RB	2.657	1.010	--	--	--	--
149 79	RB	2.179	1.004	--	--	--	--
149 80	RB	1.735	1.010	--	--	--	--
149 81	RB	1.411	1.014	--	--	--	--
149 82	RB	1.194	1.074	--	--	--	--

Table 4.2.3-3 ZPPR-18A: Radial Reaction Rate Distributions along the Y-axis at Z = 5.16 cm

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp. ^a	C/E	Exp.	C/E
149	49 IC SF	9.283	1.012	1.2370	1.044	0.2071	1.008
148	49 IC SM	9.202	1.008	--	--	--	--
147	49 IC SF	9.177	1.004	--	--	--	--
146	49 IC SM	8.992	1.013	--	--	--	--
145	49 IC SF	9.193	0.989	--	--	--	--
144	49 IC SF	9.010	1.001	--	--	--	--
143	49 IC SM	8.836	1.004	--	--	--	--
142	49 IC SF	8.890	0.995	--	--	--	--
141	49 IC SM	8.971	0.996	--	--	--	--
	CRP						
138	49 IC SF	8.324	1.001	--	--	--	--
137	49 IC SM	7.909	1.001	--	--	--	--
136	49 IC SF	7.818	0.987	--	--	--	--
135	49 IC SF	7.635	0.988	--	--	--	--
134	49 IC SM	7.423	0.993	--	--	--	--
133	49 IC SF	7.447	0.990	--	--	--	--
	CRP						
130	49 IC SM	6.709	0.979	--	--	--	--
129	49 IC SF	6.334	0.971	--	--	--	--
128	49 IC SM	5.916	0.983	--	--	--	--
127	49 IC SF	5.713	0.970	--	--	--	--
126	49 IC SF	5.420	0.960	--	--	--	--
125	49 OC UD	4.976	0.944	0.6730	0.991	0.1476	0.853
124	49 OC US	4.548	0.961	0.6133	1.000	0.1394	0.814
123	49 OC UD	4.173	0.941	0.5670	0.989	0.1287	0.833
122	49 OC US	3.707	0.948	0.5045	0.995	0.1131	0.770
121	49 OC US	3.178	0.949	0.4354	0.996	0.0989	0.771
120	49 OC UD	2.668	0.937	0.3758	0.980	0.0784	0.836
119	49 OC US	2.211	0.928	0.3067	1.005	0.0580	0.734

^aNo cell-average factors were measured for ^{238}U reaction in the uranium-fuelled sector.

Table 4.2.3-4 ZPPR-18A: Radial Reaction Rate Distributions at 15° to the X-axis at Z = 5.16 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC SF	8.697	1.005	9.221	1.010	1.2150	1.058	0.2130	0.977
148 52	IC SM	8.500	1.010	9.033	1.015	1.1290	1.061	0.2028	1.005
148 53	IC SF	8.568	0.995	9.119	0.998	1.1870	1.055	0.2064	0.980
147 54	IC SF	8.347	1.010	9.193	0.984	1.1730	1.059	0.2008	0.988
147 55	IC SM	8.247	1.011	8.880	1.015	1.1150	1.048	0.1967	0.986
147 56	IC SF	8.322	1.000	9.033	1.005	1.1950	1.038	0.2016	0.951
147 57	IC SF	8.305	0.995	9.029	0.996	1.1800	1.043	0.1966	0.966
146 58	IC SF	8.231	0.989	9.011	0.990	1.1760	1.035	0.1888	0.972
146 59	IC SM	7.925	1.008	8.517	1.013	1.0760	1.040	0.1787	1.034
146 60	IC SF	7.890	1.000	8.452	0.999	1.1090	1.047	0.1838	1.006
145 61	IC SF	7.800	0.989	8.230	1.000	1.0950	1.035	0.1839	0.985
145 62	IC SM	7.499	1.010	8.013	1.006	1.0130	1.040	0.1749	1.017
144 63	IC SM	7.290	1.009	7.776	1.010	0.9864	1.039	0.1742	0.983
144 64	IC SF	7.299	0.994	7.790	0.994	1.0150	1.050	0.1738	0.974
144 65	IC SM	7.056	1.008	7.478	1.012	0.9349	1.058	0.1716	0.970
144 66	IC SF	7.014	0.997	7.469	0.996	0.9739	1.054	0.1702	0.973
143 67	IC SF	6.800	0.988	7.199	0.993	0.9536	1.035	0.1573	1.007
143 68	IC SF	6.595	0.991	7.045	0.991	0.9260	1.039	0.1553	0.991
143 69	IC SM	6.300	1.002	6.723	1.008	0.8457	1.040	0.1481	0.990
143 70	IC SF	6.209	0.987	6.677	0.999	0.8919	1.022	0.1386	0.988
142 70	IC SM	6.044	0.998	6.571	1.003	0.8126	1.043	0.1340	0.994
	CRP								
142 73	OC SF	5.427	0.992	5.889	0.998	0.7780	1.028	0.1295	0.970
141 73	OC SF	5.345	0.991	5.658	1.007	0.7601	1.026	0.1278	0.989
141 74	OC SF	4.876	0.991	5.129	0.995	0.6796	1.026	0.1283	0.985
141 75	OC D	4.347	0.982	4.527	0.993	0.5821	1.038	0.1256	0.952
141 76	OC SF	3.756	0.993	3.923	0.996	0.5119	1.048	0.1003	1.020
140 77	OC SF	3.029	0.988	3.221	0.995	0.4214	1.055	0.0810	0.905
140 78	RB	--	--	2.753	0.990	0.3417	1.036	0.0335	1.091
140 79	RB	--	--	2.214	0.998	0.2735	1.034	0.0179	1.031
139 80	RB	--	--	1.673	0.995	0.2021	1.025	0.0112	0.831
139 81	RB	--	--	1.342	1.003	0.1558	1.013	0.0069	0.759
139 82	RB	--	--	1.116	1.069	0.1231	1.007	0.0042	0.707

Table 4.2.5-5 ZPPR-18A: Radial Reaction Rate Distributions at 15° to the X-axis at Z = 28.02 cm

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC SF	7.718	0.993	1.0200	1.038	0.1677	1.004
148 52	IC SM	7.495	1.008	0.9408	1.046	0.1621	1.019
148 53	IC SF	7.571	0.990	0.9985	1.033	0.1657	0.990
147 54	IC SF	7.486	0.996	0.9955	1.029	0.1635	0.984
147 55	IC SM	7.396	1.007	--	--	--	--
147 56	IC SF	7.496	1.001	0.9945	1.030	0.1583	0.983
147 57	IC SF	7.458	0.997	0.9991	1.017	0.1568	0.983
146 58	IC SF	7.437	0.993	0.9811	1.026	0.1538	0.968
146 59	IC SM	7.090	1.005	0.8931	1.034	0.1444	1.038
146 60	IC SF	7.026	0.991	--	--	--	--
145 61	IC SF	6.779	1.001	--	--	--	--
145 62	IC SM	6.581	1.009	0.8336	1.040	0.1451	0.993
144 63	IC SM	6.455	1.003	0.8119	1.039	0.1358	1.022
144 64	IC SF	6.433	0.991	--	--	--	--
144 65	IC SM	6.220	1.002	0.7756	1.049	0.1351	0.999
144 66	IC SF	6.147	0.996	--	--	--	--
143 67	IC SF	5.941	0.990	0.7840	1.037	0.1320	0.971
143 68	IC SF	5.800	0.990	--	--	--	--
143 69	IC SM	5.570	1.001	0.6936	1.043	0.1191	0.996
143 70	IC SF	5.508	0.999	0.7363	1.020	0.1125	0.984
142 70	IC SM	5.460	0.996	0.6776	1.030	0.1107	0.973
	CRP						
142 73	OC SF	4.876	0.993	0.6453	1.020	0.1058	0.958
141 73	OC SF	4.748	0.986	0.6344	1.011	0.1040	0.980
141 74	OC SF	4.225	0.989	0.5572	1.026	0.1021	0.998
141 75	OC D	3.728	0.985	--	--	--	--
141 76	OC SF	3.238	0.984	0.4213	1.039	0.0820	1.005
140 77	OC SF	2.688	0.971	0.3441	1.053	0.0633	0.932
140 78	RB	2.231	0.997	--	--	--	--
140 79	RB	1.802	1.002	--	--	--	--
139 80	RB	1.363	1.000	--	--	--	--
139 81	RB	1.088	1.014	--	--	--	--
139 82	RB	0.911	1.076	--	--	--	--

Table 4.2.3-6 ZPPR-18A: Radial Reaction Rate Distributions at 30° to the X-axis at Z = 5.16 cm

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
146 54	IC SM	8.942	1.010	1.1200	1.048	0.1904	1.023
145 55	IC SM	9.119	1.006	1.1400	1.036	0.1837	0.981
144 58	IC SM	8.817	1.013	1.1150	1.032	0.1727	0.977
143 58	IC SF	8.762	1.000	1.1810	1.022	0.1761	0.965
143 59	IC SM	8.341	1.008	1.0510	1.041	0.1729	1.021
142 60	IC SM	7.990	1.011	1.0100	1.044	0.1759	0.992
142 61	IC SF	8.005	1.001	1.0670	1.036	0.1722	1.002
142 62	IC SF	8.029	0.994	1.0670	1.025	0.1672	0.994
141 62	IC SF	7.943	0.999	1.0670	1.021	0.1649	0.951
140 65	IC SM	7.380	1.007	0.9362	1.025	0.1460	0.967
139 65	IC SF	7.323	0.991	0.9956	1.005	0.1459	0.972
139 66	IC SM	6.862	1.000	0.8558	1.045	0.1491	0.979
138 67	IC SM	6.516	0.993	0.8120	1.040	0.1480	0.980
138 68	IC SF	6.393	0.990	0.8350	1.043	0.1538	0.953
137 68	IC SM	6.176	0.995	0.7760	1.033	0.1495	0.977

Table 4.2.3-7

ZPPR-18A: Radial Reaction
Rate Distribution at 30° to
the X-axis at Z = 28.02 cm

Matrix	Zone	$^{235}\text{U}(n,f)$	
		Exp.	C/E
146 54	IC SM	7.408	1.007
145 55	IC SM	7.670	0.991
	CRP		
144 58	IC SM	7.302	1.015
143 58	IC SF	7.340	0.989
143 59	IC SM	6.937	1.001
142 60	IC SM	6.668	1.000
142 61	IC SF	6.710	0.986
142 62	IC SF	6.653	0.992
141 62	IC SF	6.584	0.998
	CRP		
140 65	IC SM	6.151	0.999
139 65	IC SF	6.144	0.974
139 66	IC SM	5.766	0.978
138 67	IC SM	5.305	0.996
138 68	IC SF	5.255	0.983
137 68	IC SM	5.047	0.989

Table 4.2.3-8 ZPPR-18A: Axial Reaction Rate Distributions in Matrix 149-49 (Core Center)

Zone	Z(mm)	²³⁹ Pu(n,f)		²³⁵ U(n,f)		²³⁵ U(n,γ)		²³⁸ U(n, f)	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
IC SF	26.2	8.815	0.994	9.305	1.009	1.2440	1.039	0.2090	0.999
IC SF	50.3	8.793	0.997	9.283	1.012	1.2370	1.044	0.2071	1.008
IC SF	77.0	8.695	0.999	9.201	1.011	1.2260	1.044	0.2186	0.946
IC SF	127.8	8.480	0.992	9.015	1.001	1.2060	1.030	0.2013	0.995
IC SF	178.6	8.193	0.995	8.673	1.008	1.1590	1.038	0.1922	1.008
IC SF	229.4	7.763	0.988	8.226	1.003	1.1030	1.029	0.1841	0.988
IC SF	280.2	7.230	0.991	7.708	1.002	1.0270	1.036	0.1669	1.013
IC SF	356.4	6.361	0.983	6.811	1.002	0.9178	1.023	0.1494	0.956
IC SF	380.5	6.036	0.983	6.610	0.986	0.8664	1.035	0.1376	0.966
IC SF	432.6	5.277	0.995	5.752	1.019	0.7693	1.047	0.1151	0.979
IC SF	483.4	4.672	0.977	5.173	1.026	0.6873	1.054	0.0913	0.889
Zone Average C/E			0.990		1.007		1.038		0.977
Standard Deviation			0.007		0.010		0.009		0.037
AS	534.2	--	--	4.843	1.011	0.6257	1.018	0.0485	0.941
AB	585.0	--	--	4.331	1.016	0.5409	1.034	0.0274	1.086
AB	635.8	--	--	3.787	1.046	0.4673	1.039	0.0170	1.034
AB	686.6	--	--	3.348	1.079	0.4022	1.046	0.0119	0.993
AB	737.4	--	--	2.989	1.112	0.3515	1.025	0.0077	0.838
Zone Average C/E			--		1.053		1.032		0.978
Standard Deviation			--		0.043		0.011		0.095
AR	839.0	--	--	3.219	1.103	--	--	--	--
AR	889.8	--	--	3.046	1.014	--	--	--	--

Table 4.2.3-9 ZPPR-18A: Axial Reaction Rate
Distribution for ^{235}U Fission
in Matrix 146-57 (Adj. to CRP)

Zone	Z(mm)	$^{235}\text{U}(n,f)$	
		Exp.	C/E
IC SM	26.2	9.154	1.001
IC SM	50.3	9.097	1.007
IC SM	77.0	9.083	1.000
IC SM	127.8	8.858	0.995
IC SM	178.6	8.456	1.011
IC SM	229.4	8.074	1.001
IC SM	280.2	7.584	1.002
IC SM	331.0	6.985	1.011
IC SM	381.8	6.436	1.006
IC SM	432.6	5.803	1.015
IC SM	483.4	5.285	1.022
Zone Average C/E			1.006
Standard Deviation			0.008
AB	534.2	4.999	1.019
AB	585.0	4.556	1.018
AB	635.8	4.066	1.037
AB	686.6	3.688	1.043
AB	737.4	3.361	1.043
Zone Average C/E			1.032
Standard Deviation			0.013

Table 4.2.5-10 ZPPR-18A: Axial Reaction Rate Distributions
in Matrix 149-75 (Outer Core)

Zone	Z(mm)	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)^a$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC D	26.2	4.940	1.005	0.6397	1.039	0.1428	0.953
OC D	50.3	4.919	1.009	0.6335	1.049	0.1411	0.964
OC D	77.0	4.891	1.005	0.6292	1.046	0.1423	0.947
OC D	127.8	4.726	1.007	0.6131	1.040	0.1351	0.965
OC D	178.6	4.595	1.003	0.5877	1.050	0.1291	0.976
OC D	229.4	4.311	1.005	0.5582	1.039	0.1224	0.963
OC D	280.2	4.039	1.001	0.5176	1.047	0.1141	0.959
OC D	331.0	3.678	1.010	0.4757	1.047	0.1021	0.966
OC D	381.8	3.313	1.011	0.4335	1.036	0.0887	0.961
OC D	432.6	2.980	1.000	0.3809	1.050	0.0778	0.924
OC D	483.4	2.579	1.034	0.3337	1.066	0.0603	0.842
Zone Average C/E			1.008		1.046		0.947
Standard Deviation			0.009		0.008		0.037
AB	534.2	2.415	1.004	0.2855	--	0.0302	0.909
AB	585.0	2.148	1.008	0.2456	--	0.0161	1.090
AB	635.8	1.885	1.026	0.2124	--	0.0108	0.941
AB	686.6	1.655	1.056	0.1780	--	0.0076	0.889
AB	737.4	1.486	1.070	--	--	--	--
Zone Average C/E			1.033		--		0.957
Standard Deviation			0.029		--		0.091
AB	839.0	1.556	1.064	--	--	--	--
AB	889.8	1.492	0.963	--	--	--	--

^aCell factor not measured for ^{235}U capture in the axial blanket.

Table 4.2.3-11 Corrected Results for ^{238}U Fission Rates in ZPPR-18A - x and y Axes

<u>Distribution</u>	<u>Matrix</u>	<u>Basic Measurement</u>	<u>Statistical Uncertainty</u>	<u>Cell-Average Measurement</u>	<u>Corrected C/E</u>	<u>Correction Factor^a</u>
X-Axis, Z=5.16 cm ZPR-489 Table 8.1	149-50	2.2035E-19	2.88E-21	2.100E-19	0.995	0.978
	149-51	2.1283E-19	2.49E-21	2.031E-19	1.015	0.975
	149-52	2.1488E-19	2.69E-21	2.048E-19	0.999	0.976
	149-53	2.0913E-19	2.58E-21	1.995E-19	1.010	0.976
	149-54	2.1036E-19	2.37E-21	2.005E-19	0.997	0.977
	149-55	2.0405E-19	2.57E-21	1.947E-19	1.009	0.975
	149-56	2.0888E-19	2.65E-21	1.991E-19	0.980	0.974
	149-57	2.0481E-19	2.46E-21	1.954E-19	0.988	0.976
	149-58	2.0368E-19	2.69E-21	1.942E-19	0.997	0.979
	149-60	1.9361E-19	2.57E-21	1.847E-19	1.020	0.978
	149-66	1.7665E-19	2.28E-21	1.685E-19	1.023	0.980
	149-67	1.7820E-19	2.33E-21	1.699E-19	0.990	0.976
	149-71	1.5492E-19	2.25E-21	1.476E-19	1.008	0.978
	149-77	8.8450E-20	2.21E-21	0.865E-19	0.927	0.982
	149-78	3.8993E-20	1.24E-21	0.356E-19	1.140	0.972
X-Axis, Z=28.0 cm ZPR-489 Table 8.2	149-61	1.5961E-19	2.17E-21	1.521E-19	1.001	0.976
	149-64	1.5975E-19	2.34E-21	1.523E-19	0.961	0.982
	149-67	1.4257E-19	2.24E-21	1.358E-19	0.999	0.974
	149-68	1.3541E-19	2.08E-21	1.292E-19	1.014	0.983
	149-69	1.3863E-19	2.13E-21	1.322E-19	0.965	0.970
Y-Axis, Z=5.16 cm ZPR-489 Table 8.3	123-49	1.2569E-19	2.13E-21	1.256E-19	0.853	0.976
	122-49	1.1053E-19	1.83E-21	1.105E-19	0.788	0.977
	121-49	9.6610E-20	1.77E-21	0.966E-19	0.790	0.977
	120-49	7.6543E-20	1.85E-21	0.765E-19	0.857	0.976
	119-49	5.6662E-20	1.57E-21	0.566E-19	0.752	0.976
Axial, Z=7.70 cm ZPR-489 Table 8.8	149-49	2.2076E-19	3.33E-21	2.106E-19	0.983	0.963

^aRatio of corrected experimental value to that published in ANL-ZPR-489.

Table 4.2.3-12 Corrected Results for ^{238}U Fission Rates in ZPPR-18A - 15 and 30°

Distribution	Matrix	Basic Measurement	Statistical Uncertainty	Cell-Average Measurement	Corrected C/E	Correction Factor ^a
15°, Z=5.16 cm ZPR-489 Table 8.4	148-50	2.1808E-19	2.42E-21	2.079E-19	1.001	0.976
	148-52	2.0743E-19	2.54E-21	1.979E-19	1.030	0.976
	148-53	2.1166E-19	2.53E-21	2.018E-19	1.003	0.978
	147-54	2.0554E-19	2.57E-21	1.959E-19	1.013	0.976
	147-55	2.0124E-19	2.57E-21	1.919E-19	1.010	0.976
	147-56	2.0632E-19	2.56E-21	1.966E-19	0.975	0.975
	147-57	2.0156E-19	2.45E-21	1.921E-19	0.988	0.977
	146-58	1.9321E-19	2.54E-21	1.841E-19	0.997	0.975
	146-60	1.9175E-19	2.49E-21	1.827E-19	1.012	0.994
	144-63	1.7837E-19	2.90E-21	1.702E-19	1.006	0.977
	144-64	1.7802E-19	2.54E-21	1.696E-19	0.998	0.976
	144-65	1.7484E-19	2.81E-21	1.668E-19	0.999	0.971
	144-66	1.7427E-19	2.44E-21	1.661E-19	0.997	0.976
	140-77	8.0750E-20	1.63E-21	0.789E-19	0.929	0.975
	140-78	3.5795E-20	1.21E-21	0.326E-19	1.119	0.975
15°, Z=28.02 cm ZPR-489 Table 8.5	146-58	1.5749E-19	2.26E-21	1.500E-19	0.992	0.976
	143-67	1.3570E-19	2.15E-21	1.293E-19	0.991	0.980
	141-76	8.4312E-20	1.72E-21	8.03 E-20	1.026	0.980
30°, Z=5.16 cm ZPR-489 Table 8.6	142-60	1.7811E-19	2.71E-21	1.700E-19	1.027	0.966
	139-66	1.5346E-19	2.44E-21	1.464E-19	0.997	0.982
	138-67	1.5144E-19	2.15E-21	1.445E-19	1.004	0.976
	138-68	1.5692E-19	2.23E-21	1.496E-19	0.980	0.972
	137-68	1.5329E-19	2.42E-21	1.462E-19	0.999	0.978

^aRatio of corrected experimental value to that published in ANL-ZPR-489.

Table 4.2.3-13 ZPPR-18A: Reaction Rate Ratios along the X-axis at Z = 5.16 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
149 49	IC SF	1.056	1.015	0.1407	1.047	0.02355	1.011
149 50	IC SF	1.060	1.011	0.1396	1.057	0.02454	0.972
149 51	IC SM	1.076	0.994	0.1358	1.028	0.02462	0.967
149 52	IC SF	1.067	1.001	0.1399	1.049	0.02438	0.974
149 53	IC SM	1.062	1.005	0.1328	1.050	0.02418	0.980
149 54	IC SF	1.094	0.976	0.1393	1.054	0.02433	0.971
149 55	IC SM	1.068	1.003	0.1332	1.049	0.02410	0.976
149 56	IC SF	1.072	1.001	0.1404	1.050	0.02453	0.956
149 57	IC SM	1.064	1.011	0.1325	1.058	0.02436	0.963
149 58	IC SF	1.068	1.008	0.1407	1.052	0.02396	0.985
149 59	IC SF	1.076	0.997	0.1424	1.035	0.02394	0.988
149 60	IC SM	1.064	1.005	0.1344	1.038	0.02408	0.983
149 61	IC SF	1.074	0.996	0.1419	1.037	0.02327	1.021
149 62	IC SF	1.073	0.999	0.1420	1.039	0.02388	0.997
149 63	IC SM	1.077	0.994	0.1360	1.028	0.02401	0.991
149 64	IC SF	1.067	1.003	0.1415	1.040	0.02406	0.990
149 65	IC SF	1.069	1.002	0.1427	1.033	0.02342	1.020
149 66	IC SM	1.064	1.005	0.1337	1.044	0.02420	0.985
149 67	IC SF	1.062	1.004	0.1393	1.052	0.02479	0.962
149 68	IC SM	1.061	1.002	0.1334	1.041	0.02325	1.026
149 69	IC SF	1.068	0.994	0.1399	1.042	0.02425	0.987
149 70	IC SM	1.062	0.997	--	--	--	--
149 71	IC SF	1.068	0.990	0.1383	1.047	0.02490	0.976
149 72	IC SM	1.064	0.992	0.1329	1.031	0.02497	0.998
Zone Average C/E			1.000		1.044		0.986
Standard Deviation			0.008		0.009		0.019
149 73	OC SF	1.058	0.995	0.1378	1.042	0.02554	1.024
149 74	OC SF	1.053	0.994	0.1371	1.039	0.02737	1.016
149 75	OC D	1.050	1.004	0.1353	1.044	0.03013	0.959
149 76	OC SF	1.073	0.992	0.1387	1.046	0.02604	1.046
149 77	OC SF	1.098	1.007	0.1409	1.078	0.02542	0.915
Zone Average C/E			0.998		1.050		0.992
Standard Deviation			0.007		0.016		0.054

Table 4.2.3-14 ZPPR-18A: Reaction Rate Ratios at 15° to the X-axis at Z = 5.16 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC SF	1.060	1.005	0.1397	1.053	0.02449	0.972
148 52	IC SM	1.063	1.005	0.1328	1.050	0.02386	0.995
148 53	IC SF	1.064	1.003	0.1385	1.060	0.02409	0.985
147 54	IC SF	1.101	0.974	0.1405	1.049	0.02406	0.978
147 55	IC SM	1.077	1.004	0.1352	1.037	0.02385	0.975
147 56	IC SF	1.085	1.005	0.1436	1.038	0.02422	0.951
147 57	IC SF	1.087	1.001	0.1421	1.048	0.02367	0.971
146 58	IC SF	1.095	1.001	0.1429	1.047	0.02294	0.983
146 59	IC SM	1.075	1.005	0.1358	1.032	0.02255	1.026
146 60	IC SF	1.071	0.999	0.1406	1.047	0.02330	1.006
145 61	IC SF	1.055	1.011	0.1404	1.047	0.02358	0.996
145 62	IC SM	1.069	0.996	0.1351	1.030	0.02332	1.007
144 63	IC SM	1.067	1.001	0.1353	1.030	0.02390	0.974
144 64	IC SF	1.067	1.000	0.1391	1.056	0.02381	0.980
144 65	IC SM	1.060	1.004	0.1325	1.050	0.02435	0.962
144 66	IC SF	1.065	0.999	0.1389	1.057	0.02427	0.976
143 67	IC SF	1.059	1.005	0.1402	1.048	0.02313	1.019
143 68	IC SF	1.068	1.000	0.1404	1.048	0.02355	1.000
143 69	IC SM	1.067	1.006	0.1342	1.038	0.02351	0.988
143 70	IC SF	1.075	1.012	0.1436	1.035	0.02232	1.001
142 70	IC SM	1.087	1.005	0.1344	1.045	0.02217	0.996
	CRP						
	Zone Average C/E		1.002		1.045		0.988
	Standard Deviation		0.007		0.009		0.019
142 73	OC SF	1.085	1.006	0.1434	1.036	0.02386	0.978
141 73	OC SF	1.059	1.016	0.1422	1.035	0.02391	0.998
141 74	OC SF	1.052	1.004	0.1394	1.035	0.02631	0.994
141 75	OC D	1.041	1.011	0.1339	1.057	0.02889	0.969
141 76	OC SF	1.044	1.003	0.1363	1.055	0.02670	1.027
140 77	OC SF	1.063	1.007	0.1391	1.068	0.02675	0.916
	Zone Average C/E		1.008		1.048		0.980
	Standard Deviation		0.005		0.014		0.037

Table 4.2.5-15 ZPPR-18A: Corrected Results for $^{235}\text{U}(n,f)/^{239}\text{Pu}(n,f)$ at Z=5.16 cm

x-axis				15°			
Matrix	Zone	Exp.	C/E	Matrix	Zone	Exp.	C/E
149 49	IC SF	0.02355	1.011				
149 50	IC SF	0.02400	0.994	148 50	IC SF	0.02390	0.996
149 51	IC SM	0.02400	0.992	148 52	IC SM	0.02328	1.020
149 52	IC SF	0.02378	0.998	148 53	IC SF	0.02355	1.008
149 53	IC SM	0.02359	1.005	147 54	IC SF	0.02347	1.002
149 54	IC SF	0.02377	0.994	147 55	IC SM	0.02327	0.999
149 55	IC SM	0.02351	1.001	147 56	IC SF	0.02362	0.975
149 56	IC SF	0.02389	0.982	147 57	IC SF	0.02313	0.994
149 57	IC SM	0.02377	0.987	146 58	IC SF	0.02237	1.008
149 58	IC SF	0.02345	1.007	146 59	IC SM	0.02255	1.026
149 59	IC SF	0.02394	0.988	146 60	IC SF	0.02316	1.012
149 60	IC SM	0.02356	1.005	145 61	IC SF	0.02358	0.996
149 61	IC SF	0.02327	1.021	145 62	IC SM	0.02332	1.007
149 62	IC SF	0.02388	0.997	144 63	IC SM	0.02446	0.997
149 63	IC SM	0.02401	0.991	144 64	IC SF	0.02324	1.004
149 64	IC SF	0.02406	0.990	144 65	IC SM	0.02364	0.991
149 65	IC SF	0.02342	1.020	144 66	IC SF	0.02368	1.000
149 66	IC SM	0.02372	1.005	143 67	IC SF	0.02313	1.019
149 67	IC SF	0.02420	0.985	143 68	IC SF	0.02355	1.000
149 68	IC SM	0.02325	1.026	143 69	IC SM	0.02351	0.988
149 69	IC SF	0.02425	0.987	143 70	IC SF	0.02232	1.001
149 71	IC SF	0.02434	0.998	142 70	IC SM	0.02217	0.996
149 72	IC SM	0.02497	0.998				
	Zone Average C/E		0.999		Zone Average C/E		1.002
	Standard Deviation		0.012		Standard Deviation		0.012
149 73	OC SF	0.02554	1.024	142 73	OC SF	0.02386	0.978
149 74	OC SF	0.02737	1.016	141 73	OC SF	0.02391	0.998
149 75	OC D	0.03013	0.959	141 74	OC SF	0.02631	0.994
149 76	OC SF	0.02604	1.046	141 75	OC D	0.02889	0.969
149 77	OC SF	0.02496	0.932	141 76	OC SF	0.02670	1.027
	Zone Average C/E		0.995	140 77	OC SF	0.02607	0.940
	Standard Deviation		0.048		Zone Average C/E		0.984
					Standard Deviation		0.029

Table 4.2.3-16 ZPPR-18A: Reaction Rate Ratios in Matrix 149-49 (Core Center)

Zone	Z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
IC SF	26.2	1.056	1.015	0.1411	1.045	0.02371	1.005
IC SF	50.3	1.056	1.015	0.1407	1.047	0.02355	1.011
IC SF	77.0	1.058	1.012	0.1410	1.045	0.02514	0.947
IC SF	127.8	1.063	1.009	0.1422	1.038	0.02374	1.003
IC SF	178.6	1.059	1.013	0.1415	1.043	0.02346	1.013
IC SF	229.4	1.060	1.015	0.1421	1.041	0.02372	1.000
IC SF	280.2	1.066	1.011	0.1420	1.045	0.02308	1.022
IC SF	356.4	1.071	1.019	0.1443	1.041	0.02349	0.973
IC SF	380.5	1.095	1.003	0.1435	1.053	0.02280	0.985
IC SF	432.6	1.090	1.024	0.1458	1.052	0.02181	0.984
IC SF	483.4	1.107	1.050	0.1471	1.079	0.01954	0.910
Zone Average C/E		1.017		1.048		0.987	
Standard Deviation		0.012		0.011		0.033	

Table 4.2.3-17 Basic Data for Radial Distributions of $^{239}\text{Pu}(n,f)$ in ZPPR-18A

Matrix	Loc ^a	$^{239}\text{Pu}(n,f)^b$	Matrix	Loc ^a	$^{239}\text{Pu}(n,f)^b$
x-axis data at z = 51.6 mm			15° data at z = 51.6 mm		
149 50	GH	8.790 0.043	148 50	GH	8.738 0.042
149 51	GH	8.474 0.044	148 52	GH	8.515 0.039
149 52	GH	8.651 0.040	148 53	GH	8.608 0.040
149 53	GH	8.473 0.042	147 54	GH	8.386 0.041
149 54	GH	8.472 0.040	147 55	GH	8.261 0.041
149 55	GH	8.297 0.042	147 56	GH	8.360 0.041
149 56	GH	8.369 0.043	147 57	GH	8.344 0.039
149 57	GH	8.232 0.040	146 57	GH*	8.253 0.039
149 58	GH	8.320 0.039	146 58	GH	8.269 0.040
149 59	GH	8.100 0.040	146 59	GH	7.938 0.037
149 60	GH	7.855 0.038	146 60	GH	7.927 0.039
149 61	GH	7.884 0.043	145 60	GH	7.857 0.038
149 62	GH	7.832 0.041	145 61	GH	7.836 0.038
149 63	GH	7.607 0.036	145 62	GH	7.512 0.038
149 64	GH	7.609 0.035	144 63	GH	7.302 0.035
149 65	GH	7.439 0.037	144 64	GH	7.332 0.035
149 66	GH	7.115 0.033	144 65	GH	7.068 0.033
149 67	GH	7.051 0.035	144 66	GH	7.047 0.036
149 68	GH	6.744 0.036	143 67	GH	6.832 0.039
149 69	GH	6.580 0.033	143 68	GH	6.626 0.037
149 70	GH	6.273 0.032	143 69	GH	6.311 0.034
149 71	GH	6.092 0.030	143 70	GH	6.234 0.032
149 72	GH	5.757 0.031	142 70	GH	6.064 0.032
149 73	GH	5.574 0.030	142 73	GH	5.516 0.028
149 74	GH	5.224 0.030	141 73	GH	5.433 0.030
149 75	FG*	4.703 0.026	141 74	GH	4.899 0.026
149 76	GH	4.128 0.024	141 75	GH	4.365 0.024
149 77	GH	3.519 0.022	141 76	GH	3.773 0.026
			140 77	GH	3.075 0.021

^aIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer. All foils were centered 51.6 mm from the reactor midplane except "*" which were at 50.3 mm.

^bExperimental results in units of 10^{-11} fissions per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-18 Basic Data for Radial Distributions of ^{235}U and ^{238}U Reaction Rates in ZPPR-18A

Matrix	Loc ^a	$^{235}\text{U}(n,f)^b$	$^{235}\text{U}(n,f)^b$	$^{238}\text{U}(n,\gamma)^b$
x-axis data at z = 51.6 mm				
149 50	GH	9.266 0.037	0.2253 0.0029	1.3195 0.0077
149 51	GH	9.026 0.038	0.2183 0.0025	1.1308 0.0061
149 52	GH	9.175 0.038	0.2203 0.0026	1.3016 0.0070
149 53	GH	8.910 0.038	0.2144 0.0026	1.1049 0.0066
149 54	GH	9.219 0.050	0.2153 0.0023	1.2692 0.0073
149 55	GH	8.771 0.040	0.2092 0.0026	1.0852 0.0060
149 56	GH	8.922 0.042	0.2145 0.0027	1.2637 0.0067
149 57	GH	8.674 0.040	0.2099 0.0025	1.0716 0.0064
149 58	GH	8.833 0.039	0.2081 0.0028	1.2588 0.0068
149 59	GH	8.664 0.041	0.2025 0.0027	1.2404 0.0071
149 60	GH	8.274 0.035	0.1979 0.0026	1.0373 0.0058
149 61	GH	8.417 0.037	0.1916 0.0027	1.2037 0.0063
149 62	GH	8.354 0.036	0.1954 0.0029	1.1954 0.0067
149 63	GH	8.112 0.037	0.1911 0.0033	1.0163 0.0057
149 64	GH	8.069 0.035	0.1912 0.0028	1.1578 0.0068
149 65	GH	7.907 0.036	0.1819 0.0032	1.1424 0.0068
149 66	GH	7.497 0.032	0.1802 0.0023	0.9349 0.0054
149 67	GH	7.444 0.032	0.1826 0.0024	1.0563 0.0059
149 68	GH	7.088 0.034	0.1641 0.0025	0.8841 0.0048
149 69	GH	6.987 0.031	0.1666 0.0025	0.9900 0.0057
149 70	GH	6.599 0.032		
149 71	GH	6.472 0.029	0.1585 0.0023	0.9060 0.0058
149 72	GH	6.066 0.028	0.1504 0.0024	0.7519 0.0044
149 73	GH	5.865 0.028	0.1487 0.0023	0.8260 0.0051
149 74	GH	5.470 0.026	0.1493 0.0022	0.7701 0.0044
149 76	GH	4.404 0.024	0.1122 0.0021	0.6156 0.0040
149 77	GH	3.797 0.019	0.0901 0.0023	0.5413 0.0046
149 78	GH	3.227 0.017	0.0401 0.0013	0.3939 0.0033
149 79	GH	2.655 0.015	0.0205 0.0012	0.3138 0.0024
149 80	GH	2.132 0.013	0.0121 0.0009	0.2492 0.0021
149 81	GH	1.738 0.011	0.0060 0.0008	0.1935 0.0018
149 82	GH	1.486 0.010	0.0049 0.0009	0.1530 0.0016
149 83	TC	1.550 0.012		
x-axis data at z = 280.2 mm				
149 50	GH	7.778 0.037	0.1739 0.0027	1.1210 0.0061
149 51	GH	7.488 0.035	0.1723 0.0027	0.9392 0.0053
149 52	GH	7.622 0.037	0.1769 0.0027	1.0880 0.0059
149 53	GH	7.359 0.034	0.1704 0.0031	0.9228 0.0052
149 54	GH	7.485 0.038	0.1688 0.0027	1.0659 0.0061
149 55	GH	7.356 0.036	0.1617 0.0025	0.9049 0.0051
149 56	GH	7.338 0.034	0.1695 0.0028	1.0648 0.0057
149 57	GH	7.226 0.034	0.1666 0.0025	0.9005 0.0051
149 58	GH	7.374 0.036	0.1633 0.0024	1.0496 0.0056

Table 4.2.3-18 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
149 59	GH	7.157 0.037	0.1650 0.0029	1.0268 0.0061
149 60	GH	6.901 0.033	0.1552 0.0031	0.8681 0.0050
149 61	GH	6.953 0.034	0.1635 0.0022	0.9828 0.0055
149 62	GH	6.953 0.033	0.1583 0.0030	0.9909 0.0054
149 63	GH	6.694 0.032	0.1539 0.0023	0.8320 0.0047
149 64	GH	6.687 0.031	0.1626 0.0025	0.9461 0.0054
149 65	GH	6.653 0.031	0.1500 0.0026	0.9495 0.0053
149 66	GH	6.272 0.031	0.1432 0.0020	0.7817 0.0049
149 67	GH	6.190 0.031	0.1464 0.0022	0.8788 0.0052
149 68	GH	5.858 0.030	0.1378 0.0021	0.7230 0.0044
149 69	GH	5.745 0.030	0.1429 0.0022	0.8122 0.0048
149 70	GH	5.421 0.027	0.1270 0.0024	0.6767 0.0040
149 71	GH	5.295 0.026	0.1241 0.0022	0.7594 0.0045
149 72	GH	4.941 0.027	0.1205 0.0024	0.6195 0.0038
149 73	GH	4.839 0.027	0.1237 0.0026	0.6810 0.0041
149 74	GH	4.481 0.024		
149 76	GH	3.578 0.020		
149 77	GH	3.096 0.017	0.0720 0.0020	0.4468 0.0031
149 78	GH	2.652 0.018		
149 79	GH	2.190 0.013		
149 80	GH	1.744 0.012		
149 81	GH	1.418 0.011		
149 82	GH	1.219 0.009		

15° data at z = 51.6 mm

148 50	GH	9.211 0.040	0.2235 0.0024	1.3126 0.0069
148 52	GH	8.959 0.038	0.2126 0.0026	1.1106 0.0061
148 53	GH	9.109 0.038	0.2165 0.0026	1.2826 0.0075
147 54	GH	9.183 0.043	0.2107 0.0026	1.2673 0.0065
147 55	GH	8.807 0.040	0.2062 0.0026	1.0976 0.0065
147 56	GH	9.024 0.042	0.2115 0.0026	1.2906 0.0069
147 57	GH	9.019 0.041	0.2062 0.0025	1.2749 0.0068
146 57	GH*		0.1875 0.0026	1.1027 0.0058
146 58	GH	9.001 0.043	0.1982 0.0026	1.2704 0.0068
146 59	GH	8.447 0.038	0.1873 0.0027	1.0590 0.0058
146 60	GH	8.443 0.035	0.1929 0.0024	1.1985 0.0071
145 60	GH	8.227 0.036	0.1851 0.0027	1.0194 0.0060
145 61	GH	8.221 0.034	0.1930 0.0029	1.1830 0.0066
145 62	GH	7.947 0.035	0.1833 0.0029	0.9968 0.0056
144 63	GH	7.713 0.033	0.1826 0.0030	0.9708 0.0061
144 64	GH	7.781 0.037	0.1824 0.0026	1.0963 0.0060
144 65	GH	7.417 0.034	0.1801 0.0030	0.9201 0.0059
144 66	GH	7.461 0.033	0.1786 0.0025	1.0522 0.0059
143 67	GH	7.191 0.034	0.1650 0.0023	1.0302 0.0055
143 68	GH	7.038 0.032	0.1630 0.0023	1.0004 0.0057
143 69	GH	6.668 0.030	0.1552 0.0031	0.8322 0.0052
143 70	GH	6.688 0.030	0.1442 0.0026	0.9598 0.0055

Table 4.2.3-18 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
142 70	GH	6.442 0.028	0.1379 0.0022	0.7932 0.0045
142 73	GH	5.935 0.031	0.1342 0.0021	0.8533 0.0047
141 73	GH	5.703 0.025	0.1324 0.0024	0.8336 0.0048
141 74	GH	5.123 0.024	0.1346 0.0021	0.7343 0.0043
141 75	GH	4.525 0.022	0.1280 0.0022	0.6403 0.0044
141 76	GH	3.919 0.021	0.1053 0.0019	0.5530 0.0036
140 77	GH	3.215 0.017	0.0829 0.0017	0.4672 0.0033
140 78	GH	2.747 0.015	0.0367 0.0012	0.3340 0.0027
140 79	GH	2.225 0.013	0.0181 0.0010	0.2689 0.0022
139 80	GH	1.682 0.011	0.0114 0.0010	0.1988 0.0021
139 81	GH	1.349 0.009	0.0069 0.0008	0.1532 0.0016
139 82	GH	1.140 0.008	0.0050 0.0008	0.1172 0.0014
15° data at z = 280.2 mm				
148 50	GH	7.709 0.035	0.1760 0.0027	1.1015 0.0060
148 52	GH	7.434 0.034	0.1699 0.0028	0.9259 0.0057
148 53	GH	7.563 0.035	0.1738 0.0026	1.0788 0.0064
147 54	GH	7.478 0.035	0.1715 0.0025	1.0755 0.0058
147 55	GH	7.335 0.037		
147 56	GH	7.488 0.037	0.1661 0.0026	1.0744 0.0058
147 57	GH	7.450 0.035	0.1645 0.0026	1.0794 0.0058
146 57	GH		0.1512 0.0026	0.9147 0.0051
146 58	GH	7.428 0.033	0.1614 0.0023	1.0600 0.0059
146 59	GH	7.033 0.034	0.1514 0.0028	0.8789 0.0053
146 60	GH	7.019 0.033		
145 60	GH	6.872 0.033	0.1522 0.0028	0.8541 0.0051
145 61	GH	6.772 0.029		
145 62	GH	6.528 0.032	0.1521 0.0025	0.8204 0.0047
144 63	GH	6.402 0.031	0.1424 0.0024	0.7990 0.0046
144 64	GH	6.426 0.031		
144 65	GH	6.169 0.029	0.1417 0.0023	0.7633 0.0048
144 66	GH	6.141 0.028		
143 67	GH	5.935 0.030	0.1385 0.0021	0.8470 0.0049
143 68	GH	5.794 0.029		
143 69	GH	5.524 0.027	0.1248 0.0024	0.6826 0.0041
143 70	GH	5.517 0.028	0.1171 0.0021	0.7923 0.0045
142 70	GH	5.353 0.027	0.1138 0.0022	0.6614 0.0039
142 73	GH	4.915 0.024	0.1096 0.0022	0.7077 0.0047
141 73	GH	4.786 0.023	0.1078 0.0023	0.6957 0.0042
141 74	GH	4.220 0.021	0.1071 0.0022	0.6020 0.0038
141 75	GH	3.727 0.023		
141 76	GH	3.235 0.019	0.0861 0.0017	0.4552 0.0032
140 77	GH	2.682 0.018	0.0647 0.0017	0.3814 0.0028
140 78	GH	2.226 0.016		
140 79	GH	1.811 0.012		
139 80	GH	1.370 0.009		
139 81	GH	1.094 0.008		
139 82	GH	0.931 0.008		

Table 4.2.3-18 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
30° data at z = 51.6 mm				
146 54	GH	8.870 0.040	0.1996 0.0031	1.1026 0.0062
145 55	GH	8.940 0.041	0.1890 0.0026	1.1128 0.0063
144 58	GH	8.812 0.038	0.1782 0.0029	1.0948 0.0060
143 58	GH	8.831 0.042	0.1825 0.0025	1.2956 0.0066
143 59	GH	8.273 0.037	0.1813 0.0029	1.0347 0.0056
142 60	GH	7.925 0.035	0.1843 0.0026	0.9939 0.0057
142 61	GH	7.996 0.038	0.1807 0.0028	1.1524 0.0061
142 62	GH	8.021 0.036	0.1755 0.0024	1.1526 0.0064
141 62	GH	7.957 0.036	0.1716 0.0025	1.1479 0.0061
140 65	GH	7.375 0.034	0.1506 0.0023	0.9196 0.0051
139 65	GH	7.381 0.035	0.1512 0.0025	1.0919 0.0061
139 66	GH	6.806 0.035	0.1562 0.0024	0.8423 0.0054
138 67	GH	6.463 0.035	0.1551 0.0022	0.7991 0.0051
138 68	GH	6.386 0.031	0.1614 0.0023	0.9021 0.0052
137 68	GH	6.126 0.031	0.1567 0.0023	0.7637 0.0047
30° data at z = 280.2 mm				
146 54	GH	7.347 0.035		
145 55	GH	7.520 0.035		
144 58	GH	7.298 0.037		
143 58	GH	7.398 0.038		
143 59	GH	6.881 0.032		
142 60	GH	6.614 0.030		
142 61	GH	6.702 0.031		
142 62	GH	6.646 0.034		
141 62	GH	6.596 0.029		
140 65	GH	6.148 0.028		
139 65	GH	6.192 0.031		
139 66	GH	5.719 0.032		
138 67	GH	5.262 0.028		
138 68	GH	5.249 0.029		
137 68	GH	5.006 0.026		
y-axis data at z = 51.6 mm				
146 49	GH	9.127 0.041		
147 49	GH	9.167 0.039		
146 49	GH	8.919 0.037		
145 49	GH	9.183 0.042		
144 49	GH	9.001 0.038		
143 49	GH	8.764 0.039		
142 49	GH	8.881 0.038		
141 49	GH	8.795 0.041		
138 49	GH	8.338 0.038		
137 49	GH	7.844 0.036		
136 49	GH	7.810 0.035		

Table 4.2.3-18 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
135 49	GH	7.627 0.036		
134 49	GH	7.363 0.034		
133 49	GH	7.460 0.033		
130 49	GH	6.578 0.032		
129 49	GH	6.327 0.029		
128 49	GH	5.868 0.029		
127 49	GH	5.706 0.026		
126 49	GH	5.410 0.025		
125 49	CD	4.976 0.029	0.1476 0.0023	0.6730 0.0040
124 49	HI	4.548 0.026	0.1394 0.0021	0.6133 0.0040
123 49	CD	4.173 0.023	0.1287 0.0022	0.5670 0.0041
122 49	HI	3.707 0.023	0.1131 0.0019	0.5045 0.0035
121 49	HI	3.178 0.020	0.0989 0.0018	0.4354 0.0032
120 49	CD	2.668 0.015	0.0784 0.0018	0.3758 0.0029
119 49	HI	2.211 0.015	0.0580 0.0016	0.3067 0.0027

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above and the ²³⁵U foils were centered on the mid-height of the drawer. All foils were centered 51.6 mm from the reactor midplane except "*" which were at 50.3.

^bExperimental results in units of 10⁻¹⁴ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation of uncertainty. See text for details.

Table 4.2.3-19 Basic Reaction Rate Data for Axial Distributions in ZPPR-18A

<u>z, mm</u> ^a	<u>Loc</u> ^b	<u>²³⁹Pu(n,f)^c</u>	<u>²³⁵U(n,f)^c</u>	<u>²³⁸U(n,f)^c</u>	<u>²³⁸U(n,γ)^c</u>
data in matrix position 149 49					
26.2	GH	8.856 0.048	9.294 0.037	0.2193 0.0026	1.3440 0.0066
50.3	GH	8.834 0.042	9.273 0.037	0.2173 0.0025	1.3368 0.0065
77.0	GH	8.735 0.044	9.191 0.037	0.2293 0.0038	1.3241 0.0070
127.8	GH	8.519 0.042	9.005 0.037	0.2112 0.0027	1.3027 0.0067
178.6	GH	8.231 0.040	8.664 0.036	0.2017 0.0027	1.2523 0.0064
229.4	GH	7.799 0.039	8.217 0.035	0.1932 0.0025	1.1912 0.0061
280.2	GH	7.263 0.034	7.699 0.033	0.1751 0.0024	1.1094 0.0062
356.4	GH	6.390 0.033	6.803 0.030	0.1567 0.0023	0.9915 0.0054
380.5	GH	6.064 0.030	6.603 0.030	0.1444 0.0021	0.9360 0.0050
432.6	GH	5.320 0.028	5.781 0.026	0.1212 0.0021	0.8464 0.0046
483.4	GH	4.728 0.026	5.231 0.026	0.0966 0.0018	0.7704 0.0043
534.2	GH		4.840 0.022	0.0449 0.0017	0.7109 0.0042
585.0	GH		4.329 0.021	0.0253 0.0012	0.6348 0.0039
635.8	GH		3.785 0.019	0.0158 0.0011	0.5603 0.0035
686.6	GH		3.347 0.018	0.0110 0.0012	0.4994 0.0033
737.4	GH		2.987 0.016	0.0071 0.0010	0.4497 0.0032
839.0	TC		3.219 0.017		
889.8	TC		3.046 0.017		
data in matrix position 149 75					
26.2	FG		4.938 0.023	0.1455 0.0021	0.7037 0.0040
50.3	FG		4.917 0.023	0.1438 0.0023	0.6969 0.0040
77.0	FG		4.890 0.022	0.1450 0.0028	0.6921 0.0046
127.8	FG		4.725 0.023	0.1377 0.0028	0.6745 0.0041
178.6	FG		4.593 0.023	0.1316 0.0023	0.6465 0.0040
229.4	FG		4.310 0.020	0.1248 0.0023	0.6141 0.0038
280.2	FG		4.038 0.019	0.1163 0.0024	0.5694 0.0038
331.0	FG		3.677 0.017	0.1040 0.0025	0.5233 0.0038
381.8	FG		3.312 0.018	0.0904 0.0022	0.4769 0.0032
432.6	FG		2.989 0.018	0.0790 0.0019	0.4283 0.0030
483.4	FG		2.594 0.016	0.0610 0.0017	0.3838 0.0029
534.2	FG		2.418 0.014	0.0284 0.0014	0.3309 0.0025
585.0	FG		2.147 0.012	0.0149 0.0011	0.2937 0.0027
635.8	FG		1.884 0.011	0.0100 0.0011	0.2546 0.0022
686.6	FG		1.654 0.011	0.0070 0.0009	0.2210 0.0020
737.4	FG		1.485 0.010		
839.0	TC		1.556 0.011		
889.8	TC		1.492 0.010		
data in matrix position 146 57					
26.2	GH		8.974 0.036		
50.3	GH		8.919 0.036		
77.0	GH		8.905 0.036		
127.8	GH		8.684 0.036		

Table 4.2.3-19 (contd)

z, mm^a	Loc ^b	$^{239}\text{Pu}(n, f)^c$	$^{235}\text{U}(n, f)^c$	$^{238}\text{U}(n, f)^c$	$^{238}\text{U}(n, \gamma)^c$
178.6	GH		8.290 0.036		
229.4	GH		7.916 0.034		
280.2	GH		7.436 0.031		
331.0	GH		6.848 0.031		
381.8	GH		6.310 0.028		
432.6	GH		5.690 0.027		
483.4	GH		5.183 0.024		
534.2	GH		5.026 0.024		
585.0	GH		4.580 0.021		
635.8	GH		4.088 0.021		
686.6	GH		3.708 0.019		
737.4	GH		3.379 0.019		

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ^{235}U foils were centered 13.8 mm above, the ^{238}U foils were centered on, and the ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer.

^cExperimental results in units of 10^{-10} fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-20 ZPPR-18B: Radial Reaction Rate Distributions along the x-axis at z = -5.16 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{235}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
249 49	IC SF	8.283	0.998	1.1620	1.040	0.1945	1.029
249 50	IC SF	8.295	0.995	1.1680	1.033	0.1966	1.021
249 51	IC SM	8.061	1.011	1.0860	1.040	0.1938	1.027
249 52	IC SF	8.102	0.997	1.1290	1.039	0.1966	1.007
249 53	IC SM	7.842	1.012	1.0480	1.043	0.1952	1.013
249 54	IC SF	7.828	1.003	1.0920	1.038	0.2022	0.999
249 55	IC SM	7.566	1.008	1.0170	1.035	0.1893	1.004
249 56	IC SF	7.474	1.006	1.0620	1.032	0.1840	0.995
249 57	IC SM	7.438	1.003	0.9942	1.042	0.1760	1.031
249 58	IC SF	7.572	0.998	1.0520	1.049	0.1845	1.018
249 59	IC SF	7.581	1.006	1.0550	1.050	0.1923	1.020
249 60	IC SM	7.472	1.016	0.9974	1.051	0.1862	1.016
249 61	IC SF	7.644	0.998	1.0590	1.049	0.1847	1.008
249 62	IC SF	7.639	1.000	1.0700	1.045	0.1863	0.995
249 63	IC SM	7.491	1.009	1.0020	1.048	0.1799	1.017
249 64	IC SF	7.607	0.989	1.0610	1.036	0.1846	0.994
249 65	IC SF	7.433	1.000	1.0280	1.056	0.1816	1.008
249 66	IC SM	7.132	1.010	0.9479	1.053	0.1741	1.011
249 67	IC SF	7.016	0.996	0.9643	1.053	0.1656	1.025
249 68	IC SM	6.640	1.009	0.8831	1.046	0.1583	1.028
249 69	IC SF	6.513	0.991	0.8993	1.038	0.1563	1.011
249 70	IC SM	6.104	1.007	0.8203	1.027	0.1457	1.045
249 71	IC SF	5.899	0.993	0.8084	1.042	0.1447	1.007
249 72	IC SM	5.520	1.003	0.7304	1.035	0.1390	1.006
249 73	OC SF	5.261	1.000	0.7303	1.029	0.1352	1.027
249 74	OC SF	4.905	1.003	0.6656	1.047	0.1338	1.028
249 75	OC D	4.425	0.993	0.5900	1.046	0.1326	0.967
249 76	OC SF	3.808	1.002	0.5308	1.037	0.1042	1.007
249 77	OC SF	3.241	0.988	0.4582	1.057	0.0807	0.932
249 78	RB	--	--	0.3788	1.029	0.0334	1.142
249 79	RB	--	--	0.2990	1.047	0.0198	0.991
249 80	RB	--	--	0.2311	1.051	0.0117	0.922
249 81	RB	--	--	0.1793	1.041	0.0068	0.895
249 82	RB	--	--	0.1496	0.989	0.0036	0.949

Table 4.2.3-21 ZPPR-18B: Radial ^{235}U Fission Distributions along the x-axis at $z = 5.16$ cm

Half-1 (CRP Half) $z = +5.16$ cm				Half-2 (CR Half) $z = -5.16$ cm			
Matrix	Zone	Exp.	C/E	Matrix	Zone	Exp.	C/E
149 49	IC SF	9.111	0.996	249 49	IC SF	8.791	1.001
149 50	IC SF	9.050	1.003	249 50	IC SF	8.781	1.001
149 51	IC SM	8.833	1.013	249 51	IC SM	8.581	1.009
149 52	IC SF	8.791	1.008	249 52	IC SF	8.566	0.999
149 53	IC SM	8.663	1.006	249 53	IC SM	8.339	1.005
149 54	IC SF	8.633	1.001	249 54	IC SF	8.280	1.000
149 55	IC SM	8.381	1.010	249 55	IC SM	8.020	1.006
149 56	IC SF	8.419	0.998	249 56	IC SF	7.987	0.999
149 57	IC SM	8.269	1.009	249 57	IC SM	7.856	1.010
149 58	IC SF	8.384	1.004	249 58	IC SF	7.990	1.005
149 59	IC SF	8.384	1.002	249 59	IC SF	8.032	1.005
149 60	IC SM	8.241	1.009	249 60	IC SM	7.896	1.018
149 61	IC SF	8.329	1.002	249 61	IC SF	8.103	1.000
149 62	IC SF	8.289	1.008	249 62	IC SF	8.103	1.005
149 63	IC SM	8.163	1.009	249 63	IC SM	8.004	1.006
149 64	IC SF	8.222	0.995	249 64	IC SF	8.047	0.996
149 65	IC SF	8.034	1.005	249 65	IC SF	7.891	1.003
149 66	IC SM	7.680	1.017	249 66	IC SM	7.557	1.013
149 67	IC SF	7.575	0.998	249 67	IC SF	7.401	1.001
149 68	IC SM	7.206	1.005	249 68	IC SM	7.060	1.004
149 69	IC SF	6.985	0.998	249 69	IC SF	6.843	0.995
149 70	IC SM	6.622	1.002	249 70	IC SM	6.470	1.000
149 71	IC SF	6.382	0.992	249 71	IC SF	6.157	1.001
149 72	IC SM	5.980	1.000	249 72	IC SM	5.788	1.005
149 73	OC SF	5.662	1.005	249 73	OC SF	5.554	0.993
149 74	OC SF	5.262	0.998	249 74	OC SF	5.137	0.999
149 75	OC D	4.728	1.001	249 75	OC D	4.675	0.986
149 76	OC SF	4.188	0.990	249 76	OC SF	4.066	0.994
149 77	OC SF	3.629	0.996	249 77	OC SF	3.542	0.995
149 78	RB	3.077	1.011	249 78	RB	3.056	0.993
149 79	RB	2.525	1.002	249 79	RB	2.460	1.004
149 80	RB	2.017	1.002	249 80	RB	1.985	0.996
149 81	RB	1.653	0.997	249 81	RB	1.604	1.005
149 82	RB	1.381	1.067	249 82	RB	1.363	1.058
149 83	RR	---	---	249 83	RR	1.431	1.106

Table 4.2.3-22 ZPPR-18B: Radial Reaction Rate Distributions along the x-axis at Z = 28.02 cm

Matrix	Zone	Half-1 z = +28cm				Half-2 z = -28cm			
		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{235}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
1,249 49	IC SF	8.025	0.984	6.811	0.996	0.8979	1.038	0.1494	1.013
1,249 50	IC SF	7.971	0.991	6.784	0.998	0.9024	1.031	0.1484	1.023
1,249 51	IC SM	7.793	1.001	6.618	1.005	0.8407	1.031	0.1471	1.020
1,249 52	IC SF	7.809	0.993	6.546	1.001	0.8594	1.046	0.1480	1.007
1,249 53	IC SM	7.694	0.995	6.333	1.008	0.8032	1.037	0.1471	1.007
1,249 54	IC SF	7.761	0.983	6.288	0.996	0.8307	1.035	0.1524	0.989
1,249 55	IC SM	7.552	0.996	6.020	1.008	0.7573	1.047	0.1391	1.014
1,249 56	IC SF	7.586	0.989	5.976	1.001	0.7950	1.036	0.1371	0.988
1,249 57	IC SM	7.460	0.999	5.895	1.010	0.7410	1.051	0.1288	1.044
1,249 58	IC SF	7.537	0.991	6.069	1.000	0.8052	1.037	0.1392	1.006
1,249 59	IC SF	7.421	0.996	6.126	1.004	0.8037	1.051	0.1445	1.019
1,249 60	IC SM	7.209	1.007	6.055	1.020	0.7733	1.042	0.1430	1.000
1,249 61	IC SF	7.286	0.992	6.268	1.002	0.8355	1.033	0.1451	0.977
1,249 62	IC SF	7.283	0.988	6.366	0.998	0.8499	1.027	0.1431	0.992
1,249 63	IC SM	7.109	0.993	6.200	1.018	0.7869	1.045	0.1387	1.015
1,249 64	IC SF	7.093	0.985	6.340	0.994	0.8440	1.025	0.1420	0.996
1,249 65	IC SF	6.958	0.990	6.201	1.005	0.8232	1.040	0.1398	1.012
1,249 66	IC SM	6.612	1.006	6.033	0.999	0.7512	1.046	0.1334	1.019
1,249 67	IC SF	6.517	0.989	5.843	0.997	0.7717	1.036	0.1309	1.000
1,249 68	IC SM	6.234	0.991	5.543	1.004	0.6974	1.040	0.1242	1.009
1,249 69	IC SF	6.052	0.984	5.355	0.995	0.7074	1.033	0.1222	0.993
1,249 70	IC SM	5.701	0.996	5.028	1.003	0.6344	1.036	0.1156	1.008
1,249 71	IC SF	5.487	0.989	4.778	1.002	0.6264	1.046	0.1095	1.014
1,249 72	IC SM	5.128	1.000	4.476	1.007	0.5652	1.035	0.1048	1.014
1,249 73	OC SF	4.922	0.991	4.241	1.005	0.5597	1.039	0.1065	0.990
1,249 74	OC SF	4.560	0.985	3.947	1.003	0.5105	1.055	0.1057	0.987
1,249 75	OC D	4.107	0.984	3.552	1.001	0.4578	1.040	0.1037	0.939
1,249 76	OC SF	3.624	0.975	3.150	0.990	0.4132	1.030	0.0810	0.984
1,249 77	OC SF	3.152	0.977	2.729	0.999	0.3519	1.065	0.0605	0.945
1,249 78	RB	2.647	1.002	2.323	1.014	--	--	--	--
1,249 79	RB	2.193	0.984	1.924	1.000	--	--	--	--
1,249 80	RB	1.716	1.005	1.546	0.998	--	--	--	--
1,249 81	RB	1.417	0.993	1.270	0.994	--	--	--	--
1,249 82	RB	1.205	1.044	1.052	1.077	--	--	--	--

Table 4.2.3-23 ZPPR-18B: Radial
 $^{235}\text{U}(n,f)$ Distribution
 along the y-axis at
 z = -5.16 cm

Matrix	Zone	$^{235}\text{U}(n,f)$	
		Exp.	C/E
249 49	IC SF	8.791	1.001
248 49	IC SM	--	--
247 49	IC SF	8.628	0.996
246 49	IC SM	8.391	1.005
245 49	IC SF	8.381	0.991
244 49	IC SF	8.137	0.993
243 49	IC SM	7.559	1.018
242 49	IC SF	7.128	1.010
241 49	IC SM	6.072	1.048
	CR		
238 49	IC SF	6.511	1.019
237 49	IC SM	7.157	0.996
236 49	IC SF	7.594	0.978
235 49	IC SF	7.740	0.977
234 49	IC SM	7.617	0.998
233 49	IC SF	7.919	0.978
	CRP		
230 49	IC SM	7.213	0.975
229 49	IC SF	6.744	0.977
228 49	IC SM	6.383	0.974
227 49	IC SF	6.116	0.970
226 49	IC SF	5.790	0.965
225 49	OC UD	5.273	0.959
224 49	OC US	4.890	0.965
223 49	OC UD	4.527	0.941
222 49	OC US	4.000	0.960
221 49	OC US	3.469	0.955
220 49	OC UD	2.948	0.938
219 49	OC US	2.439	0.941

Table 4.2.5-24 ZPPR-18B: Radial Reaction Rate Distributions at 15°
to the x-axis at z = -5.16 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{235}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
248 50	IC SF	8.278	0.994	1.1610	1.033	0.1988	1.007
248 52	IC SM	7.959	1.010	1.0620	1.044	0.1935	1.021
248 53	IC SF	7.965	0.998	1.0950	1.051	0.1980	1.008
247 54	IC SF	7.652	1.005	1.0620	1.046	0.1915	1.000
247 55	IC SM	--	--	--	--	--	--
247 56	IC SF	7.316	0.994	1.0220	1.036	0.1769	0.983
247 57	IC SF	7.296	0.991	0.9996	1.054	0.1748	0.987
246 57	IC SM	6.823	0.990	0.9026	1.032	0.1571	0.988
246 58	IC SF	6.898	1.013	0.9501	1.069	0.1647	1.001
246 59	IC SM	7.070	1.018	0.9438	1.052	0.1699	1.017
246 60	IC SF	7.383	0.997	1.0180	1.050	0.1758	1.010
245 60	IC SM	7.134	1.011	0.9536	1.047	0.1707	1.022
245 61	IC SF	7.481	0.983	1.0130	1.056	0.1802	1.007
245 62	IC SM	7.287	1.009	0.9783	1.038	0.1779	1.001
244 63	IC SM	7.181	1.007	0.9569	1.046	0.1713	1.007
244 64	IC SF	7.227	0.992	1.0030	1.043	0.1728	0.987
244 65	IC SM	7.020	1.003	0.9297	1.046	0.1633	1.034
244 66	IC SF	6.946	0.994	0.9672	1.038	0.1665	1.009
243 67	IC SF	6.535	1.003	0.9139	1.041	0.1619	0.988
243 68	IC SF	6.307	0.990	0.8749	1.033	0.1532	1.009
243 69	IC SM	5.747	1.003	0.7642	1.036	0.1397	1.003
243 70	IC SM	5.100	1.018	0.7129	1.048	0.1241	0.995
242 70	IC SM	4.814	1.028	0.6544	1.045	0.1193	0.991
	CR						
242 73	OC SF	3.933	1.015	0.5495	1.043	0.1035	0.992
241 73	OC SF	3.924	1.013	0.5529	1.038	0.1026	1.029
241 74	OC SF	3.895	1.011	0.5389	1.043	0.1071	1.009
241 75	OC D	3.684	0.989	0.4998	1.029	0.1118	0.931
241 76	OC SF	3.283	0.988	0.4501	1.034	0.0905	0.992
240 77	OC SF	2.675	0.994	0.3814	1.036	0.0698	0.940
240 78	RB	--	--	0.3053	1.039	0.0288	1.136
240 79	RB	--	--	0.2500	1.020	0.0179	0.927
139 80	RB	--	--	0.1812	1.042	0.0094	0.903
239 81	RB	--	--	0.1386	1.040	0.0059	0.803
239 82	RB	--	--	0.1164	0.977	0.0027	1.006

Table 4.2.3-25 ZPPR-18B: Radial ^{235}U Fission Distributions at 15° to the x-axis at $z = 5.16$ cm

Half-1 (CRP Half) $z = +5.16$ cm				Half-2 (CR Half) $z = -5.16$ cm			
Matrix	Zone	Exp.	C/E	Matrix	Zone	Exp.	C/E
148 50	IC SF	8.988	1.001	248 50	IC SF	8.644	1.007
148 52	IC SM	8.722	1.011	248 52	IC SM	8.400	1.012
148 53	IC SF	8.697	1.002	248 53	IC SF	8.338	1.003
147 54	IC SF	8.545	0.993	247 54	IC SF	8.069	0.995
147 55	IC SM	8.184	1.015	247 55	IC SM	--	--
147 56	IC SF	8.301	0.993	247 56	IC SF	7.590	0.993
147 57	IC SF	8.227	0.995	247 57	IC SF	7.492	0.999
146 58	IC SF	8.045	1.000	246 58	IC SF	7.139	1.012
146 59	IC SM	7.977	1.011	246 59	IC SM	7.407	1.018
146 60	IC SF	8.129	0.999	246 60	IC SF	7.773	0.997
145 60	IC SM	7.996	1.006	245 60	IC SM	7.541	1.012
145 61	IC SF	8.155	0.990	245 61	IC SF	7.768	1.002
145 62	IC SM	7.997	1.002	245 62	IC SM	7.700	1.010
144 63	IC SM	7.880	1.001	244 63	IC SM	7.626	1.008
144 64	IC SF	7.802	0.999	244 64	IC SF	7.684	0.991
144 65	IC SM	7.550	1.011	244 65	IC SM	7.425	1.004
144 66	IC SF	7.531	0.992	244 66	IC SF	7.325	0.995
143 67	IC SF	7.151	0.994	243 67	IC SF	6.966	0.990
143 68	IC SF	6.911	0.987	243 68	IC SF	6.579	0.995
143 69	IC SM	6.397	1.002	243 69	IC SM	5.988	1.006
143 70	IC SF	6.057	0.990	243 70	IC SF	5.189	1.029
142 70	IC SM	5.957	0.988	242 70	IC SM	5.025	1.032
	CRP				CR		
142 73	OC SF	4.998	0.995	242 73	OC SF	4.027	1.029
141 73	OC SF	4.968	0.987	241 73	OC SF	4.170	1.010
141 74	OC SF	4.570	0.990	241 74	OC SF	4.091	1.007
141 75	OC D	4.142	0.987	241 75	OC D	3.840	0.995
141 76	OC SF	3.602	0.991	241 76	OC SF	3.438	0.987
140 77	OC SF	3.055	0.972	240 77	OC SF	2.904	0.982
140 78	RB	2.571	0.985	240 78	RB	2.492	0.980
140 79	RB	2.060	1.000	240 79	RB	2.047	0.973
139 80	RB	1.591	0.983	239 80	RB	1.561	0.973
139 81	RB	1.256	1.008	239 81	RB	1.251	0.985
139 82	RB	1.068	1.052	239 82	RB	1.043	1.050

Table 4.2.3-26 ZPPR-18B: Radial Reaction Rate Distributions at 15° to the x-axis at z = 28.02 cm

Matrix	Zone	Half-1 z = +28cm		Half-2 z = -28cm					
		²³⁵ U(n,f)		²³⁵ U(n,f)		²³⁵ U(n,γ)		²³⁵ U(n,f)	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
1,248 50	IC SF	--	--	6.689	1.001	0.8839	1.045	0.1520	0.995
1,248 52	IC SM	7.741	0.998	6.427	1.011	0.8082	1.050	0.1460	1.016
1,248 55	IC SF	7.736	0.992	6.320	1.005	0.8340	1.050	0.1459	1.024
1,247 54	IC SF	7.729	0.983	6.029	0.996	0.8066	1.034	0.1416	1.002
1,247 55	IC SM	7.555	1.000	--	--	--	--	--	--
1,247 56	IC SF	7.610	0.999	5.542	0.991	0.7487	1.042	0.1319	0.965
1,247 57	IC SF	7.620	0.991	5.446	1.002	0.7453	1.044	0.1295	0.977
1,246/57	IC SM	7.676	1.001	4.742	0.994	0.6444	1.032	0.1148	0.975
1,246 58	IC SF	7.651	0.981	5.181	1.007	0.7050	1.053	0.1171	1.029
1,246 59	IC SM	7.273	1.004	5.495	1.021	0.7113	1.044	0.1239	1.033
1,246 60	IC SF	--	--	5.836	1.008	--	--	--	--
1,245 60	IC SM	7.100	1.008	5.621	1.027	0.7238	1.045	0.1305	1.026
1,245 61	IC SF	7.113	0.994	5.929	1.009	--	--	--	--
1,245 62	IC SM	6.933	1.001	5.990	1.009	0.7683	1.027	0.1358	1.000
1,244 63	IC SM	6.775	1.004	5.966	1.008	0.7527	1.039	0.1314	1.007
1,244 64	IC SF	6.764	0.991	5.963	1.002	--	--	--	--
1,244 65	IC SM	6.536	1.003	5.818	1.005	0.7291	1.046	0.1296	1.002
1,244 66	IC SF	6.443	0.997	5.716	0.997	--	--	--	--
1,243 67	IC SF	6.280	0.981	5.350	0.999	0.7164	1.031	0.1208	1.009
1,243 68	IC SF	6.071	0.983	5.047	0.993	0.6685	1.038	0.1178	0.992
1,243 69	IC SF	5.795	0.989	4.470	1.011	0.5712	1.045	0.1024	1.021
1,243 70	IC SF	5.666	0.984	3.754	1.027	0.5144	1.058	0.0964	0.937
1,242 70	IC SM	5.631	0.980	3.643	1.018	0.4733	1.041	0.0850	1.009
	CRP/CR								
1,242 73	OC SF	4.908	0.979	2.736	1.028	0.3686	1.060	0.0734	0.982
1,241 73	OC SF	4.789	0.974	2.891	1.006	0.3790	1.043	0.0757	0.985
1,241 74	OC SF	--	--	2.930	1.006	0.3844	1.046	0.0751	1.032
1,241 75	OC D	--	--	2.807	0.996	0.3625	1.037	0.0803	0.940
1,241 76	OC SF	--	--	2.554	0.987	0.3360	1.030	0.0661	0.995
1,240 77	OC SF	--	--	2.200	0.975	0.2873	1.034	0.0516	0.940
140 78	RB	--	--	1.870	0.992	--	--	--	--
140 79	RB	--	--	1.524	0.999	--	--	--	--
139 80	RB	--	--	1.191	0.982	--	--	--	--
139 81	RB	--	--	0.945	1.009	--	--	--	--
139 82	RB	--	--	0.784	1.087	--	--	--	--

Table 4.2.3-27 ZPPR-18B: Radial Reaction Rate Distributions at 30° to the x-axis

Matrix	Zone	Half-2 z = -28cm				Half-2 z = -5 cm			
		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{235}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
246 54	IC SM	5.691	1.013	7.721	1.010	0.9852	1.042	0.1762	1.023
245 55	IC SM	4.717	1.040	6.690	1.044	0.8869	1.050	0.1613	0.968
	CR								
244 58	IC SM	4.538	1.025	6.446	1.033	0.8405	1.049	0.1425	1.020
243 58	IC SF	4.822	1.014	6.784	1.012	0.8997	1.048	0.1556	0.959
243 59	IC SM	5.283	1.026	7.199	1.017	0.9153	1.043	0.1605	1.017
242 60	IC SM	5.705	1.020	7.491	1.016	0.9515	1.040	0.1682	1.019
242 61	IC SF	5.987	1.000	7.736	0.999	1.0200	1.040	0.1734	0.996
242 62	IC SF	6.103	1.001	7.775	1.004	1.0310	1.034	0.1680	0.994
241 62	IC SF	6.108	1.007	7.814	1.004	1.0470	1.023	0.1631	0.980
	CRP								
240 65	IC SM	5.806	0.998	7.365	1.003	0.9252	1.028	0.1530	0.967
239 65	IC SF	5.704	0.988	7.267	0.994	0.9758	1.018	0.1555	0.973
239 66	IC SM	5.199	1.002	6.765	0.996	0.8518	1.031	0.1509	1.006
238 67	IC SM	4.722	1.001	6.194	1.003	0.7852	1.037	0.1410	1.035
238 68	IC SF	4.609	0.985	6.046	0.994	0.7994	1.035	0.1432	1.005
237 68	IC SM	4.353	0.991	5.737	1.006	0.7431	1.020	0.1383	1.027

Table 4.2.3-28 ZPPR-18B: Axial Reaction Rate Distributions in Matrix 249-49 (core center)

Zone	z (mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
AB	737.4	2.307	1.102	2.307	1.102	0.2689	1.039	0.0071	0.763
AB	686.6	2.611	1.077	2.611	1.077	0.3103	1.068	0.0111	0.908
AB	635.8	3.001	1.043	3.001	1.043	0.3645	1.063	0.0149	1.009
AB	585.0	3.485	1.014	3.485	1.014	0.4326	1.045	0.0243	1.051
AB	534.2	3.939	1.012	3.939	1.012	0.5075	1.029	0.0383	1.028
Zone Average C/E			1.050		1.050		1.049		0.952
Standard Deviation			0.039		0.039		0.016		0.119
CC SF	483.4	3.882	0.984	4.279	1.020	0.5641	1.060	0.0787	0.932
CC SF	432.6	4.495	0.994	4.894	1.011	0.6466	1.051	0.0966	1.006
CC SF	380.5	5.188	0.990	5.590	0.999	0.7464	1.028	0.1193	0.996
CC SF	356.4	5.424	1.003	5.898	0.996	0.7813	1.034	0.1297	0.990
CC SF	280.2	6.351	0.996	6.811	0.996	0.8979	1.038	0.1494	1.013
CC SF	229.4	6.904	1.001	7.356	1.004	0.9738	1.042	0.1660	1.004
CC SF	178.6	7.403	0.995	7.855	1.000	1.0500	1.028	0.1742	1.022
CC SF	127.8	7.786	0.998	8.296	0.998	1.0990	1.035	0.1842	1.021
CC SF	77.0	8.138	1.004	8.731	0.997	1.1490	1.040	0.1977	1.001
CC SF	50.3	8.283	0.998	8.791	1.001	1.1620	1.040	0.1945	1.029
CC SF	26.2	8.461	0.984	8.897	0.997	1.1740	1.037	0.2029	0.995
Zone Average C/E			0.995		1.002		1.039		1.001
Standard Deviation			0.007		0.007		0.009		0.026

Table 4.2.5-29 ZPPR-18B: Axial Reaction Rate Distributions in Matrix 49-49 (core center)

Zone	z(mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
IC SF	26.2	8.623	0.981	9.097	0.991	1.1940	1.036	0.2023	1.013
IC SF	50.3	8.488	1.004	9.111	0.996	1.1990	1.039	0.2044	1.010
IC SF	77.0	8.542	1.001	9.097	1.002	1.2070	1.037	0.2065	1.004
IC SF	127.8	8.486	0.984	9.014	0.988	1.1940	1.025	0.2022	1.008
IC SF	178.6	8.260	0.987	8.793	0.990	1.1630	1.027	0.1957	1.008
IC SF	229.4	7.983	0.986	8.453	0.996	1.1160	1.035	0.1914	0.992
IC SF	280.2	7.479	0.983	8.025	0.984	1.0690	1.015	0.1793	0.981
IC SF	356.4	6.657	0.988	7.182	0.991	0.9556	1.023	0.1554	0.996
IC SF	380.5	6.288	0.996	6.882	0.992	0.9059	1.035	0.1461	0.987
IC SF	432.6	5.621	0.988	6.144	1.006	0.8102	1.046	0.1270	0.944
IC SF	483.4	4.954	0.980	5.504	1.014	0.7197	1.060	0.1018	0.904
Zone Average C/E			0.989		0.995		1.034		0.985
Standard Deviation			0.008		0.009		0.012		0.033
AB	534.2	--	--	5.207	1.001	0.6647	1.021	0.0514	0.969
AB	585.0	--	--	4.671	1.007	0.5833	1.024	0.0307	1.058
AB	635.8	--	--	4.118	1.031	0.5019	1.037	0.0191	1.009
AB	686.6	--	--	3.624	1.070	0.4296	1.052	0.0123	1.045
AB	737.4	--	--	3.302	1.084	0.3723	1.043	0.0083	0.852
Zone Average C/E			--		1.039		1.035		0.987
Standard Deviation			--		0.037		0.013		0.083

Table 4.2.3-30 ZPPR-18B: Axial ^{235}U Fission Distributions in Matrix 249-64 and 149-64

Matrix 249-64				Matrix 149-64			
Zone	z(mm)	Exp.	C/E	Zone	z(mm)	Exp.	C/E
AB	737.4	2.233	1.097	AB	737.4	2.861	1.085
AB	686.6	2.498	1.080	AB	686.6	3.185	1.058
AB	635.8	2.908	1.029	AB	635.8	3.638	1.016
AB	585.0	3.350	1.005	AB	585.0	4.075	1.006
AB	534.2	3.765	1.005	AB	534.2	4.545	1.002
Zone Average C/E			1.043	Zone Average C/E			1.033
Standard Deviation			0.043	Standard Deviation			0.036
IC SF	483.4	4.062	1.014	AB	483.4	4.812	1.014
IC SF	432.6	4.622	1.006	IC SF	432.6	5.445	0.995
IC SF	381.8	5.263	0.991	IC SF	381.8	5.996	0.998
IC SF	331.0	5.802	0.993	IC SF	331.0	6.605	0.985
IC SF	280.2	6.340	0.994	IC SF	280.2	7.093	0.985
IC SF	229.4	6.793	1.006	IC SF	229.4	7.539	0.991
IC SF	178.6	7.281	0.994	IC SF	178.6	7.832	0.991
IC SF	127.8	7.673	0.989	IC SF	127.8	8.089	0.986
IC SF	77.0	7.922	1.002	IC SF	77.0	8.136	1.007
IC SF	50.3	8.047	0.996	IC SF	50.3	8.222	0.995
IC SF	26.2	8.106	0.993	IC SF	26.2	8.194	0.993
Zone Average C/E			0.998	Zone Average C/E			0.995
Standard Deviation			0.008	Standard Deviation			0.009

Table 4.2.3-31 ZPPR-18B: Axial Reaction Rate Distributions in Matrix 249-75 (outer core)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)^a$		$^{235}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
AB	737.4	1.171	1.072	--	--	--	--
A	686.6	1.310	1.066	--	--	0.0062	0.920
AB	635.8	1.509	1.036	--	--	0.0097	0.892
AB	585.0	1.752	1.012	--	--	0.0142	1.062
AB	534.2	1.999	1.005	--	--	0.0253	0.933
Zone Average C/E			1.038				0.952
Standard Deviation			0.030				0.075
OC D	483.4	2.185	1.016	0.2785	1.067	0.0520	0.887
OC D	432.6	2.499	1.018	0.3197	1.068	0.0648	0.956
OC D	381.8	2.899	0.998	0.3705	1.047	0.0791	0.958
OC D	331.0	3.225	1.001	0.4213	1.027	0.0931	0.939
OC D	280.2	3.552	1.001	0.4578	1.040	0.1037	0.939
OC D	229.4	3.914	0.991	0.5069	1.025	0.1119	0.959
OC D	178.6	4.141	0.996	0.5348	1.033	0.1196	0.957
OC D	127.8	4.402	0.987	0.5648	1.029	0.1274	0.947
OC D	77.0	4.576	0.997	0.5814	1.050	0.1309	0.969
OC D	50.3	4.675	0.986	0.5900	1.046	0.1326	0.967
OC D	26.2	4.702	0.987	0.5970	1.040	0.1344	0.960
Zone Average C/E			0.998		1.043		0.949
Standard Deviation			0.011		0.015		0.023

^aCell factor not measured for ^{235}U capture in the axial blanket.

Table 4.2.3-32 ZPPR-18B: Axial Reaction Rate Distributions in Matrix 149-75 (outer core)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)^a$		$^{235}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC D	26.2	4.735	0.993	0.6147	1.024	0.1379	0.949
OC D	50.3	4.728	1.001	0.6143	1.031	0.1371	0.960
OC D	77.0	4.795	0.990	0.6097	1.042	0.1392	0.949
OC D	127.8	4.686	0.987	0.6019	1.028	0.1367	0.940
OC D	178.6	4.565	0.986	0.5853	1.029	0.1303	0.958
OC D	229.4	4.395	0.986	0.5603	1.035	0.1250	0.958
OC D	280.2	4.107	0.984	0.5271	1.026	0.1187	0.931
OC D	331.0	3.770	0.994	0.4887	1.027	0.1070	0.947
OC D	381.8	3.463	0.989	0.4459	1.029	0.0957	0.933
OC D	432.6	3.075	0.996	0.3900	1.053	0.0806	0.917
OC D	483.4	2.704	1.008	0.3440	1.059	0.0638	0.875
Zone Average C/E			0.992		1.035		0.938
Standard Deviation			0.007		0.012		0.025
AB	534.2	2.534	0.994	--	--	0.0295	0.977
AB	585.0	2.279	0.989	--	--	0.0177	1.043
AB	635.8	2.006	1.007	--	--	0.0131	0.816
AB	686.6	1.735	1.055	--	--	0.0080	0.884
AB	737.4	1.584	1.056	--	--	--	--
Zone Average C/E			1.020				0.930
Standard Deviation			0.033				0.100

^aCell factor not measured for ^{235}U capture in the axial blanket.

Table 4.2.3-33 ZPPR-18B: Axial ²³⁵U Fission Distributions in Matrix 246-57 and 146-57

Matrix 246-57 ^a				Matrix 146-57 ^b			
Zone	z(mm)	Exp.	C/E	Zone	z(mm)	Exp.	C/E
AB	737.4	1.371	1.013	AB	737.4	3.655	1.040
AB	686.6	1.556	1.016	AB	686.6	3.990	1.041
AB	635.8	1.818	1.001	AB	635.8	4.420	1.027
A	585.0	2.139	1.000	AB	585.0	4.942	1.007
AB	534.2	2.521	0.993	AB	534.2	5.400	1.009
Zone Average C/E			1.005	Zone Average C/E			1.025
Standard Deviation			0.010	Standard Deviation			0.016
IC SM	483.4	2.885	0.995	IC SM	483.4	5.551	1.026
IC SM	432.6	3.362	0.990	IC SM	432.6	6.106	1.018
IC SM	381.8	3.821	0.995	IC SM	381.8	6.674	1.014
IC SM	331.0	4.254	1.002	IC SM	331.0	7.227	1.003
IC SM	280.2	4.742	0.994	IC SM	280.2	7.676	1.001
IC SM	229.4	5.181	0.997	IC SM	229.4	8.036	1.010
IC SM	178.6	5.595	1.002	IC SM	178.6	8.253	0.996
IC SM	127.8	5.970	1.011	IC SM	127.8	8.303	0.990
IC SM	77.0	6.461	1.001	IC SM	77.0	8.160	1.007
IC SM	50.3	6.668	1.015	IC SM	50.3	7.984	0.997
IC SM	26.2	7.052	1.000	IC SM	26.2	7.695	0.997
Zone Average C/E			1.000	Zone Average C/E			0.995
Standard Deviation			0.007	Standard Deviation			0.011

^aAdjacent to control rod.

^bAdjacent to CRP.

Table 4.2.5-34 ZPPR-18B: Reaction Rate Ratios along the x-axis at z = -5.16 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
249 49	IC SF	1.061	1.003	0.1403	1.042	0.02348	1.031
249 50	IC SF	1.059	1.006	0.1408	1.038	0.02370	1.026
249 51	IC SM	1.065	0.998	0.1347	1.029	0.02404	1.016
249 52	IC SF	1.057	1.002	0.1393	1.042	0.02427	1.010
249 53	IC SM	1.063	0.993	0.1336	1.031	0.02489	1.001
249 54	IC SF	1.058	0.997	0.1395	1.035	0.02583	0.996
249 55	IC SM	1.060	0.998	0.1344	1.027	0.02502	0.996
249 56	IC SF	1.069	0.993	0.1421	1.026	0.02462	0.989
249 57	IC SM	1.056	1.007	0.1337	1.039	0.02366	1.028
249 58	IC SF	1.055	1.007	0.1389	1.051	0.02437	1.020
249 59	IC SF	1.059	0.999	0.1392	1.044	0.02537	1.014
249 60	IC SM	1.057	1.002	0.1335	1.034	0.02492	1.000
249 61	IC SF	1.060	1.002	0.1385	1.051	0.02416	1.010
249 62	IC SF	1.061	1.005	0.1401	1.045	0.02439	0.995
249 63	IC SM	1.068	0.997	0.1338	1.039	0.02402	1.008
249 64	IC SF	1.058	1.007	0.1395	1.048	0.02427	1.005
249 65	IC SF	1.062	1.003	0.1383	1.056	0.02443	1.008
249 66	IC SM	1.060	1.003	0.1329	1.043	0.02441	1.001
249 67	IC SF	1.055	1.005	0.1374	1.057	0.02360	1.029
249 68	IC SM	1.063	0.995	0.1330	1.037	0.02384	1.019
249 69	IC SF	1.051	1.004	0.1381	1.047	0.02400	1.020
249 70	IC SM	1.060	0.993	0.1344	1.020	0.02387	1.038
249 71	IC SF	1.044	1.008	0.1370	1.049	0.02453	1.014
249 72	IC SM	1.049	1.002	0.1323	1.032	0.02518	1.003
Zone Average C/E			1.001		1.040		1.012
Standard Deviation			0.005		0.010		0.013
249 73	OC SF	1.056	0.993	0.1388	1.029	0.02570	1.027
249 74	OC SF	1.047	0.996	0.1357	1.044	0.02728	1.025
249 75	OC D	1.056	0.993	0.1333	1.053	0.02997	0.974
249 76	OC SF	1.068	0.992	0.1394	1.035	0.02736	1.005
249 77	OC SF	1.093	1.007	0.1414	1.070	0.02490	0.943
Zone Average C/E			0.996		1.046		0.995
Standard Deviation			0.006		0.016		0.036

Table 4.2.3-35 ZPPR-18B: Reaction Rate Ratios at 15° to the x-axis at z = -5.16 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
248 50	IC SF	1.044	1.013	0.1403	1.039	0.02402	1.013
248 52	IC SM	1.055	1.002	0.1334	1.034	0.02431	1.011
248 53	IC SF	1.047	1.005	0.1375	1.053	0.02486	1.010
247 54	IC SF	1.054	0.990	0.1388	1.041	0.02503	0.995
247 56	IC SF	1.037	0.999	0.1397	1.042	0.02418	0.989
247 57	IC SF	1.027	1.008	0.1370	1.064	0.02396	0.996
246 57	IC SM	0.977	1.025	0.1323	1.042	0.02303	0.998
246 58	IC SF	1.035	0.999	0.1377	1.055	0.02388	0.988
246 59	IC SM	1.048	1.000	0.1335	1.033	0.02403	0.999
246 60	IC SF	1.053	1.000	0.1379	1.053	0.02381	1.013
245 61	IC SF	1.038	1.019	0.1354	1.074	0.02409	1.024
245 62	IC SM	1.057	1.001	0.1343	1.029	0.02441	0.992
244 63	IC SM	1.062	1.001	0.1333	1.039	0.02385	1.000
244 64	IC SF	1.063	0.999	0.1388	1.051	0.02391	0.995
244 65	IC SM	1.058	1.001	0.1324	1.043	0.02326	1.031
244 66	IC SF	1.055	1.001	0.1392	1.044	0.02397	1.015
243 67	IC SF	1.043	0.987	0.1398	1.038	0.02477	0.985
243 68	IC SF	1.042	1.005	0.1387	1.043	0.02429	1.019
243 69	IC SM	1.042	1.003	0.1330	1.033	0.02431	1.000
243 70	IC SF	1.017	1.011	0.1398	1.029	0.02433	0.977
242 70	IC SM	1.044	1.004	0.1359	1.017	0.02478	0.964
	CR						
	Zone Average C/E		1.003		1.043		1.001
	Standard Deviation		0.008		0.013		0.016
242 73	OC SF	1.024	1.014	0.1397	1.028	0.02632	0.977
241 73	OC SF	1.063	0.997	0.1409	1.025	0.02615	1.016
241 74	OC SF	1.050	0.996	0.1384	1.032	0.02750	0.998
241 75	OC D	1.042	1.006	0.1357	1.040	0.03035	0.941
241 76	OC SF	1.047	0.999	0.1371	1.047	0.02758	1.004
240 77	OC SF	1.086	0.988	0.1426	1.042	0.02609	0.946
	Zone Average C/E		1.000		1.036		0.980
	Standard Deviation		0.009		0.009		0.031

Table 4.2.3-36 ZPPR-18B: Reaction Rate Ratios in Matrix 249-49 and 149-49 (core center)

Matrix	Zone	z(mm)	F5/F9		C8/F9		F8/F9	
			Exp.	C/E	Exp.	C/E	Exp.	C/E
249 49	IC SF	483.4	1.102	1.037	0.1453	1.077	0.02028	0.947
249 49	IC SF	432.6	1.089	1.017	0.1438	1.057	0.02149	1.012
249 49	IC SF	380.5	1.077	1.009	0.1439	1.038	0.02300	1.006
249 49	IC SF	356.4	1.087	0.993	0.1440	1.031	0.02391	0.987
249 49	IC SF	280.2	1.072	1.000	0.1414	1.042	0.02352	1.017
249 49	IC SF	229.4	1.065	1.003	0.1410	1.041	0.02404	1.003
249 49	IC SF	178.6	1.061	1.005	0.1418	1.033	0.02353	1.027
249 49	IC SF	127.8	1.066	1.000	0.1412	1.037	0.02366	1.023
249 49	IC SF	77.0	1.073	0.993	0.1412	1.036	0.02429	0.997
249 49	IC SF	50.3	1.061	1.003	0.1403	1.042	0.02348	1.031
249 49	IC SF	26.2	1.052	1.013	0.1388	1.054	0.02398	1.011
149 49	IC SF	26.2	1.055	1.010	0.1385	1.056	0.02346	1.033
149 49	IC SF	50.3	1.073	0.992	0.1413	1.035	0.02408	1.006
149 49	IC SF	77.0	1.065	1.001	0.1413	1.036	0.02417	1.003
149 49	IC SF	127.8	1.062	1.004	0.1407	1.042	0.02383	1.017
149 49	IC SF	178.6	1.065	1.003	0.1408	1.041	0.02369	1.021
149 49	IC SF	229.4	1.059	1.010	0.1398	1.050	0.02398	1.006
149 49	IC SF	280.2	1.073	1.001	0.1429	1.033	0.02397	0.998
149 49	IC SF	356.4	1.079	1.003	0.1435	1.035	0.02334	1.008
149 49	IC SF	380.5	1.094	0.996	0.1441	1.039	0.02323	0.991
149 49	IC SF	432.6	1.093	1.018	0.1441	1.059	0.02259	0.955
149 49	IC SF	483.4	1.111	1.035	0.1453	1.082	0.02055	0.922
	Zone Average C/E			1.007		1.045		1.001
	Standard Deviation			0.012		0.014		0.028

Table 4.2.3-37 Basic Data for Radial Distributions of $^{239}\text{Pu}(n,f)$ in ZPPR-18B

Matrix	Loc ^a	$^{239}\text{Pu}(n,f)$ ^b	Matrix	Loc ^b	$^{239}\text{Pu}(n,f)$
x-axis data at z = 51.6 mm ^c			15° data at z = 51.6 mm ^c		
249 50	IJ	8.333 0.040	248 50	IJ	8.316 0.040
249 51	IJ	8.075 0.040	248 52	IJ	7.973 0.038
249 52	IJ	8.139 0.038	248 53	IJ	8.002 0.038
249 53	IJ	7.855 0.036	247 54	IJ	7.688 0.037
249 54	IJ	7.864 0.040	247 56	IJ	7.350 0.034
249 55	IJ	7.579 0.038	247 57	IJ	7.330 0.037
249 56	IJ	7.508 0.037	246 57	IJ*	6.771 0.034
249 57	IJ	7.450 0.037	246 58	IJ	6.930 0.037
249 58	IJ	7.607 0.038	246 59	IJ	7.082 0.037
249 59	IJ	7.616 0.038	246 60	IJ	7.417 0.038
249 60	IJ	7.485 0.038	245 60	IJ	7.146 0.037
249 61	IJ	7.680 0.040	245 61	IJ	7.516 0.038
249 62	IJ	7.674 0.039	245 62	IJ	7.300 0.037
249 63	IJ	7.503 0.042	244 63	IJ	7.194 0.035
249 64	IJ*	7.643 0.040	244 64	IJ	7.260 0.037
249 65	IJ	7.468 0.038	244 65	IJ	7.032 0.035
249 66	IJ	7.144 0.036	244 66	IJ	6.978 0.036
249 67	IJ	7.049 0.036	243 67	IJ	6.565 0.034
249 68	IJ	6.651 0.035	243 68	IJ	6.336 0.034
249 69	IJ	6.543 0.034	243 69	IJ	5.757 0.032
249 70	IJ	6.115 0.033	243 70	IJ	5.204 0.029
249 71	IJ	5.927 0.032	242 70	IJ	4.899 0.028
249 72	IJ	5.529 0.031	242 73	IJ	3.907 0.024
249 73	IJ	5.285 0.031	241 73	IJ	3.898 0.024
249 74	JK	4.928 0.031	241 74	IJ	3.913 0.024
249 75	JK*	4.443 0.024	241 75	JK	3.699 0.024
249 76	IJ	3.825 0.025	241 76	IJ	3.298 0.021
249 77	IJ	3.290 0.021	240 77	IJ	2.715 0.019

^aIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer. All foils were centered 51.6 mm from the reactor midplane except "*" which were at 50.3 mm.

^bExperimental results in units of 10^{-14} fissions per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.5-38 Basic Data for Radial Distributions of $^{235}\text{U}(n,f)$ in Half 2 of ZPPR-18B

Matrix	Loc ^a	$^{235}\text{U}(n,f)^b$	$^{235}\text{U}(n,f)^b$	$^{235}\text{U}(n,\gamma)^b$
data on the x-axis at z = 280.2 mm ^c				
249 50	IJ	6.777 0.022	0.1557 0.0026	0.9749 0.0053
249 51	IJ	6.564 0.032	0.1542 0.0024	0.8273 0.0050
249 52	IJ	6.539 0.033	0.1552 0.0024	0.9285 0.0055
249 53	IJ	6.281 0.031	0.1542 0.0025	0.7905 0.0045
249 54	IJ	6.281 0.032	0.1599 0.0025	0.8974 0.0052
249 55	IJ	5.971 0.032	0.1458 0.0026	0.7453 0.0046
249 56	IJ	5.970 0.030	0.1439 0.0027	0.8589 0.0048
249 57	IJ	5.848 0.029	0.1350 0.0025	0.7292 0.0042
249 58	IJ	6.062 0.029	0.1460 0.0028	0.8699 0.0053
249 59	IJ	6.119 0.032	0.1516 0.0026	0.8683 0.0056
249 60	IJ	6.005 0.029	0.1499 0.0026	0.7610 0.0044
249 61	IJ	6.261 0.030	0.1522 0.0029	0.9027 0.0050
249 62	IJ	6.359 0.030	0.1502 0.0029	0.9182 0.0051
249 63	IJ	6.150 0.030	0.1454 0.0025	0.7744 0.0049
249 64	IJ		0.1490 0.0029	0.9118 0.0054
249 65	IJ	6.194 0.021	0.1467 0.0025	0.8893 0.0049
249 66	IJ	5.984 0.031	0.1398 0.0026	0.7393 0.0046
249 67	IJ	5.837 0.031	0.1374 0.0025	0.8337 0.0047
249 68	IJ	5.497 0.030	0.1302 0.0023	0.6863 0.0040
249 69	IJ	5.349 0.028	0.1282 0.0025	0.7642 0.0044
249 70	IJ	4.987 0.028	0.1211 0.0027	0.6243 0.0041
249 71	IJ	4.773 0.026	0.1149 0.0024	0.6767 0.0045
249 72	IJ	4.439 0.025	0.1098 0.0023	0.5562 0.0035
249 73	IJ	4.236 0.023	0.1118 0.0023	0.6046 0.0037
249 74	JK	3.943 0.024	0.1109 0.0025	0.5515 0.0035
249 76	IJ	3.147 0.018	0.0851 0.0021	0.4464 0.0029
249 77	IJ	2.723 0.016	0.0618 0.0017	0.3902 0.0032
249 78	IJ	2.318 0.018		
249 79	IJ	1.934 0.014		
249 80	IJ	1.554 0.013		
249 81	IJ	1.277 0.012		
249 82	IJ	1.075 0.009		
data on the 15° radial at z = 280.2 mm ^c				
248 50	IJ	6.682 0.033	0.1594 0.0025	0.9550 0.0052
248 52	IJ	6.375 0.032	0.1531 0.0024	0.7954 0.0047
248 53	IJ	6.314 0.031	0.1531 0.0023	0.9010 0.0049
247 54	IJ	6.022 0.031	0.1486 0.0025	0.8715 0.0048
247 56	IJ	5.536 0.032	0.1384 0.0025	0.8089 0.0046
247 57	IJ	5.440 0.027	0.1359 0.0026	0.8052 0.0047
246 58	IJ	5.175 0.027	0.1199 0.0024	0.6226 0.0038
246 59	IJ	5.451 0.028	0.1229 0.0026	0.7617 0.0044
246 60	IJ	5.829 0.029	0.1299 0.0024	0.7000 0.0042
245 60	IJ	5.575 0.028	0.1334 0.0023	0.7123 0.0041
245 61	IJ	5.922 0.029		

Table 4.2.3-38 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
245 62	IJ	5.941 0.031	0.1423 0.0024	0.7561 0.0044
244 63	IJ	5.918 0.029	0.1377 0.0024	0.7408 0.0043
244 64	IJ	5.956 0.031		
244 65	IJ	5.771 0.030	0.1358 0.0024	0.7176 0.0042
244 66	IJ	5.709 0.030		
243 67	IJ	5.344 0.029	0.1268 0.0022	0.7740 0.0044
243 68	IJ	5.042 0.027	0.1236 0.0024	0.7222 0.0045
243 69	IJ	4.433 0.026	0.1074 0.0024	0.5621 0.0036
243 70	IJ	3.846 0.024	0.0998 0.0023	0.5609 0.0036
242 70	IJ	3.678 0.024	0.0870 0.0021	0.4677 0.0034
242 73	IJ	2.717 0.017	0.0751 0.0020	0.3884 0.0030
241 73	IJ	2.870 0.018	0.0774 0.0021	0.3994 0.0031
241 74	IJ	2.927 0.019	0.0788 0.0020	0.4153 0.0029
241 75	JK	2.806 0.019	0.0819 0.0020	0.3988 0.0028
241 76	IJ	2.551 0.015	0.0694 0.0019	0.3630 0.0026
240 77	IJ	2.196 0.014	0.0528 0.0014	0.3185 0.0026
240 78	IJ	1.866 0.015		
240 79	IJ	1.532 0.013		
239 80	IJ	1.197 0.011		
239 81	IJ	0.950 0.010		
239 82	IJ	0.801 0.007		

data on the 30° radial at z = 280.2 mm^c

246 54	IJ	5.645 0.029		
245 55	IJ	4.753 0.026		
244 58	IJ	4.425 0.024		
243 58	IJ	4.788 0.026		
243 59	IJ	5.240 0.026		
242 60	IJ	5.659 0.029		
242 61	IJ	5.980 0.030		
242 62	IJ	6.096 0.030		
241 62	IJ	6.118 0.030		
240 65	IJ	5.802 0.030		
239 65	IJ	5.749 0.029		
239 66	IJ	5.156 0.026		
238 67	IJ	4.684 0.025		
238 68	IJ	4.604 0.025		
237 68	IJ	4.317 0.025		

data on the x-axis at z = 51.6 mm^c

249 50	IJ	8.771 0.027	0.2063 0.0030	1.2621 0.0065
249 51	IJ	8.511 0.037	0.2031 0.0030	1.0684 0.0058
249 52	IJ	8.557 0.036	0.2063 0.0029	1.2196 0.0063
249 53	IJ	8.272 0.036	0.2046 0.0031	1.0310 0.0055
249 54	IJ	8.271 0.035	0.2122 0.0030	1.1797 0.0066
249 55	IJ	7.955 0.038	0.1984 0.0030	1.0007 0.0060
249 56	IJ	7.978 0.025	0.1931 0.0028	1.1479 0.0066

Table 4.2.3-38 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
249 57	IJ	7.792 0.035	0.1844 0.0027	0.9784 0.0053
249 58	IJ	7.981 0.036	0.1936 0.0026	1.1367 0.0063
249 59	IJ	8.023 0.036	0.2017 0.0028	1.1395 0.0065
249 60	IJ	7.832 0.035	0.1951 0.0028	0.9816 0.0058
249 61	IJ	8.094 0.038	0.1938 0.0029	1.1446 0.0065
249 62	IJ	8.094 0.037	0.1955 0.0029	1.1559 0.0066
249 63	IJ	7.939 0.036	0.1886 0.0027	0.9856 0.0063
249 64	IJ*		0.1937 0.0027	1.1465 0.0059
249 65	IJ	7.883 0.031	0.1905 0.0029	1.1112 0.0063
249 66	IJ	7.496 0.033	0.1825 0.0026	0.9329 0.0055
249 67	IJ	7.393 0.033	0.1737 0.0025	1.0418 0.0059
249 68	IJ	7.002 0.032	0.1660 0.0026	0.8691 0.0052
249 69	IJ	6.836 0.031	0.1640 0.0026	0.9716 0.0052
249 70	IJ	6.417 0.029	0.1527 0.0026	0.8073 0.0048
249 71	IJ	6.151 0.028	0.1518 0.0023	0.8734 0.0048
249 72	IJ	5.741 0.026	0.1457 0.0024	0.7188 0.0042
249 73	IJ	5.548 0.026	0.1419 0.0024	0.7890 0.0045
249 74	JK	5.131 0.024	0.1404 0.0023	0.7191 0.0044
249 76	IJ	4.061 0.020	0.1093 0.0020	0.5735 0.0037
249 77	IJ	3.535 0.019	0.0825 0.0019	0.5080 0.0035
249 78	IJ	3.049 0.019	0.0366 0.0012	0.3704 0.0031
249 79	IJ	2.473 0.015	0.0201 0.0010	0.2940 0.0025
249 80	IJ	1.995 0.013	0.0118 0.0009	0.2273 0.0023
249 81	IJ	1.613 0.011	0.0069 0.0008	0.1763 0.0019
249 82	IJ	1.392 0.011	0.0043 0.0008	0.1423 0.0016
249 83	TC	1.431 0.011		

data on the 15° radial at z = 51.6 mm^c

248 50	IJ	8.635 0.041	0.2086 0.0031	1.2542 0.0068
248 52	IJ	8.332 0.036	0.2029 0.0029	1.0452 0.0060
248 53	IJ	8.329 0.036	0.2078 0.0028	1.1829 0.0066
247 54	IJ	8.060 0.038	0.2009 0.0029	1.1470 0.0070
247 56	IJ	7.582 0.033	0.1856 0.0025	1.1047 0.0058
247 57	IJ	7.484 0.033	0.1834 0.0027	1.0800 0.0061
246 57	IJ*		0.1642 0.0026	0.8722 0.0048
246 58	IJ	7.131 0.032	0.1729 0.0026	1.0265 0.0060
246 59	IJ	7.346 0.032	0.1781 0.0029	0.9288 0.0055
246 60	IJ	7.764 0.037	0.1844 0.0027	1.0998 0.0062
245 60	IJ	7.480 0.035	0.1790 0.0026	0.9384 0.0056
245 61	IJ	7.759 0.036	0.1891 0.0028	1.0939 0.0066
245 62	IJ	7.637 0.034	0.1865 0.0027	0.9628 0.0056
244 63	IJ	7.564 0.034	0.1796 0.0027	0.9417 0.0061
244 64	IJ	7.675 0.034	0.1813 0.0028	1.0837 0.0062
244 65	IJ	7.364 0.032	0.1711 0.0026	0.9150 0.0054
244 66	IJ	7.317 0.033	0.1747 0.0027	1.0449 0.0060
243 67	IJ	6.959 0.031	0.1698 0.0026	0.9874 0.0057
243 68	IJ	6.571 0.033	0.1607 0.0024	0.9452 0.0055
243 69	IJ	5.939 0.029	0.1465 0.0028	0.7521 0.0043

Table 4.2.3-38 (contd)

Matrix	Loc ^a	$^{235}\text{U}(n,r)^b$	$^{235}\text{U}(n,r)^b$	$^{235}\text{U}(n,\gamma)^b$
243 70	IJ	5.317 0.025	0.1284 0.0023	0.7774 0.0044
242 70	IJ	5.074 0.027	0.1221 0.0022	0.6466 0.0041
242 73	IJ	3.998 0.021	0.1058 0.0022	0.5790 0.0039
241 73	IJ	4.140 0.022	0.1049 0.0022	0.5826 0.0036
241 74	IJ	4.087 0.021	0.1124 0.0023	0.5822 0.0036
241 75	JK	3.839 0.020	0.1139 0.0022	0.5498 0.0034
241 76	IJ	3.434 0.019	0.0950 0.0020	0.4862 0.0031
240 77	IJ	2.898 0.016	0.0714 0.0016	0.4228 0.0028
240 78	IJ	2.486 0.016	0.0316 0.0012	0.2985 0.0028
240 79	IJ	2.057 0.014	0.0181 0.0010	0.2458 0.0025
239 80	IJ	1.569 0.012	0.0095 0.0009	0.1782 0.0018
239 81	IJ	1.257 0.010	0.0060 0.0008	0.1363 0.0016
239 82	IJ	1.065 0.009	0.0032 0.0009	0.1107 0.0017

data on the 30° radial at z = 51.6 mm^c

246 54	IJ	7.658 0.035	0.1846 0.0026	0.9696 0.0052
245 55	IJ	6.755 0.034	0.1651 0.0027	0.8764 0.0049
244 58	IJ	6.286 0.031	0.1489 0.0028	0.8127 0.0047
243 58	IJ	6.736 0.031	0.1591 0.0028	0.9480 0.0052
243 59	IJ	7.140 0.032	0.1682 0.0029	0.9008 0.0050
242 60	IJ	7.430 0.035	0.1763 0.0029	0.9364 0.0052
242 61	IJ	7.727 0.034	0.1819 0.0029	1.1016 0.0058
242 62	IJ	7.766 0.034	0.1763 0.0029	1.1138 0.0059
241 62	IJ	7.827 0.036	0.1697 0.0028	1.1269 0.0059
240 65	IJ	7.361 0.035	0.1579 0.0026	0.9087 0.0050
239 65	IJ	7.324 0.036	0.1612 0.0026	1.0702 0.0057
239 66	IJ	6.710 0.035	0.1581 0.0030	0.8383 0.0048
238 67	IJ	6.144 0.031	0.1478 0.0026	0.7727 0.0048
238 68	IJ	6.039 0.036	0.1502 0.0027	0.8636 0.0048
237 68	IJ	5.690 0.031	0.1450 0.0028	0.7313 0.0047

data on the y-axis at z = 51.6 mm^c

247 49	IJ	8.619 0.041		
246 49	IJ	8.323 0.039		
245 49	IJ	8.372 0.039		
244 49	IJ	8.128 0.038		
243 49	IJ	7.498 0.036		
242 49	IJ	7.120 0.035		
241 49	IJ	6.131 0.029		
238 49	IJ	6.671 0.031		
237 49	IJ	7.098 0.033		
236 49	IJ	7.586 0.034		
235 49	IJ	7.732 0.036		
234 49	IJ	7.555 0.035		
233 49	IJ	7.933 0.037		
230 49	IJ	7.071 0.033		

Table 4.2.3-38 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b	²³⁵ U(n,γ) ^b
229 49	IJ	6.737	0.033	
228 49	IJ	6.331	0.030	
227 49	IJ	6.109	0.029	
226 49	IJ	5.778	0.030	
225 49	MN	5.273	0.025	
224 49	HI	4.890	0.025	
223 49	MN	4.528	0.024	
222 49	HI	4.000	0.023	
221 49	HI	3.469	0.019	
220 49	MN	2.948	0.018	
219 49	HI	2.439	0.017	

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above and the ²³⁵U foils were centered on the mid-height of the drawer.

^bExperimental results in units of 10⁻¹⁴ fissions per atom per second at a reactor power of approximately one watt. The second number is one standard deviation of uncertainty. See text for details.

^cDistance from the reactor interface to the center of the foil except "*" which were at 50.3 mm.

Table 4.2.3-39 Basic Data for Radial
Distributions of $^{235}\text{U}(n,f)$
in Half 1 of ZPPR-18B

Matrix	Loc ^a	$^{235}\text{U}(n,f)^b$	$^{235}\text{U}(n,f)^b$
x-axis data at z = 51.6 mm, ^c z = 280.2 mm ^c			
149 50	GH	9.040 0.042	7.962 0.040
149 51	GH	8.761 0.042	7.730 0.039
149 52	GH	8.781 0.045	7.800 0.039
149 53	GH	8.593 0.041	7.631 0.038
149 54	GH	8.624 0.040	7.752 0.038
149 55	GH	8.312 0.039	7.491 0.039
149 56	GH	8.409 0.026	7.578 0.024
149 57	GH	8.202 0.036	7.399 0.033
149 58	GH	8.375 0.037	7.528 0.033
149 59	GH	8.375 0.038	7.412 0.034
149 60	GH	8.174 0.038	7.151 0.033
149 61	GH	8.320 0.039	7.278 0.035
149 62	GH	8.279 0.038	7.275 0.035
149 63	GH	8.097 0.039	7.051 0.035
149 65	GH	8.025 0.026	6.950 0.023
149 66	GH	7.618 0.035	6.558 0.031
149 67	GH	7.567 0.035	6.510 0.030
149 68	GH	7.147 0.033	6.183 0.030
149 69	GH	6.977 0.033	6.046 0.030
149 70	GH	6.568 0.030	5.655 0.028
149 71	GH	6.375 0.031	5.481 0.029
149 72	GH	5.931 0.030	5.087 0.027
149 73	FG	5.656 0.030	4.917 0.026
149 74	GH	5.256 0.029	4.555 0.026
149 76	GH	4.184 0.024	3.620 0.023
149 77	GH	3.622 0.022	3.145 0.020
149 78	GH	3.071 0.017	2.641 0.016
149 79	GH	2.538 0.016	2.204 0.015
149 80	GH	2.027 0.016	1.725 0.013
149 81	GH	1.662 0.011	1.424 0.012
149 82	GH	1.410 0.013	1.231 0.012
15° data at z = 51.6 mm, ^c z = 280.2 mm ^c			
148 50	GH	8.978 0.043	
148 52	GH	8.651 0.043	7.678 0.038
148 53	GH	8.687 0.042	7.728 0.041
147 54	GH	8.535 0.042	7.721 0.040
147 55	GH	8.117 0.036	7.493 0.034
147 56	GH	8.292 0.038	7.602 0.034
147 57	GH	8.218 0.037	7.612 0.033
146 58	GH	8.036 0.035	7.642 0.035
146 59	GH	7.912 0.036	7.213 0.034
146 60	GH	8.120 0.038	

Table 4.2.3-39 (contd)

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁵ U(n,f) ^b
145 60	GH	7.931 0.037	7.042 0.032
145 61	GH	8.146 0.040	7.105 0.035
145 62	GH	7.932 0.037	6.877 0.033
144 63	GH	7.816 0.038	6.720 0.034
144 64	GH	7.793 0.037	6.757 0.033
144 65	GH	7.488 0.034	6.483 0.033
144 66	GH	7.523 0.034	6.436 0.033
143 67	GH	7.143 0.033	6.273 0.030
143 68	GH	6.903 0.032	6.064 0.030
143 69	GH	6.345 0.031	5.748 0.028
143 70	GH	6.067 0.031	5.676 0.029
142 70	GH	5.840 0.030	5.520 0.028
142 73	GH	5.037 0.026	4.947 0.026
141 73	GH	5.008 0.025	4.826 0.024
141 74	GH	4.565 0.024	4.259 0.024
141 75	FG	4.141 0.026	3.757 0.023
141 76	GH	3.597 0.022	3.237 0.021
140 77	GH	3.049 0.020	2.665 0.017
140 78	GH	2.566 0.018	
140 79	GH	2.071 0.013	
139 80	GH	1.599 0.014	
139 81	GH	1.262 0.013	
139 82	GH	1.091 0.011	

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^bExperimental results in units of 10⁻¹⁴ fissions per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

^cDistance from the reactor interface to the center of the foil.

Table 4.2.3-40 Basic Data for Axial Distributions of ^{239}Pu and ^{238}U
Reaction Rates in ZPPR-18B

Matrix	z, mm ^a	Loc ^b	$^{239}\text{Pu}(n, f)^c$	$^{238}\text{U}(n, f)^c$	$^{238}\text{U}(n, \gamma)^c$
249 49	737.4	IJ		0.0066 0.0011	0.3440 0.0027
249 49	686.6	IJ		0.0102 0.0013	0.3853 0.0027
249 49	635.8	IJ		0.0138 0.0011	0.4371 0.0029
249 49	585.0	IJ		0.0225 0.0013	0.5077 0.0033
249 49	534.2	IJ		0.0354 0.0015	0.5757 0.0036
249 49	483.4	IJ	3.928 0.023	0.0833 0.0020	0.6322 0.0037
249 49	432.6	IJ	4.532 0.025	0.1018 0.0021	0.7114 0.0040
249 49	380.5	IJ	5.212 0.028	0.1251 0.0022	0.8063 0.0049
249 49	356.4	IJ	5.450 0.029	0.1361 0.0025	0.8441 0.0050
249 49	280.2	IJ	6.380 0.033	0.1568 0.0031	0.9700 0.0056
249 49	229.4	IJ	6.935 0.034	0.1742 0.0026	1.0521 0.0058
249 49	178.6	IJ	7.438 0.037	0.1828 0.0028	1.1339 0.0059
249 49	127.8	IJ	7.822 0.039	0.1933 0.0031	1.1869 0.0062
249 49	77.0	IJ	8.175 0.038	0.2074 0.0029	1.2411 0.0075
249 49	50.3	IJ	8.321 0.042	0.2041 0.0028	1.2557 0.0064
249 49	26.2	IJ	8.500 0.042	0.2128 0.0029	1.2686 0.0064
149 49	26.2	GH	8.663 0.040	0.2123 0.0029	1.2899 0.0065
149 49	50.3	GH	8.527 0.041	0.2145 0.0029	1.2955 0.0066
149 49	77.0	GH	8.582 0.041	0.2167 0.0029	1.3037 0.0066
149 49	127.8	GH	8.525 0.044	0.2121 0.0028	1.2895 0.0065
149 49	178.6	GH	8.298 0.042	0.2053 0.0029	1.2568 0.0064
149 49	229.4	GH	8.019 0.040	0.2008 0.0029	1.2059 0.0062
149 49	280.2	GH	7.513 0.036	0.1881 0.0031	1.1546 0.0061
149 49	356.4	GH	6.688 0.033	0.1631 0.0026	1.0324 0.0054
149 49	380.5	GH	6.317 0.031	0.1533 0.0028	0.9787 0.0057
149 49	432.6	GH	5.667 0.030	0.1338 0.0025	0.8914 0.0049
149 49	483.4	GH	5.014 0.028	0.1077 0.0023	0.8066 0.0056
149 49	534.2	GH		0.0475 0.0017	0.7540 0.0043
149 49	585.0	GH		0.0284 0.0012	0.6846 0.0039
149 49	635.8	GH		0.0177 0.0011	0.6018 0.0036
149 49	686.6	GH		0.0114 0.0010	0.5335 0.0033
149 49	737.4	GH		0.0077 0.0010	0.4763 0.0033
249 75	686.6	JK		0.0058 0.0009	0.1774 0.0019
249 75	635.8	JK		0.0090 0.0012	0.2075 0.0018
249 75	585.0	JK		0.0132 0.0011	0.2423 0.0020
249 75	534.2	JK		0.0238 0.0013	0.2727 0.0022
249 75	483.4	JK		0.0526 0.0017	0.3203 0.0024
249 75	432.6	JK		0.0659 0.0020	0.3595 0.0026
249 75	381.8	JK		0.0807 0.0022	0.4075 0.0028
249 75	331.0	JK		0.0949 0.0022	0.4634 0.0034
249 75	280.2	JK		0.1057 0.0025	0.5036 0.0032
249 75	229.4	JK		0.1141 0.0025	0.5576 0.0035
249 75	178.6	JK		0.1219 0.0024	0.5884 0.0036
249 75	127.8	JK		0.1299 0.0026	0.6213 0.0038

Table 4.2.3-40 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁹ Pu(n,f) ^c	²³⁵ U(n,f) ^c	²³⁵ U(n,γ) ^c
249 75	77.0	JK		0.1334 0.0023	0.6395 0.0040
249 75	50.3	JK		0.1352 0.0024	0.6490 0.0038
249 75	26.2	JK		0.1370 0.0022	0.6568 0.0041
149 75	26.2	FG		0.1405 0.0028	0.6762 0.0040
149 75	50.3	FG		0.1397 0.0027	0.6758 0.0040
149 75	77.0	FG		0.1419 0.0025	0.6707 0.0039
149 75	127.8	FG		0.1393 0.0027	0.6621 0.0039
149 75	178.6	FG		0.1328 0.0025	0.6439 0.0039
149 75	229.4	FG		0.1274 0.0023	0.6164 0.0041
149 75	280.2	FG		0.1210 0.0024	0.5798 0.0036
149 75	331.0	FG		0.1090 0.0022	0.5377 0.0034
149 75	381.8	FG		0.0976 0.0021	0.4905 0.0036
149 75	432.6	FG		0.0820 0.0020	0.4386 0.0029
149 75	483.4	FG		0.0646 0.0016	0.3957 0.0027
149 75	534.2	FG		0.0277 0.0012	0.3437 0.0027
149 75	585.0	FG		0.0164 0.0015	0.3082 0.0023
149 75	635.8	FG		0.0121 0.0010	0.2705 0.0022
149 75	686.6	FG		0.0074 0.0009	0.2382 0.0020

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered on and the ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^cExperimental results in units of 10⁻¹⁴ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-41 Basic Data for Axial Distributions of $^{235}\text{U}(n,f)$ in ZPPR-18B

Matrix	z, mm ^a	Loc ^b	$^{235}\text{U}(n,f)^c$	Matrix	Loc ^b	$^{235}\text{U}(n,f)^c$
249 49	737.4	IJ	2.306 0.014	249 64	IJ	2.231 0.016
249 49	686.6	IJ	2.609 0.016	249 64	IJ	2.497 0.017
249 49	635.8	IJ	2.999 0.017	249 64	IJ	2.907 0.017
249 49	585.0	IJ	3.483 0.019	249 64	IJ	3.348 0.020
249 49	534.2	IJ	3.937 0.022	249 64	IJ	3.763 0.021
249 49	483.4	IJ	4.327 0.022	249 64	IJ	4.108 0.023
249 49	432.6	IJ	4.919 0.023	249 64	IJ	4.645 0.025
249 49	380.5	IJ	5.584 0.026	249 64	IJ	5.257 0.027
249 49	356.4	IJ	5.891 0.027	249 64	IJ	5.796 0.029
249 49	280.2	IJ	6.804 0.031	249 64	IJ	6.333 0.032
249 49	229.4	IJ	7.348 0.032	249 64	IJ	6.785 0.031
249 49	178.6	IJ	7.846 0.036	249 64	IJ	7.273 0.035
249 49	127.8	IJ	8.286 0.036	249 64	IJ	7.664 0.036
249 49	77.0	IJ	8.721 0.037	249 64	IJ	7.914 0.040
249 49	50.3	IJ	8.782 0.036	249 64	IJ	8.038 0.035
249 49	26.2	IJ	8.887 0.037	249 64	IJ	8.097 0.037
149 49	26.2	GH	9.087 0.038	149 64	GH	8.185 0.039
149 49	50.3	GH	9.101 0.038	149 64	GH	8.213 0.041
149 49	77.0	GH	9.087 0.038	149 64	GH	8.127 0.034
149 49	127.8	GH	9.004 0.037	149 64	GH	8.080 0.039
149 49	178.6	GH	8.783 0.037	149 64	GH	7.823 0.035
149 49	229.4	GH	8.444 0.035	149 64	GH	7.531 0.038
149 49	280.2	GH	8.017 0.034	149 64	GH	7.085 0.033
149 49	356.4	GH	7.174 0.031	149 64	GH	6.598 0.036
149 49	380.5	GH	6.874 0.030	149 64	GH	5.989 0.030
149 49	432.6	GH	6.175 0.028	149 64	GH	5.472 0.029
149 49	483.4	GH	5.566 0.026	149 64	GH	4.866 0.025
149 49	534.2	GH	5.204 0.026	149 64	GH	4.543 0.024
149 49	585.0	GH	4.669 0.024	149 64	GH	4.073 0.023
149 49	635.8	GH	4.116 0.021	149 64	GH	3.636 0.021
149 49	686.6	GH	3.622 0.019	149 64	GH	3.183 0.020
149 49	737.4	GH	3.300 0.018	149 64	GH	2.860 0.018
249 75	737.4	JK	1.171 0.011	246 57	IJ	1.376 0.011
249 75	686.6	JK	1.309 0.011	246 57	IJ	1.562 0.011
249 75	635.8	JK	1.508 0.014	246 57	IJ	1.824 0.014
249 75	585.0	JK	1.751 0.014	246 57	IJ	2.146 0.014
249 75	534.2	JK	2.002 0.015	246 57	IJ	2.530 0.017
249 75	483.4	JK	2.198 0.016	246 57	IJ	2.813 0.016
249 75	432.6	JK	2.507 0.017	246 57	IJ	3.279 0.020
249 75	381.8	JK	2.898 0.020	246 57	IJ	3.726 0.021
249 75	331.0	JK	3.223 0.019	246 57	IJ	4.149 0.022
249 75	280.2	JK	3.551 0.020	246 57	IJ	4.624 0.024
249 75	229.4	JK	3.912 0.024	246 57	IJ	5.052 0.025
249 75	178.6	JK	4.140 0.024	246 57	IJ	5.456 0.027

Table 4.2.3-41 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁵ U(n,f) ^c	Matrix	Loc ^b	²³⁵ U(n,f) ^c
249 75	127.8	JK	4.400 0.025	246 57	IJ	5.822 0.028
249 75	77.0	JK	4.574 0.024	246 57	IJ	6.300 0.030
249 75	50.3	JK	4.674 0.024	246 57	IJ	6.502 0.029
249 75	26.2	JK	4.700 0.023	246 57	IJ	6.877 0.030
149 75	26.2	FG	4.734 0.027	146 57	GH	7.691 0.036
149 75	50.3	FG	4.727 0.026	146 57	GH	7.979 0.038
149 75	77.0	FG	4.794 0.023	146 57	GH	8.155 0.037
149 75	127.8	FG	4.685 0.028	146 57	GH	8.298 0.037
149 75	178.6	FG	4.563 0.023	146 57	GH	8.248 0.037
149 75	229.4	FG	4.394 0.024	146 57	GH	8.031 0.037
149 75	280.2	FG	4.106 0.023	146 57	GH	7.671 0.035
149 75	331.0	FG	3.768 0.021	146 57	GH	7.223 0.032
149 75	381.8	FG	3.462 0.020	146 57	GH	6.670 0.032
149 75	432.6	FG	3.084 0.018	146 57	GH	6.102 0.030
149 75	483.4	FG	2.720 0.017	146 57	GH	5.548 0.028
149 75	534.2	FG	2.537 0.015	146 57	GH	5.429 0.028
149 75	585.0	FG	2.278 0.014	146 57	GH	4.968 0.026
149 75	635.8	FG	2.005 0.013	146 57	GH	4.443 0.023
149 75	686.6	FG	1.734 0.014	146 57	GH	4.011 0.023
149 75	737.4	FG	1.583 0.014	146 57	GH	3.675-0.023

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-42 Basic Data for $^{239}\text{Pu}(n,f)$ Cell Studies in ZPPR-18B

Matrix	z, mm^a	Loc ^b	$^{239}\text{Pu}(n,f)^c$	Matrix	z, mm^a	Loc ^b	$^{239}\text{Pu}(n,f)^c$
40	51.6	GH	6.054 0.033	244 43	77.0	GH	6.257 0.033
40	51.6	HI	6.121 0.033	244 43	77.0	HI	6.053 0.033
40	51.6	IJ	6.292 0.032	244 43	77.0	IJ	5.993 0.033
40	254.8	GH	7.078 0.035	144 43	254.8	GH	7.473 0.040
40	254.8	HI	7.004 0.033	144 43	254.8	HI	7.277 0.036
40	254.8	IJ	7.155 0.034	144 43	254.8	IJ	7.382 0.037
37	77.0	GH	7.704 0.038	148 35	77.0	GH	7.769 0.038
37	77.0	HI	7.683 0.039	148 35	77.0	HI	7.656 0.037
37	77.0	IJ	7.686 0.039	148 35	77.0	IJ	7.749 0.038
37	254.8	GH	6.943 0.035	148 35	127.8	GH	7.689 0.039
37	254.8	HI	6.923 0.034	148 35	127.8	HI	7.620 0.039
37	254.8	IJ	6.979 0.035	148 35	127.8	IJ	7.693 0.037
24	77.0	DE	4.727 0.026	148 35	483.4	GH	4.531 0.027
24	77.0	EF	4.818 0.026	148 35	483.4	HI	4.394 0.027
24	77.0	FG	4.894 0.027	148 35	483.4	IJ	4.610 0.026
24	77.0	JK	4.971 0.027				
24	77.0	KL	4.987 0.027				
24	77.0	LM	5.068 0.027				

^aDistance from the reactor interface to the center of the foil
^bIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer.
^cExperimental results in units of 10^{18} fissions per sec per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-43 Basic Data for Cell Studies of ^{235}U and ^{238}U
Reaction Rates in ZPPR-18B

Matrix	z, mm^a	Loc ^b	$^{235}\text{U}(n, f)^c$	$^{238}\text{U}(n, f)^c$	$^{238}\text{U}(n, \gamma)^c$
254 43	77.0	AB	6.767 0.030	0.1398 0.0026	0.9191 0.0055
244 43	77.0	-AB		0.1410 0.0029	0.9368 0.0056
244 43	77.0	GH	6.600 0.030	0.1516 0.0029	0.9547 0.0058
244 43	77.0	HI	6.296 0.026	0.1563 0.0025	0.8640 0.0048
244 43	77.0	IJ	6.298 0.029	0.1474 0.0028	0.9122 0.0051
244 43	77.0	-OP		0.1210 0.0024	0.8217 0.0055
254 43	77.0	OP	5.835 0.025	0.1196 0.0029	0.8131 0.0047
254 43	254.8	AB	5.251 0.024	0.1048 0.0024	0.7113 0.0052
244 43	254.8	-AB		0.1107 0.0026	0.7153 0.0045
244 43	254.8	GH	5.050 0.026	0.1173 0.0027	0.7308 0.0043
244 43	254.8	HI	4.844 0.022	0.1221 0.0024	0.6591 0.0039
244 43	254.8	IJ	4.783 0.021	0.1111 0.0024	0.6892 0.0041
244 43	254.8	-OP		0.0919 0.0022	0.6229 0.0041
254 43	254.8	OP	4.489 0.021	0.0953 0.0023	0.6202 0.0039
154 43	77.0	AB	8.344 0.034	0.1500 0.0030	1.1387 0.0060
144 43	77.0	-AB		0.1440 0.0028	1.1571 0.0064
144 43	77.0	GH	8.240 0.033	0.1750 0.0030	1.2043 0.0067
144 43	77.0	HI	8.102 0.033	0.1849 0.0029	1.0933 0.0057
144 43	77.0	IJ	8.272 0.034	0.1782 0.0028	1.1893 0.0066
144 43	77.0	-OP		0.1635 0.0029	1.1250 0.0064
154 43	77.0	OP	8.338 0.035	0.1618 0.0030	1.1081 0.0063
154 43	254.8	AB	8.231 0.035	0.1342 0.0030	1.1105 0.0059
144 43	254.8	-AB		0.1356 0.0028	1.1418 0.0064
144 43	254.8	GH	8.190 0.035	0.1618 0.0031	1.1860 0.0062
144 43	254.8	HI	7.917 0.034	0.1762 0.0028	1.0518 0.0056
144 43	254.8	IJ	8.034 0.035	0.1646 0.0029	1.1535 0.0060
144 43	254.8	-OP		0.1504 0.0029	1.0683 0.0067
154 43	254.8	OP	7.963 0.033	0.1485 0.0029	1.0446 0.0060
150 35	77.0	AB	8.166 0.036	0.1698 0.0024	1.0930 0.0060
148 35	77.0	-AB		0.1655 0.0031	1.1006 0.0063
148 35	77.0	GH	8.200 0.036	0.1928 0.0025	1.1626 0.0064
148 35	77.0	HI	8.106 0.036	0.2013 0.0029	1.0852 0.0057
148 35	77.0	IJ	8.203 0.037	0.1917 0.0026	1.1665 0.0065
148 35	77.0	-OP		0.1705 0.0032	1.1128 0.0063
150 35	77.0	OP	8.310 0.038	0.1712 0.0027	1.1059 0.0062
150 35	127.8	AB	8.026 0.036	0.1649 0.0024	1.0691 0.0056
148 35	127.8	-AB		0.1614 0.0032	1.0826 0.0062
148 35	127.8	GH	8.076 0.035	0.1896 0.0024	1.1595 0.0060
148 35	127.8	HI	7.979 0.036	0.2019 0.0028	1.0645 0.0056
148 35	127.8	IJ	8.024 0.035	0.1878 0.0026	1.1651 0.0061
148 35	127.8	-OP		0.1644 0.0028	1.0856 0.0062
150 35	127.8	OP	8.191 0.040	0.1650 0.0026	1.0814 0.0062

Table 4.2.3-43 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁵ U(n, f) ^c	²³⁵ U(n, f) ^c	²³⁵ U(n, γ) ^c
150 35	483.4	AB	4.933 0.025	0.0742 0.0017	0.6499 0.0038
148 35	483.4	-AB		0.0797 0.0021	0.6644 0.0044
148 35	483.4	GH	5.073 0.025	0.0907 0.0018	0.7393 0.0046
148 35	483.4	HI	5.039 0.025	0.0981 0.0019	0.6624 0.0038
148 35	483.4	IJ	5.247 0.026	0.0939 0.0020	0.8071 0.0046
148 35	483.4	OP		0.0772 0.0022	0.7054 0.0046
150 35	483.4	OP	5.051 0.026	0.0750 0.0017	0.6621 0.0039
254 40	51.6	AB	6.043 0.028	0.1243 0.0022	0.8215 0.0049
244 40	51.6	GG	6.329 0.029	0.1424 0.0023	0.7922 0.0045
244 40	51.6	GH	6.280 0.030	0.1417 0.0021	0.8103 0.0049
244 40	51.6	HI	6.412 0.030	0.1577 0.0025	0.8348 0.0046
244 40	51.6	IJ	6.561 0.032	0.1491 0.0022	0.8374 0.0046
254 40	51.6	JJ	6.616 0.031	0.1482 0.0025	0.8368 0.0047
254 40	51.6	OP	6.916 0.033	0.1423 0.0025	0.9225 0.0051
254 40	254.8	AB	4.390 0.022	0.0882 0.0018	0.6034 0.0036
254 40	254.8	GG	4.592 0.023	0.1059 0.0020	0.5925 0.0035
244 40	254.8	GH	4.579 0.024	0.1120 0.0018	0.6017 0.0035
244 40	254.8	HI	4.721 0.024	0.1223 0.0021	0.6165 0.0036
244 40	254.8	IJ	4.865 0.024	0.1128 0.0022	0.6285 0.0038
254 40	254.8	JJ	4.923 0.026	0.1120 0.0021	0.6244 0.0037
254 40	254.8	OP	5.201 0.025	0.1044 0.0019	0.6987 0.0044
154 40	51.6	AB	8.008 0.034	0.1523 0.0022	1.0427 0.0058
154 40	51.6	GG	7.809 0.033	0.1624 0.0025	0.9618 0.0056
144 40	51.6	GH	7.672 0.032	0.1731 0.0023	0.9694 0.0054
144 40	51.6	HI	7.722 0.032	0.1790 0.0025	0.9904 0.0056
144 40	51.6	IJ	7.816 0.033	0.1647 0.0023	0.9777 0.0055
154 40	51.6	JJ	7.793 0.033	0.1591 0.0022	0.9669 0.0054
154 40	51.6	OP	7.971 0.034	0.1383 0.0022	1.0756 0.0061
154 40	254.8	AB	7.773 0.033	0.1421 0.0023	1.0098 0.0060
154 40	254.8	GG	7.679 0.033	0.1529 0.0022	0.9254 0.0058
144 40	254.8	GH	7.540 0.031	0.1554 0.0023	0.9458 0.0058
144 40	254.8	HI	7.561 0.032	0.1666 0.0024	0.9579 0.0054
144 40	254.8	IJ	7.719 0.033	0.1543 0.0021	0.9520 0.0057
154 40	254.8	JJ	7.750 0.033	0.1472 0.0021	0.9436 0.0054
154 40	254.8	OP	5.792 0.025	0.1306 0.0021	1.0896 0.0060
150 37	77.0	AB	8.295 0.034	0.1693 0.0029	1.0978 0.0062
150 37	77.0	GG	8.095 0.033	0.1886 0.0038	1.0130 0.0055
148 37	77.0	GH	8.058 0.032	0.1943 0.0028	1.0183 0.0058
148 37	77.0	HI	8.021 0.034	0.2029 0.0030	1.0328 0.0055
148 37	77.0	IJ	8.030 0.034	0.1934 0.0027	1.0189 0.0053
150 37	77.0	JJ	8.113 0.034	0.1828 0.0028	1.0091 0.0054
150 37	77.0	OP	8.263 0.035	0.1742 0.0032	1.0907 0.0059

Table 4.2.3-43 (contd)

Matrix	z, mm ^a	Loc ^b	²³⁵ U(n, f) ^c	²³⁵ U(n, f) ^c	²³⁵ U(n, γ) ^c
150 37	254.8	AB	7.475 0.031	0.1462 0.0027	0.9803 0.0053
150 37	254.8	GG	7.301 0.030	0.1639 0.0029	0.9116 0.0051
148 37	254.8	GH	7.273 0.033	0.1705 0.0026	0.9145 0.0054
148 37	254.8	HI	7.266 0.031	0.1863 0.0027	0.9263 0.0050
148 37	254.8	IJ	7.274 0.031	0.1729 0.0027	0.9248 0.0054
150 37	254.8	JJ	7.301 0.031	0.1665 0.0031	0.9210 0.0051
150 37	254.8	OP	7.486 0.031	0.1485 0.0030	0.9892 0.0054
150 24	77.0	AB	4.975 0.024	0.1283 0.0021	0.6364 0.0044
150 24	77.0	DE	4.979 0.023	0.1427 0.0021	0.6618 0.0041
150 24	77.0	EF	4.974 0.023	0.1532 0.0022	0.6521 0.0042
150 24	77.0	FG	5.081 0.023	0.1513 0.0022	0.7188 0.0044
148 24	77.0	JK	5.124 0.022	0.1484 0.0024	0.7271 0.0044
148 24	77.0	KL	5.134 0.025	0.1557 0.0021	0.6787 0.0042
148 24	77.0	LM	5.179 0.024	0.1474 0.0021	0.7042 0.0048
148 24	77.0	OP	5.294 0.024	0.1321 0.0020	0.6987 0.0043
150 24	483.4	AB	2.866 0.015	0.0576 0.0014	0.3713 0.0031
150 24	483.4	DE	2.876 0.016	0.0655 0.0015	0.3919 0.0029
150 24	483.4	EF	2.854 0.015	0.0724 0.0014	0.3720 0.0035
150 24	483.4	FG	2.956 0.015	0.0676 0.0014	0.4318 0.0030
148 24	483.4	JK	3.015 0.016	0.0697 0.0016	0.4395 0.0030
148 24	483.4	KL	2.996 0.016	0.0716 0.0016	0.3902 0.0032
148 24	483.4	LM	3.062 0.017	0.0687 0.0014	0.4216 0.0030
148 24	483.4	OP	3.109 0.017	0.0614 0.0014	0.4061 0.0030

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer.

The ²³⁵U foils were centered 13.8 mm above and the ²³⁵U foils were centered on the mid-height of the drawer. A negative sign designates a plate-spanning averaging foil.

^cExperimental results in units of 10⁻¹¹ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-44 Cell-Averaging Factors for ZPPR-18A and ZPPR-18B

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		Environment ^b	z, mm ^c
.9954	.0058	1.0011	.0049	0.953	.011	0.9256	.0088	F-SF-F	0-381.8
.9918	.0064	0.9950	.0052	0.949	.014	0.9089	.0079	F-SF-F	432.6
.9881	.0069	0.9889	.0055	0.945	.016	0.8922	.0069	F-SF-F	483.4
.9950	.0058	0.9983	.0047	0.961	.013	0.9293	.0059	F-SF-CRP	0-381.8
.9839	.0060	0.9922	.0089	0.965	.014	0.9118	.0086	CRP-SF-F	0-381.8
.9801	.0060	0.9760	.0051	0.966	.016	0.9170	.0063	F-SF-CR	0-381.8
.0066	.0063	1.0072	.0058	0.978	.016	0.9490	.0065	CR-SF-F	0-381.8
.9850	.0059	1.0020	.0057	0.978	.019	0.9020	.0051	F-SF-RB	0-381.8
.9987	.0041	1.0082	.0046	0.954	.008	1.0161	.0045	F-SM-F	0-483.4
.9991	.0058	1.0200	.0047	0.972	.016	1.0244	.0066	F-SM-CRP	0-483.4
.9876	.0055	1.0006	.0047	0.969	.011	1.0181	.0065	CRP-SM-F	0-483.4
.9826	.0060	0.9904	.0053	0.977	.018	1.0120	.0096	F-SM-CR	0-483.4
.0077	.0064	1.0255	.0055	0.957	.018	1.0349	.0125	CR-SM-F	0-483.4
.9958	.0060	1.0003	.0049	0.981	.016	0.9090	.0063	F-D-F	0-381.8
.9917	.0073	0.9971	.0053	0.984	.017	0.8892	.0067	F-D-F	432.6
.0	.01	0.9939	.0057	0.988	.017	0.8694	.0071	F-D-F	483.4
.0	.01	1.0022	.0063	0.912	.026	1.0229	.0058	F-RB-RB	ALL
.0	.01	0.9949	.0074	0.988	.071	1.0170	.0071	RB-RB-RB	ALL
.0	.01	0.9791	.0085	0.838	.100	1.0508	.0090	RB-RB-RF	ALL
.0	.01	1.0	.01	1.0	.01	1.0	.01	RR	ALL
.0	.008	1.0005	.0059	1.081	.031	0.8815	.0061	AB-AB-AB (SC)	534.2
.0	.008	1.0005	.0059	1.081	.053	0.8521	.0064	AB-AB-AB (SC)	585.0
.0	.008	1.0005	.0070	1.081	.077	0.8340	.0060	AB-AB-AB (SC)	635.8
.0	.008	1.0005	.0073	1.081	.16	0.8053	.0058	AB-AB-AB (SC)	686.6
.0	.008	1.0005	.0074	1.081	.14	0.7817	.0064	AB-AB-AB (SC)	734.4
.0	.008	0.9986	.0059	1.064	.052	0.8627	.0057	AB-AB-AB (DC)	534.2
.0	.008	1.0005	.0059	1.081	.053	0.8361	.0064	AB-AB-AB (DC)	585.0
.0	.008	1.0005	.0070	1.081	.077	0.8340	.0060	AB-AB-AB (DC)	635.8
1.0	.008	1.0005	.0073	1.081	.16	0.8053	.0058	AB-AB-AB (DC)	686.6
1.0	.008	1.0005	.0074	1.081	.14	0.7817	.0064	AB-AB-AB (DC)	734.4
.0	.008	0.9947	.0055	1.012	.019	0.8410	.0045	AB-AB-CRP (SC)	534.2
.0	.008	0.9947	.0055	1.047	.038	0.8145	.0040	AB-AB-CRP (SC)	585.0
.0	.008	0.9947	.0055	1.047	.042	0.7839	.0061	AB-AB-CRP (SC)	635.8
1.0	.008	0.9947	.0055	1.047	.063	0.7551	.0052	AB-AB-CRP (SC)	686.6
1.0	.008	0.9947	.0055	1.047	.101	0.7262	.0042	AB-AB-CRP (SC)	737.4

Table 4.2.5-44 (contd)

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		Environment ^b	z, mm ^c
1.0	.008	0.9964	.0085	0.967	.034	0.9241	.0212	AB-AB-CR (SC)	534.2
1.0	.008	0.9964	.0085	0.967	.052	0.8945	.0278	AB-AB-CR (SC)	585.0
1.0	.008	0.9964	.0085	0.967	.067	0.8868	.0280	AB-AB-CR (SC)	635.8
1.0	.008	0.9964	.0085	0.967	.097	0.8539	.0230	AB-AB-CR (SC)	686.6
1.0	.008	0.9964	.0085	0.967	.100	0.8377	.0253	AB-AB-CR (SC)	737.4

^aThe second number for each cell factor is one standard deviation uncertainty. See text for details.

^bType of cell and local environment. See text for key and discussion.

^cAxial position to which this cell factor applies.

Table 4.2.3-45 ZPPR-18C: Radial ^{235}U Fission Distributions Along the X-axis at Z=-5.16 cm

RHS CR 2 ⁴ Withdrawn				LHS Control Rods Inserted				Ratio RHS/LHS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
249 49	IC SF	8.715	1.012	249 49	IC SF	8.715	1.012	1.00	1.000
249 50	IC SF	8.847	1.002	249 48	IC SF	8.797	1.000	1.01	1.002
249 51	IC SM	8.667	1.010	249 47	IC SM	8.509	1.013	1.02	0.997
249 54	IC SF	8.483	1.001	249 44	IC SF	8.063	1.011	1.05	0.990
249 56	IC SF	8.327	0.997	249 42	IC SF	7.797	1.002	1.07	0.995
249 58	IC SF	8.499	0.998	249 40	IC SF	7.838	0.998	1.08	1.000
249 60	IC SM	8.498	1.009	249 38	IC SM	7.696	1.007	1.10	1.002
249 62	IC SF	8.884	0.996	249 36	IC SF	7.791	1.005	1.14	0.991
249 64	IC SF	8.863	0.998	249 34	IC SF	7.615	1.006	1.16	0.992
249 66	IC SM	8.565	1.006	249 32	IC SM	7.221	1.011	1.19	0.995
249 68	IC SM	8.106	1.006	249 30	IC SM	6.615	1.019	1.23	0.987
249 70	IC SM	7.685	0.991	249 28	IC SM	5.983	1.028	1.28	0.964
249 72	IC SM	6.973	1.000	249 26	IC SM	5.375	1.027	1.30	0.974
249 73	OC SF	6.683	0.998	249 25	OC SF	5.209	1.006	1.28	0.992
249 75	OC D	5.654	0.987	249 23	OC D	4.308	1.009	1.31	0.978
249 77	OC SF	4.322	0.993	249 21	OC SF	3.318	1.005	1.30	0.988
249 78	RB	3.728	1.002	249 20	RB	2.838	1.021	1.31	0.981
249 80	RB	2.422	0.999	249 18	RB	1.843	1.017	1.31	0.982
249 82	RB	1.663	1.037	249 16	RB	1.290	1.035	1.29	1.002

^a IC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

Table 4.2.3-46 ZPPR-18C: Radial ^{235}U Capture Distributions Along the X-axis at Z=-5.16 cm

RHS CR 24 Withdrawn				LHS Control Rods Inserted				Ratio RHS/LHS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
249 49	IC SF	1.1610	1.046	249 49	IC SF	1.1610	1.046	1.00	1.000
249 50	IC SF	1.1730	1.039	249 48	IC SF	1.1660	1.037	1.01	1.002
249 51	IC SM	1.0940	1.040	249 47	IC SM	1.0890	1.029	1.00	1.011
249 54	IC SF	1.1090	1.051	249 44	IC SF	1.0670	1.049	1.04	1.002
249 56	IC SF	1.1070	1.033	249 42	IC SF	1.0250	1.050	1.08	0.984
249 58	IC SF	1.1290	1.033	249 40	IC SF	1.0350	1.040	1.09	0.993
249 60	IC SM	1.0800	1.033	249 38	IC SM	0.9571	1.054	1.13	0.980
249 62	IC SF	1.1720	1.037	249 36	IC SF	1.0210	1.054	1.15	0.984
249 64	IC SF	1.1700	1.038	249 34	IC SF	1.0050	1.047	1.16	0.991
249 66	IC SM	1.0790	1.035	249 32	IC SM	0.8997	1.055	1.20	0.981
249 68	IC SM	1.0310	1.026	249 30	IC SM	0.8313	1.056	1.24	0.972
249 70	IC SM	0.9614	1.025	249 28	IC SM	0.7537	1.061	1.28	0.966
249 72	IC SM	0.8742	1.029	249 26	IC SM	0.6820	1.049	1.28	0.981
249 73	OC SF	0.8789	1.029	249 25	OC SF	0.6942	1.029	1.27	1.000
249 75	OC D	0.7186	1.036	249 23	OC D	0.5540	1.052	1.30	0.985
249 77	OC SF	0.5691	1.034	249 21	OC SF	0.4321	1.062	1.32	0.974
249 78	RB	0.4645	1.027	249 20	RB	0.3502	1.061	1.33	0.968
249 80	RB	0.2870	1.034	249 18	RB	0.2197	1.050	1.31	0.985
249 82	RB	0.1836	0.970	249 16	RB	0.1373	1.008	1.34	0.962

^a IC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

Table 4.2.3-47 ZPPR-18C: Radial ^{235}U Fission Distributions Along the X-axis at Z=-5.16 cm

RHS CR 24 Withdrawn				LHS Control Rods Inserted				Ratio RHS/LHS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
249 49	IC SF	0.1971	1.022	249 49	IC SF	0.1971	1.022	1.00	1.000
249 50	IC SF	0.2059	0.982	249 48	IC SF	0.1966	1.021	1.05	0.962
249 51	IC SM	0.2052	0.980	249 47	IC SM	0.1963	1.008	1.05	0.972
249 54	IC SF	0.2088	0.985	249 44	IC SF	0.2014	0.981	1.04	1.004
249 56	IC SF	0.1944	0.986	249 42	IC SF	0.1856	0.973	1.05	1.013
249 58	IC SF	0.2014	0.982	249 40	IC SF	0.1861	0.980	1.08	1.002
249 60	IC SM	0.2038	0.988	249 38	IC SM	0.1826	0.996	1.12	0.992
249 62	IC SF	0.1979	1.016	249 36	IC SF	0.1792	0.994	1.10	1.022
249 64	IC SF	0.2115	0.959	249 34	IC SF	0.1789	0.983	1.18	0.976
249 66	IC SM	0.1967	1.007	249 32	IC SM	0.1660	1.013	1.18	0.994
249 68	IC SM	0.1851	1.012	249 30	IC SM	0.1546	1.005	1.20	1.007
249 70	IC SM	0.1796	0.997	249 28	IC SM	0.1402	1.035	1.28	0.963
249 72	IC SM	0.1720	0.981	249 26	IC SM	0.1310	1.024	1.31	0.958
249 73	OC SF	0.1698	0.987	249 25	OC SF	0.1307	1.012	1.30	0.975
249 75	OC D	0.1688	0.912	249 23	OC D	0.1296	0.929	1.30	0.982
249 77	OC SF	0.0968	0.945	249 21	OC SF	0.0773	0.924	1.25	1.023
249 78	RB	0.0417	1.149	249 20	RB	0.0339	1.101	1.23	1.044
249 80	RB	0.0146	0.908	249 18	RB	0.0116	0.888	1.26	1.023
249 82	RB	0.0055	0.705	249 16	RB	0.0040	0.755	1.38	0.93

^a IC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

Table 4.2.3-48 ZPPR-18C: Radial ^{235}U Fission Distributions Along the X-axis at Z=-28.02 cm

RHS CR 24 Withdrawn				LHS Control Rods Inserted				Ratio RHS/LHS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
249 49	IC SF	6.842	0.995	249 49	IC SF	6.842	0.995	1.00	1.000
249 50	IC SF	6.873	0.995	249 48	IC SF	6.837	0.993	1.01	1.002
249 51	IC SM	6.728	1.001	249 47	IC SM	6.623	1.002	1.02	0.999
249 54	IC SF	6.499	0.991	249 44	IC SF	6.221	0.993	1.06	0.998
249 56	IC SF	6.259	0.998	249 42	IC SF	5.910	0.993	1.06	1.005
249 58	IC SF	6.489	0.992	249 40	IC SF	5.861	1.009	1.11	0.983
249 60	IC SM	6.592	1.007	249 38	IC SM	5.903	1.010	1.12	0.997
249 62	IC SF	7.065	0.986	249 36	IC SF	6.112	1.001	1.16	0.985
249 64	IC SF	7.104	0.988	249 34	IC SF	5.995	1.006	1.18	0.982
249 66	IC SM	6.898	0.997	249 32	IC SM	5.625	1.024	1.32	0.974
249 68	IC SM	6.560	0.993	249 30	IC SM	5.232	1.013	1.25	0.980
249 70	IC SM	6.113	0.993	249 28	IC SM	4.703	1.021	1.30	0.973
249 72	IC SM	5.628	0.986	249 26	IC SM	4.198	1.020	1.34	0.967
249 73	OC SF	5.379	0.986	249 25	OC SF	3.995	1.016	1.35	0.970
249 75	OC D	4.500	0.984	249 23	OC D	3.318	1.012	1.36	0.972
249 77	OC SF	3.479	0.981	249 21	OC SF	2.577	1.002	1.35	0.979
249 78	RB	2.981	0.999	249 20	RB	2.177	1.035	1.37	0.965
249 80	RB	1.954	0.991	249 18	RB	1.432	1.024	1.36	0.968
249 82	RB	1.352	1.027	249 16	RB	1.011	1.040	1.34	0.988

^a IC is Inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

Table 4.2.5-49 -ZPPR-18C: Radial ^{235}U Fission Distributions at 15 Degrees to the X-axis at Z=+5.16 cm

RHS CR 24 Withdrawn				LHS Control Rods Inserted				Ratio RHS/LHS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
149 51	IC SM	8.984	1.005	149 47	IC SM	8.870	1.003	1.01	1.002
148 52	IC SM	8.959	0.999	151 46	IC SF	8.796	0.993	1.02	1.006
148 53	IC SF	8.943	0.995	150 45	IC SF	8.601	1.002	1.04	0.993
147 54	IC SF	8.747	0.999	151 44	IC SF	8.478	0.990	1.03	1.000
147 56	IC SF	8.665	1.000	151 42	IC SF	8.139	1.000	1.06	1.000
146 57	IC SM ^b	8.551	0.998	152 41	IC SM ^c	7.858	1.007	1.09	0.991
146 59	IC SM	8.635	0.998	152 39	IC SM	7.740	1.013	1.12	0.985
145 60	IC SM	8.636	1.003	153 38	IC SM	7.722	1.005	1.12	0.998
145 62	IC SM	8.836	0.994	153 36	IC SM	7.542	1.021	1.17	0.974
144 63	IC SM	8.759	1.000	154 35	IC SM	7.506	1.005	1.17	0.995
144 65	IC SM	8.682	1.000	154 33	IC SM	7.230	1.010	1.20	0.990
144 66	IC SF	8.730	0.990	154 32	IC SF	7.086	1.012	1.23	0.978
143 67	IC SF	8.572	0.983	155 31	IC SF	6.810	1.002	1.26	0.981
143 68	IC SF	8.461	0.981	155 30	IC SF	6.528	1.000	1.30	0.981
143 69	IC SM	--	--	155 29	IC SM	6.044	1.016	--	--
143 70	IC SF	8.027	0.996	155 28	IC SF	5.715	1.018	1.40	0.978
CRP Number 24				CRP Number 18					
141 73	OC SF	6.993	0.987	157 25	OC SF	4.603	1.032	1.52	0.956
141 74	OC SF	6.276	0.986	157 24	OC SF	4.273	1.012	1.47	0.974
141 75	OC D	5.547	0.987	157 23	OC D	3.859	1.008	1.44	0.979
141 76	OC SF	4.819	0.981	157 22	OC SF	3.360	1.014	1.43	0.977

^aIC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

^bAdjacent to CRP Number 6.

^cAdjacent to CRP Number 3.

Table 4.2.3-50 ZPPR-18C: Radial ^{235}U Fission Distributions at 15 Degrees to the X-axis at Z=-5.16 cm

RHS CR 24 Withdrawn				LHS Control Rods Inserted				Ratio RHS/LHS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
248 52	IC SM	8.601	1.005	250 46	IC SM	8.351	1.010	1.03	0.995
248 53	IC SF	8.499	1.007	250 45	IC SF	8.277	1.003	1.03	1.005
247 54	IC SF	8.250	1.004	251 44	IC SF	7.958	1.006	1.04	1.007
247 55	IC SM	--	--	251 43	IC SM	7.636	1.012	--	--
247 56	IC SF	7.972	0.994	251 42	IC SF	7.610	0.997	1.05	0.991
247 57	IC SF	7.848	1.008	251 41	IC SF	7.525	1.003	1.04	1.005
246 57	IC SM ^b	6.791	1.038	252 41	IC SM ^c	6.719	1.044	1.01	0.994
246 58	IC SF	7.642	1.013	252 40	IC SF	7.191	1.009	1.06	1.004
246 59	IC SM	7.919	1.022	252 39	IC SM	7.310	1.012	1.08	1.010
246 60	IC SF	8.421	0.995	252 38	IC SF	7.414	1.017	1.14	0.978
245 60	IC SM	8.170	1.012	253 38	IC SM	7.280	1.015	1.12	0.997
245 61	IC SF	8.566	0.993	253 37	IC SF	7.416	1.012	1.16	0.981
245 62	IC SM	8.564	1.001	253 36	IC SM	7.355	1.017	1.16	0.984
244 63	IC SM	8.576	1.002	254 35	IC SM	7.263	1.014	1.18	0.988
244 64	IC SF	8.690	0.994	254 34	IC SF	7.319	0.998	1.19	0.992
244 65	IC SM	8.567	0.999	254 33	IC SM	7.101	1.006	1.21	0.993
244 66	IC SF	8.605	0.992	254 32	IC SF	6.989	1.002	1.23	0.990
243 68	IC SF	8.216	1.000	255 30	IC SF	6.236	1.008	1.32	0.992
243 69	IC SM	7.987	1.001	255 29	IC SM	5.687	1.022	1.40	0.979
243 70	IC SF	7.952	0.996	255 28	IC SF	4.966	1.058	1.60	0.941
242 70	IC SM	7.881	0.993	256 28	IC SM	4.678	1.069	1.68	0.929
CRP Number 24				Control Rod Number 18					
242 73	OC SF	7.058	1.000	256 25	OC SF	3.767	1.056	1.87	0.947
241 73	OC SF	6.902	0.991	257 25	OC SF	3.752	1.051	1.84	0.943
241 74	OC SF	6.211	0.988	257 24	OC SF	3.813	1.024	1.63	0.965
241 75	OC D	5.537	0.981	257 23	OC D	3.594	1.011	1.54	0.970
241 76	OC SF	4.801	0.977	257 22	OC SF	3.221	1.005	1.49	0.972
240 77	OC SF	3.939	0.981	258 21	OC SF	2.720	1.002	1.45	0.979
240 78	RB	3.366	0.990	258 20	RB	2.324	1.021	1.45	0.909
240 79	RB	2.761	0.977	258 19	RB	1.894	1.021	1.46	0.957
239 80	RB	2.076	0.976	259 18	RB	1.466	1.003	1.42	0.973
239 81	RB	1.640	0.991	259 17	RB	1.176	1.008	1.39	0.983
239 82	RB	1.368	1.038	259 16	RB	0.980	1.060	1.40	0.979

^a IC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

^b Adjacent to Control Rod Number 6

^c Adjacent to Control Rod Number 3

Table 4.2.3-51 ZPPR-18C: Na²³⁰U Capture Distributions at 15° to the X-axis at Z=-5.16 cm

RHS				LHS				Ratio RHS/LHS	
Matrix	CR 24 Zone ^a	Exp.	C/E	Matrix	Control Rods Zone ^a	Exp.	C/E	Exp.	C/E
248 52	IC SM	1.0880	1.034	250 46	IC SM	1.0530	1.041	1.03	0.993
248 53	IC SF	1.1320	1.040	250 45	IC SF	1.0900	1.044	1.04	0.996
247 54	IC SF	1.0910	1.050	251 44	IC SF	1.0370	1.056	1.05	0.994
247 55	IC SM	--	--	251 43	IC SM	0.9598	1.044	--	--
247 56	IC SF	1.0620	1.045	251 42	IC SF	0.9898	1.051	1.10	0.993
247 57	IC SF	1.0640	1.046	251 41	IC SF	0.9868	1.046	1.08	1.000
246 57	IC SM ^b	0.9342	1.050	252 41	IC SM ^c	0.8551	1.060	1.09	0.990
246 58	IC SF	1.0170	1.068	252 40	IC SF	0.9149	1.085	1.11	0.975
246 59	IC SM	1.0160	1.045	252 39	IC SM	0.9110	1.053	1.12	0.992
246 60	IC SF	1.1100	1.042	252 38	IC SF	0.9807	1.053	1.13	0.990
245 60	IC SM	1.0390	1.039	253 38	IC SM	0.9203	1.043	1.13	0.996
245 61	IC SF	1.1300	1.035	253 37	IC SF	0.9730	1.058	1.16	0.978
245 62	IC SM	1.0810	1.033	253 36	IC SM	0.9261	1.048	1.17	0.986
244 63	IC SM	1.0860	1.028	254 35	IC SM	0.9003	1.059	1.22	0.971
244 64	IC SF	1.1560	1.026	254 34	IC SF	0.9629	1.038	1.20	0.988
244 65	IC SM	1.0790	1.033	254 33	IC SM	0.8785	1.051	1.23	0.983
244 66	IC SF	1.1430	1.029	254 32	IC SF	0.9131	1.048	1.25	0.982
243 68	IC SF	1.0910	1.034	255 30	IC SF	0.8239	1.043	1.32	0.992
243 69	IC SM	1.0050	1.029	255 29	IC SM	0.7146	1.050	1.41	0.980
243 70	IC SF	1.0630	1.016	255 28	IC SF	0.6589	1.084	1.61	0.937
242 70	IC SM	0.9811	1.022	256 28	IC SM	0.6021	1.081	1.63	0.945
CRP Number 24				Control Rod Number 18					
242 73	OC SF	0.9448	1.013	256 25	OC SF	0.5029	1.082	1.88	0.936
241 73	OC SF	0.9209	1.017	257 25	OC SF	0.5016	1.083	1.84	0.939
241 74	OC SF	0.8150	1.028	257 24	OC SF	0.4972	1.072	1.64	0.959
241 75	OC D	0.7130	1.024	257 23	OC D	0.4604	1.053	1.55	0.972
241 76	OC SF	0.6286	1.027	257 22	OC SF	0.4155	1.059	1.51	0.970
240 77	OC SF	0.5176	1.037	258 21	OC SF	0.3496	1.065	1.48	0.974
240 78	RB	0.4196	1.030	258 20	RB	0.2880	1.048	1.46	0.983
240 79	RB	0.3335	1.034	258 19	RB	0.2304	1.051	1.45	0.984
239 80	RB	0.2467	1.023	259 18	RB	0.1707	1.044	1.45	0.980
239 81	RB	0.1859	1.030	259 17	RB	0.1303	1.041	1.43	0.989
239 82	RB	0.1519	0.982	259 16	RB	0.1068	0.991	1.42	0.991

^aIC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

^bAdjacent to Control Rod Number 6

^cAdjacent to Control Rod Number 3

Table 4.2.3-52 ZPPR-18C: Ratios of ^{235}U Fission Distributions at 15 Degrees to the X-axis at Z=-5.16 cm

RIIS CR 24 Withdrawn				LIIS Control Rods Inserted				Ratio RIIS/LIIS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
248 52	IC SM	0.1960	1.025	250 46	IC SM	0.1942	1.009	1.01	1.016
248 53	IC SF	0.2027	1.004	250 45	IC SF	0.1938	1.014	1.05	0.990
247 54	IC SF	0.1991	0.983	251 44	IC SF	0.1901	0.985	1.05	0.998
247 55	IC SM	--	--	251 43	IC SM	0.1734	1.021	--	--
247 56	IC SF	0.1864	0.977	251 42	IC SF	0.1704	1.002	1.09	0.975
247 57	IC SF	0.1878	0.971	251 41	IC SF	0.1721	0.981	1.09	0.990
246 57	IC SM ^b	0.1690	0.980	252 41	IC SM ^c	0.1578	0.971	1.07	1.009
246 58	IC SF	0.1805	0.974	252 40	IC SF	0.1609	0.997	1.12	0.971
246 59	IC SM	0.1853	0.996	252 39	IC SM	0.1652	1.009	1.12	0.987
246 60	IC SF	0.1906	1.006	252 38	IC SF	0.1764	0.971	1.08	1.042
245 60	IC SM	0.1884	1.001	253 38	IC SM	0.1680	0.999	1.12	1.002
245 61	IC SF	0.2021	0.978	253 37	IC SF	0.1762	0.987	1.15	0.991
245 62	IC SM	0.1996	0.985	253 36	IC SM	0.1729	0.989	1.15	0.996
244 63	IC SM	0.1983	0.975	254 35	IC SM	0.1647	1.004	1.20	0.971
244 64	IC SF	0.1931	1.002	254 34	IC SF	0.1622	1.004	1.19	0.998
244 65	IC SM	0.1943	0.997	254 33	IC SM	0.1557	1.030	1.25	0.968
244 66	IC SF	0.2063	0.950	254 32	IC SF	0.1577	1.011	1.31	0.940
243 68	IC SF	0.1953	0.976	255 30	IC SF	0.1437	1.018	1.36	0.959
243 69	IC SM	0.1831	0.981	255 29	IC SM	0.1310	1.014	1.40	0.967
243 70	IC SF	0.1756	0.953	255 28	IC SF	0.1181	1.002	1.49	0.951
242 70	IC SM	0.1707	0.958	256 28	IC SM	0.1119	1.015	1.53	0.944
CRP Number 24				Control Rod Number 18					
242 73	OC SF	0.1641	0.935	256 25	OC SF	0.0968	1.014	1.70	0.922
241 73	OC SF	0.1641	0.949	257 25	OC SF	0.0988	1.018	1.66	0.932
241 74	OC SF	0.1589	0.965	257 24	OC SF	0.1003	1.014	1.58	0.952
241 75	OC D	0.1574	0.919	257 23	OC D	0.1020	0.957	1.54	0.960
241 76	OC SF	0.1261	0.970	257 22	OC SF	0.0820	1.020	1.54	0.951
240 77	OC SF	0.0970	0.918	258 21	OC SF	0.0634	0.972	1.53	0.944
240 78	RB	0.0390	1.178	258 20	RB	0.0290	1.099	1.34	1.072
240 79	RB	0.0218	1.082	258 19	RB	0.0157	1.049	1.39	1.031
239 80	RB	0.0109	1.057	259 18	RB	0.0092	0.873	1.18	1.21
239 81	RB	0.0084	0.726	259 17	RB	0.0060	0.713	1.40	1.02
239 82	RB	0.0034	0.958	259 16	RB	0.0038	0.605	0.90	1.58

^aIC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

^bAdjacent to Control Rod Number 6

^cAdjacent to Control Rod Number 3

Table 4.2.3-53 ZPPR-18C: Radial ²³⁵U Fission Distributions at 15 Degrees to the X-axis at Z--28.02 cm

RIIS CR 24 Withdrawn				LIIS Control Rods Inserted				Ratio RIIS/LIIS	
Matrix	Zone ^a	Exp.	C/E	Matrix	Zone ^a	Exp.	C/E	Exp.	C/E
248 52	IC SM	6.535	1.013	250 46	IC SM	6.440	1.005	1.01	1.008
248 53	IC SF	6.505	0.990	250 45	IC SF	6.330	1.000	1.04	0.990
247 54	IC SF	6.258	0.993	251 44	IC SF	5.998	1.005	1.04	0.998
247 55	IC SM	--	--	251 43	IC SM	5.661	1.019	--	--
247 56	IC SF	5.798	1.004	251 42	IC SF	5.613	1.002	1.03	1.002
247 57	IC SF	5.831	1.000	251 41	IC SF	5.554	1.008	1.05	0.992
246 57	IC SM ^b	4.835	1.042	252 41	IC SM ^c	4.915	1.034	0.98	1.008
246 58	IC SF	5.537	1.025	252 40	IC SF	5.207	1.026	1.06	0.999
246 59	IC SM	5.983	1.016	252 39	IC SM	5.478	1.013	1.09	1.003
246 60	IC SF	6.435	0.999	252 38	IC SF	5.692	1.011	1.13	0.988
245 60	IC SM	6.269	1.008	253 38	IC SM	5.508	1.019	1.14	0.989
245 61	IC SF	6.668	0.991	253 37	IC SF	5.762	1.004	1.16	0.987
245 62	IC SM	6.745	0.999	253 36	IC SM	5.708	1.021	1.18	0.978
244 63	IC SM	6.765	1.007	254 35	IC SM	5.664	1.018	1.19	0.989
244 64	IC SF	6.947	0.991	254 34	IC SF	5.699	1.007	1.22	0.984
244 65	IC SM	6.859	0.999	254 33	IC SM	5.501	1.021	1.25	0.978
244 66	IC SF	6.955	0.985	254 32	IC SF	5.483	1.003	1.27	0.982
243 68	IC SF	6.703	0.986	255 30	IC SF	4.845	1.000	1.38	0.986
243 69	IC SM	6.399	1.007	255 29	IC SM	4.291	1.025	1.49	0.982
243 70	IC SF	6.529	0.982	255 28	IC SF	3.646	1.063	1.79	0.924
242 70	IC SM	6.412	0.987	256 28	IC SM	3.436	1.058	1.87	0.933
CRP Number 24				Control Rod Number 18					
242 73	OC SF	5.773	0.990	256 25	OC SF	2.568	1.074	2.25	0.922
241 73	OC SF	5.591	0.988	257 25	OC SF	2.564	1.067	2.18	0.926
241 74	OC SF	5.110	0.967	257 24	OC SF	2.606	1.042	1.90	0.928
241 75	OC D	4.430	0.986	257 23	OC D	2.614	1.017	1.69	0.970
241 76	OC SF	3.910	0.964	257 22	OC SF	2.359	1.022	1.66	0.943
240 77	OC SF	3.205	0.968	258 21	OC SF	2.047	1.003	1.57	0.965
240 78	RB	2.688	0.999	258 20	RB	1.746	1.033	1.54	0.967
240 79	RB	2.196	0.991	258 19	RB	1.444	1.026	1.52	0.966
239 80	RB	1.657	0.988	259 18	RB	1.138	0.997	1.46	0.991
239 81	RB	1.351	0.975	259 17	RB	0.895	1.026	1.51	0.950
239 82	RB	1.123	1.026	259 16	RB	0.758	1.068	1.48	0.961

^aIC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

^bAdjacent to Control Rod Number 6

^cAdjacent to Control Rod Number 3

Table 4.2.5-54 ZPPR-18C: Axial ²³⁵U Fission Distributions in Matrix 149-49 and 249-49

Zone ^a	Z(mm)	Matrix 149-49		Zone ^a	Z(mm)	Matrix 249-49	
		Exp.	C/E			Exp.	C/E
IC SF	26.2	9.133	0.994	IC SF	26.2	8.873	1.007
IC SF	50.3	9.147	0.993	IC SF	50.3	8.715	1.012
IC SF	77.0	9.128	0.995	IC SF	77.0	8.737	0.994
IC SF	127.8	9.076	0.988	IC SF	127.8	8.286	1.006
IC SF	178.6	8.842	0.987	IC SF	178.6	7.834	1.008
IC SF	229.4	8.384	0.999	IC SF	229.4	7.412	0.996
IC SF	280.2	8.081	0.979	IC SF	280.2	6.842	0.995
IC SF	356.4 b	7.191	0.980	IC SF	356.4 b	5.895	0.995
IC SF	380.5 b	6.882	0.980	IC SF	380.5 b	5.607	0.992
IC SF	432.6	6.203	0.981	IC SF	432.6	4.902	1.002
IC SF	483.4	5.553	0.989	IC SF	483.4	4.317	1.006
-----				-----			
Zone Average C/E			0.988	Zone Average C/E			1.001
Standard Deviation			0.007	Standard Deviation			0.007
AB	534.2	5.212	1.000	AB	534.2	3.969	1.017
AB	585.0	4.680	1.006	AB	585.0	3.462	1.032
AB	635.8	4.077	1.024	AB	635.8	2.993	1.039
AB	686.6	3.580	1.039	AB	686.6	2.602	1.046
AB	737.4	3.293	1.047	AB	737.4	2.309	1.075
-----				-----			
Zone Average C/E			1.023	Zone Average C/E			1.042
Standard Deviation			0.020	Standard Deviation			0.021

^aIC is inner core, SF is single fuel column with iron oxide, and AB is axial blanket.

^bNote that these positions were different to those in the other axial distributions since different foil holders were used.

Table 4.2.3-55 ZPPR-18C: Axial ^{235}U Fission Distributions in Matrix 149-64 and 249-64

Zone ^a	Z(mm)	Matrix 149-64		Zone ^a	Z(mm)	Matrix 249-64	
		Exp.	C/E			Exp.	C/E
IC SF	26.2	9.040	0.997	IC SF	26.2	8.952	0.998
IC SF	50.3	9.111	0.986	IC SF	50.3	8.863	0.998
IC SF	77.0	8.983	0.997	IC SF	77.0	8.816	0.991
IC SF	127.8	8.897	0.988	IC SF	127.8	8.443	1.000
IC SF	178.6	8.675	0.981	IC SF	178.6	8.047	1.001
IC SF	229.4	8.306	0.977	IC SF	229.4	7.563	1.001
IC SF	280.2	7.773	0.982	IC SF	280.2	7.104	0.988
IC SF	331.0	7.220	0.978	IC SF	331.0	6.561	0.978
IC SF	381.8	6.590	0.977	IC SF	381.8	5.878	0.983
IC SF	432.6	5.854	0.991	IC SF	432.6	5.152	0.999
IC SF	483.4	5.267	0.990	IC SF	483.4	4.582	0.999
			-----				-----
	Zone Average C/E		0.986		Zone Average C/E		0.994
	Standard Deviation		0.007		Standard Deviation		0.008
AB	534.2	4.968	0.994	AB	534.2	4.235	1.011
AB	585.0	4.465	0.997	AB	585.0	3.782	1.009
AB	635.8	3.930	1.001	AB	635.8	3.286	1.016
AB	686.6	3.461	1.011	AB	686.6	2.871	1.023
AB	737.4	3.105	1.042	AB	737.4	2.582	1.042
			-----				-----
	Zone Average C/E		1.009		Zone Average C/E		1.020
	Standard Deviation		0.020		Standard Deviation		0.013

^aIC is inner core, SF is single fuel column with iron oxide and AB is axial blanket.

Table 4.2.3-56 · ZPPR-18C: Axial ²³⁵U Fission Distributions in Matrix 149-75 and 249-75

Zone ^a	Z(mm)	Matrix 149-75		Zone ^a	Z(mm)	Matrix 249-75	
		Exp.	C/E			Exp.	C/E
OC D	26.2	5.785	0.980	OC D	26.2	5.693	0.989
OC D	50.3	5.760	0.981	OC D	50.3	5.654	0.987
OC D	77.0	5.765	0.976	OC D	77.0	5.607	0.984
OC D	127.8	5.594	0.984	OC D	127.8	5.383	0.991
OC D	178.6	5.424	0.979	OC D	178.6	5.151	0.988
OC D	229.4	5.151	0.980	OC D	229.4	4.900	0.976
OC D	280.2	4.854	0.973	OC D	280.2	4.500	0.984
OC D	331.0	4.478	0.969	OC D	331.0	4.155	0.970
OC D	381.8	4.029	0.973	OC D	381.8	3.672	0.982
OC D	432.6	3.577	0.974	OC D	432.6	3.243	0.980
OC D	483.4	3.148	0.978	OC D	483.4	2.814	0.989
			-----				-----
	Zone Average C/E		0.977		Zone Average C/E		0.984
	Standard Deviation		0.004		Standard Deviation		0.006
AB	534.2	2.915	0.995	AB	534.2	2.593	1.001
AB	585.0	2.592	1.001	AB	585.0	2.307	0.998
AB	635.8	2.305	0.987	AB	635.8	1.977	1.013
AB	686.6	2.000	1.003	AB	686.6	1.718	1.019
AB	737.4	1.831	1.005	AB	737.4	1.532	1.041
			-----				-----
	Zone Average C/E		0.998		Zone Average C/E		1.014
	Standard Deviation		0.007		Standard Deviation		0.017

^aOC is outer core, AB is axial blanket, D is double fuel column.

Table 4.2.3-57 ZPPR-18C: Axial ²³⁵U Fission Distributions In Matrix 143-69 and 243-69

Zone ^a	Z(mm)	Matrix 143-69 ^b		Zone ^a	Z(mm)	Matrix 243-69 ^b	
		Exp.	C/E			Exp.	C/E
IC SM	26.2	8.162	0.993	IC SM	26.2	8.010	1.007
IC SM	50.3	8.175	0.988	IC SM	50.3	7.987	1.001
IC SM	77.0	8.058	0.997	IC SM	77.0	7.955	0.995
IC SM	127.8	8.079	0.973	IC SM	127.8	7.600	1.009
IC SM	178.6	7.816	0.971	IC SM	178.6	7.258	1.011
IC SM	229.4	7.573	0.954	IC SM	229.4	6.967	0.994
IC SM	280.2	7.033	0.964	IC SM	280.2	6.399	1.007
IC SM	331.0	6.597	0.950	IC SM	331.0	5.954	0.993
IC SM	381.8	6.065	0.942	IC SM	381.8	5.334	1.003
IC SM	432.6	5.514	0.934	IC SM	432.6	4.789	0.999
IC SM	483.4	4.891	0.950	IC SM	483.4	4.252	1.007
Zone Average C/E				Zone Average C/E			
Standard Deviation				Standard Deviation			
0.965				1.002			
0.021				0.006			
AB	534.2	4.509	0.985	AB	534.2	3.978	1.022
AB	585.0	4.207	0.955	AB	585.0	3.556	1.026
AB	635.8	3.751	0.948	AB	635.8	3.142	1.022
AB	686.6	3.081	1.023	AB	686.6	2.718	1.041
AB	737.4	2.787	1.037	AB	737.4	2.434	1.059
Zone Average C/E				Zone Average C/E			
Standard Deviation				Standard Deviation			
0.990				1.034			
0.040				0.016			

^aIC is inner core, SM is single fuel column with depleted uranium metal, and AB is axial blanket.

^bNear withdrawn control rod position.

Table 4.2.3-58 ZPPR-18C: C/E Results for ^{235}U Capture and Fission Ratios
Along the X-axis at Z=-5.16 cm

RHS CR 24 Withdrawn				LHS Control Rods Inserted			
Matrix	Zone ^a	C8/F5	F8/F5	Matrix	Zone ^a	C8/F5	F8/F5
249 49	IC SF	1.034	1.010	249 49	IC SF	1.044	1.010
249 50	IC SF	1.037	0.980	249 48	IC SF	1.037	1.021
249 51	IC SM	1.030	0.970	249 47	IC SM	1.026	0.995
249 54	IC SF	1.050	0.984	249 44	IC SF	1.038	0.970
249 56	IC SF	1.036	0.989	249 42	IC SF	1.048	0.971
249 58	IC SF	1.035	0.984	249 40	IC SF	1.042	0.982
249 60	IC SM	1.022	0.979	249 38	IC SM	1.047	0.989
249 62	IC SF	1.041	1.020	249 36	IC SF	1.049	0.989
249 64	IC SF	1.040	0.961	249 34	IC SF	1.041	0.977
249 66	IC SM	1.029	1.001	249 32	IC SM	1.044	1.002
249 68	IC SM	1.020	1.006	249 30	IC SM	1.036	0.986
249 70	IC SM	1.034	1.006	249 28	IC SM	1.032	1.007
249 72	IC SM	1.029	0.981	249 26	IC SM	1.021	0.997
		-----	-----			-----	-----
	Mean C/E	1.034	0.990		Mean C/E	1.039	0.992
	Standard Deviation	0.008	0.017		Standard Deviation	0.008	0.015
249 73	OC SF	1.031	0.989	249 25	OC SF	1.023	1.006
249 75	OC D	1.049	0.924	249 23	OC D	1.043	0.921
249 77	OC SF	1.041	0.952	249 21	OC SF	1.057	0.919
249 78	RB	1.025	1.147	249 20	RB	1.039	1.094
249 80	RB	1.035	0.909	249 18	RB	1.032	0.873
249 82	RB	0.935	0.68	249 16	RB	0.974	0.73

^aIC is inner core, OC is outer core, RB is radial blanket, SF is single fuel column with iron oxide, SM is single fuel column with depleted uranium metal, and D is double fuel column.

Table 4.2.5-59 Basic Data for Radial Distributions of ^{235}U
and ^{238}U Reaction Rates in ZPPR-18C

Matrix	Loc ^a	$^{235}\text{U}(n,f)^b$	$^{238}\text{U}(n,f)^b$	$^{238}\text{U}(n,\gamma)^b$
Data on the X-Axis				
249 16	GH	1.318 0.010	0.0048 0.0009	0.1307 0.0014
249 18	GH	1.852 0.011	0.0118 0.0010	0.2160 0.0020
249 20	GH	2.832 0.017	0.0372 0.0015	0.3423 0.0028
249 21	GH	3.311 0.018	0.0790 0.0018	0.4790 0.0031
249 23	FG	4.307 0.022	0.1322 0.0026	0.6095 0.0041
249 25	GH	5.203 0.026	0.1372 0.0026	0.7500 0.0047
249 26	GH	5.332 0.023	0.1373 0.0024	0.6712 0.0040
249 28	GH	5.934 0.026	0.1470 0.0024	0.7418 0.0046
249 30	GH	6.561 0.029	0.1620 0.0025	0.8181 0.0046
249 32	GH	7.162 0.034	0.1741 0.0030	0.8855 0.0049
249 34	GH	7.607 0.033	0.1878 0.0027	1.0863 0.0057
249 36	GH	7.782 0.034	0.1881 0.0028	1.1036 0.0058
249 38	GH	7.633 0.036	0.1915 0.0028	0.9420 0.0056
249 40	GH	7.829 0.033	0.1953 0.0028	1.1179 0.0059
249 42	GH	7.788 0.035	0.1947 0.0027	1.1074 0.0063
249 44	GH	8.054 0.033	0.2113 0.0033	1.1524 0.0060
249 47	GH	8.440 0.038	0.2058 0.0029	1.0715 0.0063
249 48	GH	8.788 0.038	0.2063 0.0026	1.2598 0.0064
249 49	IJ*		0.2068 0.0032	1.2547 0.0065
249 50	IJ	8.838 0.037	0.2161 0.0031	1.2671 0.0066
249 51	IJ	8.596 0.039	0.2151 0.0030	1.0771 0.0057
249 54	IJ	8.474 0.038	0.2191 0.0030	1.1985 0.0068
249 56	IJ	8.318 0.034	0.2040 0.0029	1.1960 0.0062
249 58	IJ	8.490 0.039	0.2113 0.0027	1.2202 0.0069
249 60	IJ	8.429 0.038	0.2136 0.0029	1.0631 0.0056
249 62	IJ	8.874 0.039	0.2076 0.0026	1.2659 0.0064
249 64	IJ*		0.2219 0.0029	1.2639 0.0065
249 66	IJ	8.495 0.038	0.2061 0.0030	1.0622 0.0057
249 68	IJ	8.040 0.033	0.1940 0.0030	1.0145 0.0059
249 70	IJ	7.623 0.034	0.1883 0.0030	0.9462 0.0052
249 72	IJ	6.916 0.029	0.1803 0.0029	0.8603 0.0049
249 73	IJ	6.676 0.028	0.1782 0.0028	0.9496 0.0055
249 75	JK*		0.1720 0.0026	0.7906 0.0044
249 77	IJ	4.314 0.020	0.0990 0.0022	0.6309 0.0038
249 78	IJ	3.720 0.021	0.0457 0.0013	0.4541 0.0029
249 80	IJ	2.435 0.014	0.0148 0.0010	0.2822 0.0022
249 82	IJ	1.699 0.010	0.0066 0.0009	0.1747 0.0016
Data on the 15 degree radial				
259 16	GH	1.001 0.007	0.0046 0.0009	0.1016 0.0013
259 17	GH	1.182 0.010	0.0061 0.0009	0.1281 0.0015
259 18	GH	1.474 0.012	0.0094 0.0012	0.1679 0.0018
258 19	GH	1.904 0.013	0.0159 0.0011	0.2265 0.0019
258 20	GH	2.319 0.014	0.0318 0.0013	0.2816 0.0023
258 21	GH	2.714 0.017	0.0648 0.0016	0.3876 0.0029

Table 4.2.3-59 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
257 22	GH	3.218 0.018	0.0860 0.0018	0.4489 0.0032
257 23	FG	3.592 0.019	0.1040 0.0020	0.5065 0.0033
257 24	GH	3.809 0.020	0.1052 0.0024	0.5371 0.0037
257 25	GH	3.726 0.020	0.1010 0.0021	0.5285 0.0037
256 25	GH	3.740 0.022	0.0990 0.0020	0.5300 0.0034
256 28	GH	4.723 0.022	0.1145 0.0024	0.5950 0.0041
255 28	GH	5.089 0.026	0.1223 0.0022	0.7185 0.0042
255 29	GH	5.641 0.028	0.1373 0.0023	0.7033 0.0041
255 30	GH	6.230 0.030	0.1507 0.0024	0.8902 0.0048
254 32	GH	6.981 0.033	0.1655 0.0029	0.9865 0.0053
254 33	GH	7.043 0.035	0.1632 0.0027	0.8646 0.0052
254 34	GH	7.311 0.033	0.1702 0.0028	1.0403 0.0056
254 35	GH	7.204 0.032	0.1726 0.0025	0.8860 0.0052
253 36	GH	7.295 0.032	0.1812 0.0027	0.9114 0.0050
253 37	GH	7.408 0.035	0.1849 0.0028	1.0512 0.0056
253 38	GH	7.221 0.033	0.1761 0.0028	0.9058 0.0050
252 38	GH	7.406 0.030	0.1851 0.0028	1.0595 0.0057
252 39	GH	7.251 0.032	0.1731 0.0027	0.8966 0.0054
252 40	GH	7.183 0.033	0.1689 0.0027	0.9884 0.0059
252 41	GH	6.784 0.029	0.1615 0.0028	0.8449 0.0051
251 41	GH	7.517 0.034	0.1806 0.0029	1.0661 0.0061
251 42	GH	7.601 0.035	0.1788 0.0027	1.0694 0.0057
251 43	GH	7.573 0.035	0.1818 0.0026	0.9446 0.0051
251 44	GH	7.949 0.032	0.1995 0.0030	1.1199 0.0059
250 45	GH	8.268 0.036	0.2034 0.0028	1.1781 0.0062
250 46	GH	8.283 0.036	0.2036 0.0026	1.0365 0.0059
248 52	IJ	8.531 0.036	0.2055 0.0027	1.0710 0.0056
248 53	IJ	8.490 0.035	0.2126 0.0032	1.2235 0.0068
247 54	IJ	8.241 0.034	0.2089 0.0031	1.1788 0.0065
247 56	IJ	7.963 0.037	0.1956 0.0031	1.1477 0.0066
247 57	IJ	7.839 0.032	0.1970 0.0029	1.1499 0.0061
246 57	IJ	6.857 0.033	0.1730 0.0024	0.9231 0.0054
246 58	IJ	7.634 0.034	0.1894 0.0026	1.0992 0.0057
246 59	IJ	7.854 0.033	0.1943 0.0031	1.0000 0.0006
246 60	IJ	8.412 0.036	0.2000 0.0026	1.1990 0.0062
245 60	IJ	8.104 0.034	0.1975 0.0029	1.0222 0.0066
245 61	IJ	8.556 0.038	0.2120 0.0031	1.2212 0.0067
245 62	IJ	8.495 0.037	0.2092 0.0028	1.0641 0.0056
244 63	IJ	8.506 0.038	0.2078 0.0027	1.0685 0.0057
244 64	IJ	8.681 0.038	0.2026 0.0026	1.2490 0.0063
244 65	IJ	8.497 0.038	0.2037 0.0026	1.0614 0.0056
244 66	IJ	8.596 0.035	0.2165 0.0032	1.2352 0.0065
244 67	GH	8.501 0.038	0.2132 0.0028	1.2193 0.0063
243 68	IJ	8.207 0.033	0.2049 0.0031	1.1784 0.0068
243 69	IJ*		0.1919 0.0027	0.9890 0.0053
243 70	IJ	7.966 0.036	0.1827 0.0025	1.1442 0.0059
242 70	IJ	7.727 0.036	0.1756 0.0028	0.9578 0.0052

Table 4.2.3-59 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
242 73	IJ	7.114 0.029	0.1701 0.0027	1.0362 0.0055
241 73	IJ	6.956 0.029	0.1701 0.0029	1.0100 0.0055
241 74	IJ	6.204 0.030	0.1667 0.0026	0.8805 0.0053
241 75	JK	5.535 0.028	0.1605 0.0024	0.7843 0.0044
241 76	IJ	4.796 0.025	0.1323 0.0021	0.6791 0.0039
240 77	IJ	3.931 0.022	0.0992 0.0020	0.5738 0.0035
240 78	IJ	3.358 0.020	0.0427 0.0014	0.4102 0.0028
240 79	IJ	2.775 0.016	0.0221 0.0010	0.3279 0.0026
239 80	IJ	2.087 0.015	0.0110 0.0010	0.2426 0.0021
239 81	IJ	1.648 0.010	0.0085 0.0008	0.1828 0.0016
239 82	IJ	1.397 0.010	0.0041 0.0008	0.1445 0.0015

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above and the ²³⁸U foils were centered on the mid-height of the drawer. All foils were centered 51.6 mm from the reactor midplane except "*" which were at 50.3.

^bExperimental results in units of 10⁻¹⁸ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation of uncertainty. See text for details.

Table 4.2.3-60

Basic Data for Radial Distributions of
 ^{235}U (n,f) in ZPPR-18C

<u>Matrix</u>	<u>Loc^a</u>	<u>$^{235}\text{U}(n,f)^b$</u>	<u>Matrix</u>	<u>Loc^a</u>	<u>$^{235}\text{U}(n,f)^b$</u>
Data on the X-axis at Z = 280.2 mm					
249 16	GH	1.033 0.010	249 48	GH	6.830 0.035
249 18	GH	1.439 0.010	249 50	IJ	6.866 0.035
249 20	GH	2.172 0.013	249 51	IJ	6.673 0.032
249 21	GH	2.572 0.015	249 54	IJ	6.492 0.035
249 23	FG	3.317 0.018	249 56	IJ	6.252 0.030
249 25	GH	3.991 0.021	249 58	IJ	6.482 0.031
249 26	GH	4.164 0.025	249 60	IJ	6.539 0.034
249 28	GH	4.665 0.025	249 62	IJ	7.057 0.033
249 30	GH	5.189 0.026	249 66	IJ	6.842 0.032
249 32	GH	5.579 0.027	249 68	IJ	6.507 0.031
249 34	GH	5.989 0.027	249 70	IJ	6.063 0.029
249 36	GH	6.105 0.033	249 72	IJ	5.582 0.029
249 38	GH	5.855 0.030	249 73	IJ	5.373 0.027
249 40	GH	5.855 0.026	249 77	IJ	3.472 0.019
249 42	GH	5.903 0.031	249 78	IJ	2.974 0.020
249 44	GH	6.214 0.033	249 80	IJ	1.964 0.015
249 47	GH	6.569 0.033	249 82	IJ	1.381 0.012
Data on the 15 degree radial at Z = 280.2 mm					
259 16	GH	0.775 0.007	248 52	IJ	6.482 0.033
259 17	GH	0.900 0.008	248 53	IJ	6.578 0.034
259 18	GH	1.144 0.010	247 54	IJ	6.251 0.037
258 19	GH	1.451 0.011	247 56	IJ	5.792 0.032
258 20	GH	1.742 0.012	247 57	IJ	5.825 0.028
258 21	GH	2.042 0.016	246 57	IJ	4.881 0.027
257 22	GH	2.356 0.014	246 58	IJ	5.530 0.033
257 23	FG	2.613 0.014	246 59	IJ	5.934 0.032
257 24	GH	2.683 0.019	246 60	IJ	6.428 0.032
257 25	GH	2.546 0.015	245 60	IJ	6.217 0.033
256 25	GH	2.550 0.015	245 61	IJ	6.661 0.032
256 28	GH	3.469 0.021	245 62	IJ	6.690 0.034
255 28	GH	3.735 0.020	244 63	IJ	6.710 0.032
255 29	GH	4.256 0.022	244 64	IJ	6.939 0.032
255 30	GH	4.840 0.030	244 65	IJ	6.803 0.032
254 32	GH	5.477 0.027	244 66	IJ	6.948 0.033
254 33	GH	5.457 0.026	244 67	GH	6.861 0.032
254 34	GH	5.693 0.026	243 68	IJ	6.696 0.035
254 35	GH	5.618 0.026	243 70	IJ	6.540 0.033
253 36	GH	5.661 0.025	242 70	IJ	6.287 0.030
253 37	GH	5.755 0.030	242 73	IJ	5.818 0.027
253 38	GH	5.463 0.029	241 73	IJ	5.635 0.029
252 38	GH	5.686 0.027	241 74	IJ	5.105 0.028
252 39	GH	5.434 0.031	241 75	JK	4.428 0.025
252 40	GH	5.202 0.024	241 76	IJ	3.906 0.022
252 41	GH	4.963 0.026	240 77	IJ	3.198 0.022

Table 4.2.3-60 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	Matrix	Loc ^a	²³⁵ U(n,f) ^b
251 41	GH	5.548 0.026	240 78	IJ	2.683 0.019
251 42	GH	5.607 0.028	240 79	IJ	2.207 0.017
251 43	GH	5.615 0.030	239 80	IJ	1.665 0.015
251 44	GH	5.991 0.030	239 81	IJ	1.357 0.013
250 45	GH	6.323 0.033	239 82	IJ	1.147 0.011
250 46	GH	6.388 0.034			

Data on the 15 degree radial at Z = 51.6 mm

157 22	IJ	3.357 0.018	149 51	GH	8.911 0.039
157 23	JK	3.858 0.021	148 52	GH	8.886 0.041
157 24	IJ	4.268 0.024	148 53	GH	8.933 0.044
157 25	IJ	4.640 0.024	147 54	GH	8.737 0.042
155 28	IJ	5.725 0.028	147 56	GH	8.655 0.041
155 29	IJ	5.995 0.028	146 57	GH	8.384 0.040
155 30	IJ	6.521 0.032	146 59	GH	8.564 0.042
155 31	IJ	6.802 0.031	145 60	GH	8.566 0.041
154 32	IJ	7.078 0.033	145 62	GH	8.764 0.040
154 33	IJ	7.171 0.032	144 63	GH	8.688 0.041
154 35	IJ	7.445 0.035	144 65	GH	8.611 0.040
153 36	IJ	7.481 0.032	144 66	GH	8.720 0.039
153 38	IJ	7.659 0.040	143 67	GH	8.562 0.039
152 39	IJ	7.677 0.035	143 68	GH	8.452 0.038
152 41	IJ	7.704 0.036	143 70	GH	8.040 0.037
151 42	IJ	8.130 0.037	141 73	GH	7.048 0.032
151 44	IJ	8.469 0.037	141 74	GH	6.269 0.029
151 46	IJ	8.787 0.038	141 75	FG	5.545 0.026
150 45	IJ	8.592 0.038	141 76	GH	4.814 0.023
149 47	IJ	8.798 0.039			

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^bExperimental results in units of 10⁻¹⁸ fissions per atom per second at a reactor power of approximately one watt. The second number is one standard deviation of uncertainty. See text for details.

Table 4.2.3-61 Basic Data for Axial Distributions of $^{235}\text{U}(n,f)$ in ZPPR-18C

z, mm^a	Matrix	Loc ^b	$^{235}\text{U}(n,f)^c$	Matrix	Loc ^b	$^{235}\text{U}(n,f)^c$
737.4	249 49	IJ	2.308 0.014	249 75	JK	1.531 0.011
686.6	249 49	IJ	2.600 0.015	249 75	JK	1.717 0.011
635.8	249 49	IJ	2.991 0.016	249 75	JK	1.975 0.012
585.0	249 49	IJ	3.460 0.017	249 75	JK	2.305 0.015
534.2	249 49	IJ	3.967 0.023	249 75	JK	2.596 0.015
483.4	249 49	IJ	4.365 0.023	249 75	JK	2.831 0.018
432.6	249 49	IJ	4.927 0.023	249 75	JK	3.252 0.018
381.8 ^d	249 49	IJ	5.601 0.027	249 75	JK	3.670 0.018
331.0 ^e	249 49	IJ	5.889 0.028	249 75	JK	4.153 0.023
280.2	249 49	IJ	6.834 0.032	249 75	JK	4.499 0.024
229.4	249 49	IJ	7.404 0.034	249 75	JK	4.898 0.025
178.6	249 49	IJ	7.826 0.033	249 75	JK	5.149 0.026
127.8	249 49	IJ	8.277 0.036	249 75	JK	5.382 0.025
77.0	249 49	IJ	8.727 0.037	249 75	JK	5.605 0.027
50.3	249 49	IJ	8.705 0.035	249 75	JK	5.652 0.025
26.2	249 49	IJ	8.863 0.036	249 75	JK	5.692 0.025
26.2	149 49	GH	9.123 0.042	149 75	FG	5.784 0.029
50.3	149 49	GH	9.137 0.042	149 75	FG	5.758 0.029
77.0	149 49	GH	9.118 0.039	149 75	FG	5.763 0.028
127.8	149 49	GH	9.066 0.039	149 75	FG	5.592 0.028
178.6	149 49	GH	8.832 0.039	149 75	FG	5.422 0.026
229.4	149 49	GH	8.374 0.035	149 75	FG	5.150 0.023
280.2	149 49	GH	8.072 0.037	149 75	FG	4.852 0.023
331.0 ^f	149 49	GH	7.183 0.033	149 75	FG	4.476 0.024
381.8 ^g	149 49	GH	6.874 0.033	149 75	FG	4.028 0.020
432.6	149 49	GH	6.234 0.030	149 75	FG	3.587 0.019
483.4	149 49	GH	5.615 0.028	149 75	FG	3.167 0.018
534.2	149 49	GH	5.210 0.026	149 75	FG	2.919 0.015
585.0	149 49	GH	4.678 0.024	149 75	FG	2.590 0.014
635.8	149 49	GH	4.075 0.021	149 75	FG	2.304 0.013
686.6	149 49	GH	3.579 0.019	149 75	FG	1.999 0.012
737.4	149 49	GH	3.291 0.020	149 75	FG	1.830 0.012
737.4	249 64	IJ	2.580 0.019	243 69	IJ	2.432 0.014
686.6	249 64	IJ	2.869 0.019	243 69	IJ	2.716 0.015
635.8	249 64	IJ	3.284 0.021	243 69	IJ	3.141 0.019
585.0	249 64	IJ	3.780 0.023	243 69	IJ	3.554 0.021
534.2	249 64	IJ	4.232 0.025	243 69	IJ	3.976 0.020
483.4	249 64	IJ	4.633 0.026	243 69	IJ	4.218 0.022
432.6	249 64	IJ	5.177 0.030	243 69	IJ	4.750 0.025
381.8	249 64	IJ	5.871 0.031	243 69	IJ	5.291 0.027
331.0	249 64	IJ	6.554 0.033	243 69	IJ	5.905 0.028
280.2	249 64	IJ	7.096 0.036	243 69	IJ	6.347 0.028
229.4	249 64	IJ	7.555 0.032	243 69	IJ	6.910 0.033
178.6	249 64	IJ	8.038 0.034	243 69	IJ	7.199 0.031
127.8	249 64	IJ	8.433 0.035	243 69	IJ	7.539 0.032
77.0	249 64	IJ	8.806 0.037	243 69	IJ	7.890 0.035

Table 4.2.5-61 cont'd

z, mm ^a	Matrix	Loc ^b	²³⁵ U(n,f) ^c	Matrix	Loc ^b	²³⁵ U(n,f) ^c
50.3	249 64	IJ	8.853 0.036	243 69	IJ	7.922 0.032
26.2	249 64	IJ	8.942 0.036	243 69	IJ	7.945 0.032
26.2	149 64	GH	9.030 0.041	143 69	GH	8.095 0.036
50.3	149 64	GH	9.101 0.041	143 69	GH	8.109 0.035
77.0	149 64	GH	8.973 0.039	143 69	GH	7.992 0.035
127.8	149 64	GH	8.887 0.041	143 69	GH	8.014 0.038
178.6	149 64	GH	8.665 0.041	143 69	GH	7.752 0.037
229.4	149 64	GH	8.297 0.037	143 69	GH	7.512 0.035
280.2	149 64	GH	7.765 0.037	143 69	GH	6.976 0.032
331.0	149 64	GH	7.212 0.033	143 69	GH	6.543 0.030
381.8	149 64	GH	6.582 0.032	143 69	GH	6.016 0.028
432.6	149 64	GH	5.883 0.030	143 69	GH	5.469 0.026
483.4	149 64	GH	5.326 0.030	143 69	GH	4.851 0.024
534.2	149 64	GH	4.966 0.027	143 69	GH	4.507 0.022
585.0	149 64	GH	4.463 0.023	143 69	GH	4.205 0.022
635.8	149 64	GH	3.928 0.023	143 69	GH	3.749 0.019
686.6	149 64	GH	3.459 0.020	143 69	GH	3.080 0.017
737.4	149 64	GH	3.103 0.022	143 69	GH	2.785 0.016

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above the mid-height of the drawer.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

^dThe axial distance was 380.4 mm for matrix position 249-49 only.

^eThe axial distance was 356.4 mm for matrix position 249-49 only.

^fThe axial distance was 356.4 mm for matrix position 149-49 only.

^gThe axial distance was 380.5 mm for matrix position 149-49 only.

Table 4.2.3-62 ZPPR-19B: Radial Reaction Rate Distributions Along the X-axis at Z = 5.16 cm

Matrix	Zone	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
149 49	IC SF	9.404	1.008	10.010	1.014	1.3210	1.057	0.2240	1.010
149 50	IC SF	9.404	1.007	10.090	1.006	1.3290	1.050	0.2261	1.000
149 51	IC SM	9.221	1.015	9.802	1.021	1.2430	1.052	0.2191	1.018
149 52	IC SF	9.204	1.012	9.877	1.006	1.2890	1.060	0.2202	1.006
149 53	IC SM	9.047	1.015	9.636	1.017	1.2100	1.057	0.2110	1.033
149 54	IC SF	9.126	0.999	9.667	1.008	1.2770	1.048	0.2099	1.029
149 55	IC SM	8.884	1.012	9.478	1.015	1.1930	1.052	0.2030	1.044
149 56	IC SF	8.933	1.001	9.542	1.006	1.2650	1.042	0.2089	1.005
149 57	IC SM	8.744	1.010	9.386	1.012	1.1760	1.053	0.2057	1.008
149 58	IC SF	8.823	0.997	9.473	0.999	1.2420	1.047	0.2050	1.013
149 60	IC SM	8.261	1.027	8.925	1.016	1.1190	1.058	0.1939	1.037
149 61	IC SF	8.392	1.001	8.974	1.001	1.1720	1.054	0.1965	1.017
149 62	IC SF	8.288	1.001	8.871	1.002	1.1750	1.041	0.1946	1.017
149 63	IC SM	7.990	1.014	8.487	1.021	1.0790	1.049	0.1883	1.025
149 64	IC SF	7.957	1.000	8.493	1.003	1.1210	1.045	0.1904	0.997
149 65	IC SF	7.799	0.998	8.250	1.011	1.1050	1.039	0.1860	1.001
149 66	IC SM	7.453	1.008	7.934	1.012	0.9957	1.053	0.1753	1.023
149 67	IC SF	7.264	1.002	7.741	1.002	1.0160	1.049	0.1721	1.009
149 68	IC SM	6.899	1.011	7.365	1.007	0.9284	1.044	0.1601	1.038
149 69	IC SF	6.711	1.001	7.183	0.993	0.9453	1.037	0.1638	0.980
149 70	IC SM	6.401	1.001	6.774	1.002	0.8514	1.041	0.1535	0.999
149 71	IC SF	6.131	1.000	6.535	0.994	0.8549	1.042	0.1462	1.011
149 72	IC SM	5.861	0.991	6.083	1.010	0.7711	1.039	0.1413	1.001
149 73	OC US	5.617	1.000	5.751	0.983	0.7539	1.038	0.1326	0.974
149 74	OC US	5.120	1.006	5.208	0.994	0.6837	1.041	0.1285	0.994
149 75	OC D	4.597	0.982	4.812	0.986	0.6165	1.036	0.1346	0.950
149 76	OC US	3.945	1.004	4.054	0.985	0.5377	1.028	0.0942	1.025
149 77	OC SF	3.261	0.985	3.600	0.986	0.4679	1.048	0.0723	1.001
149 78	RB	--	--	3.046	1.000	0.3729	1.052	0.0296	1.224
149 79	RB	--	--	2.491	0.994	0.3004	1.045	0.0204	0.915
149 80	RB	--	--	2.004	0.989	0.2365	1.029	0.0116	0.884
149 81	RB	--	--	1.633	0.989	0.1790	1.043	0.0069	0.832
149 82	RB	--	--	1.364	1.060	0.1514	0.977	0.0047	0.704
149 83	RR	--	--	1.461	1.086	--	--	--	--

Table 4.2.3-63 ZPRN-19D: Radial Reaction Rate Distributions
along the X-axis at Z = 28.02 cm

Matrix	Zone	$^{235}\text{U}(n, f)$		$^{235}\text{U}(n, \gamma)$		$^{238}\text{U}(n, f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
149 49	IC SF	8.356	0.993	1.1010	1.038	0.1826	0.995
149 50	IC SF	8.321	0.997	1.1080	1.031	0.1863	0.975
149 51	IC SM	8.161	1.003	1.0210	1.046	0.1738	1.031
149 52	IC SF	8.202	0.991	1.0780	1.038	0.1792	0.993
149 53	IC SM	7.967	1.006	0.9973	1.049	0.1722	1.017
149 54	IC SF	8.084	0.987	1.0660	1.029	0.1708	1.016
149 55	IC SM	7.923	0.995	0.9948	1.033	0.1691	1.008
149 56	IC SF	7.905	0.995	1.0510	1.028	0.1730	0.976
149 57	IC SM	7.794	0.999	0.9692	1.046	0.1632	1.023
149 58	IC SF	7.796	0.995	1.0330	1.032	0.1666	1.002
149 59	IC SF	--	--	--	--	--	--
149 60	IC SM	7.420	1.000	0.9351	1.035	0.1556	1.038
149 61	IC SF	7.387	0.995	0.9787	1.033	0.1597	1.005
149 62	IC SF	7.298	0.996	0.9793	1.022	0.1594	0.996
149 63	IC SM	7.146	0.992	0.8910	1.038	0.1517	1.021
149 64	IC SF	7.057	0.986	0.9285	1.032	0.1550	0.983
149 65	IC SF	6.907	0.986	0.9131	1.027	0.1531	0.975
149 66	IC SM	6.553	1.000	0.8274	1.034	0.1457	0.987
149 67	IC SF	6.415	0.987	0.8385	1.038	0.1438	0.967
149 68	IC SM	6.070	0.997	0.7645	1.033	0.1339	0.995
149 69	IC SF	5.934	0.980	0.7781	1.027	0.1268	1.013
149 70	IC SM	5.588	0.989	0.6984	1.033	0.1211	1.013
149 71	IC SF	5.330	0.990	0.7089	1.022	0.1206	0.980
149 72	IC SM	5.049	0.988	0.6402	1.015	0.1132	1.000
149 73	OC US	4.666	0.979	0.6169	1.027	0.1081	0.956
149 74	OC US	4.298	0.971	0.5639	1.020	0.1059	0.965
149 75	OC D	3.925	0.976	0.4977	1.036	0.1090	0.937
149 76	OC US	3.353	0.960	--	--	--	--
149 77	OC SF	2.932	0.978	0.3869	1.023	0.0634	0.911
149 78	RB	2.517	0.980	--	--	--	--
149 79	RB	2.057	0.977	--	--	--	--
149 80	RB	1.621	0.994	--	--	--	--
149 81	RB	1.336	0.986	--	--	--	--
149 82	RB	1.138	1.038	--	--	--	--

Table 4.2.3-64 ZPPR-19B: Radial Reaction Rate Distributions
along the Y-axis at Z = 5.16 cm

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{235}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
149	49 IC SF	10.010	1.014	1.3210	1.057	0.2240	1.010
148	49 IC SM	9.894	1.014	--	--	--	--
147	49 IC SF	9.851	1.012	--	--	--	--
146	49 IC SM	9.683	1.018	--	--	--	--
145	49 IC SF	9.779	1.007	--	--	--	--
144	49 IC SF	9.761	1.002	--	--	--	--
143	49 IC SM	9.495	1.015	--	--	--	--
142	49 IC SF	9.612	1.002	--	--	--	--
141	49 IC SM	9.481	1.029	--	--	--	--
	Control Rod Position						
138	49 IC SF	8.992	1.017	--	--	--	--
137	49 IC SM	8.592	1.014	--	--	--	--
136	49 IC SF	8.528	0.999	--	--	--	--
135	49 IC SF	8.326	1.004	--	--	--	--
134	49 IC SM	8.117	1.010	--	--	--	--
133	49 IC SF	8.260	0.997	--	--	--	--
	Control Rod Position						
130	49 IC SM	7.284	1.017	--	--	--	--
129	49 IC SF	7.027	0.992	--	--	--	--
128	49 IC SM	6.620	1.001	--	--	--	--
127	49 IC SF	6.460	0.985	--	--	--	--
126	49 IC SF	6.154	0.983	--	--	--	--
125	49 OC US	5.673	0.978	0.7502	1.040	0.1346	0.976
124	49 OC SF	5.395	0.973	0.7005	1.044	0.1427	0.982
123	49 OC UD	4.787	0.969	0.6360	1.039	0.1296	0.984
122	49 OC SF	4.360	0.981	0.5834	1.034	0.1162	0.972
121	49 OC US	3.682	0.983	0.4998	1.037	0.0957	0.980
120	49 OC UD	3.136	0.964	0.4302	1.028	0.0848	0.956
119	49 OC SF	2.690	0.976	0.3615	1.058	0.0597	0.961

Table 4.2.3-65 ZPPR-19B: Radial Reaction Rate Distributions at 15° to the X-axis at Z = 5.16 cm

Matrix	Zone	$^{239}\text{Pu}(n,r)$		$^{235}\text{U}(n,r)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,r)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC SF	9.408	1.004	9.993	1.007	1.3110	1.059	0.2226	1.012
148 52	IC SM	9.139	1.015	9.686	1.023	1.2280	1.053	0.2155	1.023
148 53	IC SF	9.202	1.000	9.783	1.005	1.2800	1.056	0.2171	1.007
147 54	IC SF	9.044	1.006	9.702	1.006	1.2800	1.047	0.2081	1.030
147 55	IC SM	8.895	1.011	9.577	1.014	1.2050	1.045	0.2030	1.032
147 56	IC SF	8.917	1.004	9.733	1.004	1.2830	1.039	0.2090	0.988
147 57	IC SF	8.886	0.999	9.567	1.011	1.2680	1.042	0.2058	0.993
146 58	IC SF	8.825	0.989	9.651	0.993	1.2630	1.034	0.1959	1.007
146 59	IC SM	8.438	1.013	9.113	1.013	1.1410	1.050	0.1918	1.032
146 60	IC SF	8.419	1.000	8.954	1.007	1.1870	1.044	0.2005	0.986
145 61	IC SF	8.156	1.007	8.813	0.994	1.1600	1.040	0.1894	1.020
145 62	IC SM	7.984	1.006	8.501	1.006	1.0720	1.042	0.1866	1.012
144 63	IC SM	7.850	0.992	8.213	1.013	1.0300	1.053	0.1786	1.017
144 64	IC SF	7.613	1.004	8.146	1.002	1.0770	1.042	0.1809	0.987
144 65	IC SM	7.358	1.013	7.844	1.012	0.9909	1.046	0.1738	1.006
144 66	IC SF	7.345	0.992	7.756	1.000	1.0280	1.041	0.1696	1.018
143 67	IC SF	7.044	0.990	7.459	0.996	0.9890	1.036	0.1603	1.025
143 68	IC SF	6.820	0.987	7.281	0.989	0.9620	1.031	0.1612	0.983
143 69	IC SM	6.451	1.000	6.964	0.996	0.8742	1.031	0.1490	1.003
143 70	IC SF	6.374	0.975	6.861	0.989	0.9070	1.022	0.1425	0.966
142 70	IC SM	6.170	0.993	6.774	0.991	0.8348	1.034	0.1397	0.958
Control Rod Position									
142 73	OC USA	5.582	0.993	5.764	0.965	0.7623	1.020	0.1134	0.986
141 73	OC USA	5.450	0.998	5.605	0.963	0.7435	1.018	0.1136	0.999
141 74	OC SF	4.751	0.979	4.978	0.984	0.6593	1.019	0.1214	0.988
141 75	OC UD	4.381	0.994	4.358	0.983	0.5823	1.034	0.1163	0.961
141 76	OC USA	3.709	0.973	3.684	0.972	0.4789	1.041	0.0940	0.954
140 77	OC SF	2.860	0.987	3.063	0.985	0.4008	1.047	0.0691	0.996
140 78	RB	--	--	2.587	0.993	0.3216	1.042	0.0295	1.162
140 79	RB	--	--	2.107	0.989	0.2604	1.027	0.0190	0.906
139 80	RB	--	--	1.603	0.983	0.1878	1.046	0.0109	0.797
139 81	RB	--	--	1.288	0.989	0.1464	1.022	0.0066	0.739
139 82	RB	--	--	1.059	1.068	0.1178	0.998	0.0039	0.709

Table 4.2.5-66 ZPPR-19B: Radial Reaction Rate Distributions
at 15° to the X-axis at Z = 28.02 cm

Matrix	Zone	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC SF	8.297	0.992	1.0940	1.039	0.1826	0.991
148 52	IC SM	8.067	1.005	1.0120	1.045	0.1751	1.012
148 53	IC SF	8.137	0.989	1.0540	1.050	0.1771	0.993
147 54	IC SF	8.063	0.992	1.0580	1.038	0.1725	1.000
147 55	IC SM	7.892	1.011	--	--	--	--
147 56	IC SF	8.071	0.995	1.0620	1.031	0.1672	0.994
147 57	IC SF	8.030	0.990	1.0580	1.025	0.1637	1.005
146 58	IC SF	7.993	0.987	1.0590	1.013	0.1616	0.982
146 59	IC SM	7.533	1.006	0.9445	1.039	0.1615	0.987
146 60	IC SF	7.419	0.996	--	--	--	--
145 61	IC SF	7.215	0.995	--	--	--	--
145 62	IC SM	7.016	0.998	0.8836	1.035	0.1493	1.017
144 63	IC SM	6.824	0.999	0.8614	1.030	0.1432	1.019
144 64	IC SF	6.726	0.994	--	--	--	--
144 65	IC SM	6.553	0.992	0.8338	1.017	0.1395	1.006
144 66	IC SF	6.451	0.984	--	--	--	--
143 67	IC SF	6.171	0.984	0.8214	1.021	0.1366	0.966
143 68	IC SF	6.030	0.976	--	--	--	--
143 69	IC SM	5.721	0.991	0.7174	1.026	0.1225	0.979
143 70	IC SF	5.656	0.982	0.7563	1.003	0.1160	0.952
142 70	IC SM	5.613	0.979	0.6949	1.015	0.1166	0.920
	Control Rod Position						
142 73	OC USA	4.794	0.945	0.6329	1.002	0.0926	0.970
141 73	OC USA	4.649	0.944	0.6143	1.003	0.0904	1.007
141 74	OC SF	4.102	0.969	0.5391	1.012	0.0964	0.996
141 75	OC D	3.613	0.959	--	--	--	--
141 76	OC USA	3.021	0.957	0.3981	1.013	0.0764	0.940
140 77	OC SF	2.532	0.964	0.3282	1.033	0.0569	0.967
140 78	RB	2.158	0.964	--	--	--	--
140 79	RB	1.735	0.975	--	--	--	--
139 80	RB	1.311	0.978	--	--	--	--
139 81	RB	1.043	0.996	--	--	--	--
139 82	RB	0.890	1.038	--	--	--	--

Table 4.2.3-67 ZPPR-19B: Radial Reaction Rate Distributions at
30° to the X-axis at Z = 5.16 cm

Matrix	Zone	$^{235}\text{U}(n, f)$		$^{238}\text{U}(n, \gamma)$		$^{238}\text{U}(n, f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
146 54	IC SM	9.514	1.025	1.2070	1.049	0.2073	1.016
145 55	IC SM	9.834	1.007	1.2200	1.044	0.1991	0.979
	Control Rod Position						
144 58	IC SM	9.429	1.020	1.1760	1.052	0.1895	0.960
143 58	IC SF	9.363	1.009	1.2650	1.028	0.1879	0.977
143 59	IC SM	8.906	1.014	1.1190	1.050	0.1852	1.025
142 60	IC SM	8.627	1.005	1.0750	1.052	0.1828	1.027
142 61	IC SF	8.547	1.003	1.1440	1.033	0.1795	1.031
142 62	IC SF	8.505	1.001	1.1270	1.035	0.1791	0.992
141 62	IC SF	8.461	1.004	1.1430	1.018	0.1769	0.950
	Control Rod Position						
140 65	IC SM	7.822	1.009	0.9836	1.034	0.1562	0.959
139 65	IC SF	7.803	0.991	1.0460	1.018	0.1581	0.956
139 66	IC SM	7.251	1.002	0.9206	1.028	0.1528	1.010
138 67	IC SM	6.819	1.001	0.8620	1.033	0.1521	1.005
138 68	IC SF	6.699	0.989	0.8818	1.034	0.1546	0.986
137 68	IC SM	6.450	1.000	0.8113	1.038	0.1485	1.028

Table 4.2.3-68. ZPPR-19B: Radial Reaction
Rate Distribution at 30° to
the X-axis at Z = 28.02 cm

Matrix	Zone	$^{235}\text{U}(n,r)$	
		Exp.	C/E
146 54	IC SM	7.971	1.004
145 55	IC SM	8.174	0.999
Control Rod Position			
144 58	IC SM	7.790	1.018
143 58	IC SF	7.789	0.999
143 59	IC SM	7.391	1.004
142 60	IC SM	7.148	0.995
142 61	IC SF	7.192	0.979
142 62	IC SF	7.099	0.986
141 62	IC SF	7.042	0.993
Control Rod Position			
140 65	IC SM	6.550	0.992
139 65	IC SF	6.488	0.978
139 66	IC SM	6.147	0.966
138 67	IC SM	5.618	0.987
138 68	IC SF	5.517	0.973
137 68	IC SM	5.283	0.986

Table 4.2.3-69 ZPPR-19B: Axial Reaction Rate Distributions in Matrix 149-49 (core center)

Zone	z(mm)	$^{239}\text{Pu}(n,f)$		$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E	Exp.	C/E
IC SF	26.2	9.421	1.006	10.040	1.011	1.3280	1.052	0.2214	1.022
IC SF	50.3	9.404	1.008	10.010	1.014	1.3210	1.057	0.2240	1.010
IC SF	77.0	9.405	0.999	9.883	1.018	1.3130	1.055	0.2231	1.005
IC SF	127.8	9.180	0.990	9.648	1.010	1.2840	1.044	0.2129	1.018
IC SF	178.6	8.789	0.999	9.361	1.006	1.2330	1.051	0.2046	1.022
IC SF	229.4	8.289	0.998	8.887	1.001	1.1790	1.038	0.1988	0.987
IC SF	280.2	7.753	0.993	8.356	0.993	1.1010	1.038	0.1826	0.995
IC SF	356.4	6.797	0.990	7.312	1.004	0.9757	1.035	0.1581	0.973
IC SF	380.5	6.461	0.988	6.967	1.007	0.9331	1.034	0.1470	0.975
IC SF	432.6	5.689	0.993	6.209	1.016	0.8252	1.051	0.1247	0.967
IC SF	483.4	5.030	0.980	5.569	1.028	0.7381	1.059	0.0974	0.906
Zone Average C/E			0.995		1.010		1.047		0.989
Standard Deviation			0.008		0.009		0.009		0.034
AB	534.2	--	--	5.186	1.025	0.6674	1.038	0.0523	0.951
AB	585.0	--	--	4.669	1.024	0.5824	1.043	0.0299	1.081
AB	635.8	--	--	4.090	1.052	0.4959	1.064	0.0195	0.980
AB	686.6	--	--	3.611	1.086	0.4326	1.056	0.0126	1.019
AB	737.4	--	--	3.222	1.120	0.3711	1.055	0.0096	0.733
Zone Average C/E			--		1.061		1.051		0.953
Standard Deviation			--		0.041		0.011		0.132
AR	839.0	--	--	3.514	1.097	--	--	--	--
AR	889.8	--	--	3.199	1.049	--	--	--	--

Table 4.2.3-70: ZPPR-19B: Axial Reaction
Rate Distribution for ^{235}U
Fission in Matrix 146/57
(adjacent to CRP)

Zone	z(mm)	$^{235}\text{U}(n,\gamma)$	
		Exp.	C/E
IC SM	26.2	9.745	1.012
IC SM	50.3	9.805	1.006
IC SM	77.0	9.603	1.019
IC SM	127.8	9.521	0.996
IC SM	178.6	9.066	1.012
IC SM	229.4	8.678	1.001
IC SM	280.2	8.095	1.005
IC SM	331.0	7.533	1.005
IC SM	381.8	6.890	1.008
IC SM	432.6	6.241	1.013
IC SM	483.4	5.633	1.031
Zone Average C/E			1.010
Standard Deviation			0.010
AB	534.2	5.309	1.038
AB	585.0	4.864	1.031
AB	635.8	4.355	1.047
AB	686.6	3.903	1.065
AB	737.4	3.604	1.052
Zone Average C/E			1.047
Standard Deviation			0.013

Table 4.2.5-71 ZPPR-19B: Axial Reaction Rate Distributions
in Matrix 149-75 (outer core)

Zone	z(mm)	$^{235}\text{U}(n,f)$		$^{238}\text{U}(n,\gamma)^a$		$^{238}\text{U}(n,f)$	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
OC D	26.2	4.793	0.990	0.6115	1.044	0.1359	0.941
OC D	50.3	4.812	0.986	0.6165	1.036	0.1346	0.950
OC D	77.0	4.728	0.995	0.5997	1.055	0.1327	0.955
OC D	127.8	4.593	0.990	0.5901	1.036	0.1340	0.914
OC D	178.6	4.386	1.000	0.5709	1.034	0.1213	0.973
OC D	229.4	4.183	0.986	0.5300	1.047	0.1181	0.936
OC D	280.2	3.925	0.976	0.4977	1.036	0.1090	0.937
OC D	331.0	3.580	0.983	0.4555	1.040	0.0986	0.939
OC D	381.8	3.212	0.984	0.4187	1.016	0.0902	0.885
OC D	432.6	2.841	0.986	0.3629	1.040	0.0740	0.907
OC D	483.4	2.464	1.014	0.3112	1.076	0.0574	0.844
Zone Average C/E			0.990		1.042		0.926
Standard Deviation			0.010		0.015		0.036
AB	534.2	2.284	0.993	0.3147	--	0.0286	0.938
AB	585.0	2.086	0.974	0.2840	--	0.0187	0.918
AB	635.8	1.829	0.990	0.2464	--	0.0114	0.870
AB	686.6	1.612	1.001	0.2138	--	0.0070	0.947
AB	737.4	1.490	0.961	--	--	--	--
Zone Average C/E			0.984		--		0.918
Standard Deviation			0.016		--		0.034
AR	839.0	1.591	0.784	--	--	--	--
AR	889.8	1.466	0.694	--	--	--	--

^aCell factor not measured for ^{238}U capture in the axial blanket; exp. values are basic data

Table 4.2.3-72 ZPPR-19B: Reaction Rate Ratios along the X-axis at Z = 5.16 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
149 49	IC SF	1.064	1.006	0.1405	1.049	0.02382	1.002
149 50	IC SF	1.073	0.999	0.1413	1.043	0.02404	0.993
149 51	IC SM	1.063	1.006	0.1348	1.036	0.02376	1.003
149 52	IC SF	1.073	0.994	0.1400	1.047	0.02392	0.994
149 53	IC SM	1.065	1.002	0.1337	1.041	0.02332	1.018
149 54	IC SF	1.059	1.009	0.1399	1.049	0.02300	1.030
149 55	IC SM	1.067	1.003	0.1343	1.040	0.02285	1.032
149 56	IC SF	1.068	1.005	0.1416	1.041	0.02339	1.004
149 57	IC SM	1.073	1.002	0.1345	1.043	0.02352	0.998
149 58	IC SF	1.074	1.002	0.1408	1.050	0.02323	1.016
149 59	IC SF	--	--	--	--	--	--
149 60	IC SM	1.080	0.989	0.1355	1.030	0.02347	1.010
149 61	IC SF	1.069	1.000	0.1397	1.053	0.02342	1.016
149 62	IC SF	1.070	1.001	0.1418	1.040	0.02348	1.016
149 63	IC SM	1.062	1.007	0.1350	1.035	0.02357	1.011
149 64	IC SF	1.067	1.003	0.1409	1.045	0.02393	0.997
149 65	IC SF	1.058	1.013	0.1417	1.041	0.02385	1.003
149 66	IC SM	1.065	1.004	0.1336	1.045	0.02352	1.015
149 67	IC SF	1.066	1.000	0.1399	1.047	0.02369	1.007
149 68	IC SM	1.068	0.996	0.1346	1.033	0.02321	1.027
149 69	IC SF	1.070	0.992	0.1409	1.036	0.02441	0.979
149 70	IC SM	1.058	1.001	0.1330	1.040	0.02398	0.998
149 71	IC SF	1.066	0.994	0.1394	1.042	0.02385	1.011
149 72	IC SM	1.038	1.019	0.1316	1.048	0.02411	1.010
		-----		-----		-----	
Zone Average C/E		1.002		1.042		1.008	
Standard Deviation		0.007		0.006		0.013	
149 73	OC US	1.024	0.983	0.1342	1.038	0.02361	0.974
149 74	OC US	1.017	0.988	0.1335	1.035	0.02510	0.988
149 75	OC D	1.047	1.004	0.1341	1.055	0.02928	0.967
149 76	OC US	1.028	0.981	0.1363	1.024	0.02388	1.021
149 77	OC SF	1.104	1.001	0.1435	1.064	0.02217	1.016
		-----		-----		-----	
Zone Average C/E		0.991		1.043		0.993	
Standard Deviation		0.011		0.016		0.024	

Table 4.2.3-73 ZPPR-19B: Reaction Rate Ratios at 15° to the X-axis at Z = 5.16 cm

Matrix	Zone	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
148 50	IC SF	1.062	1.003	0.1393	1.055	0.02366	1.008
148 52	IC SM	1.060	1.008	0.1344	1.037	0.02358	1.008
148 53	IC SF	1.063	1.005	0.1391	1.056	0.02359	1.007
147 54	IC SF	1.073	1.000	0.1415	1.041	0.02301	1.024
147 55	IC SM	1.077	1.003	0.1355	1.034	0.02282	1.021
147 56	IC SF	1.092	1.000	0.1439	1.035	0.02344	0.984
147 57	IC SF	1.077	1.012	0.1427	1.043	0.02316	0.994
146 58	IC SF	1.094	1.004	0.1431	1.046	0.02220	1.018
146 59	IC SM	1.080	1.000	0.1352	1.037	0.02273	1.019
146 60	IC SF	1.064	1.007	0.1410	1.044	0.02382	0.986
145 61	IC SF	1.081	0.987	0.1422	1.033	0.02322	1.013
145 62	IC SM	1.065	1.000	0.1343	1.036	0.02337	1.006
144 63	IC SM	1.046	1.021	0.1312	1.061	0.02275	1.025
144 64	IC SF	1.070	0.998	0.1415	1.038	0.02376	0.983
144 65	IC SM	1.066	0.999	0.1347	1.033	0.02362	0.993
144 66	IC SF	1.056	1.008	0.1400	1.049	0.02309	1.026
143 67	IC SF	1.059	1.006	0.1404	1.046	0.02276	1.035
143 68	IC SF	1.068	1.002	0.1411	1.045	0.02364	0.996
143 69	IC SM	1.080	0.996	0.1355	1.031	0.02310	1.003
143 70	IC SF	1.076	1.014	0.1423	1.048	0.02236	0.991
142 70	IC SM	1.098	0.998	0.1353	1.041	0.02264	0.965
			-----		-----		-----
	Zone Average C/E		1.003		1.042		1.005
	Standard Deviation		0.007		0.008		0.018
142 73	OC USA	1.033	0.972	0.1366	1.027	0.02032	0.993
141 73	OC USA	1.028	0.965	0.1364	1.020	0.02084	1.001
141 74	OC SF	1.048	1.005	0.1388	1.041	0.02555	1.009
141 75	OC D	0.995	0.989	0.1329	1.040	0.02655	0.967
141 76	OC USA	0.993	0.999	0.1291	1.070	0.02534	0.980
140 77	OC SF	1.071	0.998	0.1401	1.061	0.02417	1.009
			-----		-----		-----
	Zone Average C/E		0.988		1.043		0.993
	Standard Deviation		0.016		0.019		0.017

Table 4.2.3-74 ZPPR-19B: Reaction Rate Ratios in Matrix 149-49 (core center)

Zone	z(mm)	F5/F9		C8/F9		F8/F9	
		Exp.	C/E	Exp.	C/E	Exp.	C/E
IC SF	26.2	1.066	1.005	0.1410	1.046	0.02350	1.016
IC SF	50.3	1.064	1.006	0.1405	1.049	0.02382	1.002
IC SF	77.0	1.051	1.019	0.1396	1.056	0.02372	1.006
IC SF	127.8	1.051	1.020	0.1399	1.055	0.02319	1.028
IC SF	178.6	1.065	1.007	0.1403	1.052	0.02328	1.023
IC SF	229.4	1.072	1.003	0.1422	1.040	0.02398	0.989
IC SF	280.2	1.078	1.000	0.1420	1.045	0.02355	1.002
IC SF	356.4	1.076	1.014	0.1435	1.045	0.02326	0.983
IC SF	380.5	1.078	1.019	0.1444	1.047	0.02275	0.987
IC SF	432.6	1.091	1.023	0.1451	1.058	0.02192	0.974
IC SF	483.4	1.107	1.049	0.1467	1.081	0.01936	0.924
			-----		-----		-----
	Zone Average C/E		1.015		1.052		0.994
	Standard Deviation		0.014		0.011		0.029

Table 4.2.3-75 Basic Data For Radial Distributions of ^{239}Pu (n,f) in ZPPR-19B

<u>Matrix</u>	<u>Loc^a</u>	<u>$^{239}\text{Pu}(n,f)^b$</u>	<u>Matrix</u>	<u>Loc^a</u>	<u>$^{239}\text{Pu}(n,f)^b$</u>
Data on the X-axis			Data on the 15 deg radial		
149 50	GH	9.448 0.043	148 50	GH	9.452 0.043
149 51	GH	9.237 0.044	148 52	GH	9.155 0.042
149 52	GH	9.246 0.041	148 53	GH	9.245 0.048
149 53	GH	9.063 0.047	147 54	GH	9.085 0.045
149 54	GH	9.168 0.046	147 55	GH	8.910 0.043
149 55	GH	8.899 0.043	147 56	GH	8.958 0.043
149 56	GH	8.974 0.046	147 57	GH	8.927 0.044
149 57	GH	8.759 0.044	146 57	GH*	8.809 0.042
149 58	GH	8.864 0.043	146 58	GH	8.865 0.045
150 59	GH	8.505 0.041	146 59	GH	8.452 0.040
149 60	GH	8.275 0.043	146 60	GH	8.458 0.042
149 61	GH	8.431 0.043	145 60	GH	8.328 0.043
149 62	GH	8.327 0.041	145 61	GH	8.194 0.041
149 63	GH	8.004 0.041	145 62	GH	7.998 0.040
149 64	GH	7.994 0.042	144 63	GH	7.863 0.042
149 65	GH	7.835 0.041	144 64	GH	7.648 0.040
149 66	GH	7.465 0.040	144 65	GH	7.371 0.040
149 67	GH	7.298 0.040	144 66	GH	7.379 0.039
149 68	GH	6.911 0.038	143 67	GH	7.077 0.040
149 69	GH	6.742 0.034	143 68	GH	6.852 0.039
149 70	GH	6.412 0.035	143 69	GH	6.462 0.035
149 71	GH	6.159 0.036	143 70	GH	6.399 0.034
149 72	GH	5.871 0.034	142 70	GH	6.190 0.034
149 73	HH	5.617 0.035	142 73	GH	5.582 0.031
149 74	HH	5.120 0.031	141 73	GH	5.450 0.031
149 75*	FG	4.617 0.027	141 74	GH	4.773 0.029
149 76	HH	3.945 0.025	141 75	CC	4.381 0.026
149 77	GH	3.311 0.022	141 76	GH	3.709 0.024
			140 77	GH	2.903 0.019

^aIn-drawer column which designates the foil location in the drawer. The ^{239}Pu foils were centered 13.8 mm below the mid-height of the drawer. All foils were centered 51.6 mm from the reactor midplane except "*" which were at 50.3 mm.

^bExperimental results in units of 10^{-16} fissions per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-76 Basic Data for Radial Distributions of ^{235}U and ^{238}U Reaction Rates in ZPPR-19B

Matrix	Loc ^a	$^{235}\text{U}(n,f)^b$	$^{238}\text{U}(n,f)^b$	$^{238}\text{U}(n,\gamma)^b$
Data on the X-axis at Z = 51.6 mm				
149 50	GH	10.075 0.045	0.2373 0.0033	1.4361 0.0074
149 51	GH	9.722 0.042	0.2297 0.0031	1.2235 0.0068
149 52	GH	9.866 0.044	0.2311 0.0030	1.3923 0.0077
149 53	GH	9.557 0.046	0.2211 0.0030	1.1908 0.0063
149 54	GH	9.657 0.043	0.2202 0.0036	1.3797 0.0072
149 55	GH	9.401 0.043	0.2128 0.0031	1.1740 0.0062
149 56	GH	9.531 0.043	0.2192 0.0029	1.3662 0.0070
149 57	GH	9.310 0.043	0.2156 0.0030	1.1569 0.0061
149 58	GH	9.462 0.043	0.2151 0.0033	1.3422 0.0069
150 59	GH	8.978 0.039	0.2092 0.0032	1.1234 0.0060
149 60	GH	8.852 0.042	0.2033 0.0027	1.1010 0.0059
149 61	GH	8.964 0.042	0.2062 0.0028	1.2666 0.0065
149 62	GH	8.862 0.041	0.2042 0.0033	1.2695 0.0066
149 63	GH	8.418 0.038	0.1974 0.0033	1.0621 0.0058
149 64	GH	8.484 0.038	0.1998 0.0029	1.2116 0.0063
149 65	GH	8.241 0.040	0.1951 0.0031	1.1935 0.0068
149 66	GH	7.870 0.035	0.1837 0.0028	0.9799 0.0054
149 67	GH	7.732 0.034	0.1806 0.0029	1.0982 0.0059
149 68	GH	7.305 0.035	0.1679 0.0028	0.9137 0.0055
149 69	GH	7.175 0.038	0.1718 0.0030	1.0213 0.0058
149 70	GH	6.719 0.034	0.1609 0.0029	0.8379 0.0049
149 71	GH	6.528 0.033	0.1534 0.0027	0.9236 0.0053
149 72	GH	6.034 0.032	0.1481 0.0028	0.7589 0.0050
149 73	HH	5.751 0.028	0.1569 0.0025	0.7607 0.0044
149 74	HH	5.208 0.027	0.1521 0.0027	0.6899 0.0041
149 76	HH	4.054 0.022	0.1115 0.0025	0.5426 0.0038
149 77	GH	3.612 0.021	0.0772 0.0021	0.5214 0.0035
149 78	GH	3.039 0.021	0.0325 0.0013	0.3646 0.0030
149 79	GH	2.504 0.015	0.0206 0.0010	0.2954 0.0026
149 80	GH	2.014 0.014	0.0117 0.0011	0.2326 0.0023
149 81	GH	1.642 0.012	0.0070 0.0009	0.1760 0.0023
149 82	GH	1.394 0.009	0.0056 0.0011	0.1440 0.0018
149 83	TC	1.461 0.011		
Data on the 15 degree radial at Z = 51.6 mm				
148 50	GH	9.982 0.042	0.2336 0.0032	1.4168 0.0077
148 52	GH	9.607 0.041	0.2259 0.0031	1.2081 0.0064
148 53	GH	9.773 0.046	0.2278 0.0033	1.3829 0.0072
147 54	GH	9.692 0.042	0.2184 0.0032	1.3831 0.0072
147 55	GH	9.499 0.044	0.2128 0.0029	1.1860 0.0067
147 56	GH	9.722 0.045	0.2194 0.0032	1.3866 0.0078
147 57	GH	9.556 0.044	0.2159 0.0031	1.3704 0.0072
146 57	GH*		0.1965 0.0029	1.1792 0.0063
146 58	GH	9.641 0.043	0.2055 0.0031	1.3647 0.0070
146 59	GH	9.039 0.040	0.2010 0.0030	1.1231 0.0061

Table 4.2.3-76 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
146 60	GH	8.944 0.039	0.2104 0.0031	1.2825 0.0066
145 60	GH	8.834 0.040	0.2022 0.0031	1.0945 0.0058
145 61	GH	8.803 0.044	0.1987 0.0030	1.2538 0.0065
145 62	GH	8.432 0.037	0.1956 0.0028	1.0554 0.0058
144 63	GH	8.146 0.037	0.1872 0.0029	1.0135 0.0056
144 64	GH	8.138 0.036	0.1898 0.0029	1.1640 0.0061
144 65	GH	7.780 0.035	0.1822 0.0026	0.9752 0.0053
144 66	GH	7.747 0.035	0.1780 0.0026	1.1110 0.0060
143 67	GH	7.451 0.034	0.1682 0.0026	1.0685 0.0058
143 68	GH	7.273 0.036	0.1691 0.0029	1.0393 0.0058
143 69	GH	6.908 0.034	0.1562 0.0029	0.8603 0.0050
143 70	GH	6.872 0.034	0.1483 0.0026	0.9761 0.0054
142 70	GH	6.641 0.033	0.1437 0.0030	0.8149 0.0050
142 73	GH	5.748 0.028	0.1429 0.0028	0.8762 0.0051
141 73	GH	5.589 0.026	0.1430 0.0026	0.8546 0.0049
141 74	GH	4.973 0.027	0.1274 0.0023	0.7123 0.0042
141 75	CC	4.357 0.023	0.1297 0.0026	0.5977 0.0039
141 76	GH	3.682 0.022	0.1099 0.0022	0.5395 0.0035
140 77	GH	3.073 0.018	0.0739 0.0019	0.4466 0.0030
140 78	GH	2.582 0.019	0.0323 0.0013	0.3144 0.0027
140 79	GH	2.118 0.014	0.0193 0.0010	0.2561 0.0027
139 80	GH	1.611 0.012	0.0111 0.0011	0.1846 0.0020
139 81	GH	1.295 0.010	0.0067 0.0010	0.1439 0.0021
139 82	GH	1.081 0.008	0.0046 0.0009	0.1121 0.0018

Data on the 30 degree radial at Z = 51.6 mm

146 54	GH	9.436 0.042	0.2173 0.0034	1.1880 0.0063
145 55	GH	9.641 0.043	0.2048 0.0035	1.1908 0.0069
144 58	GH	9.423 0.044	0.1955 0.0029	1.1554 0.0061
143 58	GH	9.436 0.045	0.1947 0.0029	1.3869 0.0072
143 59	GH	8.834 0.040	0.1942 0.0033	1.1015 0.0060
142 60	GH	8.557 0.041	0.1916 0.0029	1.0584 0.0058
142 61	GH	8.537 0.041	0.1883 0.0036	1.2362 0.0067
142 62	GH	8.496 0.046	0.1879 0.0033	1.2174 0.0065
141 62	GH	8.475 0.045	0.1841 0.0031	1.2300 0.0066
140 65	GH	7.818 0.038	0.1612 0.0028	0.9661 0.0056
139 65	GH	7.864 0.040	0.1638 0.0030	1.1475 0.0062
139 66	GH	7.192 0.041	0.1602 0.0033	0.9060 0.0057
138 67	GH	6.763 0.031	0.1595 0.0027	0.8484 0.0053
138 68	GH	6.692 0.033	0.1623 0.0032	0.9527 0.0058
137 68	GH	6.397 0.032	0.1557 0.0028	0.7985 0.0046

Data on the Y-axis at Z = 51.6 mm

148 49	GH	9.814 0.045		
147 49	GH	9.840 0.046		

Table 4.2.3-76 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
146	49	GH	9.604 0.045	
145	49	GH	9.768 0.044	
144	49	GH	9.750 0.048	
143	49	GH	9.417 0.045	
142	49	GH	9.601 0.047	
141	49	GH	9.475 0.043	
138	49	GH	9.062 0.042	
137	49	GH	8.522 0.039	
136	49	GH	8.519 0.039	
135	49	GH	8.316 0.041	
134	49	GH	8.051 0.040	
133	49	GH	8.325 0.041	
130	49	GH	7.280 0.035	
129	49	GH	7.019 0.035	
128	49	GH	6.566 0.034	
127	49	GH	6.453 0.032	
126	49	GH	6.147 0.033	
125	49	HH	5.673 0.033	0.1593 0.0024
124	49	GH	5.389 0.032	0.1498 0.0025
123	49	CC	4.786 0.028	0.1445 0.0025
122	49	GH	4.355 0.027	0.1219 0.0022
121	49	HH	3.682 0.024	0.1132 0.0021
120	49	CC	3.135 0.019	0.0945 0.0018
119	49	GH	2.698 0.017	0.0637 0.0015
				0.7570 0.0053
				0.7568 0.0053
				0.6528 0.0044
				0.6303 0.0045
				0.5043 0.0037
				0.4415 0.0037
				0.4028 0.0032

Data on the X-axis at Z = 280.2 mm

149	50	GH	8.312 0.036	0.1955 0.0035	1.1967 0.0065
149	51	GH	8.095 0.039	0.1821 0.0029	1.0050 0.0056
149	52	GH	8.193 0.039	0.1880 0.0033	1.1642 0.0063
149	53	GH	7.902 0.037	0.1805 0.0031	0.9815 0.0054
149	54	GH	8.075 0.039	0.1792 0.0032	1.1516 0.0066
149	55	GH	7.858 0.039	0.1773 0.0029	0.9790 0.0055
149	56	GH	7.896 0.036	0.1816 0.0032	1.1356 0.0061
149	57	GH	7.730 0.038	0.1711 0.0031	0.9538 0.0054
149	58	GH	7.787 0.038	0.1748 0.0029	1.1166 0.0060
150	59	GH	7.508 0.035	0.1719 0.0027	0.9389 0.0052
149	60	GH	7.359 0.037	0.1631 0.0027	0.9203 0.0052
149	61	GH	7.379 0.036	0.1676 0.0027	1.0574 0.0063
149	62	GH	7.290 0.037	0.1673 0.0030	1.0580 0.0063
149	63	GH	7.088 0.039	0.1591 0.0030	0.8769 0.0051
149	64	GH	7.049 0.037	0.1627 0.0028	1.0031 0.0056
149	65	GH	6.899 0.037	0.1607 0.0030	0.9865 0.0055
149	66	GH	6.500 0.034	0.1527 0.0027	0.8143 0.0047
149	67	GH	6.408 0.036	0.1509 0.0030	0.9059 0.0058
149	68	GH	6.020 0.029	0.1404 0.0027	0.7524 0.0045
149	69	GH	5.927 0.033	0.1331 0.0026	0.8406 0.0048
149	70	GH	5.543 0.032	0.1270 0.0023	0.6873 0.0044

Table 4.2.5-76 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
149 71	GH	5.324 0.030	0.1265 0.0023	0.7659 0.0045
149 72	GH	5.008 0.030	0.1186 0.0026	0.6301 0.0039
149 73	HH	4.666 0.029	0.1279 0.0025	0.6225 0.0039
149 74	HH	4.298 0.027	0.1253 0.0023	0.5690 0.0041
149 76	HH	3.353 0.021		
149 77	GH	2.941 0.022	0.0678 0.0019	0.4311 0.0030
149 78	GH	2.511 0.018		
149 79	GH	2.067 0.013		
149 80	GH	1.629 0.011		
149 81	GH	1.343 0.012		
149 82	GH	1.162 0.010		

Data on the 15 degree radial at Z = 280.2 mm

148 50	GH	8.288 0.038	0.1916 0.0033	1.1817 0.0064
148 52	GH	8.002 0.036	0.1835 0.0035	0.9956 0.0056
148 53	GH	8.128 0.037	0.1858 0.0031	1.1390 0.0061
147 54	GH	8.054 0.038	0.1810 0.0032	1.1428 0.0062
147 55	GH	7.828 0.037		
147 56	GH	8.062 0.039	0.1755 0.0031	1.1470 0.0066
147 57	GH	8.021 0.043	0.1717 0.0033	1.1436 0.0063
146 57*	GH		0.1688 0.0027	0.9769 0.0058
146 58	GH	7.984 0.042	0.1696 0.0031	1.1444 0.0062
146 59	GH	7.472 0.036	0.1693 0.0028	0.9295 0.0058
146 60	GH	7.410 0.036		
145 60	GH	7.239 0.036	0.1621 0.0027	0.9176 0.0067
145 61	GH	7.207 0.034		
145 62	GH	6.959 0.036	0.1565 0.0028	0.8696 0.0050
144 63	GH	6.768 0.039	0.1501 0.0032	0.8478 0.0049
144 64	GH	6.719 0.036		
144 65	GH	6.499 0.031	0.1463 0.0029	0.8206 0.0048
144 66	GH	6.443 0.034		
143 67	GH	6.164 0.037	0.1434 0.0027	0.8874 0.0051
143 68	GH	6.023 0.030		
143 69	GH	5.675 0.031	0.1284 0.0024	0.7060 0.0042
143 70	GH	5.665 0.033	0.1207 0.0024	0.8138 0.0049
142 70	GH	5.503 0.030	0.1200 0.0022	0.6784 0.0041
142 73	GH	4.780 0.029	0.1166 0.0023	0.7275 0.0043
141 73	GH	4.636 0.028	0.1139 0.0023	0.7061 0.0048
141 74	GH	4.097 0.026	0.1012 0.0023	0.5825 0.0037
141 75	CC	3.613 0.023		
141 76	GH	3.020 0.022	0.0894 0.0022	0.4484 0.0033
140 77	GH	2.540 0.020	0.0608 0.0019	0.3657 0.0027
140 78	GH	2.153 0.015		
140 79	GH	1.744 0.012		
139 80	GH	1.317 0.010		
139 81	GH	1.048 0.009		
139 82	GH	0.909 0.009		

Table 4.2.3-76 cont'd

Matrix	Loc ^a	²³⁵ U(n,f) ^b	²³⁸ U(n,f) ^b	²³⁸ U(n,γ) ^b
Data on the 30 degree radial at Z = 280.2 mm				
146	54	GH	7.906	0.038
145	55	GH	8.014	0.038
144	58	GH	7.785	0.037
143	58	GH	7.850	0.037
143	59	GH	7.331	0.034
142	60	GH	7.090	0.035
142	61	GH	7.184	0.035
142	62	GH	7.091	0.033
141	62	GH	7.054	0.036
140	65	GH	6.546	0.033
139	65	GH	6.539	0.032
139	66	GH	6.097	0.035
138	67	GH	5.572	0.028
138	68	GH	5.510	0.028
137	68	GH	5.240	0.028

^aIn-drawer column which designates the foil location in the drawer. The ²³⁵U foils were centered 13.8 mm above and the ²³⁸U foils were centered on the mid-height of the drawer. All foils were centered 51.6 mm from the reactor midplane except "*" which were at 50.3.

^bExperimental results in units of 10⁻¹⁸ fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation of uncertainty. See text for details.

Table 4.2.5-77 Basic Data for Axial Distributions of Reaction Rates
in ZPPR-19B

<u>z, mm^a</u>	<u>Loc^b</u>	<u>²³⁹Pu(n,f)^c</u>	<u>²³⁵U(n,f)^c</u>	<u>²³⁸U(n,f)^c</u>	<u>²³⁸U(n,γ)^c</u>
Data for matrix position 149 49					
26.2	GH	9.464 0.044	10.027 0.041	0.2323 0.0029	1.4348 0.0078
50.3	GH	9.447 0.045	10.003 0.041	0.2350 0.0030	1.4273 0.0077
77.0	GH	9.449 0.044	9.872 0.041	0.2341 0.0031	1.4181 0.0084
127.8	GH	9.222 0.045	9.637 0.039	0.2233 0.0027	1.3869 0.0075
178.6	GH	8.829 0.042	9.351 0.039	0.2147 0.0027	1.3323 0.0072
229.4	GH	8.328 0.040	8.877 0.038	0.2086 0.0029	1.2734 0.0076
280.2	GH	7.789 0.037	8.347 0.038	0.1916 0.0024	1.1896 0.0072
356.4	GH	6.828 0.036	7.304 0.032	0.1659 0.0023	1.0541 0.0060
380.5	GH	6.491 0.034	6.959 0.031	0.1542 0.0025	1.0081 0.0059
432.6	GH	5.736 0.032	6.240 0.028	0.1314 0.0023	0.9079 0.0055
483.4	GH	5.090 0.027	5.631 0.028	0.1030 0.0018	0.8272 0.0057
534.2	GH		5.183 0.024	0.0484 0.0015	0.7571 0.0048
585.0	GH		4.667 0.024	0.0277 0.0013	0.6834 0.0044
635.8	GH		4.088 0.022	0.0181 0.0010	0.5946 0.0040
686.6	GH		3.610 0.024	0.0116 0.0010	0.5372 0.0041
737.4	GH		3.220 0.017	0.0089 0.0010	0.4747 0.0035
839.0	TC		3.514 0.021		
889.8	TC		3.199 0.019		
Data for matrix position 149 75					
26.2	FG		4.791 0.023	0.1386 0.0024	0.6727 0.0049
50.3	FG		4.810 0.024	0.1372 0.0020	0.6782 0.0048
77.0	FG		4.727 0.022	0.1353 0.0022	0.6597 0.0048
127.8	FG		4.592 0.023	0.1365 0.0022	0.6492 0.0044
178.6	FG		4.385 0.021	0.1237 0.0022	0.6281 0.0043
229.4	FG		4.181 0.022	0.1204 0.0020	0.5831 0.0040
280.2	FG		3.924 0.021	0.1111 0.0018	0.5475 0.0038
331.0	FG		3.579 0.020	0.1005 0.0020	0.5011 0.0036
381.8	FG		3.211 0.018	0.0919 0.0019	0.4606 0.0034
432.6	FG		2.850 0.018	0.0752 0.0017	0.4081 0.0033
483.4	FG		2.479 0.017	0.0581 0.0016	0.3579 0.0033
534.2	FG		2.288 0.014	0.0269 0.0011	0.3147 0.0027
585.0	FG		2.085 0.013	0.0173 0.0010	0.2840 0.0025
635.8	FG		1.828 0.012	0.0106 0.0011	0.2464 0.0025
686.6	FG		1.611 0.012	0.0064 0.0010	0.2138 0.0023
737.4	FG		1.490 0.012		
839.0	TC		1.591 0.011		
889.8	TC		1.466 0.010		
Data for matrix position 146 57					
26.2	GH		9.554 0.039		
50.3	GH		9.612 0.042		
77.0	GH		9.414 0.039		
127.8	GH		9.335 0.041		

Table 4.2.3-77 cont'd

<u>z, mm^a</u>	<u>Loc^b</u>	<u>²³⁹Pu(n,f)^c</u>	<u>²³⁵U(n,f)^c</u>	<u>²³⁸U(n,f)^c</u>	<u>²³⁸U(n,γ)^c</u>
178.6	GH		8.888 0.037		
229.4	GH		8.507 0.041		
280.2	GH		7.936 0.035		
331.0	GH		7.386 0.033		
381.8	GH		6.755 0.030		
432.6	GH		6.118 0.029		
483.4	GH		5.523 0.026		
534.2	GH		5.338 0.024		
585.0	GH		4.890 0.023		
635.8	GH		4.379 0.024		
686.6	GH		3.924 0.021		
737.4	GH		3.623 0.020		

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer.

The ²³⁵U foils were centered 13.8 mm above, the ²³⁸U foils were centered on, and the ²³⁹Pu foils were centered 13.8 mm below the mid-height of the drawer.

^cExperimental results in units of 10⁻¹⁸ fissions or captures per second per atom at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-78 Basic Reaction Rate Data for Cell Studies in ZPPR-19B

<u>z, mm^a</u>	<u>Matrix</u>	<u>Loc^b</u>	<u>²³⁵U(n,f)^c</u>	<u>²³⁸U(n,f)^c</u>	<u>²³⁸U(n,γ)^c</u>
77.0	249 76	PP	4.388 0.020	0.1002 0.0018	0.5541 0.0038
77.0	149 76	-AA		0.1012 0.0020	0.5561 0.0039
77.0	149 76	GH	4.148 0.019	0.1035 0.0017	0.5963 0.0037
77.0	149 76	HH	4.037 0.017	0.1144 0.0020	0.5396 0.0035
77.0	249 76	HI	4.042 0.017	0.1145 0.0019	0.5318 0.0034
77.0	149 76	HI	4.021 0.018	0.1152 0.0018	0.5261 0.0037
77.0	149 76	IJ	4.030 0.019	0.1025 0.0018	0.5837 0.0037
77.0	149 76	-PP		0.0788 0.0018	0.4951 0.0036
77.0	249 76	AA	3.867 0.019	0.0756 0.0016	0.4925 0.0033
77.0	249 77	OP	3.729 0.017	0.0731 0.0016	0.4910 0.0032
77.0	149 77	-AB		0.0753 0.0018	0.4929 0.0036
77.0	249 77	IJ	3.565 0.016	0.0821 0.0017	0.5178 0.0038
77.0	149 77	GH	3.595 0.016	0.0810 0.0017	0.5129 0.0033
77.0	149 77	HI	3.506 0.016	0.0732 0.0017	0.5013 0.0035
77.0	149 77	-OP		0.0544 0.0015	0.4372 0.0033
77.0	249 77	AB	3.401 0.017	0.0538 0.0013	0.4460 0.0030
77.0	242 73	PP	6.194 0.026	0.1031 0.0019	0.7950 0.0046
77.0	142 73	-AA		0.1054 0.0022	0.8227 0.0055
77.0	142 73	GH	5.696 0.023	0.1446 0.0021	0.8672 0.0049
77.0	242 73	HI	5.604 0.022	0.1421 0.0021	0.7887 0.0046
77.0	242 73	HH	5.614 0.024	0.1288 0.0019	0.7194 0.0042
77.0	142 73	-II		0.1287 0.0023	0.7212 0.0050
77.0	242 73	GH	5.641 0.024	0.1197 0.0019	0.8191 0.0047
77.0	142 73	-PP		0.1106 0.0020	0.6952 0.0045
77.0	242 73	AA	5.387 0.023	0.1118 0.0018	0.6864 0.0041
77.0	241 74	OP	5.103 0.022	0.1114 0.0017	0.6711 0.0047
77.0	141 74	-AB		0.1072 0.0022	0.6790 0.0045
77.0	241 74	IJ	4.924 0.020	0.1264 0.0021	0.6982 0.0044
77.0	141 74	GH	4.950 0.021	0.1244 0.0021	0.6991 0.0041
77.0	141 74	HI	4.774 0.019	0.1266 0.0021	0.6790 0.0045
77.0	141 74	-OP		0.1104 0.0021	0.6175 0.0043
77.0	241 74	AB	4.665 0.020	0.1139 0.0017	0.6114 0.0037
77.0	241 75	NO	4.424 0.019	0.1333 0.0019	0.6419 0.0041
77.0	241 75	MN	4.369 0.019	0.1283 0.0020	0.5875 0.0040
77.0	141 75	CD	4.386 0.019	0.1274 0.0019	0.5852 0.0036
77.0	241 75	MM	4.333 0.019	0.1129 0.0019	0.5553 0.0035
77.0	141 75	-DD		0.1197 0.0021	0.5588 0.0040
77.0	141 75	-FF		0.1022 0.0021	0.5789 0.0041
77.0	241 75	FG	4.222 0.019	0.1008 0.0017	0.6116 0.0037
77.0	141 75	-KK		0.1026 0.0020	0.5586 0.0040
77.0	241 75	EF	4.150 0.018	0.1060 0.0018	0.5700 0.0035
77.0	241 75	DD	4.007 0.018	0.1091 0.0018	0.5131 0.0033
77.0	141 75	-MM		0.1095 0.0021	0.5164 0.0042

Table 4.2.3-78 cont'd

z, mm^a	Matrix	Loc ^b	$^{235}\text{U}(n, f)^c$	$^{238}\text{U}(n, f)^c$	$^{238}\text{U}(n, \gamma)^c$
77.0	141 75	MN	3.974 0.018	0.1211 0.0019	0.5354 0.0037
77.0	141 76	-AA		0.0928 0.0020	0.5083 0.0040
77.0	141 76	GH	3.651 0.016	0.1049 0.0019	0.5397 0.0039
77.0	141 76	HI	3.620 0.017	0.1049 0.0017	0.4944 0.0032
77.0	141 76	-II		0.0974 0.0019	0.4709 0.0035
77.0	141 76	IJ	3.611 0.017	0.0927 0.0015	0.5160 0.0032
77.0	141 76	-PP		0.0747 0.0018	0.4447 0.0034
77.0	249 75	OP	4.917 0.021	0.1245 0.0018	0.6337 0.0040
77.0	149 75	-AB		0.1233 0.0022	0.6346 0.0043
77.0	249 75	JK	4.749 0.020	0.1360 0.0020	0.6668 0.0040
77.0	149 75	FG	4.805 0.020	0.1405 0.0022	0.6707 0.0045
77.0	149 75	JK	4.630 0.021	0.1316 0.0020	0.6519 0.0039
77.0	149 75	-OP		0.1158 0.0020	0.5830 0.0040
77.0	249 75	AB	4.450 0.020	0.1116 0.0017	0.5769 0.0038
331.0	249 75	OP	3.707 0.016	0.0931 0.0016	0.4905 0.0041
331.0	149 75	-AB		0.0933 0.0019	0.4788 0.0036
331.0	149 75	FG	3.634 0.016	0.1006 0.0019	0.5033 0.0033
331.0	149 75	JK	3.538 0.017	0.1020 0.0019	0.4938 0.0034
331.0	149 75	-OP		0.0824 0.0017	0.4377 0.0033
331.0	249 75	AB	3.388 0.016	0.0817 0.0017	0.4383 0.0030
381.8	249 75	OP	3.343 0.016	0.0800 0.0016	0.4320 0.0029
381.8	149 75	-AB		0.0820 0.0018	0.4401 0.0033
381.8	149 75	FG	3.245 0.015	0.0888 0.0017	0.4601 0.0034
381.8	149 75	JK	3.142 0.015	0.0883 0.0016	0.4447 0.0030
381.8	149 75	-OP		0.0718 0.0017	0.3958 0.0031
381.8	249 75	AB	3.042 0.015	0.0705 0.0014	0.3957 0.0028
432.6	249 75	JK	2.877 0.015	0.0755 0.0016	0.4052 0.0029
483.4	249 75	JK	2.489 0.013	0.0591 0.0015	0.3563 0.0026

^aDistance from the reactor interface to the center of the foil.

^bIn-drawer column which designates the foil location in the drawer. The ^{235}U foils were centered 13.8 mm above and the ^{238}U foils were centered on the mid-height of the drawer. A negative sign designates a plate-spanning averaging foil.

^cExperimental results in units of 10^{-10} fissions or captures per atom per second at a reactor power of approximately one watt. The second number is one standard deviation uncertainty. See text for details.

Table 4.2.3-79 Effect of Uranium-Fueled Drawers on Cell Factors
for Plutonium-Fueled Drawers

Core	Cell Factors ^a				Ratio	
	19B		18C		19B/18C	
Environment	USA-SF-UD		F-SF-F			
²³⁵ U (n,f)	0.9938	.0052	1.0011	.0049	0.9927	.0071
²³⁸ U (n,f)	0.954	.015	0.953	.011	1.001	.020
²³⁸ U (n,γ)	0.9246	.0056	0.9256	.0088	0.9989	.0113
Environment	US-D-US		F-D-F			
²³⁵ U (n,f)	0.9953	.0050	1.0003	.0049	0.9950	.0070
²³⁸ U (n,f)	0.985	.017	0.981	.016	1.004	.024
²³⁸ U (n,γ)	0.9074	.0054	0.9090	.0063	0.9982	.0091

^aSee text for the discussion on cell factors and the key to the symbols used for environment.

Table 4.2.3-80 Additional Cell-Averaging Factors for ZPPR-19B

$^{239}\text{Pu}(n,f)^a$		$^{235}\text{U}(n,f)^a$		$^{238}\text{U}(n,f)^a$		$^{238}\text{U}(n,\gamma)^a$		Environment ^b	z,mm ^c
0.9850	.0059	0.9969	.0058	0.936	.020	0.8974	.0061	US-SF-RB	0-381.8
1.00	.01	1.0005	.0055	0.855	.020	0.8877	.0076	F-USA-F	0-381.8
1.00	.01	1.0028	.0058	0.794	.015	0.8700	.0059	CRP-USA-F	0-381.8
1.00	.01	1.0000	.0045	0.845	.014	0.9911	.0062	F-US-F	0-483.4
1.00	.01	1.0002	.0045	0.897	.014	0.9743	.0065	F-UD-F	0-483.4

^aThe second number for each cell factor is one standard deviation uncertainty. See text for details.

^bType of cell and local environment. See text for key and discussion.

^cAxial position to which this cell factor applies.

4.2.4 Naボイド

(1) Naボイド反応度分布 (ZPPR-19B)

この節の記載したデータの内容は、以下のとおりである。

[実験データ]

① 軸方向積分Na反応度分布 (位置149-40) ---Table 4.2.4-1

② 軸方向微分Na反応度分布 (位置149-40) ---Table 4.2.4-2

直接に解析対象となるのはこれら2種類のデータであり、以下のデータは未補正のデータであり、解析対象とする場合にはどういうデータであるのか吟味が必要である。

③ 軸方向積分Na反応度分布-----Table 4.2.4-3

④ 軸方向微分Na反応度分布-----Table 4.2.4-4

[その他のデータ]

⑤ 測定位置図 -----Fig. 4.2.4-1

⑥ 軸方向の試料プレートの構造 -----Fig. 4.2.4-2

⑦ ドロワマスタ番号等 ----- Table 4.2.4-1

⑧ NaドロワのNa重量等 ----- Table 4.2.4-2

a 測定方法の概要

Naプレートオシレータを用いて、Na反応度の軸方向分布が測定された。

測定位置は、Fig. 4.2.4-1 に示すように、炉心中心(149-49)、±X方向の二点(149-40, 149-58)、Y方向の一点(155-49)である。

振動させるNaプレートは、66.04 cm長のものとは101.6 cm長の二種類あり、スロークはそれぞれ63.5cm、30.5cmである。149-58のポジションでは101.6 cm長のプレートによる測定が行われ、他の3ポジションでは66.4cm長のプレートによる測定が行われた。プレートの幅は、いずれも1.27cmである。

プレートの位置と炉心の関係を、Fig. 4.2.4-2 に示す。

測定位置	プレート長	ストローク
149-49 (炉中心)	66.04cm	63.5cm
149-40 (炉中心に対して-X方向)	66.04cm	63.5cm
149-58 (炉中心に対して+X方向)	101.6 cm	30.5cm
155-49 (炉中心に対して-Y方向)	66.04cm	63.5cm

149-58位置のプレートは、最も深く挿入された場合でも外端は軸方向ブランケットより更に20cm以上外側にあるので、実質的に無限長さともみなせる。但しストロークは約30cmである。一方、他の3点はプレート長さが66.04 cmであり無限長さとは見なせないが、ストロークは約64cmと大きい。したがって、66.04 cm長のプレートは、プレート下端の炉心部と上端の軸ブランケット部の両方の反応度効果が入り込むことになる。そこで、149-40の測定結果に対して、対象位置にある149-58の101.6 cm長の測定結果を利用して、軸ブランケット部の反応度効果が補正されている。

Table 4.2.4-1 にドロワマスタ番号等を示す。

Table 4.2.4-2 にNaドロワのNa重量等の詳細を示す。

b 測定結果

Table 4.2.4-1 に測定結果を示す。この測定結果（補正後の値）は、炉心中心面からの反応度価値の積分値を示しており、炉心中心面から650.1 cmが零に規格化されている。Table 4.2.4-2 には、測定結果を微分価値の形でまとめた結果を示す。

Table 4.2.4-3 に、軸ブランケット部の反応度効果の補正を含めた積分価値を、Table 4.2.4-4 に、軸ブランケット部の反応度効果の補正を含めた微分価値を示す。

TABLE 4.2.4-1 Integral Reactivity Worth, in Cents, of Sodium Column in 149-40

Distance from Interface (mm)	Corrected, Adjusted	Worth Above 660 mm	Uncorrected
2.31	$\pm 0.03868 \pm 0.00183$	0.00876 ± 0.00072	-0.05594 ± 0.00055
10.00	-0.03627 ± 0.00180	0.00682 ± 0.00067	-0.05159 ± 0.00051
20.00	-0.03327 ± 0.00185	0.00505 ± 0.00075	-0.04682 ± 0.00057
30.00	-0.03041 ± 0.00179	0.00409 ± 0.00066	-0.04300 ± 0.00050
40.00	-0.02733 ± 0.00183	0.00351 ± 0.00072	-0.03934 ± 0.00055
50.00	-0.02391 ± 0.00179	0.00306 ± 0.00066	-0.03547 ± 0.00050
60.00	-0.02022 ± 0.00181	0.00280 ± 0.00068	-0.03152 ± 0.00052
70.00	-0.01652 ± 0.00182	0.00283 ± 0.00070	-0.02785 ± 0.00053
80.00	-0.01284 ± 0.00179	0.00315 ± 0.00065	-0.02449 ± 0.00049
90.00	-0.00945 ± 0.00182	0.00329 ± 0.00071	-0.02124 ± 0.00054
100.00	-0.00651 ± 0.00179	0.00295 ± 0.00066	-0.01796 ± 0.00050
110.00	-0.00390 ± 0.00181	0.00226 ± 0.00068	-0.01466 ± 0.00052
120.00	-0.00117 ± 0.00182	0.00158 ± 0.00071	-0.01125 ± 0.00054
130.00	0.00175 ± 0.00179	0.00097 ± 0.00065	-0.00772 ± 0.00049
140.00	0.00454 ± 0.00182	0.00013 ± 0.00071	-0.00409 ± 0.00054
150.00	0.00699 ± 0.00180	-0.00110 ± 0.00067	-0.00041 ± 0.00051
160.00	0.00922 ± 0.00180	-0.00248 ± 0.00067	0.00320 ± 0.00051
170.00	0.01182 ± 0.00182	-0.00270 ± 0.00071	0.00602 ± 0.00054
180.00	0.01487 ± 0.00179	-0.00156 ± 0.00065	0.00793 ± 0.00049
190.00	0.01803 ± 0.00182	-0.00006 ± 0.00070	0.00959 ± 0.00053
200.00	0.02089 ± 0.00180	0.00071 ± 0.00067	0.01168 ± 0.00051
210.00	0.02344 ± 0.00179	0.00083 ± 0.00066	0.01411 ± 0.00050
220.00	0.02563 ± 0.00182	0.00073 ± 0.00070	0.01640 ± 0.00053
230.00	0.02746 ± 0.00178	0.00051 ± 0.00064	0.01845 ± 0.00048
240.00	0.02902 ± 0.00182	0.00019 ± 0.00070	0.02033 ± 0.00053
250.00	0.03045 ± 0.00180	-0.00018 ± 0.00068	0.02213 ± 0.00051
260.00	0.03179 ± 0.00180	-0.00055 ± 0.00067	0.02384 ± 0.00050
270.00	0.03313 ± 0.00182	-0.00053 ± 0.00071	0.02516 ± 0.00053
280.00	0.03453 ± 0.00179	0.00001 ± 0.00065	0.02602 ± 0.00049
290.00	0.03575 ± 0.00182	0.00050 ± 0.00072	0.02675 ± 0.00052
300.00	0.03644 ± 0.00182	0.00000 ± 0.00072	0.02794 ± 0.00052
310.00	0.03806 ± 0.00166	---	0.02956 ± 0.00049
320.00	0.03927 ± 0.00168	---	0.03077 ± 0.00053
330.00	0.03976 ± 0.00166	---	0.03126 ± 0.00049
340.00	0.03971 ± 0.00167	---	0.03121 ± 0.00052
350.00	0.03948 ± 0.00167	---	0.03098 ± 0.00052
360.00	0.03912 ± 0.00166	---	0.03062 ± 0.00049
370.00	0.03894 ± 0.00168	---	0.03044 ± 0.00053
380.00	0.03909 ± 0.00166	---	0.03059 ± 0.00049
390.00	0.03933 ± 0.00167	---	0.03083 ± 0.00051
400.00	0.03893 ± 0.00168	---	0.03043 ± 0.00053
410.00	0.03785 ± 0.00166	---	0.02935 ± 0.00048
420.00	0.03685 ± 0.00168	---	0.02835 ± 0.00053
430.00	0.03642 ± 0.00167	---	0.02792 ± 0.00050
440.00	0.03636 ± 0.00167	---	0.02786 ± 0.00051
450.00	0.03577 ± 0.00168	---	0.02727 ± 0.00053
460.01	0.03456 ± 0.00166	---	0.02606 ± 0.00048
470.01	0.03293 ± 0.00168	---	0.02443 ± 0.00053
480.01	0.03102 ± 0.00167	---	0.02252 ± 0.00050
490.01	0.02893 ± 0.00167	---	0.02043 ± 0.00050

TABLE 4.2.4-1 (Contd)

Distance from Interface (mm)	Corrected, Adjusted	Worth Above 660 mm.	Uncorrected
500.01	0.02722±0.00168	---	0.01872±0.00053
510.01	0.02599±0.00166	---	0.01749±0.00048
520.01	0.02480±0.00168	---	0.01630±0.00053
530.01	0.02314±0.00167	---	0.01464±0.00051
540.01	0.02111±0.00167	---	0.01261±0.00050
550.01	0.01921±0.00168	---	0.01071±0.00053
560.01	0.01754±0.00166	---	0.00904±0.00048
570.01	0.01607±0.00168	---	0.00757±0.00053
580.01	0.01472±0.00167	---	0.00622±0.00051
590.01	0.01346±0.00167	---	0.00496±0.00050
600.01	0.01240±0.00168	---	0.00390±0.00054
610.01	0.01155±0.00166	---	0.00305±0.00049
620.01	0.01080±0.00168	---	0.00230±0.00054
630.01	0.00993±0.00167	---	0.00143±0.00052
640.01	0.00896±0.00169	---	0.00046±0.00057
650.01	0.00850±0.00168	---	0.00000±0.00053

TABLE 4.2.4-2 Differential Reactivity Worth, in Cents per Kilogram, of Sodium Column in 149-40

Distance from Interface (mm)	Corrected, Adjusted	Worth Above 660 mm	Uncorrected
2.31	-0.5883±0.0621	-0.5241±0.0491	-1.1124±0.0381
10.00	-0.5669±0.0643	-0.4050±0.0508	-0.9719±0.0395
20.00	-0.5391±0.0631	-0.2500±0.0499	-0.7891±0.0387
30.00	-0.5327±0.0604	-0.1241±0.0477	-0.6568±0.0371
40.00	-0.5984±0.0610	-0.0960±0.0482	-0.6944±0.0374
50.00	-0.6641±0.0579	-0.0678±0.0458	-0.7319±0.0355
60.00	-0.6828±0.0614	-0.0215±0.0485	-0.7043±0.0377
70.00	-0.6804±0.0576	0.0331±0.0455	-0.6473±0.0354
80.00	-0.6659±0.0586	0.0668±0.0463	-0.5991±0.0360
90.00	-0.5834±0.0601	-0.0179±0.0475	-0.6013±0.0369
100.00	-0.5010±0.0571	-0.1025±0.0451	-0.6035±0.0350
110.00	-0.4883±0.0610	-0.1298±0.0482	-0.6181±0.0374
120.00	-0.5206±0.0576	-0.1198±0.0455	-0.6404±0.0353
130.00	-0.5463±0.0582	-0.1158±0.0460	-0.6621±0.0357
140.00	-0.4835±0.0604	-0.1898±0.0477	-0.6733±0.0371
150.00	-0.4208±0.0571	-0.2638±0.0451	-0.6846±0.0350
160.00	-0.4363±0.0606	-0.1659±0.0479	-0.6022±0.0372
170.00	-0.5215±0.0577	0.0852±0.0456	-0.4363±0.0354
180.00	-0.6068±0.0573	0.3363±0.0454	-0.2705±0.0350
190.00	-0.5537±0.0602	0.2088±0.0476	-0.3449±0.0368
200.00	-0.4992±0.0565	0.0772±0.0447	-0.4220±0.0346
210.00	-0.4386±0.0597	-0.0058±0.0473	-0.4444±0.0365
220.00	-0.3705±0.0577	-0.0293±0.0457	-0.3998±0.0353
230.00	-0.3024±0.0570	-0.0528±0.0451	-0.3552±0.0348
240.00	-0.2762±0.0605	-0.0631±0.0479	-0.3393±0.0369
250.00	-0.2543±0.0568	-0.0720±0.0451	-0.3263±0.0345
260.00	-0.2436±0.0599	-0.0431±0.0476	-0.2867±0.0363
270.00	-0.2521±0.0589	0.0504±0.0469	-0.2017±0.0356
280.00	-0.2608±0.0591	0.1441±0.0479	-0.1167±0.0346
290.00	-0.1766±0.0641	0.0013±0.0524	-0.1753±0.0369
300.00	-0.0734±0.0613	-0.1900±0.0507	-0.2634±0.0345
310.00	-0.2881±0.0360	---	-0.2881±0.0360
320.00	-0.1567±0.0358	---	-0.1567±0.0358
330.00	-0.0253±0.0345	---	-0.0253±0.0345
340.00	0.0277±0.0369	---	0.0277±0.0369
350.00	0.0544±0.0346	---	0.0544±0.0346
360.00	0.0630±0.0356	---	0.0630±0.0356
370.00	0.0032±0.0361	---	0.0032±0.0361
380.00	-0.0565±0.0345	---	-0.0565±0.0345
390.00	0.0093±0.0369	---	0.0093±0.0369
400.00	0.1373±0.0346	---	0.1373±0.0346
410.00	0.2352±0.0353	---	0.2352±0.0353
420.00	0.1314±0.0363	---	0.1314±0.0363
430.00	0.0275±0.0345	---	0.0275±0.0345
440.00	0.0517±0.0368	---	0.0517±0.0368
450.00	0.1650±0.0348	---	0.1650±0.0348
460.01	0.2754±0.0351	---	0.2754±0.0351
470.01	0.3267±0.0366	---	0.3267±0.0366
480.01	0.3780±0.0345	---	0.3780±0.0345
490.01	0.3586±0.0366	---	0.3586±0.0366

TABLE 4.2.4-2 (Contd)

<u>Distance from Interface (mm)</u>	<u>Corrected, Adjusted</u>	<u>Worth Above 660 mm</u>	<u>Uncorrected</u>
500.01	0.2709±0.0350	----	0.2709±0.0350
510.01	0.1831±0.0348	----	0.1831±0.0348
520.01	0.2617±0.0368	----	0.2617±0.0368
530.01	0.3454±0.0345	----	0.3454±0.0345
540.01	0.3737±0.0364	----	0.3737±0.0364
550.01	0.3285±0.0353	----	0.3285±0.0353
560.01	0.2833±0.0348	----	0.2833±0.0348
570.01	0.2607±0.0369	----	0.2607±0.0369
580.01	0.2408±0.0346	----	0.2408±0.0346
590.01	0.2146±0.0365	----	0.2146±0.0365
600.01	0.1763±0.0358	----	0.1763±0.0358
610.01	0.1379±0.0361	----	0.1379±0.0361
620.01	0.1493±0.0382	----	0.1493±0.0382
630.01	0.1724±0.0405	----	0.1724±0.0405
640.01	0.1526±0.0415	----	0.1526±0.0415
650.01	0.0160±0.0415	----	0.0160±0.0415

TABLE 4.2.4-3 Integral Reactivity Worth, in Cents, of Axial Sodium Column, ZPPR-19B

Distance from Interface (mm)	149-40	149-49	149-58, 305 mm Stroke	155-49
2.31	-0.05594±0.00055	-0.06531±0.00053	-0.04718±0.00050	-0.06551±0.00042
10.00	-0.05159±0.00051	-0.06150±0.00049	-0.04477±0.00046	-0.06088±0.00039
20.00	-0.04682±0.00057	-0.05691±0.00055	-0.04177±0.00051	-0.05650±0.00044
30.00	-0.04300±0.00050	-0.05270±0.00048	-0.03891±0.00046	-0.05390±0.00038
40.00	-0.03934±0.00055	-0.04816±0.00053	-0.03583±0.00049	-0.05091±0.00042
50.00	-0.03547±0.00050	-0.04300±0.00049	-0.03241±0.00046	-0.04655±0.00039
60.00	-0.03152±0.00052	-0.03766±0.00051	-0.02872±0.00048	-0.04141±0.00040
70.00	-0.02785±0.00053	-0.03348±0.00052	-0.02502±0.00048	-0.03728±0.00041
80.00	-0.02449±0.00049	-0.03052±0.00047	-0.02134±0.00046	-0.03428±0.00038
90.00	-0.02124±0.00054	-0.02707±0.00052	-0.01795±0.00049	-0.03107±0.00042
100.00	-0.01796±0.00050	-0.02216±0.00049	-0.01501±0.00046	-0.02695±0.00039
110.00	-0.01466±0.00052	-0.01632±0.00050	-0.01240±0.00047	-0.02224±0.00040
120.00	-0.01125±0.00054	-0.01175±0.00052	-0.00967±0.00049	-0.01831±0.00041
130.00	-0.00772±0.00049	-0.00868±0.00047	-0.00675±0.00045	-0.01529±0.00037
140.00	-0.00409±0.00054	-0.00596±0.00051	-0.00396±0.00049	-0.01242±0.00041
150.00	-0.00041±0.00051	-0.00274±0.00048	-0.00151±0.00046	-0.00908±0.00039
160.00	0.00320±0.00051	0.00090±0.00048	0.00072±0.00047	-0.00546±0.00039
170.00	0.00602±0.00054	0.00446±0.00051	0.00332±0.00049	-0.00238±0.00041
180.00	0.00793±0.00049	0.00786±0.00046	0.00637±0.00045	0.00003±0.00037
190.00	0.00959±0.00053	0.01103±0.00051	0.00953±0.00049	0.00224±0.00041
200.00	0.01168±0.00051	0.01386±0.00049	0.01239±0.00047	0.00477±0.00039
210.00	0.01411±0.00050	0.01637±0.00048	0.01494±0.00046	0.00758±0.00039
220.00	0.01640±0.00053	0.01809±0.00051	0.01713±0.00049	0.01053±0.00041
230.00	0.01845±0.00048	0.02144±0.00046	0.01896±0.00045	0.01358±0.00037
240.00	0.02033±0.00053	0.02371±0.00051	0.02052±0.00049	0.01635±0.00041
250.00	0.02213±0.00051	0.02516±0.00049	0.02195±0.00047	0.01827±0.00040
260.00	0.02384±0.00050	0.02595±0.00047	0.02329±0.00047	0.01941±0.00038
270.00	0.02516±0.00053	0.02736±0.00051	0.02463±0.00049	0.02056±0.00042
280.00	0.02602±0.00049	0.02976±0.00046	0.02603±0.00046	0.02191±0.00038
290.00	0.02675±0.00052	0.03247±0.00050	0.02725±0.00052	0.02341±0.00041
300.00	0.02794±0.00052	0.03417±0.00050	0.02794±0.00052	0.02494±0.00040
310.00	0.02956±0.00049	0.03489±0.00047	---	0.02644±0.00038
320.00	0.03077±0.00053	0.03520±0.00051	---	0.02735±0.00042
330.00	0.03126±0.00049	0.03534±0.00047	---	0.02747±0.00038
340.00	0.03121±0.00052	0.03535±0.00050	---	0.02712±0.00040
350.00	0.03098±0.00052	0.03537±0.00050	---	0.02716±0.00040
360.00	0.03062±0.00049	0.03539±0.00047	---	0.02762±0.00038
370.00	0.03044±0.00053	0.03533±0.00051	---	0.02786±0.00041
380.00	0.03059±0.00049	0.03516±0.00047	---	0.02758±0.00038

TABLE 4.2.4-3 (Contd)

Distance from Interface (mm)	149-40	149-49	149-58, 305 mm Stroke	155-49
390.00	0.03083±0.00051	0.03490±0.00049	---	0.02694±0.00040
400.00	0.03043±0.00053	0.03462±0.00050	---	0.02648±0.00041
410.00	0.02935±0.00048	0.03433±0.00046	---	0.02623±0.00037
420.00	0.02835±0.00053	0.03343±0.00051	---	0.02591±0.00041
430.00	0.02793±0.00050	0.03153±0.00048	---	0.02535±0.00039
440.00	0.02786±0.00051	0.02909±0.00049	---	0.02454±0.00040
450.00	0.02727±0.00053	0.02788±0.00051	---	0.02351±0.00041
460.01	0.02606±0.00048	0.02812±0.00046	---	0.02227±0.00037
470.01	0.02443±0.00053	0.02828±0.00051	---	0.02104±0.00041
480.01	0.02252±0.00050	0.02710±0.00048	---	0.02005±0.00039
490.01	0.02043±0.00050	0.02470±0.00048	---	0.01914±0.00039
500.01	0.01872±0.00053	0.02175±0.00051	---	0.01752±0.00041
510.01	0.01749±0.00048	0.01837±0.00046	---	0.01506±0.00037
520.01	0.01629±0.00053	0.01518±0.00051	---	0.01251±0.00041
530.01	0.01464±0.00051	0.01288±0.00049	---	0.01072±0.00039
540.01	0.01261±0.00050	0.01137±0.00048	---	0.00963±0.00039
550.01	0.01071±0.00053	0.00969±0.00051	---	0.00874±0.00041
560.01	0.00904±0.00048	0.00762±0.00046	---	0.00791±0.00037
570.01	0.00757±0.00053	0.00555±0.00051	---	0.00706±0.00041
580.01	0.00622±0.00051	0.00400±0.00049	---	0.00607±0.00040
590.01	0.00496±0.00050	0.00297±0.00048	---	0.00493±0.00039
600.01	0.00390±0.00054	0.00212±0.00052	---	0.00375±0.00042
610.01	0.00305±0.00049	0.00134±0.00047	---	0.00257±0.00038
620.01	0.00230±0.00054	0.00070±0.00052	---	0.00156±0.00042
630.01	0.00143±0.00052	0.00025±0.00050	---	0.00099±0.00040
640.01	0.00046±0.00057	0.00000±0.00055	---	0.00082±0.00044
650.01	0.00000±0.00053	0.00000±0.00051	---	0.00000±0.00041

TABLE 4.2.4-4 Differential Reactivity Worth, in Cents per Kilogram of Axial Sodium Column, ZPPR-19B

Distance from Interface (mm)	149-40	149-49	149-58, 305 m	155-49
2.31	1.1123±0.0381	0.9415±0.0373	0.5883±0.0310	1.2412±0.0293
10.00	0.9719±0.0395	0.8841±0.0388	0.5669±0.0320	0.9776±0.0300
20.00	0.7892±0.0387	0.8093±0.0381	0.5391±0.0315	0.6347±0.0293
30.00	0.6568±0.0371	0.7781±0.0365	0.5327±0.0301	0.4279±0.0281
40.00	0.6944±0.0374	0.8934±0.0368	0.5984±0.0303	0.6789±0.0283
50.00	0.7318±0.0355	1.0087±0.0350	0.6641±0.0289	0.9298±0.0269
60.00	0.7043±0.0377	0.8858±0.0371	0.6828±0.0306	0.8642±0.0285
70.00	0.6473±0.0354	0.6554±0.0348	0.6804±0.0286	0.6556±0.0267
80.00	0.5990±0.0360	0.4997±0.0354	0.6659±0.0291	0.5035±0.0272
90.00	0.6013±0.0369	0.7707±0.0363	0.5834±0.0299	0.6745±0.0279
100.00	0.6036±0.0350	1.0418±0.0345	0.5010±0.0284	0.8455±0.0265
110.00	0.6181±0.0374	0.9798±0.0368	0.4883±0.0303	0.8094±0.0283
120.00	0.6404±0.0353	0.7039±0.0345	0.5206±0.0286	0.6403±0.0267
130.00	0.6620±0.0357	0.4535±0.0341	0.5463±0.0289	0.4887±0.0269
140.00	0.6733±0.0371	0.5469±0.0352	0.4835±0.0301	0.5721±0.0281
150.00	0.6847±0.0350	0.6404±0.0332	0.4208±0.0284	0.6555±0.0264
160.00	0.6022±0.0372	0.6698±0.0352	0.4363±0.0302	0.6295±0.0281
170.00	0.4363±0.0354	0.6423±0.0336	0.5215±0.0288	0.5058±0.0269
180.00	0.2705±0.0350	0.6147±0.0335	0.6068±0.0288	0.3821±0.0268
190.00	0.3449±0.0368	0.5517±0.0352	0.5537±0.0302	0.4369±0.0282
200.00	0.4220±0.0346	0.4883±0.0330	0.4992±0.0284	0.4936±0.0265
210.00	0.4444±0.0365	0.4578±0.0349	0.4386±0.0301	0.5337±0.0279
220.00	0.3998±0.0353	0.4677±0.0337	0.3705±0.0291	0.5534±0.0269
230.00	0.3552±0.0348	0.4775±0.0333	0.3024±0.0288	0.5731±0.0267
240.00	0.3393±0.0369	0.3435±0.0354	0.2762±0.0305	0.4323±0.0283
250.00	0.3263±0.0345	0.1949±0.0330	0.2543±0.0291	0.2756±0.0264
260.00	0.2867±0.0363	0.1688±0.0347	0.2436±0.0308	0.1911±0.0278
270.00	0.2017±0.0356	0.3517±0.0340	0.2521±0.0306	0.2302±0.0272
280.00	0.1167±0.0346	0.5346±0.0332	0.2608±0.0331	0.2692±0.0266
290.00	0.1752±0.0369	0.4090±0.0354	0.1766±0.0372	0.2790±0.0283
300.00	0.2634±0.0345	0.2199±0.0330	0.0734±0.0372	0.2828±0.0264
310.00	0.2881±0.0360	0.0757±0.0344	---	0.2425±0.0276
320.00	0.1567±0.0358	0.0420±0.0343	---	0.0943±0.0274
330.00	0.0254±0.0345	0.0084±0.0331	---	-0.0540±0.0264
340.00	-0.0276±0.0369	0.0015±0.0354	---	-0.0314±0.0283
350.00	-0.0544±0.0346	0.0036±0.0332	---	0.0481±0.0264
360.00	-0.0631±0.0356	0.0007±0.0342	---	0.0911±0.0272
370.00	-0.0032±0.0361	-0.0211±0.0346	---	-0.0042±0.0276

TABLE 4.2.4-4 (Contd)

Distance from Interface (mm)				
	149-40	149-49	149-58, 305 m	155-49
380.00	0.0565±0.0345	-0.0428±0.0331	---	-0.0996±0.0264
390.00	-0.0094±0.0369	-0.0505±0.0354	---	-0.1046±0.0282
400.00	-0.1373±0.0346	-0.0513±0.0333	---	-0.0652±0.0265
410.00	-0.2352±0.0353	-0.0754±0.0339	---	-0.0366±0.0270
420.00	-0.1313±0.0363	-0.2571±0.0349	---	-0.0814±0.0278
430.00	-0.0275±0.0345	-0.4388±0.0330	---	-0.1261±0.0264
440.00	-0.0516±0.0368	-0.3560±0.0353	---	-0.1687±0.0281
450.00	-0.1650±0.0348	-0.0889±0.0334	---	-0.2095±0.0266
460.01	-0.2753±0.0351	0.1529±0.0336	---	-0.2463±0.0269
470.01	-0.3267±0.0366	-0.0942±0.0351	---	-0.2046±0.0280
480.01	-0.3782±0.0345	-0.3413±0.0330	---	-0.1629±0.0264
490.01	-0.3587±0.0366	-0.5032±0.0352	---	-0.2212±0.0281
500.01	-0.2708±0.0350	-0.5832±0.0336	---	-0.3760±0.0269
510.01	-0.1831±0.0348	-0.6631±0.0335	---	-0.5308±0.0267
520.01	-0.2616±0.0368	-0.5053±0.0353	---	-0.3995±0.0281
530.01	-0.3453±0.0345	-0.3401±0.0330	---	-0.2591±0.0264
540.01	-0.3737±0.0364	-0.2756±0.0349	---	-0.1732±0.0279
550.01	-0.3285±0.0353	-0.3450±0.0339	---	-0.1595±0.0270
560.01	-0.2833±0.0348	-0.4146±0.0333	---	-0.1459±0.0267
570.01	-0.2607±0.0369	-0.3342±0.0354	---	-0.1696±0.0283
580.01	-0.2409±0.0346	-0.2352±0.0333	---	-0.1980±0.0266
590.01	-0.2146±0.0365	-0.1653±0.0349	---	-0.2164±0.0280
600.01	-0.1762±0.0358	-0.1494±0.0344	---	-0.2163±0.0276
610.01	-0.1379±0.0361	-0.1336±0.0347	---	-0.2162±0.0277
620.01	-0.1493±0.0382	-0.1013±0.0366	---	-0.1474±0.0294
630.01	-0.1724±0.0405	-0.0650±0.0388	---	-0.0622±0.0311
640.01	-0.1525±0.0415	-0.0247±0.0398	---	-0.0533±0.0319
650.01	-0.0160±0.0415	0.0264±0.0398	---	-0.2509±0.0319

TABLE 4.2.4-5 Details of Sodium Void Worth Measurements in ZPPR-19B

Location	Description	Drawer Master	Reactor Run No.	Loading No.	Date
149-40	Sodium	19-0-835	22	25	2/3/88
149-40	Void	19-0-836	23	26	2/4/88
149-49	Sodium	19-0-835	22	25	2/3/88
149-49	Void	19-0-836	23	26	2/4/88
155-49	Sodium	19-0-839	24	27	2/5/88
155-49	Void	19-0-840	23	26	2/4/88
149-58	Sodium	19-0-837	22	25	2/3/88
149-58	Void	19-0-838	23	26	2/4/88

TABLE 4.2.4-6 Details of Sodium Cans and Void Cans

Axial Sequence	Length in.	Sodium Cans			Void Cans	
		Serial No.	Total Mass g	Can Mass g	Na Mass g	Can Mass g
149-40						
1	6	106581	143.65	61.22	82.43	61.55
2	7	33672	167.51	70.84	96.67	70.94
3	7	12426	166.58	70.15	96.43	71.30
4	6	106151	144.24	61.70	82.54	61.90
149-49						
1	6	106605	145.19	62.88	82.31	62.26
2	7	34022	168.25	70.74	97.51	70.76
3	7	12330	167.68	70.75	96.93	70.91
4	6	110779	143.04	60.13	82.91	61.32
155-49						
1	6	105965	144.63	61.63	83.00	61.89
2	7	107991	167.99	70.57	97.42	70.50
3	7	33671	166.70	69.99	96.71	69.61
4	6	11059	146.05	62.89	83.16	62.29
149-58						
1	8	23732	189.55	79.21	110.34	79.34
2	8	23726	191.95	80.39	111.56	80.28
3	4	04030	98.23	43.39	54.84	43.04
4	8	24213	190.05	79.21	110.84	79.25
5	8	24926	189.06	80.74	108.32	80.79
6	4	04771	98.15	43.64	54.51	43.66

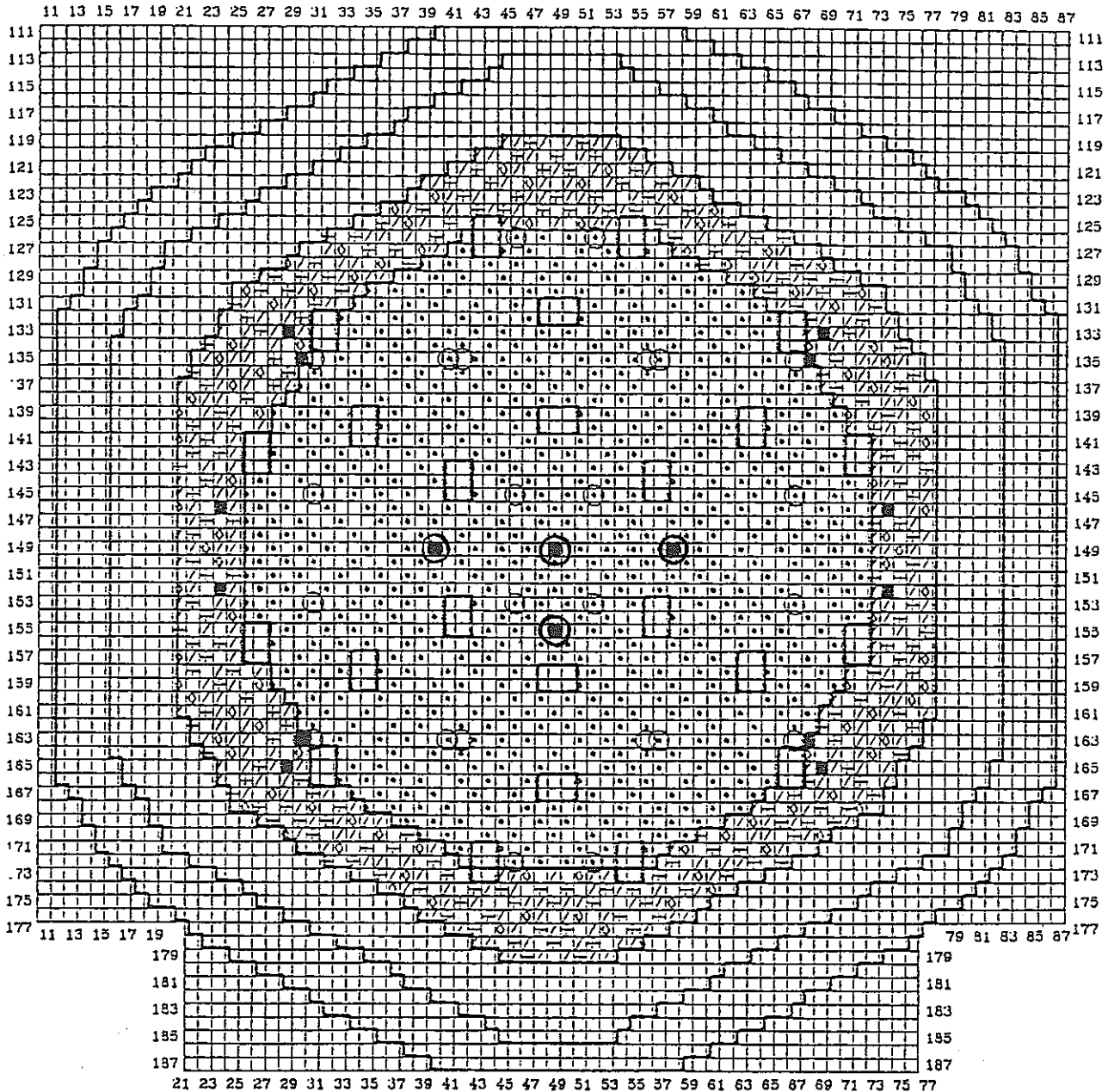


Fig 4.2.4-1 Interface Diagram for the ZPPR-19B Reference Configurations

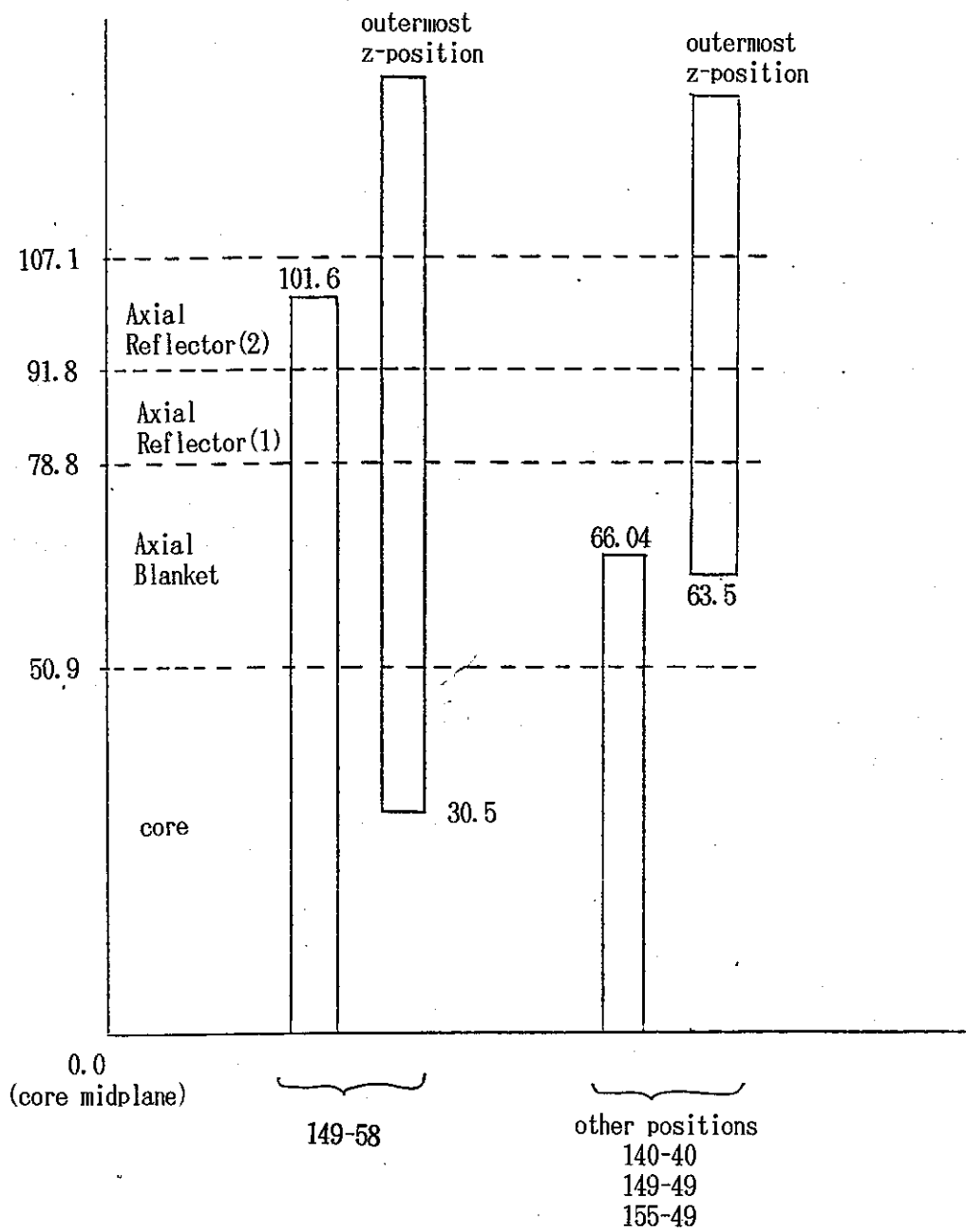


Fig 4.2.4-2 Schematic view of Axial position of plate-column oscillator for sodium reactivity worth measurement in ZPPR-19B

4.2.5 ガンマ発熱分布

(1) 測定概要

ZPPR-18 体系におけるガンマ発熱分布はZPPR-17 体系におけるTLD 照射による手法で測定処理されている。

(2) ZPPR-18 体系の測定データ

a. 測定体系のまとめ

項目	ZPPR-18A	ZPPR-18B
体系の特徴	サイクル末期模擬 24CRP チャンネル	サイクル初期模擬 6CRP チャンネル 18模擬制御棒半挿入
測定日		
測定炉心	loading # run #	loading # run #
測定体系	臨界基準体系	同左
PSR 位置	(135-67)と対称位置	同左
深度	炉心中心面より mm	mm
反応度	ρ	ρ

b. 測定結果

中性子反応率分布の箔による測定と同様に、ドロワーセル内のbasic dataとセルファクターを補正したmapping dataが用意されている。

ZPPR-18A (出典ZPR-TM-491[ref.26])

Fig.4.2.5-1 TLD In-cell 分布測定

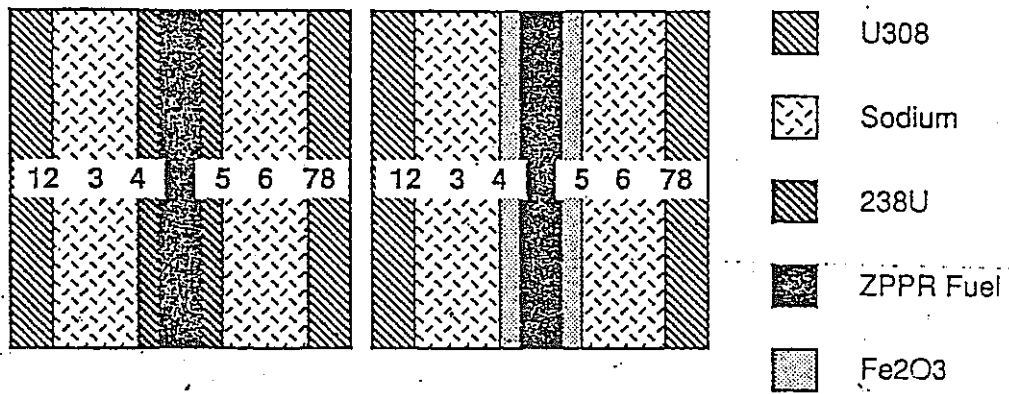
Table 4.2.5-1/2 gamma dose rate 径方向分布測定値

Table 4.2.5-3 gamma dose rate 軸方向分布測定値

Z P P R - 1 8 B (出典 Z P R - T N - 4 9 1 [r e f . 2 6])

Table 4.2.5-4/5 gamma dose rate 径方向分布測定値

Table 4.2.5-6 gamma dose rate 軸方向分布測定値



INTRA-CELL LOCATION	249-53	249-52
	DOSE RATE, mrd/s	
1	0.392	0.398
2	0.396	0.422
3	0.380	0.428
4	0.384	0.434
5	0.397	0.446
6	0.378	0.416
7	0.394	0.411
8	0.391	0.408

Fig. 4.2.5-1 Measured In-cell Gamma Dose Distributions in ZPPR-18A

Table 4.2.5-1 Measured Dose Rates along the x-axis
in ZPPR-18A

Matrix Location	Drawer Type ^a	Dose Rate, ^b mrd/s	Zone
149-49	SF	0.3716	Inner Core
149-50	SF	0.3768	Inner Core
149-51	SM	0.3360	Inner Core
149-52	SF	0.3685	Inner Core
149-53	SM	0.3271	Inner Core
149-54	SF	0.3489	Inner Core
149-55	SM	0.3286	Inner Core
149-56	SF	0.3484	Inner Core
149-57	SM	0.3172	Inner Core
149-58	SF	0.3512	Inner Core
149-59	SF	0.3551	Inner Core
149-60	SM	0.3134	Inner Core
149-61	SF	0.3417	Inner Core
149-62	SF	0.3478	Inner Core
149-63	SM	0.3000	Inner Core
149-64	SF	0.3376	Inner Core
149-65	SF	0.3315	Inner Core
149-66	SM	0.2892	Inner Core
149-67	SF	0.3219	Inner core
149-68	SM	0.2750	Inner Core
149-69	SF	0.2810	Inner Core
149-70	SM	0.2468	Inner Core
149-71	SF	0.2570	Inner Core
149-72	SM	0.2254	Inner Core
149-73	SF	0.2482	Outer Core
149-74	SF	0.2508	Outer Core
149-75	DF	0.2611	Outer Core
149-76	SF	0.2000	Outer Core
149-77	SF	0.1542	Outer Core
149-78	B	0.0782	Blanket
148-80	B	0.0202	Blanket
149-82	B	0.0199	Blanket

^aSF is single-fuel column with iron oxide, SM is single-fuel column with depleted-uranium metal, DF is double fuel column and B is blanket.

^bTotal dose rate (not corrected for neutron contribution) at an estimated reactor power of 1 watt.

Table 4.2.5-2 Measured Dose Rates 45° to the x-axis and through Control Positions in ZPPR-18A

Matrix Location	Drawer Type ^a	Dose Rate, ^b mrd/s	Zone
148-50	SF	0.3621	Inner Core
147-51	SF	0.3721	Inner Core
146-52	SF	0.3637	Inner Core
145-53	SF	0.3578	Inner Core
144-54	SF	0.3470	Inner Core
144-55	SF	0.3420	Inner Core
144-56	CRP	0.2456	CRP
144-57	CRP	0.2481	CRP
144-58	SM	0.2855	Inner Core
144-59	SF	0.3368	Inner Core
143-60	SF	0.3310	Inner Core
142-61	SF	0.3262	Inner Core
141-62	SF	0.3025	Inner Core
140-63	CRP	0.2096	CRP
140-64	CRP	0.1980	CRP
140-65	SM	0.2375	Inner Core
141-66	SM	0.2525	Inner Core
142-67	SM	0.2472	Inner Core
142-68	SF	0.2714	Inner Core
142-69	SF	0.2671	Inner Core
142-70	SM	0.2238	Inner Core
142-71	CRP	0.1692	CRP
142-72	CRP	0.1666	CRP
142-73	SF	0.2107	Outer Core
142-75	DF	0.3808	Outer Core
142-77	SF	0.1396	Outer Core

^aSF is single-fuel column with iron oxide, SM is single-fuel column with depleted-uranium metal, DF is double fuel column and CRP is control position.

^bTotal dose rate (not corrected for neutron contribution) at an estimated reactor power of 1 watt.

Table 4.2.5-3 Measured Axial Dose Distribution
in Location 145-63 in ZPPR-18A

Axial Location, mm ^a	Dose Rate ^b mrd/s
72.2	0.3266
177.8	0.3022
279.4	0.2653
381.0	0.2180
584.2	0.0589
762.0	0.0294

^aDistance from the reactor interface.

^bTotal dose rate (not corrected for neutron contribution) at an estimated reactor power of 1 watt.

Table 4.2.5-4 Measured Dose Rates along the x-axis
in ZPPR-18B

Matrix Location	Drawer Type ^a	Dose Rate, ^b mrd/s	Zone
249-49	SF	0.3940	Inner Core
249-45	SM	0.3623	Inner Core
249-41	SM	0.3338	Inner Core
249-31	SF	0.3739	Inner Core
249-33	SF	0.3702	Inner Core
249-29	SF	0.3078	Inner Core
249-26	SM	0.2438	Inner Core
249-25	SF	0.2634	Outer Core
249-23	DF	0.2743	Outer Core
249-21	SF	0.1573	Outer Core
249-20	B	0.0893	Blanket
249-17	B	0.0292	Blanket
249-16	B	0.0212	Blanket
249-15	R	0.0134	Reflector

^aSF is single-fuel column with iron oxide, SM is single-fuel column with depleted-uranium metal, DF is double fuel column and B is blanket and R is reflector.

^bTotal dose rate (not corrected for neutron contribution) at an estimated reactor power of 1 watt.

Table 4.2.5-5 Measured Dose Rates through Control Rods and Control Rod Positions in ZPPR-18B

Matrix Location	Drawer Type ^a	Dose Rate, ^b mrd/s	Zone
247-47	SF	0.4008	Inner Core
245-43	SM	0.2808	Inner Core
244-43	SF	0.2847	Inner Core
244-42	CR	0.2462	CR
244-41	CR	0.2433	CR
244-40	SM	0.2474	Inner Core
243-39	SM	0.3006	Inner Core
243-38	SF	0.3461	Inner Core
242-37	SF	0.3636	Inner Core
241-36	SF	0.3308	Inner Core
240-35	CRP	0.2425	CRP
240-34	CRP	0.2441	CRP
240-33	SM	0.2688	Inner Core
243-30	SF	0.3146	Inner Core
243-29	SM	0.2680	Inner Core
242-28	SM	0.2202	Inner Core
242-27	CR	0.1823	CR
242-26	CR	0.1740	CR
242-25	SF	0.1834	Outer Core
241-25	SF	0.1954	Outer Core
241-24	SF	0.1980	Outer Core
241-22	SF	0.1783	Outer Core

^aSF is single-fuel column with iron oxide, SM is single-fuel column with depleted-uranium metal, CR is control rod and CRP is control position.

^bTotal dose rate (not corrected for neutron contribution) at an estimated reactor power of 1 watt.

Table 4.2.5-6 Measured Axial Dose Distributions
in ZPPR-18B

Axial Location, mm ^a	Dose Rate ^b mrd/s	
	1,247-42	1,245-35
+762.0	0.0245	0.0285
+584.2	0.0552	0.0651
+482.6	0.1427	0.1578
+381.0	0.2050	0.2220
+279.4	0.2607	0.2802
+177.8	0.2942	0.3242
+76.2	0.3458	0.3506
76.2	0.3862	0.3737
177.8	0.3618	0.3556
279.4	0.3476	0.3122
381.0	0.2924	0.2534
482.6	0.2075	0.1881
584.2	0.0877	0.0758
762.0	0.0401	0.0387

^aWith respect to zero at the reactor interface, negative values in half two.

^bTotal dose rate (not corrected for neutron contribution) at an estimated power of 1 watt.

5 計算機入力データとファイル名

JUPITERフェーズⅢの実験解析で用いてきた各コードの入力データをMTに保存した。これは今後断面積ライブラリーの改定に伴う再解析や解析手法改良の為、データを利用する時、迅速に対応できる事を意図したものである。これらデータは表5. 1に記す4本のカセットMTに保存した。このMTは大洗計算センターに保管されている。MTの内容については、表5. 2～表5. 5にMT上のデータセットネーム、データの内容、MTにコピーした時のユーティリティーを記す。データセットは1990年5月下旬の時点でディスク上にあった全てのものを保存した。MT上のデータセットネーム“@@MTREC@. CNTL”は、MTを保存した時のバックアップ用JCLで、その後で使用していた時のIDと使用していた会社名を記している。内容の欄でblankになっているのは内容不明のものである。図5. 1～5. 21に各計算コードのサンプルJCL、サンプルデータを添付する。

Table 5. 1 JUPITER-Ⅲ MT

センター 管理番号	ロッカー 番号	VOL=SER
TDD010	CASET	JUP001
TDD011	CASET	JUP002
TDD012	CASET	JUP003
TDD013	CASET	JUP004

Table 5. 2 Magnetic Tape 管理票

VOL=SER

センター管理番号 TDD010

J	U	P	0	0	1
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ロッカー番号 CASET

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
1	GENER	@@MTRECO.CNTL	バックアップ用JCL (C011#-CRC)	90/05/28
2	GENER	ZPPR12.ADEN.DATA	ZPPR12 ドロワーマスター (ANL)	90/05/28
3	GENER	ZPPR12.CRIT.DATA	ZPPR12 体系データ (ANL)	90/05/28
4	GENER	ZPPR12.REACT.DATA	ZPPR12 反応率分布実験値 (ANL)	90/05/28
5	COPY	ZPPR17.ADEN.DATA	ZPPR17 ドロワーマスター (ANL)	90/05/28
6	COPY	ZPPR17.MAP.DATA	ZPPR17 体系データ (ANL)	90/05/28
7	COPY	ZPPR17.RCORE.DATA	ZPPR17 体系データ (ANL)	90/05/28
8	GENER	ZPPR17A.ADEN.LIBR	ADENライブラリー (バグあり) (ANL)	90/05/28
9	GENER	ZPPR17A.ADEN2.LIB	ADENライブラリー (バグなし) (ANL)	90/05/28
10	COPY	ZPPR18.AMM70G.XSE	ZPPR18 AMM70群断面積	90/05/28
11	COPY	ZPPR18.MIC70G.XSE	ZPPR18 ミクロ70群断面積	90/05/28
12	COPY	ZPPR18.MLT70G.XSE	ZPPR18 マルチドロワー70群断面積	90/05/28
13	COPY	Z17AL026.MAC07G.X	ZPPR17A マクロ7群断面積	90/05/28
14	COPY	Z17AL026.MAC18G.X	ZPPR17A マクロ18群断面積	90/05/28
15	COPY	Z17AL026.MAC70G.X	ZPPR17A マクロ70群断面積	90/05/28
16	COPY	Z17AL026.MIC18G.X	ZPPR17A ミクロ18群断面積	90/05/28
17	COPY	Z17ARACT.MIC07G.X	ZPPR17A 反応率用ミクロ7群断面積	90/05/28
18	COPY	Z17ASMPL.MIC18G.X	ZPPR17A サンプル用ミクロ18群断面積	90/05/28
19	COPY	Z17BFOIL.DATA	ZPPR17B 反応率分布実験値 (ANL)	90/05/28
20	COPY	Z17BL088.MAC07G.X	ZPPR17B マクロ7群断面積	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
2 1	COPY	Z17BL088. MAC18G. X	Z P P R 1 7 B マクロ18群断面積	90/05/28
2 2	COPY	Z17BL088. MAC70G. X	Z P P R 1 7 B マクロ70群断面積	90/05/28
2 3	COPY	Z17CB4C. MAC07G. XS	Z P P R 1 7 C 制御棒マクロ7群断面積	90/05/28
2 4	COPY	Z17CFOIL. DATA	Z P P R 1 7 C 反応率分布実験値 (ANL)	90/05/28
2 5	COPY	Z17CL136. MAC07G. X	Z P P R 1 7 C マクロ7群断面積	90/05/28
2 6	COPY	Z18A. FLX70G. DATA	Z P P R 1 8 A 縮約用70群中性子束	90/05/28
2 7	COPY	Z18A. MAC07G. XSEC	Z P P R 1 8 A マクロ7群断面積	90/05/28
2 8	COPY	Z18A. MAC18G. XSEC	Z P P R 1 8 A マクロ18群断面積	90/05/28
2 9	COPY	Z18A. MAC70G. XSEC	Z P P R 1 8 A マクロ70群断面積	90/05/28
3 0	COPY	Z18A. MIC07G. XSEC	Z P P R 1 8 A ミクロ7群断面積	90/05/28
3 1	COPY	Z18A. MIC18G. XSEC	Z P P R 1 8 A ミクロ18群断面積	90/05/28
3 2	COPY	Z18AC8D5. MAC07G. X	Z P P R 1 8 A σ_{238} 全群5%下げたマクロ7群断面積	90/05/28
3 3	COPY	Z18AF5D3. MAC07G. X	Z P P R 1 8 A σ_{235} 全群3%下げたマクロ7群断面積	90/05/28
3 4	COPY	Z18AHOMQ. MAC07G. X	Z P P R 1 8 A 構造材7群断面積 (ファイル32, 33と使用)	90/05/28
3 5	COPY	Z18ASENS. MAC07G. X	Z P P R 1 8 A マクロ7群断面積 (ファイル32, 33と使用)	90/05/28
3 6	COPY	Z18B. FLX70G. DATA	Z P P R 1 8 B 縮約用70群中性子束	90/05/28
3 7	COPY	Z18B. MAC07G. XSEC	Z P P R 1 8 B マクロ7群断面積	90/05/28
3 8	COPY	Z18B. MAC18G. XSEC	Z P P R 1 8 B マクロ18群断面積	90/05/28
3 9	COPY	Z18B. MAC70G. XSEC	Z P P R 1 8 B マクロ70群断面積	90/05/28
4 0	COPY	Z18B. MIC03G. XSEC	Z P P R 1 8 B ミクロ3群断面積	90/05/28
4 1	COPY	Z18B. MIC07G. XSEC	Z P P R 1 8 B ミクロ7群断面積	90/05/28
4 2	COPY	Z18B. MIC18G. XSEC	Z P P R 1 8 B ミクロ18群断面積	90/05/28
4 3	COPY	Z18C. MAC70G. XSEC	Z P P R 1 8 C マクロ70群断面積	90/05/28
4 4	COPY	Z18FOIL. DATA	Z P P R 1 8 反応率分布実験値 (ANL)	90/05/28
4 5	COPY	Z18MCR. LIST	Z P P R 1 8 体系データ (ANL)	90/05/28
4 6	COPY	Z19A. MAC70G. XSEC	Z P P R 1 9 A マクロ70群断面積	90/05/28
4 7	COPY	Z19B. MAC70G. XSEC	Z P P R 1 9 B マクロ70群断面積	90/05/28
4 8	GENER	Z19FOIL. DATA	Z P P R 1 9 反応率分布実験値 (ANL)	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
49	GENER	@@MTREC@.CNTL	バックアップ用JCL (C011A-FBEC)	90/05/28
50	COPY	CIPER.DATA	ZPPR17A Naボイド反応度解析用 CIPER データ	90/05/28
51	COPY	CITATION.DATA	ZPPR17A Naボイド反応度解析用 CITATIONデータ	90/05/28
52	COPY	PERKY.DATA	ZPPR17A Naボイド反応度解析用 PERKY データ	90/05/28
53	COPY	SNPERT.DATA	ZPPR17A Naボイド反応度解析用 SNPERTデータ	90/05/28
54	COPY	TRITAC.CNTL	TRITAC実行JCL	90/05/28
55	COPY	TRITAC.DATA	TRITACデータ	90/05/28
56	COPY	TWOTRAN.DATA	ZPPR17A Naボイド反応度解析用 TWOTRAN データ	90/05/28
57	COPY	UTIL.CNTL	ユーティリティJCL	90/05/28
58	COPY	ZPPR17.CNTL	ZPPR17関係実行JCL	90/05/28
59	COPY	ZPPR18.CNTL	ZPPR18関係実行JCL	90/05/28
60	COPY	ZPPR18A.DATA	ZPPR18A 臨界性解析データ	90/05/28
61	COPY	ZPPR18B.DATA	ZPPR18B 臨界性解析データ	90/05/28
62	GENER	Z18A.RZ18G.FLUX	ZPPR18A RZ18群/XYZ18群 FT34	90/05/28
63	GENER	Z18A.RZ18G.FT34	ZPPR18A RZ18群/XYZ18群 FT34	90/05/28
64	GENER	Z18A.XYZ18G.FLUX	ZPPR18A RZ18群/XYZ18群 FT34	90/05/28
65	GENER	Z18A.XYZ18G.FLUX	ZPPR18A RZ18群/XYZ18群 FT34	90/05/28
66	GENER	Z18A.XYZ18G.FT34	ZPPR18A RZ18群/XYZ18群 FT34	90/05/28
67	GENER	Z18A.XYZ18G.FT34	ZPPR18A RZ18群/XYZ18群 FT34	90/05/28
68	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
69	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
70	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
71	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
72	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
73	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
74	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
75	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28
76	GENER	Z18A70G.RZFLUX.CR	ZPPR18A 縮約用70群中性子束	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
77	GENER	Z18A70G. RZFLUX. CR	ZPPR18A 縮約用70群中性子束	90/05/28
78	GENER	Z18A70G. RZFLUX. CR	ZPPR18A 縮約用70群中性子束	90/05/28
79	GENER	Z18A70G. RZFLUX. FU	ZPPR18A 縮約用70群中性子束	90/05/28
80	GENER	Z18B. RZ18G. FLUX	ZPPR18B RZ18G FT34	90/05/28
81	GENER	Z18B. RZ18G. FT34	ZPPR18B RZ18G FT34	90/05/28
82	GENER	Z18B70G. RZFLUX. CR	ZPPR18B 縮約用70群中性子束	90/05/28
83	GENER	Z18B70G. RZFLUX. CR	ZPPR18B 縮約用70群中性子束	90/05/28
84	GENER	Z18B70G. RZFLUX. FU	ZPPR18B 縮約用70群中性子束	90/05/28
85	GENER	@@MTREC@. CNTL	バックアップ用JCL (C011B-CRC)	90/05/28
86	COPY	CASUP. CNTL	CASUP ソース, ロードモジュール等	90/05/28
87	COPY	CASUP. DATA	CASUP ソース, ロードモジュール等	90/05/28
88	COPY	CASUP. FORT	CASUP ソース, ロードモジュール等	90/05/28
89	COPY	CASUP. LOAD	CASUP ソース, ロードモジュール等	90/05/28
90	COPY	ETC. CNTL	ユーティリティ実行JCL	90/05/28
91	COPY	JCL. CNTL	ユーティリティ実行JCL	90/05/28
92	COPY	PDS. CNTL	ユーティリティ実行JCL	90/05/28
93	COPY	SLAROM. CNTL	SLAROM ソース, ロードモジュール等	90/05/28
94	COPY	SLAROM. DATA	SLAROM ソース, ロードモジュール等	90/05/28
95	GENER	SLAROM. FORT	SLAROM ソース, ロードモジュール等	90/05/28
96	GENER	@@MTREC@. CNTL	バックアップ用JCL (C0112-CRC)	90/05/29
97	COPY	ZPPR19. CNTL	ZPPR19関係実行JCL	90/05/29
98	COPY	ZPPR19B. DAT	ZPPR19B関係データ	90/05/29
99	COPY	Z17CCIT. DAT	ZPPR17C CITATIONデータ	90/05/29
100	GENER	Z17MCR. LIST	ZPPR17 体系データ (ANL)	90/05/29
101	GENER	Z18MAP. LIST	ZPPR18 体系データ (ANL)	90/05/29
102	COPY	Z19B. FLX70G	ZPPR19B 縮約用70群	90/05/29
103	COPY	Z19B. MAC07G	ZPPR19B マクロ7群断面積	90/05/29
104	COPY	Z19B. MAC18G	ZPPR19B マクロ18群断面積	90/05/29

File 番号	ユーザ 名	MT上のDSN	内 容	作成日
105	COPY	Z19B.MIC07G	ZPPR19B ミクロ7群断面積	90/05/29
106	COPY	Z19B.MIC18G	ZPPR19B ミクロ18群断面積	90/05/29

Table 5. 3 Magnetic Tape 管理票

VOL=SER

センター管理番号 TDD011

J	U	P	0	0	2
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ロッカー番号 CASET

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
1	GENER	@@MTREC@.CNTL	バックアップ用JCL (C011C-MAPI)	90/05/28
2	COPY	CITATION.CNTL	CITATION実行JCL	90/05/28
3	COPY	CLIST.CLIST		90/05/28
4	COPY	CMDPROC.CLIST		90/05/28
5	GENER	DUMP8.ADJOINT		90/05/28
6	GENER	DUMP8.REAL		90/05/28
7	GENER	INTERF.FORT	CITATION FT34 をTWOTRAN2のInitial guess に変換するプログラム	90/05/28
8	COPY	JCL.CNTL		90/05/28
9	COPY	JCLSET.CNTL		90/05/28
10	COPY	JOINT.LOAD		90/05/28
11	COPY	KONGOU.SOSEI		90/05/28
12	COPY	NA.DATA		90/05/28
13	COPY	PERKY.CNTL		90/05/28
14	COPY	PERKY.FORT		90/05/28
15	COPY	PERKY2.FORT		90/05/28
16	COPY	PERKY2.NEWLOAD		90/05/28
17	COPY	PFD397.OUTLIST		90/05/28
18	GENER	PFD420.OUTLIST		90/05/28
19	GENER	PFD8.LIST		90/05/28
20	GENER	SNPERT.FORT.RDTAP		90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
2 1	COPY	SNPERT. LOAD		90/05/28
2 2	COPY	TJOB CD. CNTL		90/05/28
2 3	COPY	TRITAC. CNTL		90/05/28
2 4	COPY	TRITAC. FORT		90/05/28
2 5	GENER	TRIO. FT02. Z18A		90/05/28
2 6	GENER	TRIO. FT02. Z19B		90/05/28
2 7	COPY	UTILITY. CNTL		90/05/28
2 8	COPY	ZPPR18. CNTL	Z P P R 1 8 関係実行 J C L	90/05/28
2 9	COPY	ZPPR18A. DATA	Z P P R 1 8 A ドブプラー反応度関係データ	90/05/28
3 0	COPY	ZPPR18B. DATA	Z P P R 1 8 B ドブプラー反応度関係データ	90/05/28
3 1	COPY	ZPPR19B. DATA	Z P P R 1 9 B ドブプラー反応度関係データ	90/05/28
3 2	GENER	Z18A. DOP07G. FT09	Z P P R 1 8 A ドブプラー関係中性子束ファイル	90/05/28
3 3	GENER	Z18A. DOP07G. FT34	Z P P R 1 8 A ドブプラー関係中性子束ファイル	90/05/28
3 4	GENER	Z18A. XYZ18G. FT34	Z P P R 1 8 A ドブプラー関係中性子束ファイル	90/05/28
3 5	GENER	Z18AT07G. FT12	Z P P R 1 8 A ドブプラー関係中性子束ファイル	90/05/28
3 6	COPY	Z18A1CR. DATA	Z P P R 1 8 A 関係データ	90/05/28
3 7	GENER	Z18B. DOP07G. FT34	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
3 8	GENER	Z18B. DOP07G. RESTA	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
3 9	GENER	Z18B. DOP7XG. FT34	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 0	GENER	Z18B. DOP7XG. RESTA	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 1	GENER	Z18B. DOP7ZG. FT34	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 2	GENER	Z18B. DOP7ZG. RESTA	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 3	GENER	Z18B. XYZ07G. FT34	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 4	GENER	Z18B. XYZ07G. RESTA	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 5	GENER	Z18B. XYZ7XG. FT34	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 6	GENER	Z18B. XYZ7XG. RESTA	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 7	GENER	Z18B. XYZ7YG. FT34	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28
4 8	GENER	Z18B. XYZ7YG. RESTA	Z P P R 1 8 B ドブプラー関係中性子束ファイル	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
4 9	GENER	Z18B. XYZ7ZG. FT34	Z P P R 1 8 B ドブブラー関係中性子束ファイル	90/05/28
5 0	GENER	Z18B. XYZ7ZG. RESTA	Z P P R 1 8 B ドブブラー関係中性子束ファイル	90/05/28
5 1	GENER	Z19B. DOP07G. FT09	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 2	GENER	Z19B. DOP07G. FT34	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 3	COPY	Z19B. MAC07G. XSEC	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 4	COPY	Z19B. MAC18G. XSEC	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 5	GENER	Z19B. RZ18G. FT34. N	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 6	GENER	Z19B. RZ18G. FT34. R	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 7	GENER	Z19B. RZ18G. FT34. R	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 8	GENER	Z19B. XYZ07G. FT34	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
5 9	GENER	Z19B. XYZ18G. FT34	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
6 0	GENER	Z19B. XYZ7XG. FT34	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
6 1	GENER	Z19BTA18. FT30	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
6 2	GENER	Z19BTO7G. FT12	Z P P R 1 9 B ドブブラー関係中性子束ファイル	90/05/28
6 3	GENER	@@MTREC@. CNTL	バックアップ用JCL (C011E-FUJI)	90/05/28
6 4	COPY	ANISN. FORT. DATA		90/05/28
6 5	COPY	ANISN. INPUT. DATA		90/05/28
6 6	MOVE	42E. ANISN. OUTFT17		90/05/28
6 7	COPY	ANISNW. LOADSET. LO		90/05/28
6 8	COPY	CIPER. FORT		90/05/28
6 9	GENER	CIPER. RATIO3D. CNT		90/05/28
7 0	GENER	CIT. CNTL. DATA		90/05/28
7 1	COPY	CIT. MAP. DATA		90/05/28
7 2	GENER	CIT34. Z17RZ18G. DA		90/05/28
7 3	GENER	CIT56. CNTL		90/05/28
7 4	MOVE	PA42E. CONDEX. AAB		90/05/28
7 5	COPY	CONDEX. CNTL		90/05/28
7 6	COPY	CONDEX. DATA		90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
77	GENER	CONDEX. RADIAL. ADJ		90/05/28
78	GENER	CONDEX. RADIAL2D. C		90/05/28
79	GENER	CONV. TWOT. DATA		90/05/28
80	COPY	EESULT. DATA		90/05/28
81	GENER	EXEC. RACF. CLIST		90/05/28
82	GENER	HOMO. FORT		90/05/28
83	COPY	INVENT. CNTL		90/05/28
84	COPY	JCLY. CNTL		90/05/28
85	COPY	JCLSET. CNTL	実行JCL	90/05/28
86	COPY	JCLZ12. CNTL	ZPPR12関係実行JCL	90/05/28
87	COPY	JCLZ18. CNTL	ZPPR18関係実行JCL	90/05/28
88	COPY	MAPPER. DATA	MAPPER (プロットユーティリティ) データ	90/05/28
89	GENER	G. CLIST		90/05/28
90	GENER	PDS. CLIST		90/05/28
91	COPY	PERKY. INPUT. DATA	ZPPR13A サンプルケース用PERKYデータ	90/05/28
92	GENER	PERXYZ. DATA	ZPPR13A サンプルケース用PERKYデータ	90/05/28
93	GENER	PF1. LIST		90/05/28
94	COPY	PSAMPLE. CNTL	PSAMPLEソース (ANLサンプル反応度解析プログラム)	90/05/28
95	GENER	PSZ10B. CNTL		90/05/28
96	COPY	RESULT. DATA		90/05/28
97	GENER	RF01. ANISN. DATA		90/05/28
98	GENER	RZ70GF. OUTLIST		90/05/28
99	GENER	SCFRDGI. ANISN. DAT		90/05/28
100	GENER	SLAIN. DATA	ZPPR9,10用SLAROMデータ (フェーズI解析当時のもの)	90/05/28
101	GENER	SLAROM. NDEN. DATA		90/05/28
102	COPY	TAKE. LOAD		90/05/28
103	GENER	TFLX34. Z17A. DATA		90/05/28
104	GENER	TRAPERT. FORT	TRAPERTソース (Sn振動コード)	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
105	GENER	TWOTRANH. FORT	TWOTRAN-2 (阪大研修版TRAPERT用)	90/05/28
106	COPY	T12. DATA	ZPPR12関係データ	90/05/28
107	COPY	T17. DATA	ZPPR17関係データ	90/05/28
108	COPY	T18. DATA	ZPPR18関係データ	90/05/28
109	COPY	UTIL. CNTL	ユーティリティ実行JCL	90/05/28
110	COPY	VOID. DATA		90/05/28
111	COPY	ZIKKI. CNTL	実機関係実行JCL	90/05/28
112	COPY	ZIKKI. DATA	実機関係データ	90/05/28
113	COPY	ZPPR. CNTL	実行JCL	90/05/28
114	COPY	ZPPR13B. INPUT. DAT	ZPPR13B関係入力データ	90/05/28
115	COPY	ZPPR18. CNTL	ZPPR18実行JCL	90/05/28
116	COPY	ZPPR18B. DATA	ZPPR18B 臨界性解析データ	90/05/28
117	COPY	ZPPR18C. DATA	ZPPR18C 臨界性解析データ	90/05/28

Table 5. 4 Magnetic Tape 管理票

VOL=SER

センター管理番号 TDD012

J	U	P	0	0	3
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ロッカー番号 CASET

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
1	GENER	@@MTREC@.CNTL	バックアップ用JCL (C011E-FUJI)	90/05/28
2	COPY	ZPPR19.CNTL	ZPPR19 実行JCL	90/05/28
3	COPY	ZPPR19A.DATA	ZPPR19A 関係データ	90/05/28
4	COPY	ZPPR19B.DATA	ZPPR19B 関係データ	90/05/28
5	GENER	Z17AH18G.FT34	ZPPR17A 均質定数18群中性子束	90/05/28
6	COPY	Z17DCF.XSEC		90/05/28
7	GENER	Z18A.XYZ07G.FT34	ZPPR18A 7群中性子束	90/05/28
8	GENER	Z18A.XYZ07G.FT34	ZPPR18A 7群中性子束	90/05/28
9	GENER	Z18A.XYZ07G.FT34	ZPPR18A 7群中性子束	90/05/28
10	GENER	Z18B.AMMAP.DATA	ZPPR18B AMM体系データ	90/05/28
11	COPY	Z18B.AMM03G.XSEC	ZPPR18B AMM3群断面積	90/05/28
12	COPY	Z18B.AMM07G.XSEC	ZPPR18B AMM7群断面積	90/05/28
13	COPY	Z18B.AMM18G.XSEC	ZPPR18B AMM18群断面積	90/05/28
14	COPY	Z18B.AMM70G.XSEC	ZPPR18B AMM70群断面積	90/05/28
15	GENER	Z18B.LIST	ZPPR18B 体系データ	90/05/28
16	COPY	Z18B.MAC07G.XSEC	ZPPR18B マクロ7群断面積	90/05/28
17	GENER	Z18B.XYZ07G.FT34	ZPPR18B 7群中性子束	90/05/28
18	GENER	Z18B.XYZ07G.FT34	ZPPR18B 7群中性子束	90/05/28
19	GENER	Z18B.XYZ07G.FT34	ZPPR18B 7群中性子束	90/05/28
20	GENER	Z18B.XYZ07G.FT34	ZPPR18B 7群中性子束	90/05/28

File 番号	ユーティ リ ティ	MT上のDSN	内 容	作成日
2 1	GENER	Z18B. XYZ07G. FT34	Z P P R 1 8 B 7群中性子束	90/05/28
2 2	GENER	Z18BAMM. LIST	Z P P R 1 8 B AMMリスト	90/05/28
2 3	GENER	Z18C. AMMMAP. DATA	Z P P R 1 8 C AMM体系データ	90/05/28
2 4	GENER	Z18C. AMMMAP. DATAB	Z P P R 1 8 C AMM体系データ	90/05/28
2 5	GENER	Z18C. AMMMAP. DATAC	Z P P R 1 8 C AMM体系データ	90/05/28
2 6	GENER	Z18C. LIST	Z P P R 1 8 C リスト	90/05/28
2 7	GENER	Z18C. XYZ03G. FT34	Z P P R 1 8 C 3群中性子束	90/05/28
2 8	GENER	Z18C. XYZ03G. FT34	Z P P R 1 8 C 3群中性子束	90/05/28
2 9	GENER	Z18C. XYZ03G. FT34	Z P P R 1 8 C 3群中性子束	90/05/28
3 0	COPY	Z19. DATA	Z P P R 1 9 関係データ	90/05/28
3 1	COPY	Z19A. AMM07G. XSEC	Z P P R 1 9 A AMM 7群断面積	90/05/28
3 2	GENER	Z19A. XYZ07G. FT34	Z P P R 1 9 A 7群中性子束	90/05/28
3 3	COPY	Z19B. AMM07G. XSEC	Z P P R 1 9 B AMM 7群断面積	90/05/28
3 4	COPY	Z19B. AMM18G. XSEC	Z P P R 1 9 B AMM 1 8群断面積	90/05/28
3 5	COPY	Z19B. FLX70G. DATA	Z P P R 1 9 B 縮約用 7 0群中性子束	90/05/28
3 6	COPY	Z19B. MAC07G. XSEC	Z P P R 1 9 B マクロ 7群断面積	90/05/28
3 7	COPY	Z19B. MAC18G. XSEC	Z P P R 1 9 B マクロ 1 8群断面積	90/05/28
3 8	COPY	Z19B. MIC07G. XSEC	Z P P R 1 9 B ミクロ 7群断面積	90/05/28
3 9	COPY	Z19B. MIC18G. XSEC	Z P P R 1 9 B ミクロ 1 8群断面積	90/05/28
4 0	GENER	Z19B. XYZ07G. FT34	Z P P R 1 9 B 7群中性子束	90/05/28
4 1	GENER	Z19B. XYZ07G. FT34	Z P P R 1 9 B 7群中性子束	90/05/28
4 2	GENER	Z19B. XYZ18G. FT34	Z P P R 1 9 B 1 8群中性子束	90/05/28
4 3	GENER	Z19B. XYZ18G. FT34	Z P P R 1 9 B 1 8群中性子束	90/05/28
4 4	GENER	Z19B70G. RZFLUX. CR	Z P P R 1 9 B 縮約用 7 0群中性子束	90/05/28
4 5	GENER	Z19B70G. RZFLUX. CR	Z P P R 1 9 B 縮約用 7 0群中性子束	90/05/28
4 6	GENER	Z19B70G. RZFLUX. FU	Z P P R 1 9 B 縮約用 7 0群中性子束	90/05/28
4 7	GENER	Z19M#. DATA		90/05/28
4 8	GENER	@@MTREC@. CNL	バックアップ用JCL (C 0 1 1 F - H I T A C H I)	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
49	COPY	JCLZ17. CNTL	Z P P R 1 7 関係実行 J C L	90/05/28
50	COPY	JCLZ18. CNTL	Z P P R 1 8 関係実行 J C L	90/05/28
51	COPY	JCLZ19. CNTL	Z P P R 1 9 関係実行 J C L	90/05/28
52	COPY	Z17A. DATA	Z P P R 1 7 A 制御棒ワース関係データ	90/05/28
53	COPY	Z17B. DATA	Z P P R 1 7 B 制御棒ワース関係データ	90/05/28
54	COPY	Z17C. DATA	Z P P R 1 7 C 制御棒ワース関係データ	90/05/28
55	COPY	Z18A1. DATA	Z P P R 1 8 A 制御棒ワース関係データ	90/05/28
56	COPY	Z18A1T. DATA	Z P P R 1 8 A 制御棒ワース関係データ	90/05/28
57	COPY	Z18A2. DATA	Z P P R 1 8 A 制御棒ワース関係データ	90/05/28
58	COPY	Z18A2H. DATA	Z P P R 1 8 A 制御棒ワース関係データ	90/05/28
59	COPY	Z18A2T. DATA	Z P P R 1 8 A 制御棒ワース関係データ	90/05/28
60	COPY	Z18B. DATA	Z P P R 1 8 B 制御棒ワース関係データ	90/05/28
61	COPY	Z19B. DATA	Z P P R 1 9 B 制御棒ワース関係データ	90/05/28
62	COPY	Z19B. MAC07G. XSECB		90/05/28
63	COPY	Z19B. MAC18G. XSECB		90/05/28
64	GENER	@@MTREC@. CNTL	バックアップ用 J C L (C 0 1 1 G-東芝)	90/05/28
65	COPY	CLPS. DATA		90/05/28
66	GENER	DONJOSE2. FORT	D O N J O S E ソース (反応率分布補正プログラム)	90/05/28
67	COPY	EXAMPL. DATA		90/05/28
68	GENER	EXEC. RACF. CLIST		90/05/28
69	COPY	FLBC12. DATA		90/05/28
70	GENER	FLXRDER. FORT		90/05/28
71	COPY	JCLS. CNTL	実行 J C L	90/05/28
72	COPY	KAW. LAG07G. XY. CNT	L A G O O N 入力データ	90/05/28
73	COPY	KAW. LAG18G. RZ. CNT	L A G O O N 入力データ	90/05/28
74	COPY	KAW. LAG18G. XY. CNT	L A G O O N 入力データ	90/05/28
75	COPY	KAW. LAG18G. XYZ. CN	L A G O O N 入力データ	90/05/28
76	COPY	KAW. LAG18G. Z18XYZ	L A G O O N 入力データ	90/05/28

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
7 7	COPY	LAGFILE. DATA	LAGOONファイル	90/05/28
7 8	COPY	LAGFT10. DATA	LAGOON実験値	90/05/28
7 9	COPY	LAGOON. DATA	LAGOON入力データ	90/05/28
8 0	COPY	LAGOON. FORT	LAGOONソース	90/05/28
8 1	COPY	MOR. MATRIX2. FORT	MATRIXソース	90/05/28
8 2	GENER	PDS. CLIST	ユーティリティJCL	90/05/28
8 3	COPY	PROG. FORT	ユーティリティJCL	90/05/28
8 4	COPY	PROGTOM. FORT	ユーティリティJCL	90/05/28
8 5	COPY	REACTION. RATE. CEL	ユーティリティJCL	90/05/28
8 6	COPY	TOMJCL. CNTL	ユーティリティJCL	90/05/28
8 7	COPY	ZPPR12. AMMX18G. DA	Z P P R 1 2 AMM1 8 G断面積	90/05/28
8 8	COPY	ZPPR12. JOSE2. DATA	Z P P R 1 2 DONJOSEデータ	90/05/28
8 9	COPY	ZPPR12. LAGFT20. DA	Z P P R 1 2 LAGOON計算結果	90/05/28
9 0	COPY	ZPPR12. RRLAG10. DA	Z P P R 1 2 実験値	90/05/28
9 1	COPY	ZPPR12. RRMEAS. DAT	Z P P R 1 2 実験値 (ANL)	90/05/28
9 2	COPY	ZPPR12. SLRM. DATA	Z P P R 1 2 SLAROMデータ	90/05/28
9 3	COPY	ZPPR12. XMIX. AMPL	Z P P R 1 2 XMIXデータ	90/05/28
9 4	COPY	ZPPR13. RRLAG10. DA	Z P P R 1 3 実験値	90/05/28
9 5	COPY	ZPPR13A. LAGFT05. D	Z P P R 1 3 LAGOON入力データ	90/05/28
9 6	COPY	ZPPR13A. LAGFT20. D	Z P P R 1 3 LAGOON計算結果	90/05/28
9 7	COPY	ZPPR13A. LAGFT55. D	Z P P R 1 3 計算点	90/05/28
9 8	COPY	Z13A. DRWMSTR. X18G	Z P P R 1 3 関係データ	90/05/28
9 9	COPY	Z13AASYM. TEST. DAT	Z P P R 1 3 関係データ	90/05/28
1 0 0	COPY	Z13ABC. TWOTO. DATA	Z P P R 1 3 関係データ	90/05/28
1 0 1	COPY	Z13ABC. XYZ. DATA	Z P P R 1 3 関係データ	90/05/28
1 0 2	COPY	Z13B1. LAGFT20. DAT	Z P P R 1 3 関係データ	90/05/28
1 0 3	COPY	Z13B3. LAGFT20. DAT	Z P P R 1 3 関係データ	90/05/28
1 0 4	COPY	Z13B4. LAGFT20. DAT	Z P P R 1 3 関係データ	90/05/28

File 番号	ユーティ リ ティ	MT上のDSN	内 容	作成日
105	COPY	Z13C. AMM. MAC18G. D	ZPPR13 関係データ	90/05/28
106	COPY	Z13C. AMM. XY. DATA	ZPPR13 関係データ	90/05/28
107	COPY	Z13C. LAGFT20. DATA	ZPPR13 関係データ	90/05/28
108	COPY	Z13DRWR. NDENS. COR	ZPPR13 関係データ	90/05/28
109	GENER	Z13PLT. CNTRLND. DA	ZPPR13 関係データ	90/05/28
110	COPY	Z13TLD. ANLEXP. DAT	ZPPR13 関係データ	90/05/28
111	COPY	Z1819. JOSE2. DATA	ZPPR18, 19 DONJOSEデータ	90/05/28
112	COPY	Z1819. LAGFT05. DAT	ZPPR18, 19 LAGOONデータ	90/05/28
113	COPY	Z1819. LAGFT20. DAT	ZPPR18, 19 LAGOON計算結果	90/05/28
114	GENER	Z19B. XYZ07G. FT34	ZPPR19B 7群中性子束	90/05/28
115	GENER	Z19B. XYZ07G. FT34	ZPPR19B 7群中性子束	90/05/28
116	GENER	Z19B. XYZ07G. FT34	ZPPR19B 7群中性子束	90/05/28
117	GENER	Z89FOIL. ANLTAPE. D	ZPPR18, 19 実験値 (ANL)	90/05/28
118	GENER	@@MTREC@. CNTL	バックアップ用JCL (C0111-CRC)	90/05/28
119	COPY	ZPPR17. PDS. DATA	ZPPR17 縮約用70群中性子束	90/05/28
120	COPY	ZPPR18. CNTL	ZPPR18 関係実行JCL	90/05/28
121	COPY	ZPPR18A. DATA	ZPPR18A 関係入力データ	90/05/28
122	COPY	ZPPR18B. DATA	ZPPR18B 関係入力データ	90/05/28
123	COPY	Z17ACIT. DATA	ZPPR17A CITATION入力データ	90/05/28
124	GENER	Z18A. RZ07G. FLUX	ZPPR18A 縮約用70群中性子束	90/05/28
125	COPY	Z18CAS. DATA	ZPPR18 CASUP入力データ	90/05/28
126	COPY	Z18JNT. DATA	ZPPR18 JOINT入力データ	90/05/28
127	COPY	Z18MIX. DATA	ZPPR18 XMIX入力データ	90/05/28
128	COPY	Z18MLT. DATA	ZPPR18 SLAROMマルチドロワー入力データ	90/05/28
129	COPY	Z18MLT2. DATA	ZPPR18 SLAROMマルチドロワー入力データ	90/05/28
130	COPY	Z18NBD. DATA	ZPPR18 原子数密度データ	90/05/28
131	COPY	Z18PLT. DATA	ZPPR18 PLUTO入力データ	90/05/28
132	COPY	Z18PSR. DATA	ZPPR18 SLAROM PSR用データ	90/05/28

File 番号	エ-ディ ティ	MT上のDSN	内 容	作成日
1 3 3	COPY	Z18SLM. DATA	Z P P R 1 8 S L A R O M 入 カ デ ー タ	90/05/28
1 3 4	COPY	Z18SLM#. DATA	Z P P R 1 8 S L A R O M 入 カ デ ー タ	90/05/28

Table 5. 5 Magnetic Tape 管理票

VOL=SER

センター管理番号 TDD013

J	U	P	0	0	4
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ロッカー番号 CASET

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
1	GENER	@@MTREC@.CNTL	バックアップ用JCL (C0111-CRC)	89/02/08
2	COPY	ZPPR17.MIC70G.XSE	ZPPR17 ミクロ70群断面積	89/02/08
3	COPY	Z17AB4C.FLX70G.DA	ZPPR17A 制御棒縮約用70群中性子束	89/02/08
4	COPY	Z17AB4C.MAC07G.XS	ZPPR17A 制御棒マクロ7群断面積	89/02/08
5	COPY	Z17AB4C.MAC18G.XS	ZPPR17A 制御棒マクロ18群断面積	89/02/08
6	COPY	Z17AB4C.MAC70G.XS	ZPPR17A 制御棒マクロ70群断面積	89/02/08
7	COPY	Z17AL026.@MLT07G	ZPPR17A マルチドロワーマクロ7群断面積	89/02/08
8	COPY	Z17AL026.AMM07G.X	ZPPR17A AMMマクロ7群断面積	89/02/08
9	COPY	Z17AL026.MAC07G.X	ZPPR17A マクロ7群断面積	89/02/08
10	COPY	Z17AL026.MAC18G.X	ZPPR17A マクロ18群断面積	89/02/08
11	COPY	Z17AL026.MAC70G.X	ZPPR17A マクロ70群断面積	89/02/08
12	COPY	Z17AL026.MIC18G.X	ZPPR17A ミクロ18群断面積	89/02/08
13	COPY	Z17AL026.MLT07G.X	ZPPR17A マルチドロワー7群断面積	89/02/08
14	COPY	Z17AL026.VID07G.X	ZPPR17A ボイドマクロ7群断面積	89/02/08
15	COPY	Z17AL026.VID70G.X	ZPPR17A ボイドマクロ70群断面積	89/02/08
16	COPY	Z17ARACT.MIC07G.X	ZPPR17A 反応率分布7群断面積	89/02/08
17	COPY	Z17ARACT.MIC18G.X	ZPPR17A 反応率分布18群断面積	89/02/08
18	COPY	Z17ARACT.MIC70G.X	ZPPR17A 反応率分布70群断面積	89/02/08
19	COPY	Z17ASMPL.MIC18G.X	ZPPR17A サンプル18群断面積	89/02/08
20	COPY	Z17ASMPL.MIC70G.X	ZPPR17A サンプル70群断面積	89/02/08

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
2 1	COPY	Z17BB4C. MAC07G. XS	Z P P R 1 7 B 制御棒マクロ7群断面積	89/02/08
2 2	COPY	Z17BB4C. MAC18G. XS	Z P P R 1 7 B 制御棒マクロ18群断面積	89/02/08
2 3	COPY	Z17BB4C. MAC25G. XS	Z P P R 1 7 B 制御棒マクロ25群断面積	89/02/08
2 4	COPY	Z17BB4C. MAC70G. XS	Z P P R 1 7 B 制御棒マクロ70群断面積	89/02/08
2 5	COPY	Z17BL088. AMM07G. X	Z P P R 1 7 B AMMマクロ7群断面積	89/02/08
2 6	COPY	Z17BL088. MAC07G. X	Z P P R 1 7 B マクロ7群断面積	89/02/08
2 7	COPY	Z17BL088. MAC18G. X	Z P P R 1 7 B マクロ18群断面積	89/02/08
2 8	COPY	Z17BL088. MAC25G. X	Z P P R 1 7 B マクロ25群断面積	89/02/08
2 9	COPY	Z17BL088. MAC70G. X	Z P P R 1 7 B マクロ70群断面積	89/02/08
3 0	COPY	Z17BL088. MIC18G. X	Z P P R 1 7 B ミクロ18群断面積	89/02/08
3 1	COPY	Z17BL088. MLT07G. X	Z P P R 1 7 B マルチドロワー7群断面積	89/02/08
3 2	COPY	Z17CB4C. MAC07G. XS	Z P P R 1 7 C 制御棒マクロ7群断面積	89/02/08
3 3	COPY	Z17CB4C. MAC18G. XS	Z P P R 1 7 C 制御棒マクロ18群断面積	89/02/08
3 4	COPY	Z17CL136. MAC07G. X	Z P P R 1 7 C マクロ7群断面積	89/02/08
3 5	COPY	Z17CL136. MAC18G. X	Z P P R 1 7 C マクロ18群断面積	89/02/08
3 6	COPY	Z17CL136. MAC70G. X	Z P P R 1 7 C マクロ70群断面積	89/02/08
3 7	COPY	Z17CL136. MIC18G. X	Z P P R 1 7 C ミクロ18群断面積	89/02/08
3 8	GENER	Z17A¥18G. FT34	Z P P R 1 7 A 18群中性子束	89/02/08
3 9	COPY	Z17ACIT. DATA	Z P P R 1 7 A CITATIONデータ	89/02/08
4 0	GENER	Z17AH18G. FT34	Z P P R 1 7 A 18群中性子束	89/02/08
4 1	COPY	Z17AJNT. DATA	Z P P R 1 7 A JOINTデータ	89/02/08
4 2	COPY	Z17AMIX. DATA	Z P P R 1 7 A XMIXデータ	89/02/08
4 3	COPY	Z17AMM. DATA	Z P P R 1 7 AMMデータ	89/02/08
4 4	COPY	Z17AVR. DATA	Z P P R 1 7 AVERAGEデータ	89/02/08
4 5	COPY	Z17BCIT. DATA	Z P P R 1 7 B CITATIONデータ	89/02/08
4 6	COPY	Z17BJNT. DATA	Z P P R 1 7 B JOINTデータ	89/02/08
4 7	COPY	Z17BMIX. DATA	Z P P R 1 7 B XMIXデータ	89/02/08
4 8	COPY	Z17CCIT. DATA	Z P P R 1 7 C CITATIONデータ	89/02/08

File 番号	ユーティ リティ	MT上のDSN	内 容	作成日
49	COPY	Z17CJNT. DATA	ZPPR17C JOINTデータ	89/02/08
50	COPY	Z17NBD. DATA	ZPPR17 原子数密度データ	89/02/08
51	COPY	Z17PKY. DATA	ZPPR17 PERKYデータ	89/02/08
52	COPY	Z17PLT. DATA	ZPPR17 PLUTOデータ	89/02/08
53	COPY	Z17SLB. DATA	ZPPR17	89/02/08
54	COPY	Z17SLM. DATA	ZPPR17 SLAROMデータ	89/02/08
55	COPY	Z17SLMC. DATA	ZPPR17 SLAROMデータ (センターラインモデル)	89/02/08
56	COPY	Z17SLMD. DATA	ZPPR17	89/02/08
57	COPY	Z17SLMR. DATA	ZPPR17	89/02/08
58	COPY	Z17TRI. DATA	ZPPR17 TRITACデータ	89/02/08
59	COPY	Z17TRI. OUTLIST	ZPPR17 TRITAC出力リスト	89/02/08
60	COPY	Z17TWT. DATA	ZPPR17 TWOTRANデータ	89/02/08
61	GENER	@@MTREC@. CNTL	バックアップ用JCL	89/02/08
62	GENER	Z17ARZ18. FT34	ZPPR17A CITATION RZ18群中性子束	89/02/08
63	GENER	Z17ATA18. FT30	ZPPR17A TWOTRAN RZ18群中性子束	89/02/08
64	GENER	Z17ATW18. FT30	ZPPR17A TWOTRAN RZ18群中性子束	89/02/08
65	GENER	Z17ATW18. FT34	ZPPR17A TWOTRAN RZ18群中性子束	89/02/08
66	GENER	Z17BA07G. FT34	ZPPR17B CITATION7群中性子束	89/02/08
67	GENER	Z17BC18G. FT34	ZPPR17B CITATION18群中性子束	89/02/08
68	GENER	Z17BI07G. FT34	ZPPR17B CITATION7群中性子束	89/02/08
69	GENER	Z17BS07G. FT34	ZPPR17B CITATION7群中性子束	89/02/08
70	GENER	Z17BT07G. FT09	ZPPR17B TRITAC7群中性子束	89/02/08
				89/02/08

Fig. 5. 1 プレートセル計算コード CASUP 実行JCL

```

*****
** CASGO **
*****

//PA42ACAS JOB (PA42A),SCFSTR,MSGCLASS=X,MSGLEVEL=(1,1),NOTIFY=PA42A,
//          ATTR=(T3,C6,W4)
//*ROUTE PRINT HONSYA
//*-----
//*          PA42#.SAMPLE.CNTL(CASGO)
//*-----
//CASUP EXEC FORT7CLG,
//          PARM.FORT='ELM(MICROY2,COLPROO1,CHIMIX,CLEA,PUTPDS,MICR*S*T)',
//          PARM.LKED='MAP,LIST,LET,OVLY',COND.LKED=(8,LE),SYSTEM=FEP2
//FORT.SYSPRINT DD DUMMY
//FORT.SYSIN   DD DSN=PA421.CASUP.FORT,DISP=SHR,LABEL=(,,IN)
//LKED.SYSLIB DD DSN=SYS1.FORTLIB,DISP=SHR
//           DD DSN=SYS1.SSL2,DISP=SHR
//LKED.OLDLM  DD DSN=PA421.CASUP.LOAD,DISP=OLD,LABEL=(,,IN)
//LKED.SYSIN  DD *
//          ENTRY   MAIN
//          INCLUDE OLDLM(CASTN01)
//*
//*-----
//GO.FT05F001 DD DSN=PA42A.Z10CAS.DATA(SCFSTR),DISP=SHR,LABEL=(,,IN)
//GO.FT06F001 DD SYSOUT=*
//GO.FT24F001 DD DSN=PA40E.JFS3J2.FP2N33.LIBR,DISP=SHR,LABEL=(,,IN)
//GO.FT74F001 DD UNIT=SYSDA,SPACE=(TRK,(20,20)),
//           DCB=(RECFH=VBS,LRECL=4092,BLKSIZE=4096)
//GO.FT75F001 DD UNIT=SYSDA,SPACE=(TRK,(20,20)),DCB=*.FT74F001
//GO.FT76F001 DD UNIT=SYSDA,SPACE=(TRK,(20,20)),DCB=*.FT74F001
//GO.FT77F001 DD UNIT=SYSDA,SPACE=(TRK,(20,20)),DCB=*.FT74F001
//GO.FT02F001 DD UNIT=SYSDA,SPACE=(TRK,(50,50)),DCB=*.FT74F001
//GO.PDSIN   DD DSN=PA42#.ZPPR10.MIC70G.XSEC,DISP=SHR
//GO.PDSOUT  DD DSN=PA42#.ZPPR10.MIC70G.XSEC,DISP=SHR
//

```

Fig. 5. 2 プレートセル計算コード CASUP サンプルデータ

 ** CASUP **

```

ZPPR-09 DCF STRECH TONE      SIGTR(FLUX) JFS3-J2(OLD) B**2=0.0 SIGO(NO)
 1 1 1 0 1 0 0 0 1 0 0 1 0 1
18 18 1 18 1.70 0
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
0.22225 0.63500 0.31750 0.03810 1.19380 0.03810 0.03810 0.55880 0.03810 0.55880
0.03810 0.03810 0.55880 0.03810 0.03810 0.55880 0.03810 0.31750
0.63500 0.22225
 0.0
300.0
 9 3 2 9 11 9 9 8 9 9 11 9 9 12 9 10 3 9

13 1.24785E-06 42 9.12385E-05 6 2.18142E-04 26 5.01505E-02
24 1.39189E-02 28 5.66821E-03 25 1.23896E-03 14 8.32995E-04
29 2.25353E-04

925 3.07665E-05 928 1.44204E-02 8 3.83985E-02

925 9.48874E-05 928 4.21202E-02

13 7.79157E-05 42 1.86967E-05 6 1.53364E-04 26 5.88792E-02
24 1.69023E-02 28 8.50993E-03 25 1.28209E-03 14 1.04807E-03
29 1.79730E-04

13 1.24785E-06 42 9.61557E-06 8 1.57286E-06 6 2.53093E-05
11 2.16968E-02 29 3.10613E-05 26 5.88237E-03 24 1.64293E-03
28 6.91250E-04 25 1.43247E-04 14 9.61350E-05

13 7.79157E-05 42 1.86967E-05 6 1.53364E-04 26 5.88792E-02
24 1.69023E-02 28 8.50993E-03 25 1.28209E-03 14 1.04807E-03
29 1.79730E-04

13 9.23082E-05 42 9.61557E-06 6 2.32142E-05 26 6.62142E-02
24 1.91740E-02 28 9.46572E-03 25 1.63401E-03 14 9.41784E-04
29 1.28480E-04

942 2.47295E-05 949 8.74968E-03 940 1.15840E-03 941 1.11441E-04
951 6.77393E-05 925 5.58786E-05 928 2.48634E-02 42 2.23659E-03

13 9.23082E-05 42 9.61557E-06 6 2.32142E-05 26 6.62142E-02
24 1.91740E-02 28 9.46572E-03 25 1.63401E-03 14 9.41784E-04
29 1.28480E-04

13 7.92408E-05 42 1.86437E-05 6 1.54963E-04 26 5.89803E-02
24 1.69317E-02 28 8.52549E-03 25 1.28372E-03 14 1.05061E-03
29 1.81108E-04

13 1.24785E-06 42 9.61557E-06 8 1.50009E-06 6 2.52043E-05
11 2.09839E-02 29 3.08648E-05 26 5.88237E-03 24 1.64293E-03
28 6.91250E-04 25 1.43247E-04 14 9.61350E-05

13 7.92408E-05 42 1.86437E-05 6 1.54963E-04 26 5.89803E-02
24 1.69317E-02 28 8.52549E-03 25 1.28372E-03 14 1.05061E-03
29 1.81108E-04

13 6.19548E-05 42 5.22983E-05 6 2.32142E-05 26 5.91457E-02
24 1.71421E-02 28 8.41948E-03 25 1.26132E-03 14 8.25143E-04
29 1.15591E-04

13 1.24785E-06 42 9.61557E-06 8 3.06899E-02 6 1.02357E-02
11 2.04499E-02 29 5.44479E-05 26 5.88237E-03 24 1.64293E-03
28 6.91250E-04 25 1.43247E-04 14 9.61350E-05 1 8.88888E-05

13 6.19548E-05 42 5.22983E-05 6 2.32142E-05 26 5.91457E-02
24 1.71421E-02 28 8.41948E-03 25 1.26132E-03 14 8.25143E-04
29 1.15591E-04

13 1.24785E-06 42 9.61557E-06 8 4.71991E-02 6 2.32142E-05
26 3.85487E-02 24 1.64293E-03 28 6.91250E-04 25 1.43247E-04
14 9.61350E-05 29 2.53735E-05
  
```


Fig. 5. 2 プレートセル計算コード CASUP サンプルデータ (続き)

```
925 3.07665E-05 928 1.44204E-02 8 3.83985E-02
13 1.24785E-06 42 9.12385E-05 6 2.18142E-04 26 5.01505E-02
24 1.39189E-02 28 5.66821E-03 25 1.23896E-03 14 8.32995E-04
29 2.25353E-04

1 1 1 1 1 0 0 0
1
1
1.0000E-4 1.0000E-5 10 600
SCFSTR
```

Fig. 5. 3 セル計算コード SLAROM 実行JCL

```

*****
** SLMGO **
*****

//PA42ASLH JOB (PA42A),SLMHOM,MSGCLASS=X,MSGLEVEL=(2,0),NOTIFY=PA42A, SLMGO
// ATTR=(T3,C4,W4). SLMGO
//*ROUTE PRINT HONSYA SLMGO
//*----- SLMGO
//* PA42#.SAMPLE.CNTL(SLMGO) SLMGO
//*----- SLMGO
//DATAP EXEC PGM=DATAP,SYSTEM=FEP2 SLMGO
//STEPLIB DD DISP=SHR,DSN=PA40A.DATAP.LOAD,LABEL=(,,IN) SLMGO
//FT06F001 DD SYSOUT=* SLMGO
//FT09F001 DD UNIT=SYSDA,DSN=&&INPUT,DISP=(,PASS),SPACE=(CYL,(1,1)) SLMGO
//*----- ( INPUT DATA )----- SLMGO
//FT05F001 DD DSN=PA42A.ZO9SLM.DATA(ALLHOM),DISP=SHR,LABEL=(,,IN) SLMGO
//*----- SLMGO
//GO EXEC PGM=SLAROM04,SYSTEM=FEP2 SLMGO
//STEPLIB DD DSN=PA40A.SLAROM.LOAD,DISP=SHR SLMGO
//*----- ( INPUT PDS )----- SLMGO
//PDSIN DD DSN=PA42#.ZPPR09.MIC70G.XSEC,DISP=SHR SLMGO
//*----- ( OUTPUT PDS )----- SLMGO
//PDSOUT DD DSN=PA42#.ZPPR09.MIC70G.XSEC,DISP=SHR SLMGO
//*----- SLMGO
//FT01F001 DD UNIT=SYSDA,SPACE=(CYL,(10,5)), SLMGO
// DCB=(RECFM=VSB,LRECL=19000,BLKSIZE=19004) SLMGO
//FT02F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT03F001 DD UNIT=SYSDA,SPACE=(CYL,(10,5)),DCB=*.FT01F001 SLMGO
//FT04F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT05F001 DD DDNAME=SYSIN SLMGO
//FT06F001 DD SYSOUT=*,DCB=(RECFM=FB,LRECL=137,BLKSIZE=1370) SLMGO
//FT06F002 DD SYSOUT=*,DCB=(RECFM=FB,LRECL=137,BLKSIZE=1370) SLMGO
//FT07F001 DD DUMMY SLMGO
//*----- ( GROUP CONSTANTS LIBRARY )----- SLMGO
//FT08F001 DD DSN=PA40A.JFS3RJ2.LIB33.DATA,DISP=SHR,LABEL=(,,IN) SLMGO
//*----- SLMGO
//FT09F001 DD UNIT=SYSDA,SPACE=(CYL,(10,10)),DCB=*.FT01F001 SLMGO
//FT10F001 DD UNIT=SYSDA,SPACE=(CYL,(10,5)),DCB=*.FT01F001 SLMGO
//FT11F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT12F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//*----- ( FOR REACTION RATE CONSERV. VERSION)----- SLMGO
//FT13F001 DD DUMMY SLMGO
//FT15F001 DD UNIT=SYSDA,SPACE=(CYL,(10,5)),DCB=*.FT01F001 SLMGO
//FT20F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT21F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT22F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT25F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT26F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT30F001 DD DUMMY SLMGO
//FT40F001 DD SYSOUT=* SLMGO
//FT41F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT42F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT43F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT55F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO

//FT56F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT59F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT60F001 DD SYSOUT=* SLMGO
//FT70F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT72F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT73F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT71F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT80F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT90F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT96F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//FT99F001 DD UNIT=SYSDA,SPACE=(CYL,(05,5)),DCB=*.FT01F001 SLMGO
//SYSIN DD DSN=&&INPUT,DISP=(OLD,DELETE) SLMGO
// SLMGO

```


Fig. 5. 7 拡散計算コード CITATION 実行JCL

 ** CITGO **

```

//PA42ACIT JOB (PA42A),XYZ18G,MSGCLASS=X,NOTIFY=PA42A,MSGLEVEL=(2,0),
//      ATTR=(T5,C6,W4)
//*ROUTE PRINT HONSYA
//*-----
//*      PA42#.SAMPLE.CNTL(CITXYZ)
//*-----
//*---( UPDATE DIMENSION OF CITATION)---( ORIGINAL = 150000 )-----
//UPDC EXEC FORTXCL,PARM.FORT='LANGLVL(66),GOSTMT,NOSTATIS,ELM(*)',
//      REGION.FORT=512K,
//      PARM.LKED='LREP(JMF,JMP),MAP,LIST,OVLY,SIZE=(374K,72K)',
//      REGION.LKED=512K,COND.LKED=(8,LT),SYSTEM=FEP2
//FORT.SYSPRINT DD DUMMY
//FORT.SYSIN DD DSN=PA42A.CITUP.FORT,DISP=SHR
//*---( NEW LOAD MODULE )-----
//LKED.SYSLMOD DD DSN=&&LOADC,UNIT=SYSDA,DISP=(NEW,PASS),
//      SPACE=(TRK,(150,50,10),RLSE)
//*---( OLD LOAD MODULE )-----
//LKED.OLDLM DD DSN=PA40A.CITATION.LOAD,DISP=SHR
//LKED.SYSIN DD DSN=PA40A.JCLSET.CNTL(CITOVLYU),DISP=SHR
//*---( END OF UPDATE )---( NEW LOAD MODULE IS &&LOADC(CITATION) )-----
//* +-----+
//* |
//* |      J O I N T -----> CITATION-FBR
//* |
//* +-----+
//JOINTRUN EXEC PGM=JOINT,REGION=4000K,SYSTEM=FEP2
//STEPLIB DD DSN=PA42#.JOINT.LOAD,DISP=SHR,LABEL=(,,IN)
//SYSPRINT DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*---( INPUT CROSS SECTION DATA )-----
//USERPDS DD DSN=PA42#.ZPPRO9.MAC18G.XSEC,DISP=SHR,LABEL=(,,IN)
//FT04F001 DD UNIT=SYSDA,SPACE=(TRK,(10,2)),
//      DISP=(,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200,BUFNO=1)
//*---( INPUT DATA )-----
//FT05F001 DD DSN=PA42A.Z09CIT.DATA(XYZ18G),DISP=SHR,LABEL=(,,IN)
//FT06F001 DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*-----
//FT08F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA,      *INPUT DATA      *
//      SPACE=(TRK,(10,10)),                          *FOR NEXT JOB STEP*
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120)          *BY CARD FORM      *
//*-----
//FT09F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA,      *CROSS SECTIONS   *
//      SPACE=(TRK,(10,10))                            *FOR NEXT JOB STEP*
//*                                                     *BY BINARY FORM   *
//*-----
//FT10F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA,      *CROSS SECTIONS   *
//      SPACE=(TRK,(10,10)),                          *FOR NEXT JOB STEP*
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120)          *BY CARD FORM      *
//*-----

//FT20F001 DD DUMMY
//FT50F001 DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*-----
//CITATION EXEC PGM=CITATION,COND=(4,LT),SYSTEM=FEP2
//STEPLIB DD DSN=&&LOADC,DISP=(OLD,DELETE)
//SYSPRINT DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//FT01F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),
//      DCB=(RECFM=VSB,LRECL=4092,BLKSIZE=4096)
//FT02F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*FT01F001
//FT03F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*FT01F001
//FT04F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*FT01F001
//FT05F001 DD DSN=*JOINTRUN.FT08F001,DISP=(OLD,DELETE)
//FT06F001 DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*---( OUTPUT ZONE AVERAGED FLUX & AXIAL BUCKLING )-----***
//FT07F001 DD SPACE=(TRK,(1,1),RLSE),UNIT=DASD,
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//FT08F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),

```

Fig. 5. 7 拡散計算コード CITATION 実行JCL (続き)

```

//          DCB=(RECFM=VSB,LRECL=4092,BLKSIZE=4096)
/*---( OUTPUT FLUX MAP )-----**
//FT09F001 DD UNIT=SYSDA,SPACE=(TRK,(100,10)),DCB=*.FT01F001
/*T09F001 DD DSN=PA42A.ZPPR09.XYZ07GHH.FT09,DISP=(,CATLG),
//          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096),
//          SPACE=(TRK,(50,10),RLSE),UNIT=SYSDA
//FT10F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT11F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
//FT12F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
/*---( RESTART FILE )-----**
//FT13F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
//FT14F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
//FT15F001 DD UNIT=SYSDA,SPACE=(CYL,(2,5)),DCB=*.FT01F001
//FT16F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
//FT17F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
//FT18F001 DD UNIT=SYSDA,SPACE=(TRK,(50,5)),DCB=*.FT01F001
//FT19F001 DD UNIT=SYSDA,SPACE=(CYL,(8,8)),DCB=*.FT01F001
//FT20F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT21F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT22F001 DD UNIT=SYSDA,SPACE=(TRK,(10,10)),DCB=*.FT01F001
//FT23F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT24F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT25F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT26F001 DD UNIT=SYSDA,SPACE=(TRK,(10,10)),DCB=*.FT01F001
//FT27F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT28F001 DD UNIT=SYSDA,SPACE=(TRK,(10,10)),DCB=*.FT01F001
//FT29F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
//FT30F001 DD UNIT=SYSDA,SPACE=(CYL,(1,2)),DCB=*.FT01F001
/*---( MACRO CROSS SECTIONS )-----
//FT31F001 DD DSN=*.JOINTRUN.FT09F001,DISP=(OLD,DELETE)
//FT32F001 DD UNIT=SYSDA,SPACE=(TRK,(10,10)),DCB=*.FT01F001
//FT33F001 DD UNIT=SYSDA,SPACE=(TRK,(10,10)),DCB=*.FT01F001
/*---( OUTPUT RESULT FILE )-----
//FT34F001 DD DSN=PA40E.ZPPR09.XYZ18G.FT34,DISP=(,CATLG),
//          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096),
//          SPACE=(TRK,(70,02),RLSE),UNIT=SYSDA
/*T34F001 DD UNIT=SYSDA,SPACE=(TRK,(50,10)),DCB=*.FT01F001
//FT51F001 DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//

```

Fig. 5. 8 拡散計算コード CITATION サンプルデータ

 ** CITATION **

CITATION	CITATION
SCFS01 SLAROM	CITATION
ZPPR-9 RZ70G JFS-3-J2 HOMO 0=1/(3*SIGTR,D)	CITATION
001	CITATION
0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	CITATION
1 0 0 1 1 1 1 1 1 2 0 0 0 0 0 0	CITATION
003	CITATION
0 0 0 0 0 7 0 0 0 0 0 1 1 0 0 0 0	CITATION
1.0000E-4 1.0000E-5	CITATION
004	CITATION
18 88.872 6 31.077 5 22.645 3 16.854	CITATION
10 50.876 5 25.400 1 5.083 2 10.157 2 13.294	CITATION
005	CITATION
1 2 3 7	CITATION
5 5 3 7	CITATION
6 6 3 7	CITATION
6 6 4 7	CITATION
8 8 8 9	CITATION
008	CITATION
-70 70 0 9 0 1 1 1 0	CITATION
1	CITATION
SCFS01 SLAROM	CITATION
2	CITATION
OTCS02 SLAROM	CITATION
3	CITATION
RDBHOM SLAROM	CITATION
4	CITATION
RBLHOM SLAROM	CITATION
5	CITATION
ABLHOM SLAROM	CITATION
6	CITATION
ABUHOM SLAROM	CITATION
7	CITATION
RDRHOM SLAROM	CITATION
8	CITATION
AXRHOM SLAROM	CITATION
9	CITATION
MTXHOM SLAROM	CITATION
SCFS01 SLAROM	CITATION
023	CITATION
0 0 0 7	CITATION
040	CITATION
0 0 0 0 0 0 0 0	CITATION
999	CITATION

Fig. 5. 9 2次元輸送計算コード TWOTRAN 実行JCL

```

*****
** TWTGO **
*****

//PA42ATWT JOB (PA42A),RZ18G100,MSGCLASS=X,MSGLEVEL=(2,0),NOTIFY=PA42A,
// ATTR=(T6,C4,W3)
//*ROUTE PRINT HONSYA
//*-----
//*          PA42#.SAMPLE.CNTL(TWTGO)
//*-----
//***** J O I N T *****
//JOINTRUN EXEC PGM=JOINT,SYSTEM=FEP2
//STEPLIB DD DSN=PA42#.ZPPR10A.MAC18G.XSEC,DISP=SHR,LABEL=(,,IN)
//SYSPRINT DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*----- (X-SECTION PDS FILE)-----
//USERPDS DD DSN=PA42#.ZPPR10A.MAC18G.XSEC,DISP=SHR,LABEL=(,,IN)
//FT04F001 DD UNIT=SYSDA,SPACE=(TRK,(50,10)),
//          DISP=(,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520,BUFNO=1)
//*----- (INPUT DATA)-----
//FT05F001 DD DSN=PA42A.Z10AVID.DATA(RZ18GREF),DISP=SHR,LABEL=(,,IN)
//FT06F001 DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*****
//FT08F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA, *INPUT DATA *
//          SPACE=(TRK,(10,10)),DSN=&&INPUT, *FOR NEXT JOB STEP*
//          DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520) *BY CARD FORM *
//*****
//FT09F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA, *CROSS SECTIONS *
//          SPACE=(TRK,(50,10)), *FOR NEXT JOB STEP*
//          DSN=&&BCROSS *BY BINARY FORM *
//*****
//FT10F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA, *CROSS SECTIONS *
//          SPACE=(TRK,(50,10)),DSN=&&CCROSS, *FOR NEXT JOB STEP*
//          DCB=(RECFM=FB,LRECL=80,BLKSIZE=3520) *BY CARD FORM *
//*****
//FT20F001 DD DUMMY
//FT50F001 DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*****
//*          JOINT          END
//*****
//*          TWOTRAN2      START
//*****
//TW01 EXEC PGM=TRAN2,SYSTEM=FEP2
//STEPLIB DD DISP=SHR,DSN=PA40A.TWOTRAN2.LOAD
//FT01F001 DD UNIT=WORK,DISP=(NEW,DELETE),SPACE=(CYL,(5,1),RLSE),
//          DCB=(RECFM=VBS,LRECL=876,BLKSIZE=6136)
//FT03F001 DD UNIT=WORK,DISP=(NEW,DELETE),SPACE=(CYL,(5,1),RLSE),
//          DCB=(RECFM=VBS,LRECL=876,BLKSIZE=6136)
//*--- ( INPUT DATA FILE )-----
//FT05F001 DD DSN=&&INPUT,DISP=(OLD,DELETE)
//FT06F001 DD SYSOUT=*,DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)
//*--- ( INPUT X-SECTIONS BY CARD IMAGE )-----

//FT07F001 DD DSN=&&CCROSS,DISP=(OLD,DELETE)
//*--- ( FIRST DUMP DATA FOR RESTART )-----
//*T08F001 DD SPACE=(TRK,(50,05)),UNIT=SYSDA,DISP=(NEW,CATLG),
//*          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096),
//*          DSN=PA40E.ZPPR10B.TWT18GV7.FT08
//FT08F001 DD SPACE=(TRK,(50,5)),UNIT=SYSDA,DISP=(NEW,DELETE),
//          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096)
//*--- ( SECOND DUMP DATA FOR RESTART )-----
//*T09F001 DD SPACE=(TRK,(50,05)),UNIT=SYSDA,DISP=(NEW,CATLG),
//*          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096),
//*          DSN=PA40E.ZPPR10B.TWT18GV7.FT09
//FT09F001 DD SPACE=(TRK,(50,5)),UNIT=SYSDA,DISP=(NEW,DELETE),
//          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096)
//*--- ( FLUX GUESS )-----
//FT10F001 DD SPACE=(TRK,(50,10)),UNIT=WORK,
//          DCB=(RECFM=VBS,BLKSIZE=6136)
//*--- ( EDIT DATA )-----
//FT17F001 DD SPACE=(TRK,(50,10)),UNIT=WORK,
//          DCB=(RECFM=VBS,BLKSIZE=6136)
//FT18F001 DD SPACE=(TRK,(50,10)),UNIT=WORK,

```


Fig. 5. 11 3次元輸送計算コード TRITAC 実行JCL

```

*****
** TRIGO **
*****

//PA42ATRI JOB (PA42A),TRIO7G,MSGCLASS=X,NOTIFY=PA42A,MSGLEVEL=(2,0),
//      ATTR=(T8,C6,W2)
//*ROUTE PRINT HONSYA
//*-----
//*          PA42#.SAMPLE.CNTL(TRIGO)
//*-----
//*---( UPDATE DIMENSION OF CITATION)---( ORIGINAL = 90000 )-----
//* ZPPR-17A XYZ07G MEMORY = 600000 (T12,C5,W2)
//* ZPPR-17C XYZ07G MEMORY = 920000 (T12,C8,W2)
//* ZPPR-10 XYZ07G MEMORY = 600000 (T8,C5,W2)
//* ZPPR-10 XYZ18G MEMORY = 700000 (T8,C6,W2)
//UPDC EXEC FORT7CL,PARN.FORT='OPTIMIZE(O)',SYSTEM=FEP2
//FORT.SYSPRINT DD DUMMY
//*ORT.SYSIN DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(MAIN)
//FORT.SYSIN DD DISP=OLD,DSN=PA42A.TRITAC.FORT(MAIN)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(MAESTO)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(DUMPRD)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(RONDD)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(INITAL)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(KLUX3)
//****
//          DD DISP=OLD,DSN=PA42A.TRITAC.FORT(KLUX3)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(COUTER)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(DSCDS)
//****
//          DD DISP=OLD,DSN=PA42A.TRITAC.FORT(DSCDS)
//****
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(CONTES)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(INNER)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(SWEEPC)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(GCAL)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(ISCDS)
//****
//          DD DISP=OLD,DSN=PA42A.TRITAC.FORT(ISCDS)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(MWRD3T)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(PRINT)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(PRINTO)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(CODA)
//          DD DISP=OLD,DSN=PA400.C0070.TRITAC.FORT(DUMPWR)
//****
//          DD DISP=OLD,DSN=PA42A.TRITAC.FORT(KNSD3)
//*
//*---( NEW LOAD MODULE )-----
//LKED.SYSLMOD DD DSN=&LOADC,UNIT=SYSDA,DISP=(NEW,PASS),
//          SPACE=(TRK,(150,50,10),RLSE)
//*---( OLD LOAD MODULE )-----
//LKED.OLDLIB DD DSN=PA42#.TRITAC.LOAD,DISP=SHR,LABEL=(,,IN)
//LKED.SYSIN DD *
//          ENTRY MAIN
//          INCLUDE OLDLIB(TRITAC01)
//          NAME TRITAC(R)
//*
//*---( END OF UPDATE )---( NEW LOAD MODULE IS &LOADC(CITATION) )-----
//* +-----+
//* |
//* |          J O I N T -----> TRITAC-PNC |
//* |
//* +-----+
//JOINTRUN EXEC PGM=JOINT01,REGION=4000K,SYSTEM=FEP2
//STEPLIB DD DSN=PA42#.JOINT.LOAD,DISP=SHR,LABEL=(,,IN)
//SYSPRINT DD SYSOUT=*
//*---( INPUT CROSS SECTION DATA )-----
//USERPDS DD DSN=PA42#.ZPPR09.MAC07G.XSEC,DISP=SHR,LABEL=(,,IN)
//FT04F001 DD UNIT=SYSDA,SPACE=(TRK,(10,2)),
//          DISP=(,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200,BUFNO=1)
//*---( INPUT DATA )-----
//FT05F001 DD DSN=PA42A.Z09CIT.DATA(TRIO7G),DISP=SHR,LABEL=(,,IN)
//FT06F001 DD SYSOUT=*
//*-----
//FT08F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA, *INPUT DATA *
//          SPACE=(TRK,(10,10)), *FOR NEXT JOB STEP*
//          DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120) *BY CARD FORM *
//*-----
//FT20F001 DD DUMMY
//FT50F001 DD SYSOUT=*,

```

Fig. 5. 11 3次元輸送計算コード TRITAC 実行JCL (続き)

```
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043)
//*-----
//TRITAC   EXEC PGM=TRITAC,COND=(4,LT),SYSTEM=FEP2
//STEPLIB DD DSN=&&LOADC,DISP=(OLD,DELETE)
//FT01F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&A,SPACE=(TRK,(50,20))
//FT02F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&B,SPACE=(TRK,(50,20))
//FT02F001 DD DSN=PA42A.ZPPRO9.TRI07G.FT02,DISP=(,CATLG),
//          DCB=(LRECL=4092,BLKSIZE=4096,RECFM=VBS),UNIT=SYSDA,
//          SPACE=(TRK,(20,10))
//FT05F001 DD DSN=*.JOINRUN.FT08F001,DISP=(OLD,DELETE)
//FT06F001 DD SYSOUT=*
//FT11F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&C,SPACE=(TRK,(50,20))
//FT12F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&D,SPACE=(TRK,(50,20))
//FT23F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&E,SPACE=(TRK,(150,20))
//FT24F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&F,SPACE=(TRK,(250,20))
//FT27F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&G,SPACE=(TRK,(350,20))
//FT31F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&H,SPACE=(TRK,(50,20))
//FT32F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&I,SPACE=(TRK,(50,20))
//FT33F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&J,SPACE=(TRK,(50,20))
//FT34F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&K,SPACE=(TRK,(50,20))
//FT35F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&L,SPACE=(TRK,(50,20))
//FT60F001 DD UNIT=SYSDA,DISP=(,PASS),DSN=&&M,SPACE=(TRK,(50,20))
//
```


Fig. 5. 13 拡散振動計算コード PERKY 実行JCL

```

*****
** PKYGO **
*****

//PA42APKY JOB (PA42A),RZ18GV1,MSGCLASS=X,NOTIFY=PA42A,MSGLEVEL=(2,0),
//      ATTR=(TO,C5,W3)
//*ROUTE PRINT HONSYA
//*-----
//*          PA42#.SAMPLE.CNTL(PKYGO)
//*-----
//* *****
//* *
//* *      J O I N T      ----->   P E R K Y
//* *
//* *****
//JOINTRUN EXEC PGM=JOINT,SYSTEM=FEP2
//STEPLIB DD DSN=PA42#.JOINT.LOAD,DISP=SHR,LABEL=(,,IN)
//SYSPRINT DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)
//FT04F001 DD SPACE=(TRK,(50,5)),UNIT=WORK
//*----- ( INPUT DATA )-----
//FT05F001 DD DSN=PA42A.Z10AVID.DATA(PRZ18GV1),DISP=SHR,LABEL=(,,IN)
//*----- ( X-SECTION DATA FILE )-----
//USERPDS DD DSN=PA42#.ZPPR10A.MAC18G.XSEC,DISP=SHR,LABEL=(,,IN)
//MICROPDS DD DSN=PA42#.ZPPR10A.MAC18G.XSEC,DISP=SHR,LABEL=(,,IN)
//FT06F001 DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)
//*****
//FT08F001 DD DISP=(NEW,PASS,DELETE),UNIT=WORK,      *INPUT DATA *
//      SPACE=(TRK,(50,5)),DSN=&&INPUT,      *FOR NEXT JOB STEP*
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=6240) *BY CARD FORM *
//*****
//FT09F001 DD DISP=(NEW,PASS,DELETE),      *CROSS SECTIONS *
//      SPACE=(TRK,(50,5)),UNIT=WORK,      *FOR NEXT JOB STEP*
//      DSN=&&BMACRO      *BY BINARY FORM *
//*****
//FT10F001 DD DISP=(NEW,PASS,DELETE),UNIT=WORK,      *CROSS SECTIONS *
//      SPACE=(TRK,(50,5)),DSN=&&CCROSS,      *FOR NEXT JOB STEP*
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=6240) *BY CARD FORM *
//*****
//FT30F001 DD DISP=(NEW,PASS,DELETE),      *CROSS SECTIONS *
//      SPACE=(TRK,(50,5)),UNIT=WORK,      *FOR NEXT JOB STEP*
//      DSN=&&BMICRO      *BY BINARY FORM *
//*****
//FT40F001 DD DISP=(NEW,PASS,DELETE),      *DELAYED NEUTRON *
//      SPACE=(TRK,(10,5)),UNIT=WORK,      *FOR NEXT JOB STEP*
//      DSN=&&BDELAY      *BY BINARY FORM *
//*****
//FT50F001 DD SYSOUT=*,
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)
//*-----
//PERKY EXEC PGM=TEMPNAME,COND=(4,LT)
//*TEPLIB DD DSN=PA42B.PERKY.FCA.LOAD,DISP=SHR,LABEL=(,,IN) (TEMPNAME)
//SYSPRINT DD SYSOUT=*,

//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)
//*----- ( CITATION #34 OUTPUT )-----
//FT01F001 DD DSN=PA42A.ZPPR10A.RZ18GVR.FT34,DISP=SHR,LABEL=(,,IN)
//*-----
//FT02F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=(BLKSIZE=18628)
//FT03F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT04F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT05F001 DD DSN=*.JOINTRUN.FT08F001,DISP=(OLD,DELETE)
//FT06F001 DD SYSOUT=*,DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)
//FT08F001 DD DSN=*.JOINTRUN.FT09F001,DISP=(OLD,DELETE)
//FT10F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT11F001 DD DSN=*.JOINTRUN.FT30F001,DISP=(OLD,DELETE)
//FT13F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT14F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT15F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT16F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT17F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT18F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT19F001 DD UNIT=WORK,SPACE=(TRK,(100,50)),DCB=*.FT02F001
//FT21F001 DD DSN=*.JOINTRUN.FT40F001,DISP=(OLD,DELETE)

```


Fig. 5. 15 輸送振動計算コード SNPRT 実行JCL

 ** SNPGR **

```

//PA42ASNP JOB (PA42A),Z09V20,MSGCLASS=X,NOTIFY=PA42A,MSGLEVEL=(1,1), 00000010 SNPGR
//      ATTR=(T0,C4,W4) 00000030 SNPGR
//*ROUTE PRINT HONSYA 00000040 SNPGR
//*----- 00000050 SNPGR
//*      PA42A.ZPPR.CNTL(SNPGR) 00000060 SNPGR
//*----- 00000070 SNPGR
//* +-----+ 00001260 SNPGR
//* | 00001270 SNPGR
//* |      J O I N T -----> SNPRT | 00001280 SNPGR
//* | 00001290 SNPGR
//* +-----+ 00001350 SNPGR
//JOINTRUN EXEC PGM=JOINTCP 00001360 SNPGR
//STEPLIB DD DSN=PA42A.JOINT.LOAD,DISP=SHR 00001370 SNPGR
//SYSPRINT DD SYSOUT=*, 00001380 SNPGR
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043) 00001390 SNPGR
//*---( INPUT CROSS SECTION DATA )----- 000000150 SNPGR
//USERPDS DD DSN=PA421.ZPPR09.MAC18G.XSEC,DISP=SHR,LABEL=(,,IN) SNPGR
//FT04F001 DD UNIT=SYSDA,SPACE=(TRK,(10,2)), 00001410 SNPGR
//      DISP=(,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200,BUFNO=1) 00001420 SNPGR
//*---( INPUT DATA )----- 000000150 SNPGR
//FT05F001 DD DSN=PA42A.Z09SNP.DATA(EPV20),DISP=SHR 00000160 SNPGR
//FT06F001 DD SYSOUT=*, 00002520 SNPGR
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043) 00002530 SNPGR
//*----- 00001460 SNPGR
//FT08F001 DD DISP=(NEW,PASS),UNIT=SYSDA, *INPUT DATA * 00001470 SNPGR
//      SPACE=(TRK,(10,10)),DSN=&&INPUT, *FOR NEXT JOB STEP* 00001480 SNPGR
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120) *BY CARD FORM * 00001490 SNPGR
//*----- 00001500 SNPGR
//FT09F001 DD DISP=(NEW,PASS,DELETE),UNIT=SYSDA, *CROSS SECTIONS * 00001510 SNPGR
//      SPACE=(TRK,(10,10)),DSN=&&BCROSS *FOR NEXT JOB STEP* 00001520 SNPGR
//* *BY BINARY FORM * 00001530 SNPGR
//*----- 00001540 SNPGR
//FT10F001 DD DISP=(NEW,PASS),UNIT=SYSDA, *CROSS SECTIONS * 00001550 SNPGR
//      SPACE=(TRK,(10,10)),DSN=&&CCROSS, *FOR NEXT JOB STEP* 00001560 SNPGR
//      DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120) *BY CARD FORM * 00001570 SNPGR
//*----- 00001580 SNPGR
//FT20F001 DD DUMHY 00001590 SNPGR
//FT50F001 DD SYSOUT=*, 00002540 SNPGR
//      DCB=(RECFM=FBA,LRECL=137,BLKSIZE=19043) 00002550 SNPGR
//*----- 00001620 SNPGR
//UPDT EXEC FORTXCL, 00000520 SNPGR
//      PARH.FORT='LANGLVL(66),GOSTHT,NOSTATIS', 00000520 SNPGR
//      REGION.FORT=512K, 00000520 SNPGR
//      PARH.LKED='MAP,LIST,LET,LREP(JNF,JMP)',COND.LKED=(8,LE) 00000520 SNPGR
//FORT.SYSPRINT DD SYSOUT=* 00000520 SNPGR
//FORT.SYSIN DD * 00000520 SNPGR
C*----- BLOCK DATA ADDED BY S.ICHIKAWA 81.3.6 SNPGR
C*----- DEFINES VARIABLE DIMENSION SIZE SNPGR
      BLOCK DATA SNPGR
      COMMON /VDIN/ NREGD, NGRPD, KDOWND, NELND, ITD, JTD, SNPGR
  
```

Fig. 5. 15 輸送振動計算コード SNPERT 実行JCL (続き)

```

*          IJTD, IREGD, JREGD, ISND, MTD, IGMD,          SNPGO
*          MAXLEN, IREGD1, JREGD1, NIDBY4, NCOMPD        SNPGO
C*----- FOR SNPERT  NREGD = IREGD*JREGD  COARSE ZONE NUMBER  SNPGO
C*-- L --             NGRPD = ENERGY GROUPE NUMBER          SNPGO
C*-- I --             KDOWND = DOWN SCATTERING GROUPE NUMBER, MUST BE 10  SNPGO
C*-- M --             NELMD = ?                               SNPGO
C*-- I -- FOR TRNSFM  ITD = I-DIRECTION FINE MESH NUMBER     SNPGO
C*-- T --             JTD = J-DIRECTION FINE MESH NUMBER     SNPGO
C*-- --              IREGD = I-DIRECTION COARSE MESH NUMBER   SNPGO
C*-- S --             JREGD = J-DIRECTION COARSE MESH NUMBER   SNPGO
C*-- I --             ISND = SN-ORDER                          SNPGO
C*-- Z --             IGMD = NGRPD                             SNPGO
C*-- E --             MAXLEN = RESTART FILE RECORD LENGTH     SNPGO
C*-- --              IJTD = ITD*JTD                            SNPGO
C*-----            MTD = (ISND*(ISND+2))/2                  SNPGO
C
CCCC DATA  NREGD/100/, NGRPD/18/, KDOWND/17/, NELMD/1/,    SNPGO
CCCC *      ITD/45/,   JTD/25/,   IREGD/10/, JREGD/10/,    SNPGO
CCCC *      ISND/8/,   IGMD/18/,   MAXLEN/70000/           SNPGO
CCCC DATA  NREGD/1000/, NGRPD/18/, KDOWND/17/, NELMD/1/,  SNPGO
CCCC *      ITD/36/,   JTD/26/,   IREGD/36/, JREGD/26/,    SNPGO
CCCC *      ISND/4/,   IGMD/18/,   NCOMPD/36/             SNPGO
      DATA  NREGD/64/, NGRPD/18/, KDOWND/17/, NELMD/1/,    SNPGO
      *      ITD/36/,   JTD/26/,   IREGD/ 8/, JREGD/ 8/,    SNPGO
      *      ISND/4/,   IGMD/18/,   NCOMPD/36/             SNPGO
C
      END
C  MAIN PROGRAM OF SNPERT      BY T.MITSUNARI 83/10/17      00010003  SNPGO
C
C  DIMENSION CORE( 1200000 )   00020003  SNPGO
C  DIMENSION CORE( 120000 )    00030003  SNPGO
C
C  MEMORY = 120000             00040003  SNPGO
C  MEMORY = 1200000            00050003  SNPGO
C
C  CALL MAIN1 ( CORE , MEMORY ) 00060003  SNPGO
C
C  STOP                         00070003  SNPGO
C  END                           00080003  SNPGO
/*
//LKED.SYSLIB DD DSN=SYS1.FORTLIB,DISP=SHR                   00090003  SNPGO
//LKED.SYSLMOD DD DSN=&&LOADC,UNIT=SYSDA,DISP=(NEW,PASS),    00100003  SNPGO
//          SPACE=(TRK,(150,50,10),RLSE)                    00000520  SNPGO
//LKED.SYSUT1 DD DSN=&SYSUT1,UNIT=SYSDA,SPACE=(TRK,(10,10),RLSE) 00000520  SNPGO
//LKED.OLDLM DD DSN=PA42A.SNPERT.LOAD,DISP=SHR               00000520  SNPGO
//LKED.SYSIN DD *
      INCLUDE OLDLM(SNPERT)
      ENTRY MAIN
      00000520  SNPGO
      00000520  SNPGO

//SNPERT EXEC PGM=SNPERIM
//STEPLIB DD DSN=&&LOADC,DISP=(OLD,DELETE)                   00000520  SNPGO
//SYSPRINT DD SYSOUT=*,
//          DCB=(RECFM=FBA,LRECL=137,BLKSIZE=8220)          00000530  SNPGO
//FT01F001 DD DSN=PA42A.@Z09TWT.V2018G.FT08,DISP=SHR      00000540  SNPGO
//FT02F001 DD DSN=PA42A.@Z09TWT.REF18G.FT08,DISP=SHR      00000550  SNPGO
//FT04F001 DD UNIT=WORK,SPACE=(TRK,(40,10)),DSN=&&FLUXG,    00430000  SNPGO
//          DISP=(NEW,DELETE),DCB=(RECFM=VBS,LRECL=19065,BLKSIZE=19069) 00440000  SNPGO
//FT08F001 DD UNIT=WORK,SPACE=(TRK,(40,10)),DSN=&&INTFLX,   00450000  SNPGO
//          DISP=(NEW,DELETE),DCB=(RECFM=VBS,LRECL=19065,BLKSIZE=19069) 00460000  SNPGO
//FT20F001 DD UNIT=WORK,SPACE=(TRK,(40,10)),DSN=&&NMLIST,   00470000  SNPGO
//          DISP=(NEW,DELETE),DCB=(RECFM=VBS,LRECL=19065,BLKSIZE=19069) 00480000  SNPGO
//FT09F001 DD DSN=&&CCROSS,DISP=(OLD,DELETE)                 00490000  SNPGO
//          DISP=(NEW,DELETE),DCB=(RECFM=VBS,LRECL=19065,BLKSIZE=19069) 00500000  SNPGO
//FT10F001 DD DSN=&&CCROSS,DISP=(OLD,DELETE)                 00510000  SNPGO
//          DISP=(NEW,DELETE),DCB=(RECFM=VBS,LRECL=19065,BLKSIZE=19069) 00530001  SNPGO
//FT06F001 DD SYSOUT=*
//FT05F001 DD UNIT=WORK,DISP=(OLD,DELETE),DSN=&&INPUT       00510000  SNPGO
//          DISP=(NEW,DELETE),DCB=(RECFM=VBS,LRECL=19065,BLKSIZE=19069) 00540000  SNPGO
//          00550000  SNPGO

```

Fig. 5. 16 輸送摂動計算コード SNPRT サンプルデータ

 ** SNPRT **

```

SNPERT          0
SCFS01  SLAROM
  18  18  10  0  0  2
  1  1  1
SNPERT EXACT PERTURBATION FROM TWOTRAN-2 RESULT ; CASE-1,REG-3
002
  18G,2D-RZ,SODIUM-VOID WORTH CAL.,
  -1
&TRANS
  NOUT=4*0
&END
SODIUM VOID WORTH TRANSPORT EP CAL(18G,RZ)--> CASE-1
&DATA
  NOUT=6,4*6,6,  ICON(2)=0,  NUNIT= 8, 9, 9,
  LIBRA = 4*1, 1*1, 1*2, 1*3, 1*7,
          4*1, 1*1, 1*2, 1*3, 1*7,
          5*5, 1*5, 1*3, 1*7,
          5*6, 1*6, 1*3, 1*7,
          5*6, 1*6, 1*4, 1*7,
          5*8, 1*8, 1*8, 1*9,
  LIBRAP= 4*10, 1*1, 1*2, 1*3, 1*7,
          4*10, 1*1, 1*2, 1*3, 1*7,
          5*5, 1*5, 1*3, 1*7,
          5*6, 1*6, 1*3, 1*7,
          5*6, 1*6, 1*4, 1*7,
          5*8, 1*8, 1*8, 1*9,
  IPERTR= 4*1, 2*0, 1*0, 1*0,
          4*1, 2*0, 1*0, 1*0,
          5*0, 1*0, 1*0, 1*0,
          5*0, 1*0, 1*0, 1*0,
          5*0, 1*0, 1*0, 1*0,
          5*0, 1*0, 1*0, 1*0,
&END
XS@
SCFS01  SLAROM          00000120 SNPRT
OTCS02  SLAROM          00000480 SNPRT
RBL03   SLAROM          00000500 SNPRT
RBUH04  SLAROM          00000500 SNPRT
RBUH04  SLAROM          00000520 SNPRT
ABLS05  SLAROM          00000520 SNPRT
ABUS06  SLAROM          00000580 SNPRT
RDRH07  SLAROM          00000580 SNPRT
AXRH08  SLAROM          00000580 SNPRT
MTXH09  SLAROM          00000580 SNPRT
SCVS10  SLAROM          00000580 SNPRT
000
00000140 SNPRT
00000150 SNPRT

```


Fig. 5. 17 反応率ファイル位置計算プログラム

```

*****
** MTXGO **
*****

//PA42AMTX JOB (PA42A),MATRIX,MSGCLASS=A,NOTIFY=PA42A,
//          ATTR=(TO,C2,W1)
//ROUTE PRINT HONSYA
//*-----
//*          JCLS.CNTL(MTRIX17)
//*-----
//          EXEC FORTXCLG,PARM.FORT='GOSTHT,OPT(2),LC(0),LANGLVL(66)',
//          PARM.LKED='NOMAP,NOXREF'
//FORT.SYSPRINT DD SYSOUT=*
//FORT.SYSIN DD DSN=PA42A.GMIPRO.FORT(MATRIX),DISP=SHR
//LKED.SYSPRINT DD SYSOUT=*
//LKED.SYSLIB DD DSN=SYS1.FORTLIB,DISP=SHR
//GO.FT05F001 DD *
//          1 179.55  0.0000  0.0          HF Z10C/10D/10D1/10D2
//*
//GO.FT06F001 DD SYSOUT=A
//GO.FT10F001 DD DSN=PA42B.Z10RR.EXP.DATA(D2),DISP=SHR,LABEL=(,,IN)
//GO.FT16F001 DD DSN=&&WORK,UNIT=WORK,DISP=(NEW,DELETE),
//          SPACE=(TRK,(10,5))
//GO.FT17F001 DD DSN=&&WORK,UNIT=WORK,DISP=(NEW,DELETE),
//          SPACE=(TRK,(10,5))
//GO.FT18F001 DD DSN=&&WORK,UNIT=WORK,DISP=(NEW,DELETE),
//          SPACE=(TRK,(10,5))
//GO.FT50F001 DD DSN=&&MTRX,UNIT=WORK,DISP=(NEW,PASS),
//          DCB=(LRECL=80,RECFM=FB,BLKSIZE=3200),
//          SPACE=(TRK,(10,5))
//C1          EXEC PGM=JSDGENER
//SYSPRINT    DD SYSOUT=*
//SYSUT1      DD DSN=&&MTRX,DISP=(OLD,DELETE)
//SYSUT2      DD DSN=PA42A.Z10LAG.FT10(Z10D2HF),DISP=SHR
//SYSIN       DD DUMMY

```

Fig. 5. 18 反応率分布計算コード LAGOON 実行JCL

```

*****
** LAGGO **
*****

//PA42ALAG JOB (PA42A),Z09LAG,HSGCLASS=X,HSGLEVEL=(1,1),NOTIFY=PA42A,
//          ATTR=(T2,C4,W2)
//*ROUTE PRINT HONSYA
//*-----
//*   'PA42#.SAMPLE.CNTL(LAGGO)'
//*-----
//STEP0 EXEC FORTXCLG
//FORT.SYSIN DD DSN=PA42A.GMIPRO.FORT(STRIP3),DISP=SHR,LABEL=(,,IN)
//GO.FT06F001 DD SYSOUT=*
//GO.FT09F001 DD DISP=(NEW,PASS),UNIT=WORK,DSN=&&FT09,
//          DCB=(RECFM=VBS,LRECL=4092,BLKSIZE=4096),
//          SPACE=(TRK,(150,50))
//*---( CITATION OUTPUT #34 )-----
//GO.FT34F001 DD DSN=PA42A.ZPPR09.XYZ07GTR.FT34,DISP=SHR,
//          LABEL=(,,IN)
//*-----
//STEP1 EXEC FORTXCL,PARM.FORT='GOSTMT',PARM.LKED='MAP,LIST'
//FORT.SYSPRINT DD SYSOUT=*
//FORT.SYSIN DD *
C
C          PROGRAM LAGOON  MAIN.ROUTINE.
C
C +-----+-----+-----+-----+-----+-----+
C | COMMON   | 100000 | 150000 | 200000 | 300000 | 400000 | 500000 |
C +-----+-----+-----+-----+-----+-----+
C | CORE (KB) | 2      | 3      | 4      | 5      | 6      | 7      |
C +-----+-----+-----+-----+-----+-----+
C
COMMON /ARRAY/ A(350000)
MEMORY      = 350000
C
CALL MAIN1 (A,MEMORY)
STOP
END
/*
//LKED.SYSPRINT DD SYSOUT=*
//LKED.SYSLMOD DD DSN=&&LOADM,DISP=(NEW,PASS),UNIT=WORK,
//          SPACE=(TRK,(30,5,5),RLSE)
//INFORT DD DSN=PA40A.LAGOON.OBJ,DISP=SHR,LABEL=(,,IN)
//LKED.SYSIN DD *
INCLUDE INFORT(ASM,FORT6)
ENTRY MAIN
NAME LAGOON
/*
//DATAP EXEC PGM=DATAP
//STEPLIB DD DISP=SHR,DSN=PA40A.DATAP.LOAD,LABEL=(,,IN)
//FT06F001 DD SYSOUT=*
//FT09F001 DD UNIT=SYSDA,DSN=&&INPUT,DISP=(,PASS),SPACE=(CYL,(1,1))
//FT05F001 DD DSN=PA42A.Z10LAG.DATA(Z09XYZ),DISP=SHR
//STEP2 EXEC PGM=LAGOON

//STEPLIB DD DSN=&&LOADM,DISP=(OLD,DELETE),UNIT=WORK
//*
//*   IN      FT05  -- REACTION RATE INPUT DATA
//*   IN      FT10  -- EXPT. & XYZ COORDINATE
//*   IN      FT11  -- FLUX DATA INPUT
//*   OUT     FT20  -- REACTION RATE OUTPUT DATA FILE
//*   IN      FT55  -- CITATION 004 INPUT DATA
//*   IN USERPDSM -- PDS FILE INPUT
//*   WORK    FT08  -- FLUX INTERPOLATION WORK FILE
//*   WORK    FT12  -- FLUX CONVERSION WORK FILE
//*
//FT05F001 DD DISP=(OLD,DELETE),UNIT=SYSDA,DSN=&&INPUT
//FT06F001 DD SYSOUT=*
//FT08F001 DD DISP=(NEW,DELETE),UNIT=WORK,DSN=&&WORK,
//          SPACE=(TRK,(30,5))
//FT09F001 DD SYSOUT=*
//FT10F001 DD DISP=SHR,DSN=PA42A.Z10LAG.FT10(Z09QC)
//*---( CITATION OUTPUT #09 )-----
//FT11F001 DD DISP=(OLD,DELETE),DSN=&&FT09
//FT12F001 DD DISP=(NEW,DELETE),UNIT=WORK,DSN=&&WORK12,

```

Fig. 5. 18 反応率分布計算コード LAGOON 実行JCL (続き)

```
//
//          SPACE=(TRK,(60,3))
//FT20F001 DD UNIT=SYSDA,DSN=&&FT20K,DISP=(NEW,PASS),
//          SPACE=(TRK,(5,3)),
//          DCB=(RECFM=FB,LRECL=82,BLKSIZE=3280)
//FT55F001 DD DISP=SHR,UNIT=DASD,LABEL=(,,,IN),
//          DSN=PA42A.Z10LAG.FT55(ZO9XYZ)
//USERPDSM DD DISP=SHR,DSN=PA42#.ZPPRO9.MICO7G.XSEC,LABEL=(,,,IN)
//JNR EXEC PGM=JSDGENER
//SYSPRINT DD SYSOUT=*
//SYSUT1   DD DSN=&&FT20K,DISP=(OLD,DELETE)
//SYSUT2   DD DSN=PA42A.Z10LAG.FT20(ZO9NST),DISP=SHR
//SYSIN    DD DUMMY
//
```

Fig. 5. 19 反応率分布計算コード LAGOON サンプルデータ

```
*****
** LAGOON **
*****
```

18	29	29	20	1001100N	00N	0	0	
*** U235(N,F)	R.RATE	:XYZ	JFS3	DIFF.18G	:STRETCH	REF.		LAGOON
1 206	2		6.310					LAGOON
SCFS01SD	2	1	19					LAGOON
SCFS02SD	2	20	20					LAGOON
DCFS02SD	2	21	21					LAGOON
SCFS02SD	2	22	22					LAGOON
DCFS02SD	2	23	23					LAGOON
SCFS02SD	2	24	24					LAGOON
RBLS03SC	2	25	28					LAGOON
SCFS01SD	2	29	47					LAGOON
SCFS02SD	2	48	48					LAGOON
DCFS02SD	2	49	49					LAGOON
SCFS02SD	2	50	50					LAGOON
DCFS02SD	2	51	51					LAGOON
SCFS02SD	2	52	52					LAGOON
RBLS03SC	2	53	56					LAGOON
SCFS01SD	2	57	75					LAGOON
SCFS02SD	2	76	76					LAGOON
DCFS02SD	2	77	77					LAGOON
SCFS02SD	2	78	78					LAGOON
DCFS02SD	2	79	79					LAGOON
SCFS02SD	2	80	80					LAGOON
RBLS03SC	2	81	84					LAGOON
RBLS03SC	2	85	88					LAGOON
SCFS02SD	2	89	89					LAGOON
DCFS02SD	2	90	90					LAGOON
SCFS02SD	2	91	91					LAGOON
DCFS02SD	2	92	92					LAGOON
SCFS02SD	2	93	93					LAGOON
SCFS01SD	2	94	111					LAGOON
SCFS01SD	2	112	119					LAGOON
DCFS02SD	2	120	123					LAGOON
RBLS03SC	2	124	126					LAGOON
SCFS01SD	2	127	133					LAGOON
ABLS05SC	2	134	136					LAGOON
ABUS06SC	2	137	138					LAGOON
SCFS01SD	2	139	145					LAGOON
ABLS05SC	2	146	148					LAGOON
ABUS06SC	2	149	150					LAGOON
SCFS01SD	2	151	157					LAGOON
ABLS05SC	2	158	160					LAGOON
ABUS06SC	2	161	162					LAGOON
SCFS02SD	2	163	169					LAGOON
ABLS05SC	2	170	172					LAGOON
ABUS06SC	2	173	174					LAGOON
SCFS02SD	2	175	181					LAGOON
ABLS05SC	2	182	184					LAGOON
ABUS06SC	2	185	186					LAGOON
RBLS03SC	2	187	196					LAGOON

付録 ADENライブラリデータ

ここに示したADENライブラリからのプレートデータは

1977年1月1日時点のものである。

TABLE A.1 ZPPR MATERIAL COMPOSITIONS

(UNIT:GRAM)

NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NAME	PUMD	PUMD	PUMD	PUMD	PUMD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	UDD8	UDD8	UDD8	UDD8	UDD8
WIDTH(IN)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.500	0.500	0.500	0.500	0.500	0.125	0.250	0.250	0.500	0.500
HEIGHT(IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.000	2.000	2.000	2.000
LENGHT(IN)	4.000	5.000	6.000	7.000	8.000	4.000	5.000	6.000	7.000	8.000	4.000	5.000	6.000	7.000	8.000	2.000	2.000	2.000	2.000	2.000
PU38	0.046	0.049	0.076	0.072	0.087	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	107.856	136.526	164.375	192.961	221.938	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	14.380	18.181	21.932	25.695	29.595	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	1.329	1.335	2.127	2.219	2.605	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	0.212	0.219	0.344	0.330	0.404	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MA41	0.817	0.996	1.285	1.411	1.606	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	0.664	0.839	1.017	1.188	1.367	--	--	--	--	--	--	--	--	--	--	0.106	0.106	0.214	0.218	0.442
U238	301.320	380.602	460.967	538.981	619.969	--	--	--	--	--	--	--	--	--	--	49.109	50.354	101.586	103.782	209.858
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	11.078	13.903	16.971	19.675	22.960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.005	0.006	8.753	9.017	18.180	18.580	37.590
B10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.005	0.006	--	--	--	--	--
NA	--	--	--	--	--	24.608	31.315	36.152	43.714	50.252	54.114	68.252	82.456	96.570	111.004	--	--	--	--	--
CA	--	--	--	--	--	0.010	0.012	0.014	0.017	0.020	0.022	0.027	0.033	0.039	0.044	--	--	--	--	--
CL	--	--	--	--	--	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.005	0.006	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	30.350	35.620	41.870	47.150	53.620	24.941	30.656	36.166	41.917	47.896	29.582	35.799	42.157	48.666	54.354	--	--	--	--	--
CR	8.210	9.640	11.330	12.750	14.510	6.686	8.218	9.695	11.237	12.840	7.930	9.597	11.301	13.046	14.571	--	--	--	--	--
NI	4.640	5.450	6.400	7.210	8.200	3.868	4.755	5.609	6.501	7.429	4.588	5.552	6.539	7.548	8.430	--	--	--	--	--
NN	0.740	0.870	1.020	1.150	1.310	0.527	0.648	0.764	0.886	1.012	0.625	0.757	0.891	1.029	1.149	--	--	--	--	--
SI	0.210	0.250	0.290	0.330	0.380	0.225	0.277	0.327	0.379	0.433	0.267	0.324	0.381	0.440	0.491	--	--	--	--	--
CU	0.060	0.070	0.080	0.090	0.100	0.044	0.054	0.063	0.073	0.084	0.052	0.063	0.074	0.085	0.095	--	--	--	--	--
MO	--	--	--	--	--	0.007	0.009	0.010	0.012	0.014	0.009	0.010	0.012	0.014	0.016	--	--	--	--	--
AL	0.020	0.020	0.030	0.030	0.030	0.018	0.022	0.025	0.030	0.034	0.021	0.025	0.030	0.034	0.038	--	--	--	--	--
CO	--	--	--	--	--	0.011	0.014	0.016	0.019	0.022	0.013	0.016	0.019	0.022	0.025	--	--	--	--	--
C	--	--	--	--	--	0.009	0.011	0.013	0.015	0.017	0.010	0.013	0.015	0.017	0.019	--	--	--	--	--
P	--	--	--	--	--	0.005	0.007	0.008	0.009	0.011	0.006	0.008	0.009	0.011	0.012	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	0.008	0.010	0.012	0.014	0.016	0.010	0.012	0.014	0.017	0.019	--	--	--	--	--
HIP	--	--	--	--	--	0.015	0.019	0.022	0.026	0.029	0.017	0.022	0.026	0.030	0.033	--	--	--	--	--
IA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONF.)

NO	(UNIT:GRAM)																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
NAME	PUMH	PUMH	PUMH	PUMH	PUMH	NACO	NACO	NACO	NACO	NACO	NACO	NACO	NACO	NACO	NACO	UD	UD	UD	UD	UD
WIDTH(CM)	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.125	0.125	0.125	0.125	0.125
HEIGHT(CM)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH(CM)	4.000	5.000	6.000	7.000	8.000	4.000	5.000	6.000	7.000	8.000	4.000	5.000	6.000	7.000	8.000	1.000	2.000	3.000	4.000	5.000
PU38	0.131	0.158	0.196	0.225	0.268	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	101.704	128.407	155.380	181.637	209.158	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	39.038	49.509	59.803	70.251	80.454	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	4.954	6.362	7.650	9.123	10.258	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	2.113	2.712	3.258	3.897	4.382	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AMA1	3.245	4.167	5.022	6.007	6.777	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	0.581	0.738	0.890	1.041	1.200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	275.765	348.396	421.435	493.066	567.174	--	--	--	--	--	--	--	--	--	--	0.160	0.330	0.490	0.650	0.820
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	74.560	148.360	223.510	296.950	370.510
NO	10.975	13.873	16.777	19.613	22.557	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	25.570	32.620	38.360	44.750	51.100	56.480	70.600	84.720	98.840	112.960	--	--	--	--	--
B10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	6.389	8.150	9.983	11.180	12.770	14.110	17.640	21.170	24.690	28.220	--	--	--	--	--
CA	--	--	--	--	--	24.490	31.240	36.730	42.850	48.930	54.080	67.600	81.120	94.640	108.160	--	--	--	--	--
CL	--	--	--	--	--	0.050	0.064	0.075	0.087	0.100	0.110	0.140	0.160	0.190	0.220	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	0.003	0.004	0.005	0.005	0.006	0.010	0.010	0.010	0.010	0.010	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
JI	--	--	--	--	--	0.005	0.006	0.007	0.009	0.010	0.010	0.010	0.020	0.020	0.020	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	30.010	36.070	41.250	45.920	52.330	24.760	30.390	36.320	41.980	47.620	29.450	35.300	41.700	48.260	54.100	--	--	--	--	--
CR	8.120	9.760	11.160	12.420	14.160	6.710	8.240	9.840	11.380	12.910	7.980	9.570	11.300	13.080	14.660	--	--	--	--	--
NI	4.580	5.520	6.310	7.020	8.000	3.780	4.640	5.540	6.400	7.260	4.490	5.380	6.360	7.360	8.250	--	--	--	--	--
HN	0.730	0.880	1.010	1.120	1.280	0.510	0.630	0.750	0.870	0.980	0.610	0.730	0.860	1.000	1.120	--	--	--	--	--
SI	0.210	0.250	0.290	0.330	0.380	0.170	0.250	0.250	0.290	0.330	0.210	0.250	0.290	0.340	0.380	--	--	--	--	--
CU	0.060	0.070	0.080	0.090	0.100	0.050	0.040	0.070	0.080	0.090	0.060	0.070	0.080	0.090	0.100	--	--	--	--	--
HD	--	--	--	--	--	0.030	0.030	0.050	0.060	0.060	0.040	0.050	0.060	0.060	0.070	--	--	--	--	--
AL	0.020	0.020	0.030	0.030	0.030	0.010	0.010	0.020	0.020	0.030	0.020	0.020	0.020	0.030	0.030	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TJ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

NO	UNIT:GRAM																			
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
NAME	UD	UD	UD	UD	UD	UD	UD	UD	FE0	FE0	FE0	FE0	FE	FE	FE	FE	FE	FE	COH	COH
WIDTH(IN)	0.125	0.125	0.125	1.000	1.000	1.000	2.000	2.000	0.125	0.125	0.109	0.109	1.000	1.000	1.000	2.000	2.000	2.000	2.000	2.000
HEIGHT(IN)	2.000	2.000	2.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	2.000	2.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	2.000
LENGTH(IN)	6.000	7.000	8.000	1.000	2.000	3.000	2.000	5.000	2.000	3.000	2.000	3.000	2.000	3.000	5.000	2.000	3.000	5.000	0.060	1.000
PU38
PU39
PU40
PU41
PU42
AH41
U235	0.980	1.150	1.310	0.670	1.340	2.020	5.400	13.090	..	..	..	..	..	..	..	..	..	..	..	..
U238	445.690	520.250	595.170	303.200	608.750	916.040	2451.600	5936.910	..	..	..	..	..	..	..	..	..	..	..	..
AL
MO	0.032	0.073
O	11.560	16.760	10.140	15.260	..	..	..	..	..	..	..	..
B10
B11
C	0.432	0.648	1.082	1.741	2.611	4.355	0.015	0.033
NA
CA
CL
FE	27.930	40.490	24.090	36.240	251.800	377.500	630.300	1014.070	1521.000	2538.000	17.043	38.797
CR	0.076	0.114	0.191	0.307	0.461	0.769	4.512	10.271
HI	2.269	5.166
NR	1.805	2.706	4.518	7.269	10.905	18.190	0.334	0.759
S1	0.107	0.244
CU	0.029	0.067
P	0.038	0.057	0.095	0.154	0.230	0.384	0.006	0.013
S	0.064	0.095	0.159	0.256	0.384	0.641	0.003	0.007
CO
N
TI
F
LIP
HIP
HG
II
DE
CS
D
NO
TA
TI
ZR
NP37
U234
U236
EUS1
EUS3
U232
U233
FE
CR
HI
NR
S1
CU
MO
AL
CO
C
P
S
DE
NR
TI
LIP
HIP
TA

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

NO	UNIT: GRAM																			
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
NAME	DSF	MATX	DSF	DSF	POLY	POLY	TA	TA	POLO	NI	NI	NI	NI	NI	SST	POLY	PPOL	SS75	SS75	SS75
WIDTH (IN)	2.000	2.175	2.000	2.000	1.000	2.000	0.063	0.063	--	0.250	0.250	0.250	0.250	0.250	0.250	2.000	2.000	1.000	2.000	2.000
HEIGHT (IN)	2.000	2.277	2.000	2.000	2.000	2.000	2.000	2.000	--	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH (IN)	1.000	1.000	0.036	0.072	7.000	6.000	3.000	2.000	--	2.000	2.000	5.000	7.000	8.000	3.000	2.000	12.000	6.000	6.000	4.000
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AH41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002	--	--	--	--
U235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	0.001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	0.014	0.152	0.020	0.024	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.800	--	--	--	--	--
B10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	168.542	--	--	--
B11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.954	--	--	--
C	0.006	0.031	0.015	0.011	187.791	236.788	--	--	--	0.040	0.080	--	--	--	--	--	31.006	--	--	--
HA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.100	592.685	464.630	1.028	1.814	0.090
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	7.478	30.909	13.337	12.809	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	1.980	8.285	2.892	3.391	--	--	--	--	--	0.110	0.210	0.290	0.400	0.460	135.110	--	--	1050.970	2106.216	88.400
NI	0.996	4.058	0.454	1.706	--	--	--	--	--	--	--	--	--	--	35.650	--	--	279.554	556.416	22.900
HN	0.146	0.788	0.104	0.251	--	--	--	--	--	70.030	140.600	357.130	499.700	571.480	16.600	--	--	139.777	280.325	11.670
SI	0.047	0.190	0.045	0.080	--	--	--	--	--	0.180	0.350	0.470	0.650	0.750	2.910	--	--	28.711	60.178	2.370
CU	0.013	0.108	0.017	0.022	--	--	--	--	--	0.040	0.070	--	--	--	0.520	--	--	10.124	17.237	0.690
P	0.003	0.014	0.003	0.004	--	--	--	--	--	0.040	0.070	--	--	--	0.380	--	--	--	--	--
S	0.001	0.005	0.001	0.002	--	--	--	--	--	--	--	--	--	--	0.060	--	--	--	0.514	1.210
CO	--	--	--	--	--	--	--	--	--	0.040	0.070	--	--	--	0.080	--	--	--	0.453	0.605
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.010
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	--	--	31.310	39.478	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	98.815	88.067	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	101.920	68.080	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

(UNIT:GRAM)

NO	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
NAME	SSTX	SSTX	SSTX	SSTX	SSH	SG	SS	SS	BEQ	DEQ	PUNH	PUNH	PUNH	PUNH	PUNH	C	DSF	DSF	DSF	PUNH
WIDTH(IN)	0.125	0.125	0.125	0.125	0.125	0.063	0.063	0.063	0.125	0.125	0.250	0.250	0.250	0.250	0.250	2.000	2.000	2.000	2.000	0.250
HEIGHT(IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	4.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH(IN)	5.000	6.000	7.000	8.000	3.000	6.000	9.000	3.125	2.000	3.000	4.000	5.000	6.000	7.000	8.000	24.750	1.000	0.031	0.062	1.000
PU38	--	--	--	--	--	--	--	--	--	--	0.065	0.082	0.100	0.118	0.136	--	--	--	--	0.009
PU39	--	--	--	--	--	--	--	--	--	--	106.959	135.374	163.415	191.272	220.090	--	--	--	--	22.603
PU40	--	--	--	--	--	--	--	--	--	--	14.199	17.961	21.728	25.442	29.279	--	--	--	--	3.001
PU41	--	--	--	--	--	--	--	--	--	--	1.452	1.826	2.245	2.648	3.021	--	--	--	--	0.253
PU42	--	--	--	--	--	--	--	--	--	--	0.232	0.292	0.360	0.425	0.486	--	--	--	--	0.040
AMA1	--	--	--	--	--	--	--	--	--	--	0.733	0.931	1.132	1.342	1.528	--	--	--	--	0.158
U235	--	--	--	--	--	--	--	--	--	--	0.668	0.840	1.020	1.194	1.373	--	--	--	--	0.140
U238	--	--	--	--	--	--	--	--	--	--	302.568	382.837	462.404	541.581	622.625	--	--	--	--	67.662
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	--	--	--	--	--	--	--	10.967	13.870	16.764	19.616	22.546	--	--	0.078	0.028	0.063
O	--	--	--	--	--	--	--	--	14.470	21.700	--	--	--	--	--	--	--	--	--	2.321
DT10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DT11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.110	0.130	0.150	0.160	0.040	0.010	0.010	0.010	0.021	0.031	--	--	--	--	--	2845.135	0.016	0.005	0.013	--
HA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	0.030	0.046	--	--	--	--	--	--	--	--	--	--
FE	109.910	132.810	154.390	175.200	37.570	10.510	10.610	10.670	--	--	--	--	--	--	--	--	--	16.344	6.654	13.249
CR	28.480	34.410	40.000	45.390	9.720	2.830	2.860	2.880	--	--	--	--	--	--	--	--	--	4.263	1.727	3.456
NI	14.510	17.540	20.390	23.130	4.960	1.380	1.390	1.400	--	--	--	--	--	--	--	--	--	2.117	0.863	1.716
MN	2.950	3.560	4.140	4.700	1.010	0.170	0.170	0.180	--	--	--	--	--	--	--	--	--	0.396	0.156	0.320
SI	0.860	1.040	1.210	1.380	0.290	0.110	0.110	0.110	--	--	--	--	--	--	--	--	--	0.155	0.064	0.127
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.096	0.039	0.078
P	0.060	0.080	0.090	0.100	0.020	0.004	0.004	0.004	--	--	--	--	--	--	--	--	--	0.005	0.001	0.004
S	0.020	0.020	0.020	0.030	0.005	0.001	0.001	0.001	--	--	--	--	--	--	--	--	--	0.002	0.001	0.002
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.028	0.012	0.023
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	0.048	0.073	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	0.001	0.001	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	8.150	12.220	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	30.150	35.320	41.140	46.830	52.990	--	--	--	--	12.620
CR	--	--	--	--	--	--	--	--	--	--	8.140	9.550	11.130	12.670	14.340	--	--	--	--	3.410
NI	--	--	--	--	--	--	--	--	--	--	4.610	5.400	6.290	7.160	8.100	--	--	--	--	1.930
MN	--	--	--	--	--	--	--	--	--	--	0.740	0.860	1.000	1.140	1.290	--	--	--	--	0.310
SI	--	--	--	--	--	--	--	--	--	--	0.210	0.250	0.290	0.330	0.380	--	--	--	--	0.090
CU	--	--	--	--	--	--	--	--	--	--	0.060	0.070	0.080	0.090	0.100	--	--	--	--	0.020
MO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	0.020	0.020	0.030	0.030	0.030	--	--	--	--	0.010
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

NO	UNIT:GRAM																			
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
NAME	CON	GTS	DSF	DSF	DSF	DSF	DSF	SPR	CON	SSF	SSF	SSTX	SSTX	SSTX	SSTX	SSTX	SSTX	SSTX	SSTX	SSTX
WIDTH(CM)	2.000	0.500	1.500	1.500	1.500	1.500	2.000	2.000	2.000	2.000	0.250	0.250	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
HEIGHT(IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.500	1.000	2.000	2.000	1.000	2.000	2.000	2.000	2.000
LENGTH(IN)	1.000	1.000	1.000	0.036	0.072	0.036	0.036	0.063	0.375	1.000	2.000	2.000	2.000	2.000	3.000	2.000	2.000	3.000	2.000	3.000
PU38
PU39
PU40
PU41
PU42
AM41
U235
U238
AL	0.003	..	0.001	0.001	..	..	..	..	..	..	..	..	..	..	..	..	..
BR	0.120	0.028	0.013	0.016	0.021	0.014	0.015	..	0.230	0.260	0.530	0.039	0.078	0.155	0.233	0.076	0.153	0.229	0.160	0.230
B
B10
B11
C	0.060	0.012	0.006	0.014	0.010	0.011	0.013	0.097	0.110	0.030	0.060	0.009	0.020	0.037	0.056	0.018	0.037	0.055	0.040	0.070
CA
CL
CR	68.170	14.824	6.861	12.078	11.486	11.178	12.437	9.862	123.890	44.390	89.180	11.564	23.277	46.300	69.727	21.365	42.935	64.314	44.060	65.850
NI	18.050	3.925	1.817	2.625	3.041	2.383	2.649	..	32.800	11.710	23.530	2.336	4.702	9.353	14.085	5.163	10.375	15.541	11.450	17.110
HN	9.080	1.975	0.914	0.425	1.530	0.309	0.338	..	16.500	5.450	10.950	1.253	2.522	5.017	7.556	3.138	6.347	9.508	5.320	7.990
SI	1.330	0.289	0.134	0.095	0.225	0.078	0.086	..	2.420	0.960	1.920	0.170	0.342	0.681	1.026	0.335	0.671	1.006	0.970	1.450
CU	0.430	0.093	0.043	0.041	0.072	0.034	0.039	..	0.780	0.170	0.340	0.062	0.124	0.248	0.373	0.182	0.366	0.549	0.120	0.190
P	0.130	0.026	0.012	0.018	0.020	0.015	0.018	..	0.210	0.130	0.250	0.031	0.062	0.124	0.187	0.060	0.123	0.183	0.120	0.190
S	0.020	0.006	0.002	0.003	0.004	0.004	0.003	..	0.040	0.020	0.040	0.004	0.008	0.015	0.023	0.008	0.015	0.023	0.016	0.023
CO	0.010	0.002	0.001	0.003	0.002	0.001	0.001	..	0.020	0.030	0.060	0.002	0.005	0.010	0.014	0.005	0.009	0.014	0.009	0.001
R
TI
F
LIP
III
MG
II
BE
CS
B
HO
TA
TI
ZR
NP37
U234
U236
EU51
EU53
U232
U233
FE
CR
NI
HN
SI
CU
HO
AL
CO
C
P
S
BE
NO
TI
LIP
III
TA

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT:GRAM)

NO	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
NAME	CAF	CAF	CAV	CAV	MO9	MO9	PU0F	PU0G	PU0H	UO0R	BC	BC	FECT	FECT	FECT	NAO0	FE	FE	BGS	BGS
WIDTH (IN)	2.000	2.000	2.000	2.000	2.000	2.000	--	--	--	--	0.500	0.250	0.125	0.125	0.125	0.250	2.000	2.000	2.000	2.000
HEIGHT (IN)	2.000	2.000	2.000	2.000	0.009	0.009	0.375	0.375	0.375	0.375	0.500	0.500	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH (IN)	12.000	12.000	12.000	12.000	6.000	2.000	6.000	6.000	6.000	6.000	1.000	1.000	2.000	2.000	3.000	3.000	3.000	--	4.000	5.000
PU38	--	--	--	--	--	--	0.009	0.009	0.010	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	10.190	20.434	9.808	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	1.364	2.724	3.660	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	0.151	0.310	0.514	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	0.020	0.047	0.020	--	--	--	--	--	--	--	--	--	--	--
AM41	--	--	--	--	--	--	0.055	0.103	0.150	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	--	0.150	0.117	0.139	0.159	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	--	66.752	54.755	64.446	78.948	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	--	16.990	33.500	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	10.574	10.476	10.594	10.642	--	--	--	--	--	19.150	--	--	--	--
O10	--	--	--	--	--	--	--	--	--	--	1.100	0.690	--	--	--	--	--	--	18.390	23.000
O11	--	--	--	--	--	--	--	--	--	--	4.600	3.110	--	--	--	--	--	--	81.980	102.530
C	--	--	--	--	--	--	--	--	--	--	1.600	1.100	0.047	0.094	0.142	4.784	2.775	9.273	28.890	36.130
NA	330.049	330.044	--	--	--	--	--	--	--	--	--	--	--	--	--	18.334	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.037	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	0.030	0.020	30.628	61.295	92.131	--	1510.880	5047.820	0.400	0.500
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	0.003	0.006	0.009	--	--	--	--	--
HN	--	--	--	--	--	--	--	--	--	--	--	--	0.123	0.247	0.371	--	10.416	34.799	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	0.005	0.006	0.012	0.018	--	0.366	1.223	0.100	0.130
CU	--	--	--	--	--	--	--	--	--	--	--	--	0.003	0.006	0.009	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.198	0.662	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002	0.366	1.223	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TII	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	417.216	413.782	416.816	414.429	--	--	8.615	8.601	8.615	8.617	--	--	--	--	--	18.340	--	--	28.560	35.040
CR	112.529	111.603	112.421	111.778	--	--	2.297	2.293	2.297	2.298	--	--	--	--	--	4.970	--	--	7.660	9.390
NI	59.826	59.334	59.769	59.427	--	--	1.196	1.194	1.196	1.196	--	--	--	--	--	2.800	--	--	4.430	5.430
HN	7.788	7.724	7.780	7.736	--	--	0.159	0.158	0.159	0.159	--	--	--	--	--	0.380	--	--	0.600	0.740
SI	3.236	3.209	3.233	3.214	--	--	0.058	0.058	0.058	0.058	--	--	--	--	--	0.128	--	--	0.300	0.370
CU	0.561	0.557	0.561	0.558	--	--	0.007	0.007	0.007	0.007	--	--	--	--	--	0.035	--	--	0.040	0.050
NO	0.308	0.305	0.308	0.306	--	--	0.007	0.007	0.007	0.007	--	--	--	--	--	0.024	--	--	0.030	0.040
AL	0.121	0.120	0.121	0.120	--	--	0.004	0.004	0.004	0.004	--	--	--	--	--	0.010	--	--	0.010	0.020
CO	0.567	0.563	0.567	0.563	--	--	0.011	0.011	0.011	0.011	--	--	--	--	--	--	--	--	--	--
C	0.145	0.144	0.145	0.144	--	--	0.003	0.003	0.003	0.003	--	--	--	--	--	--	--	--	--	--
P	0.072	0.072	0.072	0.072	--	--	0.002	0.002	0.002	0.002	--	--	--	--	--	--	--	--	--	--
S	0.066	0.066	0.066	0.066	--	--	0.001	0.001	0.001	0.001	--	--	--	--	--	--	--	--	--	--
BE	0.060	0.060	0.060	0.060	--	--	0.001	0.001	0.001	0.001	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	0.006	0.006	0.006	0.006	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	0.002	0.002	0.002	0.002	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

(UNIT:GRAM)

NO	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
NAME	BCS	BCS	DCS	PANN	PANN	PANN	PANI	PANI	PANI	DC	BC	OC	BC	FE0	PUNT	OCR	SSP	SSP	SSS	DCS1
WIDTH(IN)	0.500	0.500	0.500	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.250	0.250	0.500	0.125	0.125	--	--	--	--	0.250
HEIGHT(IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.500	0.500	0.500	0.750	2.000	0.375	0.375	0.375	0.375	0.500
LENGTH(IN)	6.000	7.000	8.000	1.000	2.000	3.000	1.000	2.000	3.000	2.000	2.000	3.000	3.000	4.000	6.000	2.000	4.000	6.000	6.000	2.000
PIA	--	--	--	--	--	--	0.001	--	0.002	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	30.699	65.592	98.982	30.529	65.352	98.814	--	--	--	--	--	0.018	--	--	--	--	--
PU40	--	--	--	1.459	3.122	4.716	1.448	3.056	4.682	--	--	--	--	--	79.686	--	--	--	--	--
PU41	--	--	--	0.056	0.120	0.208	0.064	0.140	0.184	--	--	--	--	--	10.602	--	--	--	--	--
PU42	--	--	--	--	--	0.005	0.024	0.030	0.060	--	--	--	--	--	0.936	--	--	--	--	--
ANA1	--	--	--	0.067	0.143	0.248	0.080	0.175	0.229	--	--	--	--	--	0.143	--	--	--	--	--
U235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.504	--	--	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.494	--	--	--	--	--
AL	--	--	--	0.365	0.770	1.158	0.385	0.820	1.251	--	--	--	--	--	223.564	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	0.003	--	--	--	--	8.083	--	0.017	0.026	0.006	--
B10	27.720	32.390	37.020	--	--	--	--	--	--	1.517	1.375	1.570	3.155	--	--	0.990	--	--	--	4.993
D11	123.600	144.420	165.040	--	--	--	--	--	--	6.763	6.129	7.005	14.077	--	--	4.456	--	--	--	0.562
C	43.560	50.890	58.160	--	--	--	--	--	--	2.409	2.160	2.458	4.940	0.093	--	1.473	0.037	0.055	0.005	2.456
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	0.610	0.710	0.810	--	--	--	--	--	--	0.005	0.029	0.044	0.089	46.233	--	0.034	40.866	61.313	6.203	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.460	15.694	1.681	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.635	6.954	0.831	--
HN	--	--	--	--	--	--	--	--	--	--	--	--	--	0.247	--	0.001	0.524	0.786	0.155	--
SI	0.160	0.180	0.210	--	--	--	--	--	--	--	0.010	--	--	--	--	0.001	0.188	0.282	0.053	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001	0.108	0.162	0.004	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	0.019	--	--	0.012	0.018	0.002	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	0.019	--	--	0.010	0.015	--	--
CO	--	--	--	--	--	--	--	--	--	0.010	--	--	--	--	--	0.001	0.054	0.081	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.030	0.045	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IIIIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	--	--	--	--	--	--	--	0.003	--	--	--	--	--	0.006	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7R	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	41.060	47.550	53.780	6.110	11.710	17.260	6.434	12.499	18.438	--	--	--	--	--	29.490	--	--	--	--	--
CR	11.010	12.750	14.420	1.620	3.100	4.570	1.703	3.308	4.880	--	--	--	--	--	7.980	--	--	--	--	--
NI	6.370	7.370	8.340	0.780	1.500	2.220	2.006	3.885	5.697	--	--	--	--	--	4.510	--	--	--	--	--
HN	0.870	1.000	1.140	0.150	0.290	0.420	0.157	0.305	0.450	--	--	--	--	--	0.720	--	--	--	--	--
SI	0.430	0.500	0.560	0.042	0.081	0.118	0.044	0.086	0.127	--	--	--	--	--	--	--	--	--	--	--
CU	0.060	0.070	0.080	0.024	0.047	0.069	0.026	0.050	0.074	--	--	--	--	--	--	--	--	--	--	--
MO	0.040	0.050	0.050	0.028	0.054	0.079	0.030	0.057	0.085	--	--	--	--	--	--	--	--	--	--	--
AL	0.020	0.020	0.030	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	0.006	0.011	0.016	0.006	0.012	0.017	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	0.002	0.004	0.006	0.002	0.004	0.007	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	0.002	0.003	0.005	0.002	0.004	0.005	--	--	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IIIIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A-1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT: GRAM)

NO	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	
NAME	BCE1	BCE1	BC1	BC1	BC1	BC1	BCE2	BC	BC	BCE1	BCR	PUMS	PUMS	PUMS	PUMS	PUMS	PUMS	PUMS	FEQ	VBC	
WIDTH (IN)	0.250	0.250	0.500	0.500	0.500	0.500	0.125	0.250	0.250	0.250	--	0.250	0.250	0.250	0.250	0.250	0.250	0.125	0.125	0.250	
HEIGHT (IN)	0.500	2.000	2.000	2.000	2.000	2.000	1.000	0.500	0.500	1.000	0.375	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.750	2.000
LENGTH (IN)	3.000	2.000	6.000	3.000	2.000	1.000	2.000	2.000	3.000	2.000	1.000	1.000	3.000	4.000	5.000	6.000	7.000	2.000	5.000	4.000	
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	13.502	52.172	71.501	90.489	110.146	128.753	14.132	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	1.287	4.970	6.818	8.627	10.500	12.275	1.348	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	0.075	0.288	0.397	0.500	0.608	0.711	0.078	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	0.021	0.030	0.040	0.058	0.069	--	--	--	--
AM41	--	--	--	--	--	--	--	--	--	--	--	0.059	0.248	0.351	0.465	0.586	0.709	0.061	--	--	--
U235	--	--	--	--	--	--	--	--	--	--	--	0.138	0.523	0.718	0.909	1.107	1.295	0.139	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	59.318	229.239	314.143	397.565	484.012	565.821	62.119	--	--	--
AL	--	--	--	--	--	--	--	0.012	0.017	--	--	--	--	--	--	--	--	--	--	--	0.070
MO	--	--	--	--	--	--	--	--	--	--	--	1.900	7.350	10.087	12.775	15.545	18.170	1.986	--	--	0.007
O	--	--	0.420	0.420	0.140	0.070	0.011	--	--	--	--	--	--	--	--	--	--	--	--	--	--
810	7.740	20.169	32.860	16.960	11.070	5.470	5.133	1.212	1.798	10.020	0.478	--	--	--	--	--	--	--	--	--	--
B11	0.871	2.269	146.540	75.620	49.380	24.380	0.478	5.615	8.323	1.127	2.152	--	--	--	--	--	--	--	--	--	--
C	3.807	9.921	51.040	25.610	17.200	8.490	1.616	2.001	2.966	4.932	0.711	--	--	--	--	--	--	--	--	0.117	0.009
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	2.200	0.720	0.740	0.370	--	0.018	0.026	--	0.016	--	--	--	--	--	--	--	57.795	25.790	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.910
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.000
MN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.309
SI	--	--	0.470	0.480	0.160	0.080	--	0.002	0.003	--	--	--	--	--	--	--	--	--	--	--	0.550
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.220
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.050
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.023
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.005
N	--	--	--	--	--	--	0.101	--	--	--	--	--	--	--	--	--	--	--	--	--	0.012
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	0.440	0.020	0.150	0.070	0.086	--	--	--	--	--	--	--	--	--	--	--	--	--	0.009
HIP	--	--	0.470	0.020	0.160	0.080	0.019	--	--	--	--	--	--	--	--	--	--	--	--	--	0.016
HG	--	--	--	--	--	--	--	--	--	--	0.003	--	--	--	--	--	--	--	--	--	--
H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GE	--	--	--	--	--	--	--	--	--	--	--	6.390	16.200	20.960	26.090	31.400	36.000	10.750	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	1.480	3.750	4.850	6.040	7.270	8.340	2.490	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	0.730	1.850	2.390	2.990	3.590	4.120	1.230	--	--	--
MN	--	--	--	--	--	--	--	--	--	--	--	0.070	0.170	0.210	0.270	0.320	0.370	0.110	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	0.040	0.100	0.130	0.160	0.190	0.220	0.070	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

NO	UNIT:GRAM																			
	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
NAME	VDC	VDC	VDC	VDC	VDC	VDC	VDC	VDC	VDC	AL	VDFS	TUD	TUB	TUB	C	C	VDFS	VDFS	VDFS	VDFS
WIDTH(1N)	0.250	0.250	0.250	0.250	0.500	0.500	0.500	0.500	0.500	0.125	0.250	--	--	--	0.063	0.125	0.250	0.250	0.250	0.250
HEIGHT(1H)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.500	0.625	0.625	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH(1N)	5.000	6.000	7.000	8.000	4.000	5.000	6.000	7.000	8.000	1.000	2.000	7.000	9.000	5.000	2.000	2.000	4.000	6.000	7.000	8.000
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AM41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	0.020	0.030	0.031	0.034	0.021	0.025	0.030	0.034	0.038	10.540	--	--	--	--	--	--	--	--	--	--
HO	0.009	0.011	0.012	0.014	0.009	0.010	0.012	0.014	0.016	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.011	0.014	0.015	0.017	0.010	0.013	0.015	0.017	0.019	--	0.013	0.012	0.030	0.019	5.630	12.750	0.025	0.040	0.044	0.050
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	30.550	38.670	44.264	48.498	29.628	35.935	42.225	49.052	54.874	--	12.553	9.642	24.366	15.089	--	--	24.817	39.909	44.104	50.371
CR	8.190	10.370	11.866	13.001	7.942	9.633	11.319	13.150	14.710	--	3.253	2.709	6.444	3.991	--	--	6.431	10.342	11.429	13.053
NI	4.740	6.000	6.865	7.522	4.595	5.574	6.549	7.608	8.511	--	1.660	1.424	3.741	2.317	--	--	3.281	5.276	5.831	6.660
HN	0.850	0.820	0.936	1.025	0.626	0.760	0.893	1.037	1.160	--	0.337	0.283	0.712	0.441	--	--	0.666	1.071	1.184	1.357
SI	0.780	0.350	0.400	0.438	0.268	0.325	0.382	0.443	0.496	--	0.098	0.141	0.356	0.220	--	--	0.195	0.313	0.346	0.396
CU	0.050	0.070	0.077	0.085	0.052	0.063	0.074	0.086	0.096	--	--	--	--	--	--	--	--	--	--	--
P	0.007	0.008	0.009	0.011	0.006	0.008	0.009	0.011	0.012	--	0.007	0.006	0.015	0.010	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	0.002	0.004	0.010	0.006	--	--	--	--	--	--
CO	0.014	0.017	0.020	0.022	0.013	0.016	0.019	0.022	0.025	--	--	--	--	--	--	--	0.014	0.023	0.025	0.029
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004	0.006	0.006	0.007
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	0.010	0.013	0.015	0.017	0.010	0.012	0.014	0.017	0.019	--	--	--	--	--	--	--	--	--	--	--
HIP	0.019	0.024	0.027	0.030	0.017	0.022	0.026	0.030	0.033	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT: GRAM)

NO	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
NAME	SS75	SS75	SS75	SS75	VDF5	VDC	VDC	VDC	VDC	BORL	HD18	HD18	PAH8	PAH8	PAH8	PUMT	PUMT	PUMT	PUDJ	PUDK
WIDTH (CM)	2.000	1.000	0.500	0.500	0.250	0.250	0.250	0.500	0.500	0.250	2.000	2.000	0.125	0.125	0.125	0.250	0.250	0.250	--	--
HEIGHT (CM)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.009	0.001	2.000	2.000	2.000	2.000	2.000	2.000	0.375	0.375
LENGTH (CM)	5.000	5.000	6.000	5.000	1.000	2.000	3.000	2.000	3.000	7.000	8.000	8.000	1.000	2.000	3.000	4.000	7.000	8.000	3.000	3.000
PIJ8	--	--	--	--	--	--	--	--	--	--	--	--	0.010	0.039	--	0.056	0.146	0.133	--	0.010
PU39	--	--	--	--	--	--	--	--	--	--	--	--	24.787	52.345	79.763	102.607	187.369	215.787	4.597	9.107
PI40	--	--	--	--	--	--	--	--	--	--	--	--	7.460	15.771	24.000	13.477	24.951	28.587	0.610	1.719
PU41	--	--	--	--	--	--	--	--	--	--	--	--	0.943	2.020	3.018	1.313	2.608	2.939	0.069	0.158
PU42	--	--	--	--	--	--	--	--	--	--	--	--	0.204	0.442	0.671	0.208	0.427	0.490	0.010	0.020
AM41	--	--	--	--	--	--	--	--	--	--	--	--	0.611	1.259	1.998	0.687	1.376	1.483	0.021	0.042
U235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.637	1.167	1.315	0.070	0.050
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	289.740	528.040	610.740	29.554	24.710
AL	--	--	--	--	--	0.010	0.010	0.010	0.020	106.000	--	--	0.387	0.828	1.246	--	--	--	--	--
HD	--	--	--	--	--	0.004	0.005	0.005	0.006	--	55.000	79.333	--	--	--	10.462	19.122	21.975	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.661
B10	--	--	--	--	--	--	--	--	--	4.610	--	--	--	--	--	--	--	--	--	4.677
B11	--	--	--	--	--	--	--	--	--	20.550	--	--	--	--	--	--	--	--	--	--
C	1.547	0.863	0.527	0.440	0.006	0.005	0.007	0.006	0.008	7.940	--	--	--	--	--	--	--	--	--	--
HA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	1795.570	882.471	528.125	440.515	6.257	14.000	19.890	16.870	23.420	--	--	--	--	--	--	--	--	--	--	--
CR	474.350	234.734	137.700	114.857	1.622	3.750	5.330	4.530	6.280	--	--	--	--	--	--	--	--	--	--	--
NI	238.980	117.367	68.850	57.428	0.827	2.170	3.080	2.620	3.630	--	--	--	--	--	--	--	--	--	--	--
HN	51.302	24.108	13.484	11.247	0.168	0.300	0.420	0.360	0.500	--	--	--	--	--	--	--	--	--	--	--
SI	14.695	8.501	4.068	3.393	0.049	0.130	0.180	0.150	0.210	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	0.020	0.030	0.030	0.040	--	--	--	--	--	--	--	--	--	--	--
P	1.031	0.431	0.256	0.214	0.004	0.003	0.004	0.004	0.005	--	--	--	--	--	--	--	--	--	--	--
S	0.515	0.381	0.211	0.176	0.001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	0.006	0.009	0.008	0.010	--	--	--	--	--	--	--	--	--	--	--
H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	0.005	0.007	0.006	0.008	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	0.009	0.012	0.010	0.014	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	6.330	12.190	18.250	32.450	51.750	55.290	4.825	4.846
CR	--	--	--	--	--	--	--	--	--	--	--	--	1.670	3.230	4.830	8.780	14.000	14.960	1.287	1.292
NI	--	--	--	--	--	--	--	--	--	--	--	--	0.810	1.570	2.340	4.960	7.910	8.460	0.670	0.673
HN	--	--	--	--	--	--	--	--	--	--	--	--	0.150	0.300	0.450	0.790	1.260	1.350	0.089	0.089
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.033	0.033
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004	0.004
HO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004	0.004
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002	0.002
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.006	0.006
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002	0.002
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001	0.001
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001	0.001
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001	0.001
HB	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.003	0.003
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001	0.001

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

NO	(UNIT:GRAM)																			
	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
NAME	DCPR	PUNT	PUNT	PUNT	PUNT	HTU	HTU	DSF	DSF	DSF	DSF	DSF	DSF	DSF	DSF	TH	TH	TH	TH	HALI
WIDTH(IN)	0.270	0.250	0.125	0.250	0.250	2.175	2.175	2.000	2.000	2.000	1.500	1.500	1.500	1.500	1.500	0.076	0.076	0.125	0.500	0.500
HEIGHT(IN)	1.940	2.000	2.000	2.000	2.000	2.175	2.175	2.000	2.000	2.000	1.000	1.687	1.687	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH(IN)	1.840	4.000	2.000	5.000	6.000	1.000	1.000	0.030	1.000	0.060	1.000	0.035	0.031	1.000	0.031	1.500	2.750	2.000	2.000	2.000
PU38	--	0.038	--	0.065	0.093	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	100.813	58.532	131.217	158.992	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	13.451	2.786	17.344	21.315	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	1.135	0.107	1.512	2.121	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	0.169	--	0.242	0.345	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AMA1	--	0.694	0.128	0.806	1.133	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	0.626	--	0.800	0.975	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	--	284.102	--	370.494	448.920	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	0.016	0.077	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	10.307	0.030	13.352	16.420	0.063	0.102	0.058	0.050	0.041	0.046	0.040	0.034	0.030	0.012	--	--	--	--	--
O	0.112	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PI0	24.550	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.217	0.397	0.449	1.891	0.001
B11	2.730	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	8.240	--	--	--	--	0.018	0.029	0.012	0.016	0.013	0.015	0.008	0.011	0.016	0.007	--	--	--	--	--
NA	0.002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	24.445
CL	0.002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.010
GE	0.145	--	--	--	--	18.940	30.763	11.485	16.796	13.830	15.602	8.511	11.459	16.255	6.703	--	--	--	--	0.001
CR	--	--	--	--	--	4.900	7.959	3.033	4.325	3.561	4.018	2.245	2.951	4.130	1.703	--	--	--	--	--
NI	--	--	--	--	--	2.234	3.629	1.511	1.990	1.639	1.848	1.112	1.358	1.884	0.777	--	--	--	--	--
MN	0.001	--	--	--	--	0.461	0.749	0.253	0.409	0.337	0.386	0.203	0.279	0.378	0.156	--	--	--	--	--
SI	--	--	--	--	--	0.152	0.247	0.078	0.148	0.122	0.137	0.054	0.101	0.014	0.006	--	--	--	--	--
CU	--	--	--	--	--	0.087	0.141	0.035	0.062	0.051	0.057	0.023	0.042	0.039	0.016	--	--	--	--	--
P	--	--	--	--	--	0.007	0.011	0.004	0.007	0.006	0.007	0.003	0.005	0.006	0.002	--	--	--	--	--
S	--	--	--	--	--	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	--	--	--	--	--
CO	0.001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	0.134	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	0.001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	0.002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43.108	78.945	89.296	376.269	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	30.230	13.780	38.190	43.810	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16.900
CR	--	8.180	3.730	10.330	11.850	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.580
NI	--	4.620	2.110	5.840	6.700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.580
MN	--	0.740	0.340	0.930	1.070	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.150
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.120
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.030
MO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.020
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.010
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT: GRAM)

NO	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260
NAME	EU0	SSTX	FERD	TAR	B10R	U33	OSF	CALD	THRD	UO2R	SSV	SSV	HALT	AL	OSF	C	C	DSO	OSB	DSB
WIDTH (IN)	0.250	0.125	--	--	--	0.250	0.875	2.000	--	--	0.125	0.250	0.250	0.250	2.000	2.000	2.000	2.000	2.000	2.000
HEIGHT (IN)	2.000	1.000	0.375	0.375	0.375	2.000	2.000	2.000	0.625	0.625	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH (IN)	6.000	8.000	1.930	6.000	1.000	3.000	--	8.000	8.000	8.000	8.000	8.000	2.000	2.000	0.031	11.000	4.000	1.000	0.031	0.031
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AH41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	0.023	--	--	--	1.489	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	0.190	--	--	--	724.627	--	--	--	--	--	--	--	--	--	--
AL	0.076	--	--	--	--	0.011	--	--	--	--	--	--	42.550	--	--	--	--	--	--	--
MO	--	0.213	--	--	--	--	0.020	2.120	--	--	--	--	--	--	0.038	--	--	0.045	0.024	0.026
D	34.616	--	--	--	0.004	5.052	--	--	87.279	97.922	--	--	0.001	--	--	--	--	--	--	--
B10	--	--	--	--	2.446	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B11	--	--	--	--	0.234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.255	0.083	0.297	--	0.823	--	0.011	0.550	--	--	0.009	0.022	0.001	--	0.008	1118.400	406.600	0.016	0.008	0.009
NA	--	--	--	--	--	--	--	240.980	--	--	--	--	11.323	--	--	--	--	--	--	--
CA	--	--	--	--	0.001	--	--	--	--	--	--	--	0.004	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	0.001	--	--	--	--	--	--	--
FE	35.742	82.140	168.226	--	0.002	18.634	11.159	623.680	--	--	7.458	18.504	--	--	8.047	--	--	16.823	8.854	9.648
CR	9.669	21.573	--	--	--	5.043	2.835	159.960	--	--	2.095	5.114	--	--	2.099	--	--	4.416	2.324	2.533
NI	5.466	10.520	--	--	--	3.359	1.293	72.880	--	--	1.101	2.687	--	--	1.042	--	--	1.982	1.043	1.117
MN	0.872	2.035	1.274	--	--	0.453	0.259	14.730	--	--	0.219	0.535	--	--	0.196	--	--	0.407	0.214	0.253
SI	0.250	0.544	--	--	0.001	0.134	0.009	5.120	--	--	0.109	0.266	--	--	0.076	--	--	0.015	0.008	0.008
CU	0.070	0.237	--	--	--	0.035	0.027	2.910	--	--	--	--	--	--	0.047	--	--	0.057	0.030	0.033
P	--	0.986	0.068	--	--	--	0.004	0.240	--	--	0.005	0.011	--	--	0.002	--	--	0.007	0.004	0.004
S	--	0.007	0.034	--	--	--	0.002	0.070	--	--	0.003	0.008	--	--	0.001	--	--	0.002	0.001	0.001
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.014	--	--	--	--	--
N	--	--	--	--	0.001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	180.900	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	621.730	--	--	--	--	--	--	--	--	--	--	--
TH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	0.335	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	0.480	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS1	104.997	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS3	114.662	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	0.019	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	27.380	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	37.320	38.370	--	--	--	13.800	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	9.640	9.906	--	--	--	3.740	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	4.630	4.759	--	--	--	2.100	--	--	--	--	--	--	--
MN	--	--	--	--	--	--	--	0.960	0.988	--	--	--	0.290	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	0.210	0.218	--	--	--	0.100	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	0.150	0.153	--	--	--	0.030	--	--	--	--	--	--	--
MO	--	--	--	--	--	--	--	0.130	0.136	--	--	--	0.020	--	--	--	--	--	--	--
AL	0.020	--	--	--	--	--	--	--	--	--	--	--	0.010	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	0.030	0.028	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	0.010	0.015	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	0.010	0.008	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

NO	(UNIT:GRAM)																			
	761	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280
MATERIAL	POLY	SSIX	DSF	NALT	NALT	NALT	NALT	NALT	NALT	NALT	NALT	FE	DSF	SST	SST	SST	SST	SST	DSF	U93A
WIDTH (IN)	2.000	0.125	2.000	0.500	0.500	0.500	0.500	0.250	0.250	0.250	0.250	2.000	2.000	2.000	2.000	1.000	0.250	0.250	2.000	0.063
HEIGHT (IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.000	2.000	2.000	2.000	2.000
LENGTH (IN)	7.000	2.000	0.031	3.000	4.000	7.000	8.000	3.000	4.000	7.000	8.000	3.000	0.031	12.000	11.000	5.000	5.000	6.000	0.030	6.110
PU38
PU39
PU40
PU41
PU42
AMA1
U235
U238	205.154
AL	17.045
HO	..	0.123	0.034	..	..	..	..	..	..	..	..	..	0.050	16.840	15.450	0.750	1.340	1.550	0.046	..
O	0.002	0.003	0.005	0.005	0.001	0.001	0.002	0.002	..	..	..	..	..	..	..	..	..
B10
B11
C	276.240	0.037	0.007	0.002	0.003	0.005	0.005	0.001	0.001	0.002	0.002	2.654	0.010	3.580	3.280	0.310	0.160	0.180	0.010	..
HA	39.216	54.267	95.503	107.346	17.250	23.206	41.545	44.883	..	..	..	..	..	..	..	..	..
CA	0.016	0.022	0.038	0.043	0.007	0.009	0.017	0.018	..	..	..	..	..	..	..	..	..
CL	0.002	0.003	0.005	0.005	0.001	0.001	0.002	0.002	..	..	..	..	..	..	..	..	..
FE	..	44.012	7.206	..	..	..	..	..	..	..	..	1518.376	9.970	4276.969	3921.421	442.000	225.610	260.400	9.562	..
CR	..	10.958	1.879	..	..	..	..	..	..	..	..	0.341	2.608	1122.270	1028.970	124.160	59.520	68.700	2.524	..
N1	..	5.646	0.934	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
HH	..	0.844	0.175	..	..	..	..	..	..	..	..	..	1.303	532.040	487.870	58.440	27.710	31.990	1.250	..
SI	..	0.290	0.068	..	..	..	..	..	..	..	..	10.778	0.221	83.630	76.670	8.800	4.860	5.610	0.228	..
CU	..	0.158	0.042	..	..	..	..	..	..	..	..	0.095	0.094	20.420	18.720	2.700	0.860	1.000	0.060	..
P	..	0.016	0.002	..	..	..	..	..	..	..	..	..	0.056	5.990	5.510	0.690	0.640	0.740	0.026	..
S	..	0.009	0.001	..	..	..	..	..	..	..	..	0.222	0.003	1.820	1.670	0.150	0.100	0.110	0.003	..
CO	..	0.054	0.012	..	..	..	..	..	..	..	..	0.379	0.002	1.880	1.720	0.100	0.130	0.150	0.001	..
N	0.014	..	..	..	..	..	..	..
TI
F
LIP
HIP
MG
II	46.060	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
DE
CS
B
ND
TA
TI
ZR
HP37
U234
U236	2.004
EU51	0.969
EU53
U232
U233
FE	23.450	30.210	49.280	55.840	19.570	24.870	43.140	51.700	..	..	..	..	..	..	..	..	12.615
CR	6.350	8.190	13.350	15.130	5.300	6.740	11.690	14.010	..	..	..	..	..	..	..	..	3.342
H1	3.570	4.610	7.510	8.510	2.980	3.790	6.580	7.880	..	..	..	..	..	..	..	..	1.537
HH	0.480	0.620	1.020	1.150	0.400	0.510	0.890	1.070	..	..	..	..	..	..	..	..	0.275
SI	0.160	0.210	0.340	0.390	0.140	0.170	0.300	0.360	..	..	..	..	..	..	..	..	0.110
CU	0.040	0.060	0.090	0.110	0.040	0.050	0.080	0.100	..	..	..	..	..	..	..	..	0.015
HO	0.030	0.040	0.060	0.070	0.030	0.030	0.060	0.070	..	..	..	..	..	..	..	..	0.063
AL	0.010	0.020	0.030	0.030	0.010	0.010	0.030	0.030	..	..	..	..	..	..	..	..	0.012
CO	0.010
C	0.005
P	0.003
S
DE
ND
TI
LIP
HIP
TA

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT: GRAM)

NO	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
NAME	U93B	U93C	U93D	U93E	U93F	U93G	U93H	U93I	ZR-C	ZR-V	SSTX	UD	SSTX	UD	UD	UD	UD	UD	UD	AL
WIDTH(IN)	0.063	0.063	0.063	0.063	0.125	0.125	0.125	0.125	0.125	0.063	0.063	0.063	0.063	0.125	0.125	0.125	0.063	0.063	0.063	1.000
HEIGHT(IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.500	1.000	0.500	2.000	2.000	1.000	1.000
LENGTH(IN)	6.110	8.110	4.110	4.110	8.110	6.110	6.110	4.110	3.000	3.000	3.000	3.000	2.000	2.000	1.000	1.000	2.000	2.000	1.000	5.000
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AN41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	206.216	274.544	136.565	137.270	535.809	411.455	401.782	267.876	--	--	--	0.236	--	0.076	0.077	0.039	0.159	0.079	0.039	--
U238	12.106	16.117	8.017	8.058	30.907	23.780	23.176	15.452	--	--	--	111.970	--	36.990	37.540	18.640	74.990	37.400	18.540	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	219.800
HO	--	--	--	--	--	--	--	--	--	--	0.004	--	0.003	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	0.009	--	0.006	--	--	--	--	--	--	--
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	31.881	--	21.412	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	8.436	--	5.666	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	5.033	--	3.381	--	--	--	--	--	--	--
MN	--	--	--	--	--	--	--	--	--	--	0.664	--	0.446	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	0.105	--	0.071	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	0.018	--	0.012	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	0.004	--	0.003	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	0.004	--	0.003	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
IF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TIH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	77.107	37.180	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	2.014	2.681	1.334	1.341	5.228	4.015	3.920	2.614	--	--	--	--	--	--	--	--	--	--	--	--
U236	0.974	1.296	0.645	0.648	2.528	1.941	1.896	1.263	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	12.482	15.312	8.057	8.045	16.383	12.932	12.877	9.145	--	--	--	--	--	--	--	--	--	--	--	--
CR	3.277	4.018	2.118	2.115	4.303	3.399	3.384	2.407	--	--	--	--	--	--	--	--	--	--	--	--
NI	1.522	1.848	1.012	1.011	2.023	1.625	1.619	1.188	--	--	--	--	--	--	--	--	--	--	--	--
MN	0.272	0.338	0.168	0.168	0.351	0.270	0.269	0.182	--	--	--	--	--	--	--	--	--	--	--	--
SI	0.109	0.133	0.158	0.158	0.145	0.116	0.115	0.084	--	--	--	--	--	--	--	--	--	--	--	--
CU	0.015	0.018	0.009	0.009	0.019	0.015	0.015	0.010	--	--	--	--	--	--	--	--	--	--	--	--
HO	0.063	0.070	0.058	0.058	0.090	0.081	0.081	0.072	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	0.012	0.014	0.007	0.007	0.015	0.011	0.011	0.008	--	--	--	--	--	--	--	--	--	--	--	--
C	0.010	0.012	0.006	0.006	0.013	0.010	0.010	0.007	--	--	--	--	--	--	--	--	--	--	--	--
P	0.005	0.006	0.004	0.004	0.007	0.006	0.006	0.005	--	--	--	--	--	--	--	--	--	--	--	--
S	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	--	--	--	--	--	--	--	--	--	--	--	--
BE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ND	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

NO	(UNIT:GRAM)																			
	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
NAME	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL0	AL0	AL0	AL0	AL0	AL0	AL45	AL45	AL45
WIDTH (IN)	1.000	1.000	1.000	0.125	0.125	0.125	0.125	0.125	0.063	0.063	0.063	0.250	0.250	0.125	0.125	0.125	0.125	0.125	0.125	0.125
HEIGHT (IN)	1.000	1.000	1.000	2.000	2.000	1.000	2.000	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH (IN)	4.000	3.000	2.000	3.000	2.000	1.000	0.500	0.500	3.000	2.000	1.000	2.000	1.000	3.000	2.000	1.000	0.250	5.000	3.000	2.000
PU38
PU39
PU40
PU41
PU42
AM41
U235
U238
AL	175.840	131.880	87.660	31.920	21.200	5.320	5.340	2.660	17.170	11.170	5.700	23.500	16.000	15.980	10.660	8.000	2.000	23.730	14.160	9.390
NO
O
B10	20.890	14.000	14.210	9.480	7.000	1.800	..	..	..
B11
C
NA
CA
CL
FE
CR
NI
HM
SI
CU
P
S
CO
N
T1
F
LIP
HIP
MG
H
DE
CS
B
NO
TA
TII
ZR
NP37
U234
U236
EU51
EU53
U232
U233
FE
CR
NI
HM
SI
CU
NO
AL
CO
C
P
S
DE
NO
JI
LIP
HIP
TA

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

(UNIT:GRAM)

NO	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340
NAME	AL45	AL45	AL45	AL45	AL56	AL56	AL56	AL56	AL56	AL63	AL63	AL63	AL63	AL63	AL63	AL63	BNA	DNB	D10	CAS1
WIDTH(IN)	0.125	0.125	0.125	0.125	1.000	1.000	1.000	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	1.438	2.000
HEIGHT(IN)	2.000	1.000	2.000	1.000	1.000	1.000	1.000	2.000	1.000	2.000	2.000	2.000	2.000	1.000	2.000	1.000	2.000	2.000	0.125	2.000
LENGTH(IN)	1.000	1.000	0.500	0.500	5.000	3.000	2.000	0.500	0.500	5.000	3.000	2.000	1.000	1.000	0.500	0.500	2.000	2.000	2.000	2.000
PU38
PU39
PU40
PU41
PU42
AH41
U235
U238
AL	4.730	2.250	2.300	1.150	120.740	72.120	48.080	2.900	1.400	33.090	20.310	13.510	6.740	3.370	3.310	1.660	..	..	..	..
HD
O
D10	1.087	1.272	4.201
D11	4.912	5.748	0.411
C	0.268
NA
CA
CL
FE
CR
NI
HN
SI
CU
P
S
CO
N
TI
F
LIP
HIP
HC
H
DE
CS
D
ND
TA
YH
ZR
NP37
U234
U236
E051
E053
U252
U253
FE	0.023	0.014	..
CR
NI	0.002	..	..
HN	0.017	0.008	..
SI	0.022	0.005	..
CU
HD
AL	0.007	0.001	..
CO	6.391	6.299	6.295
C
P
S
DE
ND
TI
LIP
HIP
TA

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

NO NAME	(UNIT:GRAM)																			
	341 CAN	342 CAF	343 FE	344 MO	345 MO	346 MO	347 MO13	348 NACT	349 NACT	350 NANY	351 NANY	352 NANY	353 NANY	354 NANY	355 NANY	356 NAT	357 NAT	358 NIS	359 NICR	360 NICR
WIDTH(IN)	--	--	2.000	0.250	0.125	0.125	2.000	0.500	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.500	0.250	1.990	0.125	0.125
HEIGHT(IN)	--	--	2.000	2.000	2.000	2.000	0.013	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.031	2.000	2.000
LENGHT(IN)	--	--	2.000	7.000	3.000	2.000	2.000	4.000	4.000	8.000	7.000	6.000	4.000	3.000	2.000	4.000	4.000	6.000	6.000	5.000
PHJ8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PDJ9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PD40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AN41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Al	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	566.000	121.280	80.750	49.890	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	52.977	23.972	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.001	--	--	--
O10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	14.140	--	--	--	--	13.235	5.989	0.002	0.002	0.002	0.001	0.001	0.001	0.011	0.009	0.230	--	--
NA	--	--	--	--	--	--	--	50.726	22.954	49.470	43.224	37.657	24.425	17.919	10.943	49.705	23.287	--	--	--
CA	--	--	--	--	--	--	--	--	--	0.020	0.017	0.015	0.010	0.007	0.004	0.020	0.009	--	--	--
CL	--	--	--	--	--	--	--	0.103	0.047	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.001	--	--	--
FE	--	--	6080.238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.130	0.780	0.630
HI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	57.300	46.710
NH	--	--	46.100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	327.650	134.810	109.880
SI	--	--	1.480	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.660	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.130	0.490	0.400
P	--	--	0.800	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.030	0.250	0.210
S	--	--	1.480	--	--	--	--	0.006	0.003	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.010	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.580	0.470
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H	--	--	--	--	--	--	--	0.010	0.005	--	--	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	30.190	24.910	51.695	45.542	39.367	26.078	20.439	14.230	30.170	24.890	--	--	--
CR	--	--	--	--	--	--	--	8.180	6.750	14.008	12.340	10.667	7.066	5.538	3.856	8.088	6.672	--	--	--
NI	--	--	--	--	--	--	--	4.600	3.800	7.881	6.943	6.001	3.975	3.116	2.169	4.679	3.861	--	--	--
NH	--	--	--	--	--	--	--	0.620	0.510	1.069	0.942	0.814	0.539	0.423	0.294	0.638	0.526	--	--	--
SI	--	--	--	--	--	--	--	0.210	0.170	0.361	0.318	0.275	0.182	0.143	0.099	0.273	0.225	--	--	--
CU	--	--	--	--	--	--	--	0.060	0.050	0.098	0.086	0.075	0.049	0.039	0.027	0.053	0.044	--	--	--
MO	--	--	--	--	--	--	--	0.040	0.030	0.068	0.060	0.052	0.034	0.027	0.019	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	0.020	0.010	0.030	0.027	0.023	0.015	0.012	0.008	0.021	0.017	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.014	0.011	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.007	0.005	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004	0.003	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A-1 ZPPR MATERIAL COMPOSITIONS(CONT.)

(UNIT:GRAM)

NO	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380
NAME	NICR	NICR	NICR	NI	NI	NI	UO	SSTX	SST	SST	SST	SS75	SS75	SS75	TA	TA	TA	TA	UH	UH
WIDTH(IN)	0.125	0.125	0.125	0.250	0.250	0.125	1.000	0.063	1.000	0.250	0.250	2.000	1.000	0.500	0.250	0.250	0.063	0.063	0.125	0.125
HEIGHT(IN)	2.000	2.000	2.000	2.000	2.000	2.000	1.000	2.000	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.000	2.000	1.000
LENGHT(IN)	3.000	2.000	1.000	4.000	3.000	1.000	5.000	1.000	3.000	7.000	4.000	4.000	4.000	4.000	2.000	6.000	1.000	1.000	2.000	2.000
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AM41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	--	3.150	--	--	--	--	--	--	--	--	--	--	--	1.040	0.520
U238	--	--	--	--	--	--	1526.440	--	--	--	--	--	--	--	--	--	--	--	144.570	72.010
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HO	--	--	--	--	--	--	--	0.001	1.000	1.880	1.070	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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B11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	0.170	0.130	0.020	--	0.003	0.210	0.220	0.130	1.248	0.694	0.352	--	--	--	--	0.012	0.006
HA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.017	0.009
FE	0.390	0.260	0.130	0.420	0.320	0.050	--	10.984	271.280	315.840	179.850	1448.720	709.410	352.510	--	--	--	--	--	--
CR	28.460	19.030	9.430	--	--	--	--	2.907	66.840	83.330	47.450	382.720	188.700	91.910	--	--	--	--	--	--
NI	66.960	44.770	22.190	281.300	210.730	31.600	--	1.734	36.710	38.800	22.090	192.820	94.350	45.960	--	--	--	--	--	--
MN	--	--	--	0.710	0.530	0.080	--	0.229	2.890	6.810	3.880	41.390	19.380	9.000	--	--	--	--	--	--
SI	0.240	0.160	0.080	0.140	0.110	0.020	--	0.036	1.500	1.210	0.690	11.860	6.834	2.715	--	--	--	--	--	--
CU	0.130	0.080	0.040	0.140	0.110	0.020	--	0.006	0.870	0.900	0.510	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	0.001	0.110	0.130	0.080	0.707	0.347	0.171	--	--	--	--	--	--
S	--	--	--	--	--	--	--	0.001	1.370	0.180	0.100	0.416	0.306	0.141	--	--	--	--	--	--
CO	0.290	0.190	0.100	0.140	0.110	0.020	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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YA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1627.500	815.000	34.000	17.000	--	--
TH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

NO NAME	(UNIT:GRAM)																			
	381 UN	382 U008	383 VDCG	384 VDCG	385 VDCG	386 VDCG	387 VDCG	388 VDCG	389 VDCG	390 VDFS	391 V	392 V	393 V	394 V	395 W	396 W	397 W	398 W	399 W	400 ZR-C
WIDTH(IN)	0.125	0.125	0.500	0.500	0.500	0.250	0.250	0.250	0.250	0.250	0.125	0.063	0.063	0.063	0.125	0.125	0.125	0.125	0.125	0.125
HEIGHT(IN)	0.500	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.063	2.000	2.000	2.000	2.000	2.000	2.000
LENGHT(IN)	2.000	2.000	12.000	1.000	6.000	2.000	1.000	9.000	6.000	3.000	2.000	3.000	2.000	1.000	3.000	2.000	1.000	0.500	1.000	2.000
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AMA1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	0.250	0.056	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	35.310	25.234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HO	--	--	0.290	0.260	0.140	0.260	0.240	0.190	0.130	--	--	--	--	--	--	--	--	--	--	--
O	--	4.477	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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C	0.004	--	0.090	0.080	0.050	0.080	0.080	0.060	0.040	0.020	--	--	--	--	--	--	--	--	--	--
HA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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CL	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	82.130	75.290	41.070	73.940	67.780	55.450	36.970	19.954	--	--	--	--	--	--	--	--	--	--
CR	--	--	20.560	18.850	10.280	18.510	16.970	13.880	9.260	5.171	--	--	--	--	--	--	--	--	--	--
NI	--	--	9.510	8.720	4.750	8.560	7.850	6.420	4.280	2.638	--	--	--	--	--	--	--	--	--	--
NN	--	--	1.820	1.670	0.910	1.640	1.500	1.230	0.820	0.536	--	--	--	--	--	--	--	--	--	--
SI	--	--	0.420	0.390	0.210	0.380	0.350	0.290	0.190	0.157	--	--	--	--	--	--	--	--	--	--
CU	--	--	0.170	0.160	0.090	0.160	0.140	0.120	0.080	--	--	--	--	--	--	--	--	--	--	--
P	--	--	0.020	0.020	0.010	0.020	0.020	0.020	0.010	0.011	--	--	--	--	--	--	--	--	--	--
S	--	--	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.003	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	51.455
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS(CONT.)

(UNIT:GRAM)

NO	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
NAME	ZR-C	ZR-Y	ZR-C	ZR-C	ZR-V	ZR-V	UN	UR	UN	U016	U046	TAR	TAR	TAR	TAR	UD	BE	BE	BE0	BC0
WIDTH(CM)	0.125	0.125	0.125	0.125	0.063	0.063	0.031	0.031	0.031	--	--	--	--	--	--	0.063	2.000	2.000	1.000	1.000
HEIGHT(CM)	2.000	2.000	1.000	1.000	2.000	2.000	2.000	2.000	2.000	0.375	0.375	2.000	2.000	2.000	2.000	0.500	2.000	2.000	2.000	2.000
LENGTH(CM)	1.000	0.500	1.000	0.500	2.000	1.000	3.000	2.000	1.000	6.000	6.000	--	6.000	6.000	6.000	2.000	4.000	1.000	5.000	3.000
PU38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AM41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	--	0.350	0.230	0.110	13.020	36.900	--	--	--	--	0.039	--	--	--	--
U238	--	--	--	--	--	--	48.330	32.200	16.100	66.500	42.600	--	--	--	--	18.310	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	--	--	--	--	--	--	--	--	--	10.720	10.760	--	--	--	--	--	--	--	302.200	181.400
O10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.082	0.051
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.122	0.076
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.194	0.121
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002	0.001
H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	480.490	120.410	170.300	102.200
OE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	1474.840	1474.840	5133.000	1270.300	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	25.399	12.290	12.796	6.327	24.370	12.570	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU91	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	8.660	8.590	--	--	--	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	--	2.310	2.290	--	--	--	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	--	1.200	1.190	--	--	--	--	--	--	--	--	--
MN	--	--	--	--	--	--	--	--	--	0.160	0.160	--	--	--	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	--	0.059	0.058	--	--	--	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	0.007	0.007	--	--	--	--	--	--	--	--	--
HD	--	--	--	--	--	--	--	--	--	0.007	0.007	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	0.004	0.004	--	--	--	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	0.011	0.011	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	0.003	0.003	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	--	0.002	0.002	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	0.001	0.001	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	0.001	0.001	--	--	--	--	--	--	--	--	--
HR	--	--	--	--	--	--	--	--	--	0.001	0.001	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	0.006	0.006	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	0.002	0.002	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

	(UNIT: GRAM)																			
NO	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440
NAME	DE0	DE0	DE0	HA	C	W	W	DE0	SSET	SSNE	SSMX	SSET	SSNE	SSMX	GD	GD	RE	RE	RE	RE
WIDTH (IN)	1.000	0.250	0.250	0.250	2.000	0.063	0.063	0.125	0.063	0.063	0.063	0.125	0.125	0.125	0.063	0.063	0.063	0.063	0.063	0.500
HEIGHT (IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGTH (IN)	2.000	2.000	1.000	6.000	12.000	3.000	2.000	1.000	6.000	6.000	6.000	6.000	6.000	6.000	3.000	2.000	3.000	2.000	1.000	2.000
PO38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PO39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PO40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PO41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PO42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AM41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U235	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O	120.740	28.940	14.460	0.002	--	--	--	7.229	--	--	--	--	--	--	--	--	--	--	--	--
O10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
O11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.041	0.021	0.010	0.015	1234.200	--	--	0.010	0.070	0.070	0.070	0.150	0.150	0.150	--	--	--	--	--	--
HA	--	--	--	37.636	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	0.015	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	0.061	0.030	0.015	0.002	--	--	--	0.015	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	63.680	64.550	63.840	129.200	130.950	129.790	--	--	--	--	--	--
CR	--	--	--	--	--	--	--	--	17.640	17.880	17.680	35.790	36.270	35.950	--	--	--	--	--	--
NI	--	--	--	--	--	--	--	--	8.590	8.700	8.610	17.420	17.660	17.500	--	--	--	--	--	--
HM	--	--	--	--	--	--	--	--	1.860	1.880	1.860	3.770	3.820	3.780	--	--	--	--	--	--
SI	--	--	--	--	--	--	--	--	0.930	0.940	0.930	1.880	1.910	1.890	--	--	--	--	--	--
CU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	--	--	--	--	--	0.040	0.040	0.040	0.080	0.080	0.080	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	0.030	0.030	0.030	0.060	0.060	0.060	--	--	--	--	--	--
CO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	0.097	0.048	0.024	--	--	--	--	0.024	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
R	0.001	0.001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DE	68.010	16.300	8.143	--	--	--	--	4.071	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EU53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U252	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U253	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	36.420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CR	--	--	--	9.763	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NI	--	--	--	5.649	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HM	--	--	--	0.770	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SI	--	--	--	0.329	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CU	--	--	--	0.064	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MO	--	--	--	0.011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CO	--	--	--	0.016	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P	--	--	--	0.008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
S	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	0.012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	0.022	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT: GRAM)

NO	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460
NAME	RU	SSTX	ZR-Y	ZR-Y	ZR-Y	ZR-V	ZR-V	ZR-V	NO	NO	NO	NO	NO	POLY	POLY	POLY	C	C	POLY	POLY
WIDTH (IN)	0.250	0.031	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.250	0.188	1.500	1.500	2.000	2.000	2.000
HEIGHT (IN)	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
LENGHT (IN)	7.000	3.000	3.000	2.000	1.000	3.000	2.000	1.000	3.000	2.000	1.000	0.500	1.000	6.000	6.000	11.000	11.000	6.000	12.000	6.000
PU38
PU39
PU40
PU41
PU42
AM41
U235
U238
AL
NO	..	0.060	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
O
B10
D11
C	..	0.014	..	..	..	..	..	..	..	..	..	..	..	41.225	29.226	495.346	887.000	617.100	628.426	320.555
NA
CA
CL
FE	..	16.825	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CR	..	4.372	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
NI	..	2.031	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
NH	..	0.370	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
SI	..	0.048	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CU	..	0.048	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
P	..	0.006	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
S	..	0.004	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
CO
H
TI
F
LIP
HIP
HG
H	6.679	4.877	82.654	..	..	104.774	53.445
DE
CS
B
NO	100.100	68.160	32.730	16.320	16.430	..	..	..	..	..	..	..
TA
TH
ZR	76.040	50.290	24.680	78.290	51.940	25.990	..	..	..	..	..	..	..	..	..	..	..	..
NP37
U234
U236
EUS1
EUS3
U232
U233
FE
CR
NI
NH
SI
CU
NO
AL
CO
C
P
S
BE
NO
TI
LIP
HIP
TA

TABLE A.1 ZPPR MATERIAL COMPOSITIONS (CONT.)

(UNIT: GRAM)

NO	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476
NAME	SSIX	HF	POLY	POLY	POLY	POLY	POLY	SS5	P08	P08	SST	SST	SST			
WIDTH (IN)	0.370	0.040	0.250	0.188	1.000	0.500	1.500	--	2.000	2.000	0.063	0.063	0.063	--	--	--
HEIGHT (IN)	0.029	2.000	2.000	2.000	2.000	2.000	2.000	0.375	2.000	2.000	1.875	1.875	1.875	--	--	--
LENGTH (IN)	9.500	4.000	4.000	4.000	10.000	10.000	10.000	2.000	1.000	1.000	12.000	8.000	4.000	--	--	--
PN38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PU42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ANA1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U735	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U238	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AL	--	--	--	--	--	--	--	--	0.014	0.009	--	--	--	--	--	--
HO	0.030	--	--	--	--	--	--	0.002	0.005	0.004	0.697	0.522	0.261	--	--	--
O	--	0.014	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
D11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C	0.007	0.003	26.957	19.484	253.487	125.051	385.352	0.002	0.007	0.005	0.087	0.065	0.033	--	--	--
NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CL	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	8.426	0.009	--	--	--	--	--	2.102	19.292	13.069	122.769	92.076	45.749	--	--	--
CR	2.189	--	--	--	--	--	--	0.570	5.172	3.503	32.390	24.293	12.147	--	--	--
NI	1.017	--	--	--	--	--	--	0.282	2.992	2.027	14.628	10.971	5.486	--	--	--
MN	0.185	--	--	--	--	--	--	0.052	0.408	0.276	2.647	1.985	0.993	--	--	--
SI	0.024	--	--	--	--	--	--	0.018	0.174	0.118	0.470	0.353	0.176	--	--	--
CU	0.024	--	--	--	--	--	--	0.001	0.034	0.023	0.348	0.261	0.131	--	--	--
P	0.003	--	--	--	--	--	--	0.001	0.004	0.003	0.052	0.039	0.020	--	--	--
S	0.002	--	--	--	--	--	--	--	--	--	0.070	0.052	0.026	--	--	--
CO	--	--	--	--	--	--	--	--	0.009	0.006	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
F	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	0.007	0.005	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	0.012	0.008	--	--	--	--	--	--
HG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
II	--	--	4.498	3.251	42.263	20.849	64.248	--	--	--	--	--	--	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ZR	--	1.988	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NP37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U234	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U236	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EUS3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U232	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
U233	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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TI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HIP	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

6. 参考文献

- (1) 三田敏男、他：「JUPITER-Ⅲ実験解析(Ⅳ)」，PNC SN9410 90-003 (1990)
- (2) 中島文明：「大型炉心の核的結合に関する検討」，PNC SN2410 89-012 (1989)
- (3) 三田敏男：「炉雑音解析による高速炉炉心の核的結合の評価 — 米国高速臨界実験装置(ZPPR)における測定 — 」，PNC SN9410 90-015 (1990)
- (4) 三田敏男、他：「日米共同大型高速炉臨界実験(JUPITER-Ⅲ)の概要」、日本原子力学会誌、30 [12], 1324 (1989)
- (5) 白方敬章、他：「JUPITER計画の概要 — 日米共同大型高速炉物理実験 — 」，動力炉技報 No.37, 79 (1981)
- (6) Shirakata, K., et al. : “ Analysis of Axial Heterogeneous LMR Core Critical Experiments ”, Proc. 1988 Int. Reactor Physics Conf., Jackson Hole, Vol. II, 297 (1988)
- (7) Collins, P.J., et al. : “ Experiments and Analysis for an Axially Heterogeneous LMR Assembly at ZPPR ”, *ibid.*, Vol. II, 309 (1988)
- (8) Schaefer, R.W. : “ Critical Experiment Tests of Bowing and Expansion Reactivity Calculations for LMRs ”, *ibid.*, Vol. III, 309 (1988)
- (9) Kawashima, M., et al. : “ An Analysis of the Gamma-Ray Deposition in a Heterogeneous LMFBR ”, *ibid.*, Vol. II, 321 (1988)
- (10) Brumbach, S.B., et al. : “ Experiments and Analysis for an Axially Heterogeneous Liquid-Metal Reactor Assembly at the Zero-Power Physics Reactor ”, Nucl. Sci. Eng., 103, 219 (1989)
- (11) Schaefer, R.W. : “ Critical Experiment Tests of Bowing and Expansion Reactivity Calculations for Liquid-Metal-Cooled Fast Reactors, *ibid.*, 103, 196 (1989)
- (12) Kawashima, M., et al. : “ An Analysis of Gamma-Ray Energy Deposition in a Heterogeneous Liquid-Metal Fast Breeder Reactor, *ibid.*, 103, 210 (1989)

- (13) Shirakata, K., et al. : " Proceedings of the DOE / PNC Jupiter-III Analysis Meeting — Japanese Presentation —", PNC SA0382 88-001 (1988)
- (14) Brumbach, S.B, et al. : " The JUPITER-III Program — ANL Analysis of ZPPR-17 —", PNC SA0382 88-002 (1988)
- (15) Shirakata, K., et al. : " Proceedings of The JUPITER-III Analysis Meeting", PNC SA0382 88-003 (1988)
- (16) Collins, P.J., et al. : " ZPPR Progress Report : 1987.4~1987.7, PNC SA0765 ANL-ZPR-476 (1987)
- (17) McFarlane, H.F., et al. : " Benchmark Physics Tests in the Metallic Fuelled Assembly ZPPR-15 ", PNC SA0765 ANL-ZPR-479 (1987)
- (18) Brumbach, S.B., et al. : " ZPPR Progress Report : 1987.8~1987.10 ", PNC SA0765 ANL-ZPR-480 (1987)
- (19) Collins, P.J., et al. : " ZPPR Progress Report : 1987.11~1988.1 ", PNC SA0765 ANL-ZPR-481 (1988)
- (20) Brumbach, S.B., et al. : " ZPPR Progress Report : 1988.2~1988.4 ", PNC SA0765 ANL-ZPR-482 (1988)
- (21) Unesaki, H. : " Analysis of ZPPR-17 Gamma Heating Experiments ", PNC SA0765 ANL-ZPR-483 (1988)
- (22) Collins, P.J., et al. : " ZPPR Progress Report : 1988.5~1988.8 ", PNC SA0765 ANL-ZPR-485 (1988)
- (23) Schaefer, R.W. : " Calculations of Bowing, Expansion and Small-Sample Worth Experiments in ZPPR-17A ", PNC SA0765 ANL-ZPR-488 (1989)
- (24) Brumbach, S.B., et al. : " ZPPR Progress Report : 1988.9~1988.12 ", PNC SA0765 ANL-ZPR-489 (1989)
- (25) Brumbach, S.B., et al. : " The JUPITER-III Program : ANL Analysis of ZPPR-17 ", PNC SA0765 ANL-ZPR-490 (1989)
- (26) Collins, P.J., et al. : " ZPPR Progress Report : 1989.1~1989.4 ", PNC SA0765 ANL-ZPR-491 (1989)

(27) Brumbach, S. B., et al. : " Experiments and Analysis for Large Conventional Fast Reactors in ZPPR-18/19 ", PNC SA0765 ANL-ZPPR-492 (1990)