PNC-TN941 83-65

ＤＣＡ炉心実験データ集(27)

防震板を用いた臨界実験

1983年５月

動力炉・核燃料開発事業団

大洗工学センター

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

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防震板を用いた臨界実験

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要　　旨

防震板使用炉心における防震板の反応度，防震板近傍の詳細な出力分布および熱中性子束分布を明らかにするためDCA炉心中央9チャンネル重水領域に実験用防震板を配置し，臨界実験を行った。実験用防震板の厚さは5 mm，20 mm，40 mm，80 mmで，これらを25 cm格子ピッチのふげん型1.2w/o濃縮ウラン97体装荷したDCA炉心の臨界水位の1／2の高さに配置した。臨界水位を高くするため重水中に^{10}Bを溶解し（～3 ppm），かつ冷却材は0％ボイド炉心とした。

防震板の反応度の測定は臨界水位差法により測定した。

軸方向出力分布は，中心チャンネル燃料集合体の燃料棒4本（第1リング，第2リング各1本，第3リング2本）をガンマスキャンニング装置により^{140}LaのFP ガンマ線を測定して求めた。

軸方向中性子束分布は中心燃料チャンネル，防震板領域の重水中および防震板を設置していない重水中で照射した銅ワイヤの放射化分布より求めた。

これらの結果から次のことがわかった。

1. 防震板の厚みとともに防震板の反応度は単調に増加する。今回の実験の範囲内では防震板の反応度は0.1％ΔKから1％ΔKまで変化する。
2. 防震板による軸方向出力分布のひずみを厚み40 mmについて測定した。その結果，最外層燃料は一番大きく内層燃料ほどひずみは小さくなる。

   出力分布のひずみは内層燃料でピーク値に対し約5％，外層燃料で約10％となる。
3. 防震板領域における軸方向の重水中および燃料中心領域の熱中性子束分布のひずみは，防震板の厚みの増加とともに大きくなる。

   厚み40 mmの場合熱中性子束分布のひずみはピーク値に対し，重水領域で約30％となるが，燃料領域中央では，約5％となり，燃料中では熱中性子束のひずみは緩和される。

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Experimental Data on DCA Core(27)

Critical Experiments of the Cores with Aseismatic Plates

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Abstract

Critical experiments on DCA cores with aseismatic plates have been done in order to clarify the value of the reactivity worth of aseismatic plate and the behavior of the detailed power distribution or the thermal neutron flux distribution around the aseismatic plate.

The aseismatic plate was arranged in the heavy water moderator of the nine central channel region of the DCA core.

The thickness of the plate is 5mm, 20mm, 40mm or 80mm.

The axial position of the plate was a half of critical heavy water level.

The DCA core has a 25cm square lattice pitch and 97 fuel clusters with 1.2w/o uranium enrichments.

The heavy water includes ^{10}B(~3ppm). The coolant is light water.

The reactivity worth of the plate was measured by use of the critical heavy water level between the cores with and without the plate.

Axial power distribution was obtained by measuring the γ-ray intensity of the typical fission product (^{140}La) of irradiated fuel rods.

Axial thermal neutron flux distribution was obtained by measuring the activities of irradiated copper wires inserted in the central fuel channel or the moderator regions with and without the plate.

The followings are found from the present experiments.

1. The reactivity worth of the aseismatic plate is monotonously increasing with the increase of the thickness of the plate. The values obtained by the present experiments change from about 0.1% ΔK to 1% ΔK.
2. The axial power distribution depression by the plate with a 40mm thickness in the fuel cluster is increasing toward the outer from the inner in the fuel cluster.

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The value of the ratio of the depression to the maximum power is about 5% in the inner rod and about 10% in the outer rod.

3. The depression of the thermal neutron flux distribution around the plate in the moderator or in the fuel channel is increasing with increase of the plate thickness.

   The obtained value of the depression for the core with a 40mm thickness plate is about 30% in the moderator. In the fuel channel, however, the value is about 5%. Then the depression is reduced sharply in the fuel channel.

Contents

1. Experimental Conditions

Table 1-1 Core Description

Core	0% Void, Aseismatic Plate ($5mm^t$, $20mm^t$, $40 mm^t$, $80mm^t$), ~3ppm ^{10}B in D_2O
Fuel Loading	1.2w/oUO_2, 97 Assemblies
Lattice	Square Lattice of 25.0cm Pitch
Coolant	Coolant: H_2O
Moderator (D_2O) Purity & Density	99.40m/o & 1.1043g/cm^3 (Date of Analysis: 22, Dec. 1980)
Moderator (D_2O) Temperature	14°C ~ 18°C
Safety Rods	3C3, 3B3, 3A3, 3D3 (Positions of Safety Rod)
Control Rods	Nothing

Table 1-2 Fuel Description

	Inner Dia. (cm)	Outer Dia. (cm)	Material	Density (g/cm^3)
Pellet	-	1.480	1.203w/o enriched UO_2	10.36
Gap	1.480	1.503	Helium	-
Sheath	1.503	1.673	Aluminum	2.673

Composition		w/o
Pellet	^{235}U	1.057
	^{238}U	86.793
	O	12.150
Sheath	Al	96.98
	Mg	2.60

Table 1-3 Fuel Ring Description (28 Elements/Assembly in 3 Circular Rings)

Ring	No. of elements	Pitch circle dia of elements centers (cm)
1	4	2.625
2	8	6.000
3	16	9.515

Table 1-4 Fuel Channel Description

	Inner Dia. (cm)	Outer Dia. (cm)	Material	Density (g/cm^3)
Pressure Tube	11.68	12.08	Aluminum Alloy	2.674
Air Gap	12.08	13.25	Air	0.001205
Calandria Tube	13.25	13.65	Aluminum Alloy	2.674

Composition		w/o in Al	w/o in Air	Atomic No. Density
Al		96.98		0.05788
Mg		2.60		0.00172
Air	O		23.5204	0.00001067
	N		76.4796	0.00003962

Table 1-5 Moderator Description (Density of D_2O(99.4mol/o): 1.1043)

Material	w/o in Moderator	Density (g/cm^3)
D_2O	99.46	1.10504
H_2O	0.54	0.99777
*H_3BO_3	0.00	1.435

Composition	w/o in D_2O	Atomic No. Density ($/cm^3 \times 10^{24}$)
H	0.05036	0.0003323
D	20.0223	0.06613
O	79.92283	0.03323
*B	0.00	

Table 1-6 Coolant Description

Coolant Void Fraction \ Material (w/o)	H	O	N
0 %	11.190	88.810	0

*^{10}B : ~3.1ppm
See Appendix

Table 1-7 Aseismatic Plate Description*
(A5052-Aℓ)

Thickness (mm) \ Material (%)	Cu	Mn	Mg	Zn	Cr	Si+Fe	Aℓ
80^t	0.02	0.06	2.62	0.01	0.24	0.35	96.7
40^t	0.04	0.07	2.55	0.02	0.22	0.33	96.7
20^t	0.04	0.04	2.47	0.01	0.21	0.37	96.9
5^t	0.03	0.02	2.55	0.02	0.19	0.36	96.8

* See Appendix

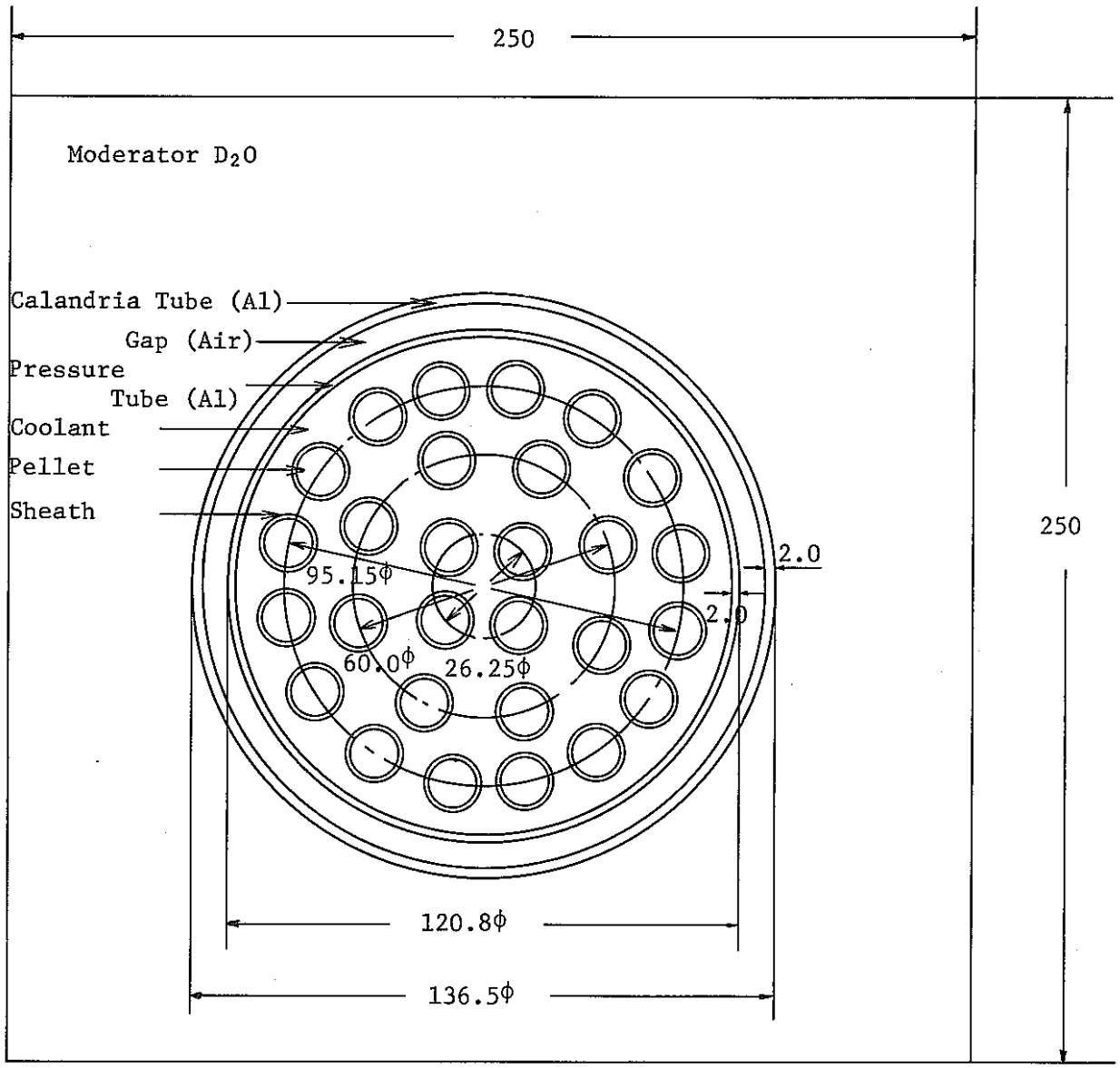
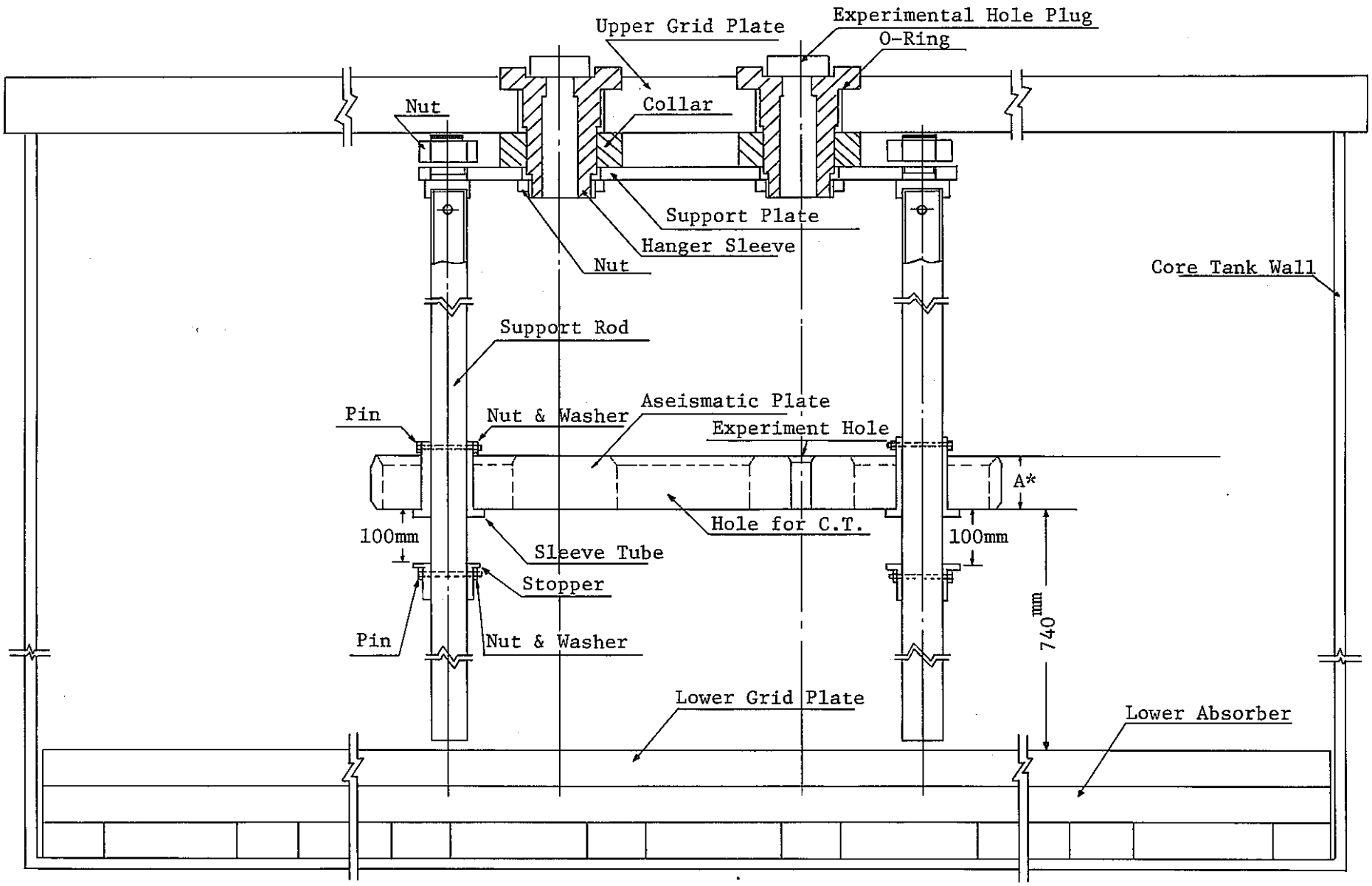
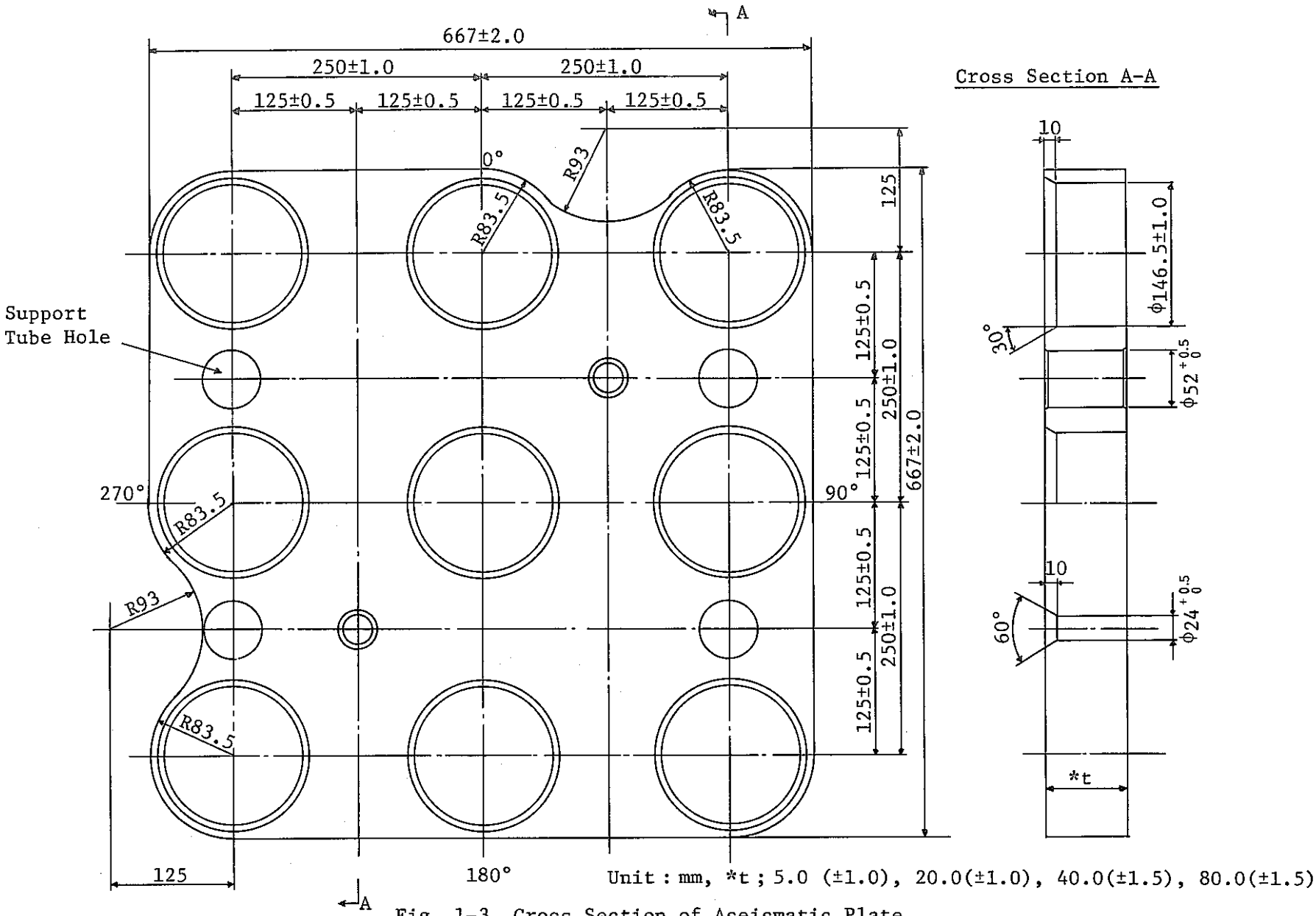


Fig. 1-1 Unit Cell Diagram



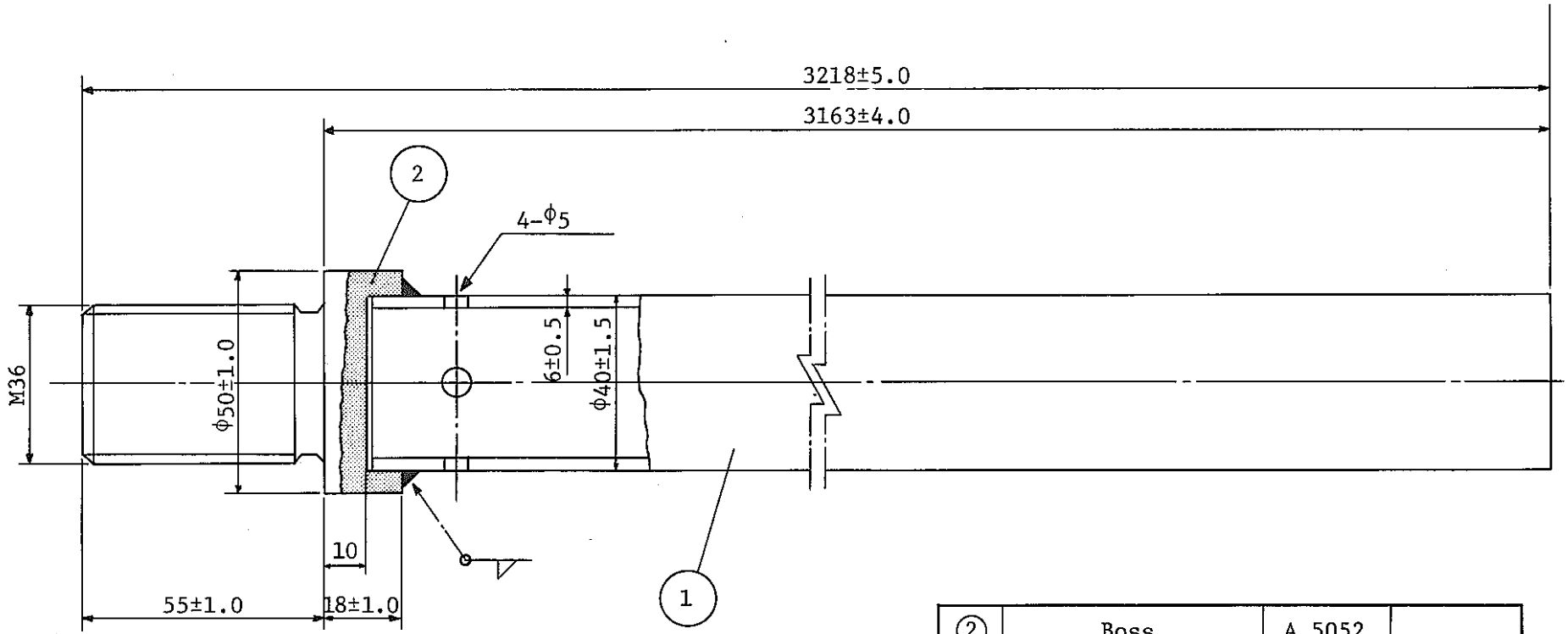
*A: 5, 20, 40, 80mm

Fig. 1-2 Experimental Aseismatic Plate



Unit : mm, *t ; 5.0 (±1.0), 20.0(±1.0), 40.0(±1.5), 80.0(±1.5)

Fig. 1-3 Cross Section of Aseismatic Plate



No.	Name	Material	Supplement
②	Boss	A 5052	
①	Pipe	A 5052	

Fig. 1-4 Support Tube

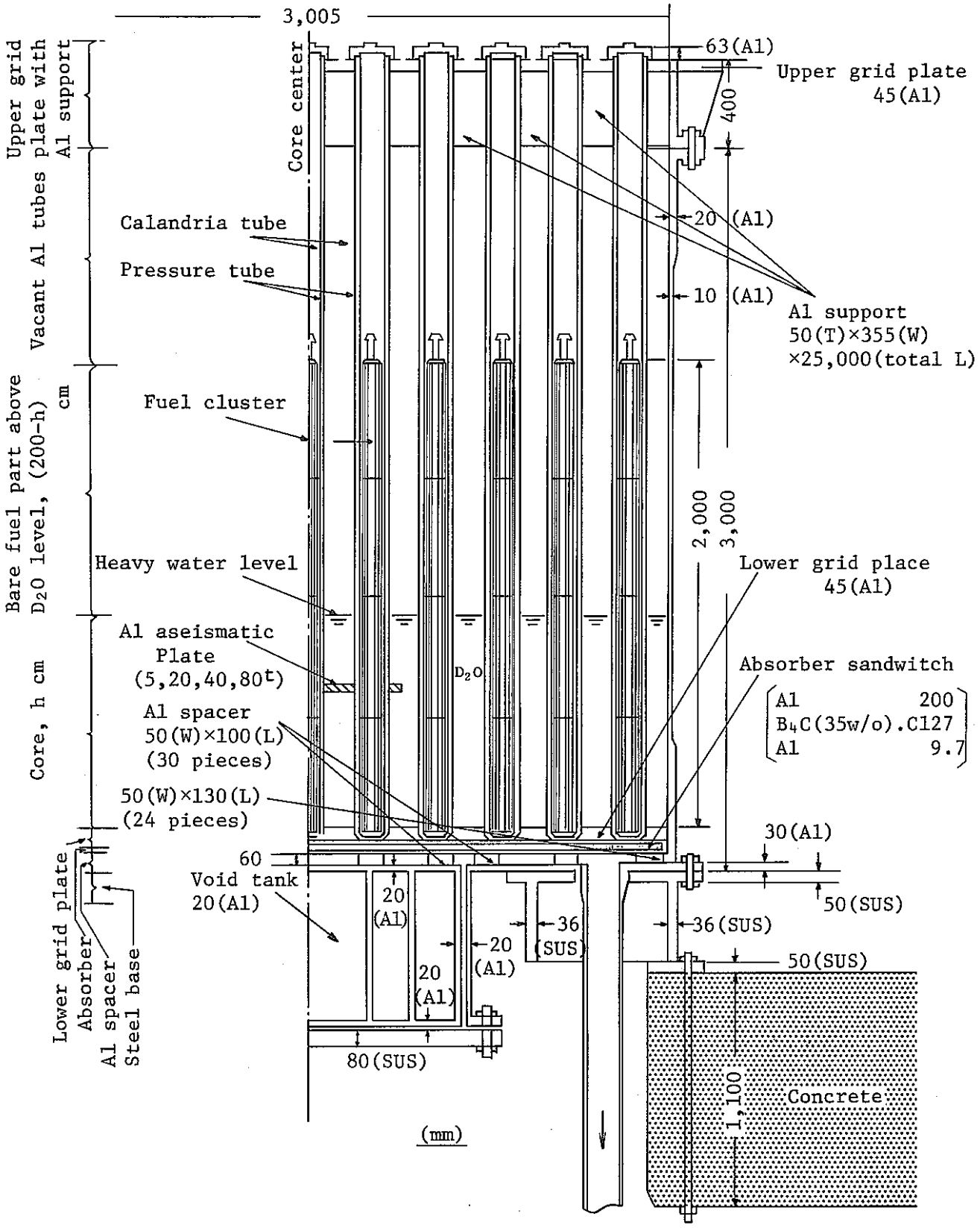
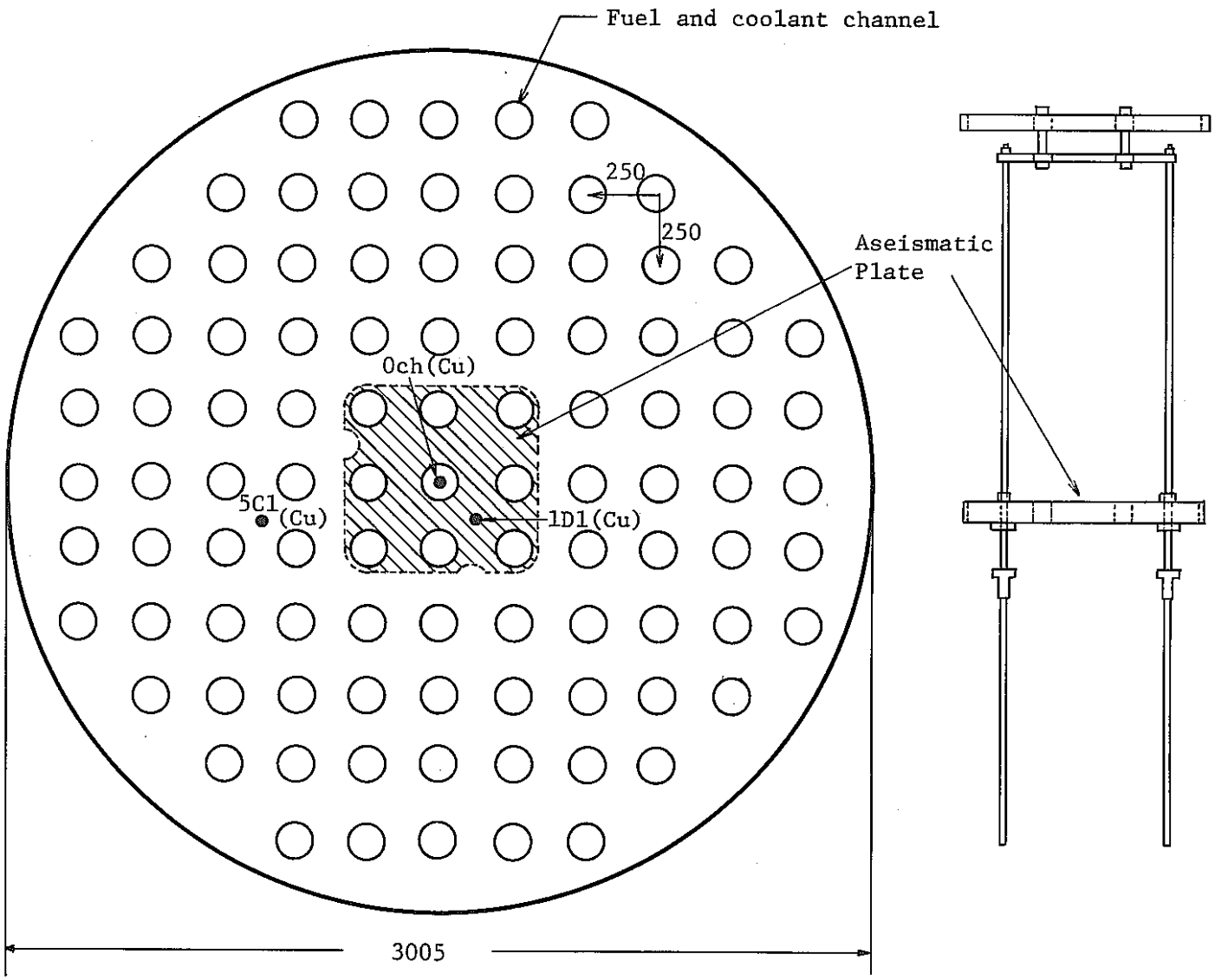


Fig. 1-5 Schematic Drawing of DCA Core Configuration (25.0 cm Square Pitch Lattice)



Total number of fuel clusters : 97

Fig. 1-6 Configuration of Aseismatic Plate Experiment in DCA

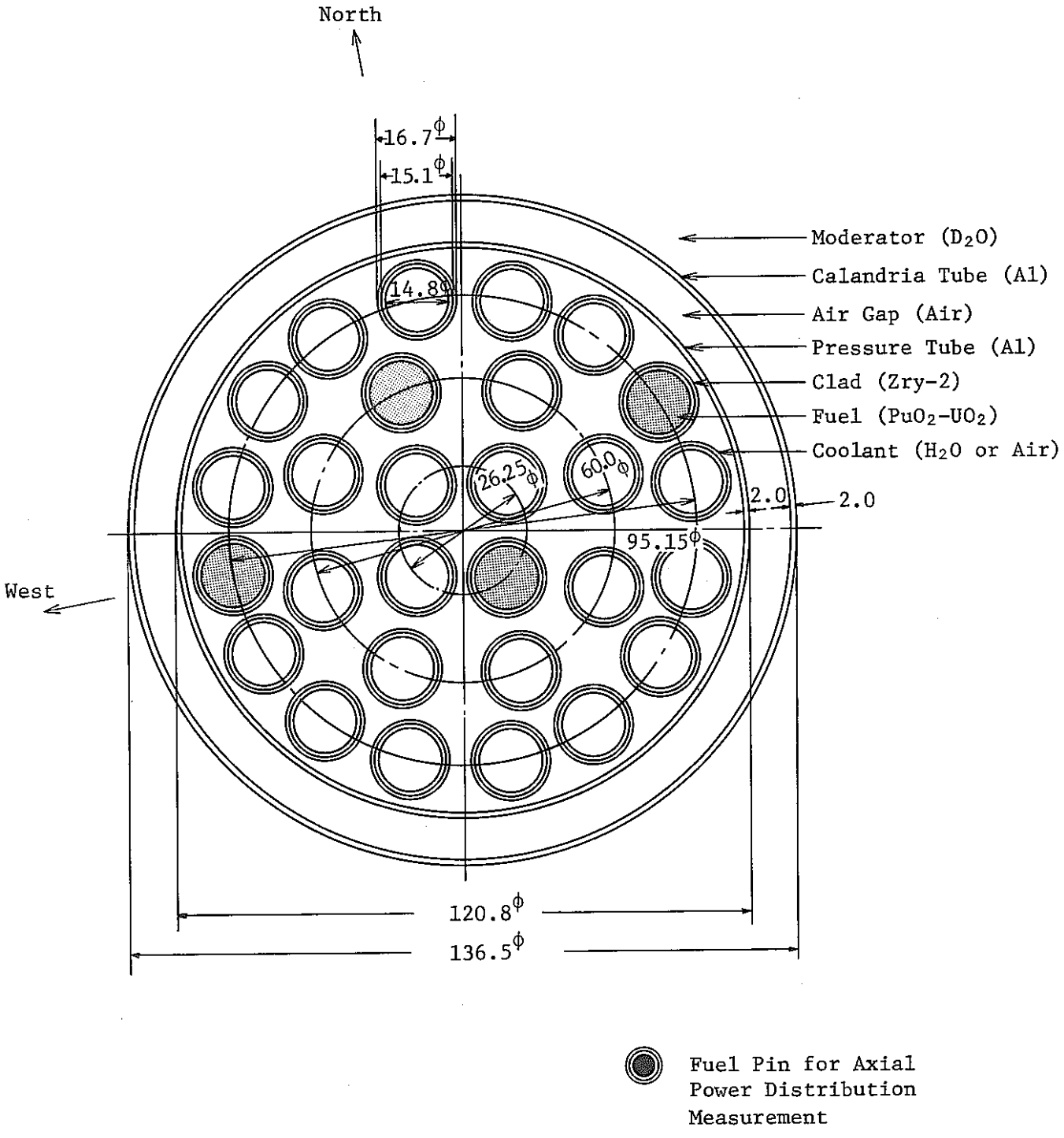


Fig. 1-7 Cross Sectional View of Fuel Cluster

2. Experimental Results

Table 2-1 Cu Wire Activation Distribution
(Och, in Fuel, 20mm^{t})

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	-1.70000E 00	1.37455E 07	0.	0.
2	3.00000E-01	2.83635E 07	0.	0.
3	2.30000E 00	2.00214E 07	0.	0.
4	4.30000E 00	3.50494E 07	0.	0.
5	6.30000E 00	4.31931E 07	0.	0.
6	8.30000E 00	5.05711E 07	0.	0.
7	1.03000E 01	5.24213E 07	0.	0.
8	1.23000E 01	6.43173E 07	0.	0.
9	1.43000E 01	7.17230E 07	0.	0.
10	1.63000E 01	7.28130E 07	0.	0.
11	1.83000E 01	8.34439E 07	0.	0.
12	2.03000E 01	8.71476E 07	0.	0.
13	2.23000E 01	9.38069E 07	0.	0.
14	2.43000E 01	9.79573E 07	0.	0.
15	2.63000E 01	1.03241E 08	0.	0.
16	2.83000E 01	1.01398E 08	0.	0.
17	3.03000E 01	1.14967E 08	0.	0.
18	3.23000E 01	1.24195E 08	0.	0.
19	3.43000E 01	1.22799E 08	0.	0.
20	3.63000E 01	1.29164E 08	0.	0.
21	3.83000E 01	1.33446E 08	0.	0.
22	4.03000E 01	1.35020E 08	0.	0.
23	4.23000E 01	1.37213E 08	0.	0.
24	4.43000E 01	1.47368E 08	0.	0.
25	4.63000E 01	1.49222E 08	0.	0.
26	4.83000E 01	1.52651E 08	0.	0.
27	5.03000E 01	1.59948E 08	0.	0.
28	5.23000E 01	1.63652E 08	0.	0.
29	5.43000E 01	1.60516E 08	0.	0.
30	5.63000E 01	1.65631E 08	0.	0.
31	5.83000E 01	1.68912E 08	0.	0.
32	6.03000E 01	1.69200E 08	0.	0.
33	6.23000E 01	1.64562E 08	0.	0.
34	6.33000E 01	1.67155E 08	0.	0.
35	6.43000E 01	1.58691E 08	0.	0.
36	6.53000E 01	1.71147E 08	0.	0.
37	6.63000E 01	1.64993E 08	0.	0.
38	6.73000E 01	1.66776E 08	0.	0.
39	6.83000E 01	1.64675E 08	0.	0.
40	6.93000E 01	1.63458E 08	0.	0.
41	7.03000E 01	1.66840E 08	0.	0.
42	7.13000E 01	1.65530E 08	0.	0.
43	7.23000E 01	1.73795E 08	0.	0.
44	7.33000E 01	1.65394E 08	0.	0.
45	7.43000E 01	1.66830E 08	0.	0.
46	7.53000E 01	1.65518E 08	0.	0.
47	7.63000E 01	1.65896E 08	0.	0.
48	7.73000E 01	1.73115E 08	0.	0.
49	7.83000E 01	1.59833E 08	0.	0.
50	7.93000E 01	1.64618E 08	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.03000E 01	1.69270E 08	0.	0.
52	8.13000E 01	1.71785E 08	0.	0.
53	8.23000E 01	1.69935E 08	0.	0.
54	8.33000E 01	1.66147E 08	0.	0.
55	8.43000E 01	1.73730E 08	0.	0.
56	8.63000E 01	1.61067E 08	0.	0.
57	8.83000E 01	1.68241E 08	0.	0.
58	9.03000E 01	1.64687E 08	0.	0.
59	9.23000E 01	1.63813E 08	0.	0.
60	9.43000E 01	1.66700E 08	0.	0.
61	9.63000E 01	1.64035E 08	0.	0.
62	9.83000E 01	1.58310E 08	0.	0.
63	1.00300E 02	1.56713E 08	0.	0.
64	1.02300E 02	1.62120E 08	0.	0.
65	1.04300E 02	1.53598E 08	0.	0.
66	1.06300E 02	1.57210E 08	0.	0.
67	1.08300E 02	1.50294E 08	0.	0.
68	1.10300E 02	1.49582E 08	0.	0.
69	1.12300E 02	1.41300E 08	0.	0.
70	1.14300E 02	1.33723E 08	0.	0.
71	1.16300E 02	1.24560E 08	0.	0.
72	1.18300E 02	1.24778E 08	0.	0.
73	1.20300E 02	1.21971E 08	0.	0.
74	1.22300E 02	1.09294E 08	0.	0.
75	1.24300E 02	1.12357E 08	0.	0.
76	1.26300E 02	1.01469E 08	0.	0.
77	1.28300E 02	9.06593E 07	0.	0.
78	1.30300E 02	8.70904E 07	0.	0.
79	1.32300E 02	8.03180E 07	0.	0.
80	1.34300E 02	7.68520E 07	0.	0.
81	1.36300E 02	6.90871E 07	0.	0.
82	1.38300E 02	6.26743E 07	0.	0.
83	1.40300E 02	5.36147E 07	0.	0.
84	1.42300E 02	4.14641E 07	0.	0.
85	1.44300E 02	4.59395E 07	0.	0.
86	1.46300E 02	3.86730E 07	0.	0.
87	1.48300E 02	3.13978E 07	0.	0.
88	1.50300E 02	2.03675E 07	0.	0.
89	1.52300E 02	1.50379E 07	0.	0.
90	1.54300E 02	9.60302E 06	0.	0.
91	1.56300E 02	9.70091E 06	0.	0.

Table 2-2 Cu Wire Activation Distribution
(1D1ch, in D_2O, 20mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	5.39230E 07	0.	0.
2	2.00000E 00	1.32609E 08	0.	0.
3	4.00000E 00	1.72449E 08	0.	0.
4	6.00000E 00	2.08816E 08	0.	0.
5	8.00000E 00	2.51065E 08	0.	0.
6	1.00000E 01	2.88083E 08	0.	0.
7	1.20000E 01	3.20439E 08	0.	0.
8	1.40000E 01	3.51644E 08	0.	0.
9	1.60000E 01	3.86920E 08	0.	0.
10	1.80000E 01	4.30801E 08	0.	0.
11	2.00000E 01	4.53292E 08	0.	0.
12	2.20000E 01	4.86807E 08	0.	0.
13	2.40000E 01	5.05225E 08	0.	0.
14	2.60000E 01	5.39102E 08	0.	0.
15	2.80000E 01	5.55404E 08	0.	0.
16	3.00000E 01	5.96384E 08	0.	0.
17	3.20000E 01	6.25094E 08	0.	0.
18	3.40000E 01	6.29759E 08	0.	0.
19	3.60000E 01	6.51263E 08	0.	0.
20	3.80000E 01	6.87590E 08	0.	0.
21	4.00000E 01	7.23252E 08	0.	0.
22	4.20000E 01	7.37989E 08	0.	0.
23	4.40000E 01	7.27819E 08	0.	0.
24	4.60000E 01	7.44602E 08	0.	0.
25	4.80000E 01	7.70002E 08	0.	0.
26	5.00000E 01	7.85433E 08	0.	0.
27	5.20000E 01	8.03044E 08	0.	0.
28	5.40000E 01	8.21162E 08	0.	0.
29	5.60000E 01	8.06906E 08	0.	0.
30	5.80000E 01	9.23411E 08	0.	0.
31	6.00000E 01	8.13366E 08	0.	0.
32	6.20000E 01	8.05957E 08	0.	0.
33	6.40000E 01	8.22578E 08	0.	0.
34	6.50000E 01	8.14193E 08	0.	0.
35	6.60000E 01	7.98453E 08	0.	0.
36	6.70000E 01	7.87825E 08	0.	0.
37	6.80000E 01	7.82177E 08	0.	0.
38	7.00000E 01	7.54549E 08	0.	0.
39	7.10000E 01	7.52958E 08	0.	0.
40	7.20000E 01	7.41350E 08	0.	0.
41	7.30000E 01	7.22949E 08	0.	0.
42	7.40000E 01	7.25507E 08	0.	0.
43	7.50000E 01	7.20197E 08	0.	0.
44	7.60000E 01	7.48940E 08	0.	0.
45	7.70000E 01	7.56337E 08	0.	0.
46	7.80000E 01	7.68898E 08	0.	0.
47	7.90000E 01	7.83766E 08	0.	0.
48	8.00000E 01	7.86638E 08	0.	0.
49	8.10000E 01	7.91890E 08	0.	0.
50	8.20000E 01	8.29540E 08	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.30000E 01	8.22237E 08	0.	0.
52	8.40000E 01	8.16620E 08	0.	0.
53	8.50000E 01	8.14010E 08	0.	0.
54	8.60000E 01	8.29155E 08	0.	0.
55	8.80000E 01	8.29305E 08	0.	0.
56	9.00000E 01	8.29360E 08	0.	0.
57	9.20000E 01	8.22530E 08	0.	0.
58	9.40000E 01	8.03646E 08	0.	0.
59	9.60000E 01	8.15220E 08	0.	0.
60	9.80000E 01	7.96033E 08	0.	0.
61	1.00000E 02	7.95023E 08	0.	0.
62	1.02000E 02	7.73095E 08	0.	0.
63	1.04000E 02	7.60191E 08	0.	0.
64	1.06000E 02	7.34862E 08	0.	0.
65	1.08000E 02	7.22610E 08	0.	0.
66	1.10000E 02	6.93200E 08	0.	0.
67	1.12000E 02	6.66825E 08	0.	0.
68	1.14000E 02	6.51781E 08	0.	0.
69	1.16000E 02	6.38733E 08	0.	0.
70	1.18000E 02	6.10078E 08	0.	0.
71	1.20000E 02	5.89722E 08	0.	0.
72	1.22000E 02	5.55246E 08	0.	0.
73	1.24000E 02	5.29531E 08	0.	0.
74	1.26000E 02	5.03038E 08	0.	0.
75	1.28000E 02	4.66768E 08	0.	0.
76	1.30000E 02	4.39538E 08	0.	0.
77	1.32000E 02	4.01438E 08	0.	0.
78	1.34000E 02	3.72385E 08	0.	0.
79	1.36000E 02	3.41366E 08	0.	0.
80	1.38000E 02	3.05271E 08	0.	0.
81	1.40000E 02	].62835E 08	0.	0.
82	1.42000E 02	2.23829E 08	0.	0.
83	1.44000E 02	1.85257E 08	0.	0.
84	1.46000E 02	1.48463E 08	0.	0.
85	1.48000E 02	1.01998E 08	0.	0.
86	1.50000E 02	5.65571E 07	0.	0.
87	1.52000E 02	3.86994E 07	0.	0.
88	1.54000E 0]	3.42608E 07	0.	0.
89	1.56000E 02	3.41232E 07	0.	0.
90	1.58000E 02	2.82451E 07	0.	0.

Table 2-3 Cu Wire Activation Distribution
(5Clch, in D_2O, 20mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	1.96435E 07	0.	0.
2	2.10000E 00	4.95768E 07	0.	0.
3	4.00000E 00	6.39586E 07	0.	0.
4	6.00000E 00	7.13620E 07	0.	0.
5	8.00000E 00	8.19202E 07	0.	0.
6	1.01000E 01	8.91612E 07	0.	0.
7	1.20000E 01	1.00099E 08	0.	0.
8	1.41000E 01	1.11054E 08	0.	0.
9	1.60000E 01	1.18505E 08	0.	0.
10	1.80000E 01	1.27583E 08	0.	0.
11	2.00000E 01	1.40464E 08	0.	0.
12	2.20000E 01	1.34488E 08	0.	0.
13	2.40000E 01	1.48535E 08	0.	0.
14	2.60000E 01	1.60019E 08	0.	0.
15	2.80000E 01	1.64084E 08	0.	0.
16	3.00000E 01	1.71042E 08	0.	0.
17	3.21000E 01	1.78372E 08	0.	0.
18	3.40000E 01	1.83518E 08	0.	0.
19	3.60000E 01	1.92278E 08	0.	0.
20	3.80000E 01	2.00779E 08	0.	0.
21	4.00000E 01	2.01158E 08	0.	0.
22	4.20000E 01	2.11524E 08	0.	0.
23	4.40000E 01	2.17540E 08	0.	0.
24	4.60000E 01	2.13563E 08	0.	0.
25	4.80000E 01	2.24674E 08	0.	0.
26	5.00000E 01	2.20983E 08	0.	0.
27	5.20000E 01	2.36018E 08	0.	0.
28	5.45000E 01	2.30579E 08	0.	0.
29	5.60000E 01	2.33441E 08	0.	0.
30	5.80000E 01	2.27542E 08	0.	0.
31	6.00000E 01	2.36145E 08	0.	0.
32	6.20000E 01	2.38618E 08	0.	0.
33	6.40000E 01	2.40379E 08	0.	0.
34	6.60000E 01	2.41118E 08	0.	0.
35	6.69000E 01	2.43076E 08	0.	0.
36	7.00000E 01	2.40234E 08	0.	0.
37	7.20000E 01	2.41450E 08	0.	0.
38	7.40000E 01	2.44012E 08	0.	0.
39	7.49000E 01	2.54118E 08	0.	0.
40	7.80000E 01	2.45267E 08	0.	0.
41	7.89000E 01	2.37976E 08	0.	0.
42	8.20000E 01	2.34594E 08	0.	0.
43	8.40000E 01	2.49369E 08	0.	0.
44	8.60000E 01	2.39666E 08	0.	0.
45	8.69000E 01	2.33010E 08	0.	0.
46	9.01000E 01	2.23575E 08	0.	0.
47	9.09000E 01	2.30990E 08	0.	0.
48	9.40000E 01	2.21819E 08	0.	0.
49	9.60000E 01	2.20816E 08	0.	0.
50	9.30000E 01	2.22206E 08	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	1.00000E 02	2.14966E 08	0.	0.
52	1.00900E 02	2.00110E 08	0.	0.
53	1.04000E 02	2.00193E 08	0.	0.
54	1.06000E 02	2.05580E 08	0.	0.
55	1.08100E 02	1.87900E 08	0.	0.
56	1.08900E 02	1.68444E 08	0.	0.
57	1.12000E 02	1.73927E 08	0.	0.
58	1.14000E 02	1.69063E 08	0.	0.
59	1.16100E 02	1.59545E 08	0.	0.
60	1.18000E 02	1.51880E 08	0.	0.
61	1.20000E 02	1.43185E 08	0.	0.
62	1.22000E 02	1.39514E 08	0.	0.
63	1.22900E 02	1.34406E 08	0.	0.
64	1.26000E 02	1.24974E 08	0.	0.
65	1.28000E 02	1.14403E 08	0.	0.
66	1.30000E 02	1.04670E 08	0.	0.
67	1.32000E 02	9.88800E 07	0.	0.
68	1.32900E 02	8.59313E 07	0.	0.
69	1.36000E 02	7.62706E 07	0.	0.
70	1.38000E 02	7.02959E 07	0.	0.
71	1.38900E 02	5.94457E 07	0.	0.
72	1.42000E 02	4.82717E 07	0.	0.
73	1.44000E 02	3.35773E 07	0.	0.
74	1.46000E 02	2.06642E 07	0.	0.
75	1.48000E 02	1.22719E 07	0.	0.
76	1.50000E 02	6.66724E 06	0.	0.
77	1.52000E 02	7.46398E 06	0.	0.
78	1.52900E 02	7.27810E 06	0.	0.
79	1.54900E 02	5.48448E 06	0.	0.
80	1.58000E 02	8.79786E 06	0.	0.

Table 2-4 Cu Wire Activation Distribution
(Och, in Fuel, 40mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	-1.70000E-01	6.78188E 02	0.	0.
2	1.83000E 00	1.76124E 03	0.	0.
3	3.83000E 00	1.80859E 03	0.	0.
4	5.83000E 00	1.94467E 03	0.	0.
5	7.83000E 00	2.30171E 03	0.	0.
6	9.83000E 00	2.67050E 03	0.	0.
7	1.18300E 01	3.07767E 03	0.	0.
8	1.38300E 01	3.36687E 03	0.	0.
9	1.58300E 01	3.80105E 03	0.	0.
10	1.78300E 01	4.14495E 03	0.	0.
11	1.98300E 01	4.41322E 03	0.	0.
12	2.18300E 01	4.63916E 03	0.	0.
13	2.38300E 01	5.27618E 03	0.	0.
14	2.58300E 01	5.52348E 03	0.	0.
15	2.78300E 01	5.71716E 03	0.	0.
16	2.98300E 01	6.11227E 03	0.	0.
17	3.18300E 01	6.31966E 03	0.	0.
18	3.38300E 01	6.49190E 03	0.	0.
19	3.58300E 01	6.75131E 03	0.	0.
20	3.78300E 01	7.10047E 03	0.	0.
21	3.98300E 01	7.30725E 03	0.	0.
22	4.18300E 01	7.62842E 03	0.	0.
23	4.38300E 01	8.03988E 03	0.	0.
24	4.58300E 01	7.89371E 03	0.	0.
25	4.78300E 01	7.91978E 03	0.	0.
26	4.98300E 01	8.20098E 03	0.	0.
27	5.18300E 01	8.41125E 03	0.	0.
28	5.38300E 01	8.61053E 03	0.	0.
29	5.58300E 01	8.92476E 03	0.	0.
30	5.78300E 01	8.91963E 03	0.	0.
31	5.98300E 01	8.93897E 03	0.	0.
32	6.18300E 01	8.86791E 03	0.	0.
33	6.38300E 01	8.87592E 03	0.	0.
34	6.48300E 01	9.02519E 03	0.	0.
35	6.58300E 01	9.00854E 03	0.	0.
36	6.68300E 01	9.32997E 03	0.	0.
37	6.78300E 01	9.04135E 03	0.	0.
38	6.88300E 01	8.79583E 03	0.	0.
39	6.98300E 01	8.86982E 03	0.	0.
40	7.08300E 01	8.91361E 03	0.	0.
41	7.18300E 01	8.78499E 03	0.	0.
42	7.28300E 01	8.73396E 03	0.	0.
43	7.38300E 01	8.82326E 03	0.	0.
44	7.48300E 01	8.70002E 03	0.	0.
45	7.68300E 01	8.63335E 03	0.	0.
46	7.78300E 01	8.61627E 03	0.	0.
47	7.88300E 01	8.53637E 03	0.	0.
48	7.98300E 01	8.76485E 03	0.	0.
49	8.08300E 01	8.87739E 03	0.	0.
50	8.18300E 01	8.75745E 03	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.28300E 01	9.00942E 03	0.	0.
52	8.38300E 01	8.78439E 03	0.	0.
53	8.48300E 01	9.10439E 03	0.	0.
54	8.58300E 01	8.94141E 03	0.	0.
55	8.78300E 01	8.95715E 03	0.	0.
56	8.98300E 01	8.88293E 03	0.	0.
57	9.18300E 01	9.09788E 03	0.	0.
58	9.38300E 01	8.91245E 03	0.	0.
59	9.58300E 01	9.18335E 03	0.	0.
60	9.78300E 01	9.18584E 03	0.	0.
61	9.98300E 01	8.78876E 03	0.	0.
62	1.01830E 02	8.81213E 03	0.	0.
63	1.03830E 02	8.55275E 03	0.	0.
64	1.05830E 02	8.57213E 03	0.	0.
65	1.07830E 02	8.45092E 03	0.	0.
66	1.09830E 02	8.22351E 03	0.	0.
67	1.11830E 02	7.94370E 03	0.	0.
68	1.13830E 02	7.95111E 03	0.	0.
69	1.15830E 02	7.56063E 03	0.	0.
70	1.17830E 02	7.41702E 03	0.	0.
71	1.19830E 02	7.02949E 03	0.	0.
72	1.21830E 02	6.95886E 03	0.	0.
73	1.23830E 02	6.78706E 03	0.	0.
74	1.25830E 02	6.42381E 03	0.	0.
75	1.27830E 02	6.02641E 03	0.	0.
76	1.29830E 02	5.76317E 03	0.	0.
77	1.31830E 02	5.51542E 03	0.	0.
78	1.33830E 02	5.10865E 03	0.	0.
79	1.35830E 02	4.79461E 03	0.	0.
80	1.37830E 02	4.53576E 03	0.	0.
81	1.39830E 02	3.93668E 03	0.	0.
82	1.41830E 02	3.68285E 03	0.	0.
83	1.43830E 02	3.42270E 03	0.	0.
84	1.45830E 02	2.86944E 03	0.	0.
85	1.47830E 02	2.46490E 03	0.	0.
86	1.49830E 02	2.18343E 03	0.	0.
87	1.51830E 02	1.77587E 03	0.	0.
88	1.53830E 02	1.36176E 03	0.	0.
89	1.55830E 02	7.59275E 02	0.	0.
90	1.57830E 02	5.81837E 02	0.	0.
91	1.59830E 02	6.08249E 02	0.	0.

Table 2-5 Cu Wire Activation Disthibution
(1D1ch, in D_2O, 40mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	1.54247E 03	0.	0.
2	2.00000E 00	4.67804E 03	0.	0.
3	4.00000E 00	6.32090E 03	0.	0.
4	6.00000E 00	8.09457E 03	0.	0.
5	8.00000E 00	9.95071E 03	0.	0.
6	1.00000E 01	1.13875E 04	0.	0.
7	1.20000E 01	1.26513E 04	0.	0.
8	1.40000E 01	1.41836E 04	0.	0.
9	1.60000E 01	1.56388E 04	0.	0.
10	1.80000E 01	1.69642E 04	0.	0.
11	2.00000E 01	1.87559E 04	0.	0.
12	2.20000E 01	1.95750E 04	0.	0.
13	2.40000E 01	2.15926E 04	0.	0.
14	2.60000E 01	2.24176E 04	0.	0.
15	2.80000E 01	2.35359E 04	0.	0.
16	3.00000E 01	2.54440E 04	0.	0.
17	3.20000E 01	2.59949E 04	0.	0.
18	3.40000E 01	2.70999E 04	0.	0.
19	3.60000E 01	2.81242E 04	0.	0.
20	3.80000E 01	2.88724E 04	0.	0.
21	4.00000E 01	3.00859E 04	0.	0.
22	4.20000E 01	3.08232E 04	0.	0.
23	4.40000E 01	3.11248E 04	0.	0.
24	4.60000E 01	3.19938E 04	0.	0.
25	4.80000E 01	3.30023E 04	0.	0.
26	5.00000E 01	3.28150E 04	0.	0.
27	5.20000E 01	3.40820E 04	0.	0.
28	5.40000E 01	3.32738E 04	0.	0.
29	5.60000E 01	3.45665E 04	0.	0.
30	5.80000E 01	3.41913E 04	0.	0.
31	6.00000E 01	3.39141E 04	0.	0.
32	6.20000E 01	3.43939E 04	0.	0.
33	6.40000E 01	3.30641E 04	0.	0.
34	6.50000E 01	3.34981E 04	0.	0.
35	6.60000E 01	3.38177E 04	0.	0.
36	6.70000E 01	3.30347E 04	0.	0.
37	6.80000E 01	3.27638E 04	0.	0.
38	6.90000E 01	3.15574E 04	0.	0.
39	7.00000E 01	3.13801E 04	0.	0.
40	7.10000E 01	3.07142E 04	0.	0.
41	7.20000E 01	2.95510E 04	0.	0.
42	7.30000E 01	2.77874E 04	0.	0.
43	7.40000E 01	2.67333E 04	0.	0.
44	7.50000E 01	2.62170E 04	0.	0.
45	7.60000E 01	2.54783E 04	0.	0.
46	7.70000E 01	2.59976E 04	0.	0.
47	7.80000E 01	2.67847E 04	0.	0.
48	7.90000E 01	2.76259E 04	0.	0.
49	8.00000E 01	2.93449E 04	0.	0.
50	8.10000E 01	3.06780E 04	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.20000E 01	3.06356E 04	0.	0.
52	8.30000E 01	3.17146E 04	0.	0.
53	8.40000E 01	3.19200E 04	0.	0.
54	8.50000E 01	3.35161E 04	0.	0.
55	8.60000E 01	3.36769E 04	0.	0.
56	8.80000E 01	3.41319E 04	0.	0.
57	9.00000E 01	3.49094E 04	0.	0.
58	9.20000E 01	3.52082E 04	0.	0.
59	9.40000E 01	3.41965E 04	0.	0.
60	9.60000E 01	3.46606E 04	0.	0.
61	9.80000E 01	3.42024E 04	0.	0.
62	1.00000E 02	3.48697E 04	0.	0.
63	1.02000E 02	3.35499E 04	0.	0.
64	1.04000E 02	3.37658E 04	0.	0.
65	1.06000E 02	3.27845E 04	0.	0.
66	1.08000E 02	3.22998E 04	0.	0.
67	1.10000E 02	3.19765E 04	0.	0.
68	1.12000E 02	3.06034E 04	0.	0.
69	1.14000E 02	3.04286E 04	0.	0.
70	1.16000E 02	2.90415E 04	0.	0.
71	1.18000E 02	2.78859E 04	0.	0.
72	1.20000E 02	2.70410E 04	0.	0.
73	1.22000E 02	2.63077E 04	0.	0.
74	1.24000E 02	2.53619E 04	0.	0.
75	1.26000E 02	2.42989E 04	0.	0.
76	1.28000E 02	2.21162E 04	0.	0.
77	1.30000E 02	2.16213E 04	0.	0.
78	1.32000E 02	2.00689E 04	0.	0.
79	1.34000E 02	1.87151E 04	0.	0.
80	1.36000E 02	1.79102E 04	0.	0.
81	1.38000E 02	1.58256E 04	0.	0.
82	1.40000E 02	1.45481E 04	0.	0.
83	1.42000E 02	1.30238E 04	0.	0.
84	1.44000E 02	1.11105E 04	0.	0.
85	1.46000E 02	9.85497E 03	0.	0.
86	1.48000E 02	8.27307E 03	0.	0.
87	1.50000E 02	6.52310E 03	0.	0.
88	1.52000E 02	4.42953E 03	0.	0.
89	1.54000E 02	2.70208E 03	0.	0.
90	1.56000E 02	1.70456E 03	0.	0.
91	1.58000E 02	1.57983E 03	0.	0.
92	1.60000E 02	1.42156E 03	0.	0.

Table 2-6 Cu Wire Activation Distribution
(5Clch, in D_2O, 40mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	2.41423E 03	0.	0.
2	2.00000E 00	6.56873E 03	0.	0.
3	4.00000E 00	7.79232E 03	0.	0.
4	6.00000E 00	8.92426E 03	0.	0.
5	8.00000E 00	1.06429E 04	0.	0.
6	1.00000E 01	1.20637E 04	0.	0.
7	1.20000E 01	1.28404E 04	0.	0.
8	1.40000E 01	1.45587E 04	0.	0.
9	1.60000E 01	1.51807E 04	0.	0.
10	1.80000E 01	1.66607E 04	0.	0.
11	2.00000E 01	1.76898E 04	0.	0.
12	2.20000E 01	1.84619E 04	0.	0.
13	2.40000E 01	1.93690E 04	0.	0.
14	2.60000E 01	2.09218E 04	0.	0.
15	2.80000E 01	2.18909E 04	0.	0.
16	3.00000E 01	2.25939E 04	0.	0.
17	3.20000E 01	2.38399E 04	0.	0.
18	3.40000E 01	2.46757E 04	0.	0.
19	3.60000E 01	2.49567E 04	0.	0.
20	3.80000E 01	2.62899E 04	0.	0.
21	4.00000E 01	2.65760E 04	0.	0.
22	4.20000E 01	2.73974E 04	0.	0.
23	4.40000E 01	2.81174E 04	0.	0.
24	4.60000E 01	2.90164E 04	0.	0.
25	4.80000E 01	2.89810E 04	0.	0.
26	5.00000E 01	2.89753E 04	0.	0.
27	5.20000E 01	2.99949E 04	0.	0.
28	5.40000E 01	3.06407E 04	0.	0.
29	5.60000E 01	3.09082E 04	0.	0.
30	5.80000E 01	3.15464E 04	0.	0.
31	6.00000E 01	3.20105E 04	0.	0.
32	6.20000E 01	3.23043E 04	0.	0.
33	6.40000E 01	3.14596E 04	0.	0.
34	6.50000E 01	3.16418E 04	0.	0.
35	6.60000E 01	3.21057E 04	0.	0.
36	6.70000E 01	3.24505E 04	0.	0.
37	6.80000E 01	3.23769E 04	0.	0.
38	6.90000E 01	3.26451E 04	0.	0.
39	7.00000E 01	3.21869E 04	0.	0.
40	7.10000E 01	3.22157E 04	0.	0.
41	7.20000E 01	3.19195E 04	0.	0.
42	7.30000E 01	3.30394E 04	0.	0.
43	7.40000E 01	3.30343E 04	0.	0.
44	7.50000E 01	3.29822E 04	0.	0.
45	7.60000E 01	3.22574E 04	0.	0.
46	7.70000E 01	3.20935E 04	0.	0.
47	7.80000E 01	3.25039E 04	0.	0.
48	7.90000E 01	3.14180E 04	0.	0.
49	8.00000E 01	3.20814E 04	0.	0.
50	8.10000E 01	3.14881E 04	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.20000E 01	3.20448E 04	0.	0.
52	8.30000E 01	3.21767E 04	0.	0.
53	8.40000E 01	3.19350E 04	0.	0.
54	8.50000E 01	3.15942E 04	0.	0.
55	8.60000E 01	3.19454E 04	0.	0.
56	9.00000E 01	3.14218E 04	0.	0.
57	9.20000E 01	3.02766E 04	0.	0.
58	9.40000E 01	3.01980E 04	0.	0.
59	9.60000E 01	2.93486E 04	0.	0.
60	9.80000E 01	2.83780E 04	0.	0.
61	1.00000E 02	2.79668E 04	0.	0.
62	1.02000E 02	2.75035E 04	0.	0.
63	1.04000E 02	2.74147E 04	0.	0.
64	1.06000E 02	2.59376E 04	0.	0.
65	1.08000E 02	2.59434E 04	0.	0.
66	1.10000E 02	2.47233E 04	0.	0.
67	1.12000E 02	2.41413E 04	0.	0.
68	1.14000E 02	2.33646E 04	0.	0.
69	1.16000E 02	2.24619E 04	0.	0.
70	1.18000E 02	2.12949E 04	0.	0.
71	1.20000E 02	2.04341E 04	0.	0.
72	1.22000E 02	1.96202E 04	0.	0.
73	1.24000E 02	1.86715E 04	0.	0.
74	1.26000E 04	1.79559E 04	0.	0.
75	1.28000E 02	1.69324E 04	0.	0.
76	1.30000E 02	1.53060E 04	0.	0.
77	1.32000E 02	1.43847E 04	0.	0.
78	1.34000E 02	1.32633E 04	0.	0.
79	1.36000E 02	1.19808E 04	0.	0.
80	1.38000E 02	1.06192E 04	0.	0.
81	1.40000E 02	9.33904E 03	0.	0.
82	1.42000E 02	8.19687E 03	0.	0.
83	1.44000E 02	6.48514E 03	0.	0.
84	1.46000E 02	5.15437E 03	0.	0.
85	1.48000E 02	3.75747E 03	0.	0.
86	1.50000E 02	2.19444E 03	0.	0.
87	1.52000E 02	1.28238E 03	0.	0.
88	1.54000E 02	1.32202E 03	0.	0.
89	1.56000E 02	1.26162E 03	0.	0.
90	1.58000E 02	1.04015E 03	0.	0.
91	1.60000E 02	1.09291E 03	0.	0.

Table 2-7 Cu Wire Activation Distribution
(0ch, in Fuel, 80mm^{t})

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	7.57133E 02	0.	0.
2	2.00000E 00	1.53836E 03	0.	0.
3	4.00000E 00	1.67763E 03	0.	0.
4	6.00000E 00	1.87280E 03	0.	0.
5	8.00000E 00	2.34313E 03	0.	0.
6	1.00000E 01	2.59674E 03	0.	0.
7	1.20000E 01	2.91424E 03	0.	0.
8	1.40000E 01	3.40554E 03	0.	0.
9	1.60000E 01	3.84935E 03	0.	0.
10	1.80000E 01	3.94461E 03	0.	0.
11	2.00000E 01	4.06316E 03	0.	0.
12	2.20000E 01	4.57789E 03	0.	0.
13	2.40000E 01	4.90196E 03	0.	0.
14	2.60000E 01	5.20714E 03	0.	0.
15	2.80000E 01	5.60760E 03	0.	0.
16	3.00000E 01	5.83427E 03	0.	0.
17	3.20000E 01	5.93523E 03	0.	0.
18	3.40000E 01	6.14691E 03	0.	0.
19	3.60000E 01	6.44431E 03	0.	0.
20	3.80000E 01	6.69160E 03	0.	0.
21	4.00000E 01	7.17641E 03	0.	0.
22	4.20000E 01	7.09188E 03	0.	0.
23	4.40000E 01	7.75286E 03	0.	0.
24	4.60000E 01	7.59653E 03	0.	0.
25	4.80000E 01	7.84741E 03	0.	0.
26	5.00000E 01	7.68505E 03	0.	0.
27	5.20000E 01	7.95977E 03	0.	0.
28	5.40000E 01	8.05709E 03	0.	0.
29	5.60000E 01	8.50703E 03	0.	0.
30	5.80000E 01	8.19930E 03	0.	0.
31	6.00000E 01	8.24999E 03	0.	0.
32	6.20000E 01	8.41241E 03	0.	0.
33	6.40000E 01	8.43586E 03	0.	0.
34	6.50000E 01	8.03541E 03	0.	0.
35	6.60000E 01	8.28418E 03	0.	0.
36	6.70000E 01	8.32899E 03	0.	0.
37	6.80000E 01	8.25198E 03	0.	0.
38	6.90000E 01	8.12175E 03	0.	0.
39	7.00000E 01	8.09764E 03	0.	0.
40	7.20000E 01	7.91923E 03	0.	0.
41	7.30000E 01	7.80026E 03	0.	0.
42	7.40000E 01	7.95742E 03	0.	0.
43	7.50000E 01	7.72771E 03	0.	0.
44	7.60000E 01	7.72496E 03	0.	0.
45	7.70000E 01	7.88237E 03	0.	0.
46	7.80000E 01	7.80847E 03	0.	0.
47	7.90000E 01	7.27312E 03	0.	0.
48	8.00000E 01	7.80302E 03	0.	0.
49	8.10000E 01	7.54453E 03	0.	0.
50	8.20000E 01	7.60511E 03	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.30000E 01	7.64590E 03	0.	0.
52	8.40000E 01	7.63709E 03	0.	0.
53	8.50000E 01	7.93640E 03	0.	0.
54	8.60000E 01	7.97749E 03	0.	0.
55	8.80000E 01	8.29156E 03	0.	0.
56	9.00000E 01	8.31123E 03	0.	0.
57	9.20000E 01	8.12958E 03	0.	0.
58	9.40000E 01	8.38854E 03	0.	0.
59	9.60000E 01	8.25658E 03	0.	0.
60	9.80000E 01	8.56392E 03	0.	0.
61	1.00000E 02	8.36794E 03	0.	0.
62	1.02000E 02	8.25770E 03	0.	0.
63	1.04000E 02	8.27741E 03	0.	0.
64	1.06000E 02	8.21903E 03	0.	0.
65	1.08000E 02	8.42115E 03	0.	0.
66	1.10000E 02	7.91546E 03	0.	0.
67	1.12000E 02	7.90888E 03	0.	0.
68	1.14000E 02	7.67934E 03	0.	0.
69	1.16000E 02	7.50375E 03	0.	0.
70	1.18000E 02	7.41640E 03	0.	0.
71	1.20000E 02	7.30077E 03	0.	0.
72	1.22000E 02	7.01779E 03	0.	0.
73	1.24000E 02	6.92791E 03	0.	0.
74	1.26000E 02	6.60598E 03	0.	0.
75	1.28000E 02	6.10801E 03	0.	0.
76	1.30000E 02	5.96683E 03	0.	0.
77	1.32000E 02	5.64558E 03	0.	0.
78	1.34000E 02	5.33401E 03	0.	0.
79	1.36000E 02	5.06652E 03	0.	0.
80	1.38000E 02	4.82499E 03	0.	0.
81	1.40000E 02	4.59327E 03	0.	0.
82	1.42000E 02	4.21319E 03	0.	0.
83	1.44000E 02	3.89550E 03	0.	0.
84	1.46000E 02	3.50225E 03	0.	0.
85	1.48000E 02	3.23037E 03	0.	0.
86	1.50000E 02	2.82799E 03	0.	0.
87	1.52000E 02	2.33351E 03	0.	0.
88	1.54000E 02	2.06841E 03	0.	0.
89	1.56000E 02	1.68886E 03	0.	0.
90	1.58000E 02	1.27005E 03	0.	0.
91	1.60000E 02	8.77200E 02	0.	0.
92	1.62000E 02	6.16502E 02	0.	0.
93	1.64000E 02	5.92414E 02	0.	0.

Table 2-8 Cu Wire Activation Distribution
(1D1ch, in D_2O, 80mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	1.92257E 03	0.	0.
2	2.00000E 00	5.60043E 03	0.	0.
3	4.00000E 00	7.10320E 03	0.	0.
4	6.00000E 00	8.71659E 03	0.	0.
5	8.00000E 00	1.03636E 04	0.	0.
6	1.00000E 01	1.19122E 04	0.	0.
7	1.20000E 01	1.31435E 04	0.	0.
8	1.40000E 01	1.46883E 04	0.	0.
9	1.60000E 01	1.61925E 04	0.	0.
10	1.80000E 01	1.73047E 04	0.	0.
11	2.00000E 01	1.85791E 04	0.	0.
12	2.20000E 01	1.99192E 04	0.	0.
13	2.40000E 01	2.13056E 04	0.	0.
14	2.60000E 01	2.19923E 04	0.	0.
15	2.80000E 01	2.33387E 04	0.	0.
16	3.00000E 01	2.48430E 04	0.	0.
17	3.20000E 01	2.47057E 04	0.	0.
18	3.40000E 01	2.60518E 04	0.	0.
19	3.60000E 01	2.73213E 04	0.	0.
20	3.80000E 01	2.31061E 04	0.	0.
21	4.00000E 01	2.37619E 04	0.	0.
22	4.20000E 01	3.00050E 04	0.	0.
23	4.40000E 01	2.98740E 04	0.	0.
24	4.60000E 01	3.09564E 04	0.	0.
25	4.80000E 01	8.10918E 04	0.	0.
26	5.00000E 01	3.16787E 04	0.	0.
27	5.20000E 01	3.18632E 04	0.	0.
28	5.40000E 01	3.17587E 04	0.	0.
29	5.60000E 01	3.18101E 04	0.	0.
30	5.80000E 01	3.21510E 04	0.	0.
31	6.00000E 01	3.18284E 04	0.	0.
32	6.20000E 01	3.08286E 04	0.	0.
33	6.40000E 01	2.96425E 04	0.	0.
34	6.50000E 01	2.95882E 04	0.	0.
35	6.60000E 01	2.94720E 04	0.	0.
36	6.70000E 01	2.85669E 04	0.	0.
37	6.80000E 01	2.80562E 04	0.	0.
38	6.90000E 01	2.67876E 04	0.	0.
39	7.00000E 01	2.58253E 04	0.	0.
40	7.10000E 01	2.48133E 04	0.	0.
41	7.20000E 01	2.32165E 04	0.	0.
42	7.30000E 01	2.18079E 04	0.	0.
43	7.40000E 01	2.08427E 04	0.	0.
44	7.50000E 01	2.02491E 04	0.	0.
45	7.60000E 01	1.99134E 04	0.	0.
46	7.70000E 01	2.00155E 04	0.	0.
47	7.80000E 01	1.97285E 04	0.	0.
48	7.90000E 01	2.01774E 04	0.	0.
49	8.00000E 01	2.05873E 04	0.	0.
50	8.10000E 01	2.15444E 04	0.	0.

Continued

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
51	8.20000E 01	2.29903E 04	0.	0.
52	8.30000E 01	2.48045E 04	0.	0.
53	8.40000E 01	2.56988E 04	0.	0.
54	8.50000E 01	2.65906E 04	0.	0.
55	8.60000E 01	2.80212E 04	0.	0.
56	8.80000E 01	2.90335E 04	0.	0.
57	9.00000E 01	3.01255E 04	0.	0.
58	9.20000E 01	3.16356E 04	0.	0.
59	9.40000E 01	3.19307E 04	0.	0.
60	9.60000E 01	3.23773E 04	0.	0.
61	9.80000E 01	3.26038E 04	0.	0.
62	1.00000E 02	3.29555E 04	0.	0.
63	1.02000E 02	3.21946E 04	0.	0.
64	1.04000E 02	3.17098E 04	0.	0.
65	1.06000E 02	3.19660E 04	0.	0.
66	1.08000E 02	3.12500E 04	0.	0.
67	1.10000E 02	3.10478E 04	0.	0.
68	1.12000E 02	3.03704E 04	0.	0.
69	1.14000E 02	2.92933E 04	0.	0.
70	1.16000E 02	2.91133E 04	0.	0.
71	1.18000E 02	2.82660E 04	0.	0.
72	1.20000E 02	2.71572E 04	0.	0.
73	1.22000E 02	2.68241E 04	0.	0.
74	1.24000E 02	2.54528E 04	0.	0.
75	1.26000E 02	2.55170E 04	0.	0.
76	1.28000E 02	2.39874E 04	0.	0.
77	1.30000E 02	2.23291E 04	0.	0.
78	1.32000E 02	2.11296E 04	0.	0.
79	1.34000E 02	1.94758E 04	0.	0.
80	1.36000E 02	1.86488E 04	0.	0.
81	1.38000E 02	1.69399E 04	0.	0.
82	1.40000E 02	1.59125E 04	0.	0.
83	1.42000E 02	1.48546E 04	0.	0.
84	1.44000E 02	1.29437E 04	0.	0.
85	1.46000E 02	1.11343E 04	0.	0.
86	1.48000E 02	9.90432E 03	0.	0.
87	1.50000E 02	8.34824E 03	0.	0.
88	1.52000E 02	6.74460E 03	0.	0.
89	1.54000E 02	4.81775E 03	0.	0.
90	1.56000E 02	2.80990E 03	0.	0.
91	1.58000E 02	1.93708E 03	0.	0.
92	1.60000E 02	1.54559E 03	0.	0.
93	1.62000E 02	1.29680E 03	0.	0.
94	1.64000E 02	1.37049E 03	0.	0.

Table 2-9 Cu Wire Activation Distribution
(5C1ch, in D_2O, 80mm^t)

	XX(I) (cm)	YY(I)	EX(I)	EY(I)
1	0.	2.68569E 03	0.	0.
2	2.00000E 00	6.53870E 03	0.	0.
3	4.00000E 00	7.94303E 03	0.	0.
4	6.00000E 00	9.48715E 03	0.	0.
5	8.00000E 00	1.03395E 04	0.	0.
6	1.00000E 01	1.18318E 04	0.	0.
7	1.40000E 01	1.41972E 04	0.	0.
8	1.60000E 01	1.54323E 04	0.	0.
9	1.80000E 01	1.64346E 04	0.	0.
10	2.00000E 01	1.72716E 04	0.	0.
11	2.20000E 01	1.80890E 04	0.	0.
12	2.40000E 01	1.90495E 04	0.	0.
13	2.60000E 01	2.05133E 04	0.	0.
14	2.80000E 01	2.13229E 04	0.	0.
15	3.00000E 01	2.27039E 04	0.	0.
16	3.20000E 01	2.33621E 04	0.	0.
17	3.40000E 01	2.36059E 04	0.	0.
18	3.60000E 01	2.45643E 04	0.	0.
19	3.80000E 01	2.56903E 04	0.	0.
20	4.00000E 01	2.63474E 04	0.	0.
21	4.20000E 01	2.71412E 04	0.	0.
22	4.40000E 01	2.76630E 04	0.	0.
23	4.60000E 01	2.86252E 04	0.	0.
24	4.80000E 01	2.92265E 04	0.	0.
25	5.00000E 01	2.90570E 04	0.	0.
26	5.20000E 01	2.93586E 04	0.	0.
27	5.40000E 01	3.03844E 04	0.	0.
28	5.60000E 01	3.04441E 04	0.	0.
29	5.80000E 01	3.07568E 04	0.	0.
30	6.00000E 01	3.06046E 04	0.	0.
31	6.20000E 01	3.09792E 04	0.	0.
32	6.40000E 01	3.20796E 04	0.	0.
33	6.50000E 01	3.16566E 04	0.	0.
34	6.60000E 01	3.20860E 04	0.	0.
35	6.70000E 01	3.14639E 04	0.	0.
36	6.80000E 01	3.16707E 04	0.	0.
37	6.90000E 01	3.21383E 04	0.	0.
38	7.00000E 01	3.19889E 04	0.	0.
39	7.10000E 01	3.21790E 04	0.	0.
40	7.20000E 01	3.20878E 04	0.	0.
41	7.30000E 01	3.22884E 04	0.	0.
42	7.40000E 01	3.18399E 04	0.	0.
43	7.50000E 01	3.16866E 04	0.	0.
44	7.60000E 01	3.19010E 04	0.	0.
45	7.70000E 01	3.22497E 04	0.	0.
46	7.80000E 01	3.14772E 04	0.	0.
47	7.90000E 01	3.16401E 04	0.	0.
48	8.00000E 01	3.14726E 04	0.	0.
49	8.10000E 01	3.21832E 04	0.	0.
50	8.20000E 01	3.24740E 04	0.	0.

Continued

	XX(I) (cm)	Y(I)	EX(I)	EY(I)
51	8.30000E 01	3.14107E 04	0.	0.
52	8.40000E 01	3.19289E 04	0.	0.
53	8.50000E 01	3.12681E 04	0.	0.
54	8.60000E 01	3.15762E 04	0.	0.
55	8.80000E 01	3.10260E 04	0.	0.
56	9.00000E 01	3.08620E 04	0.	0.
57	9.20000E 01	3.02386E 04	0.	0.
58	9.40000E 01	2.98599E 04	0.	0.
59	9.60000E 01	2.98405E 04	0.	0.
60	9.80000E 01	2.96308E 04	0.	0.
61	1.00000E 02	2.91650E 04	0.	0.
62	1.02000E 02	2.84290E 04	0.	0.
63	1.04000E 04	2.75297E 04	0.	0.
64	1.06000E 02	2.71769E 04	0.	0.
65	1.08000E 02	2.77575E 04	0.	0.
66	1.10000E 02	2.59255E 04	0.	0.
67	1.12000E 02	2.55645E 04	0.	0.
68	1.14000E 02	2.42681E 04	0.	0.
69	1.16000E 02	2.31984E 04	0.	0.
70	1.18000E 02	2.27518E 04	0.	0.
71	1.20000E 02	2.18491E 04	0.	0.
72	1.22000E 02	2.09563E 04	0.	0.
73	1.24000E 02	1.96068E 04	0.	0.
74	1.26000E 02	1.89581E 04	0.	0.
75	1.28000E 02	1.80352E 04	0.	0.
76	1.30000E 02	1.67955E 04	0.	0.
77	1.32000E 02	1.61135E 04	0.	0.
78	1.34000E 02	1.48301E 04	0.	0.
79	1.36000E 02	1.36512E 04	0.	0.
80	1.38000E 02	1.23625E 04	0.	0.
81	1.40000E 02	1.15231E 04	0.	0.
82	1.42000E 02	1.02468E 04	0.	0.
83	1.44000E 02	9.08567E 03	0.	0.
84	1.46000E 02	7.59983E 03	0.	0.
85	1.48000E 02	6.69762E 03	0.	0.
86	1.50000E 02	4.79770E 03	0.	0.
87	1.52000E 02	3.49207E 03	0.	0.
88	1.54000E 02	2.04451E 03	0.	0.
89	1.56000E 02	1.32942E 03	0.	0.
90	1.58000E 02	1.15708E 03	0.	0.
91	1.60000E 02	1.16812E 03	0.	0.
92	1.62000E 02	1.06972E 03	0.	0.
93	1.64000E 02	9.42986E 02	0.	0.

Table 2-10 Axial Power Distribution(40mm^t Aseismatic Plate)

No.	Distance	1st		2nd	
	mm	Power	Error	Power	Error
1	50	5.328E+3	2.780E+2	6.576E+3	2.998E+2
2	150	1.029E+4	3.645E+2	1.254E+4	3.949E+2
3	250	1.422E+4	4.208E+2	1.740E+4	4.579E+2
4	350	1.732E+4	4.604E+2	2.287E+4	5.200E+2
5	400	1.929E+4	4.838E+2	2.464E+4	5.385E+2
6	450	2.062E+4	4.990E+2	2.753E+4	5.676E+2
7	500	2.157E+4	5.097E+2	2.710E+4	5.634E+2
8	550	2.157E+4	5.098E+2	2.860E+4	5.781E+2
9	575	2.255E+4	5.193E+2	2.827E+4	5.764E+2
10	600	2.323E+4	5.278E+2	2.878E+4	5.799E+2
11	625	2.324E+4	5.267E+2	2.782E+4	5.721E+2
12	650	2.219E+4	5.167E+2	3.013E+4	5.927E+2
13	675	2.367E+4	5.314E+2	2.852E+4	5.789E+2
14	700	2.321E+4	5.277E+2	2.861E+4	5.785E+2
15	725	2.288E+4	5.231E+2	2.839E+4	5.778E+2
16	750	2.237E+4	5.188E+2	2.844E+4	5.769E+2
17	762.4	2.192E+4	5.124E+2	2.705E+4	5.655E+2
18	775	2.205E+4	5.141E+2	2.736E+4	5.678E+2
19	800	2.248E+4	5.200E+2	2.846E+4	5.772E+2
20	825	2.347E+4	5.295E+2	2.829E+4	5.769E+2
21	850	2.377E+4	5.338E+2	2.887E+4	5.812E+2
22	875	2.352E+4	5.301E+2	2.973E+4	5.967E+2
23	900	2.405E+4	5.369E+2	3.008E+4	5.927E+2
24	925	2.289E+4	5.234E+2	3.048E+4	5.982E+2
25	950	2.220E+4	5.172E+2	3.013E+4	5.933E+2
26	975	2.266E+4	5.210E+2	2.897E+4	5.841E+2
27	1000	2.130E+4	5.073E+2	2.958E+4	5.882E+2
28	1050	2.149E+4	5.095E+2	2.796E+4	5.727E+2
29	1100	2.167E+4	5.115E+2	2.723E+4	5.656E+2
30	1150	1.984E+4	4.910E+2	2.473E+4	5.406E+2
31	1200	1.782E+4	4.674E+2	2.228E+4	5.149E+2
32	1300	1.405E+4	4.196E+2	1.838E+4	4.697E+2
33	1400	9.864E+3	3.590E+2	1.234E+4	3.929E+2
34	1500	4.636E+3	2.646E+2	5.735E+3	2.848E+2
35	1600	2.348E+3	2.103E+2	2.207E+3	2.046E+2

Continued

No.	Distance	3rd(West)		3rd(North-West)	
	mm	Power	Error	Power	Error
1	50	8.731E+3	3.328E+2	9.236E+3	3.391E+2
2	120	1.681E+4	4.452E+2	1.806E+4	4.577E+2
3	250	2.357E+4	5.209E+2	2.609E+4	5.437E+2
4	350	3.019E+4	5.857E+2	3.207E+4	5.998E+2
5	400	3.350E+4	6.156E+2	3.488E+4	6.244E+2
6	450	3.559E+4	6.338E+9	3.741E+4	6.459E+2
7	500	3.640E+4	6.407E+2	3.855E+4	6.553E+2
8	550	3.770E+4	6.517E+2	3.990E+4	6.664E+2
9	575	3.805E+4	6.534E+2	3.948E+4	6.643E+2
10	600	3.900E+4	6.625E+2	4.111E+4	6.761E+2
11	625	3.695E+4	6.444E+2	3.918E+4	6.619E+2
12	650	3.717E+4	6.474E+2	4.046E+4	6.709E+2
13	675	3.806E+4	6.535E+2	4.037E+4	6.716E+2
14	700	3.765E+4	6.515E+2	3.908E+4	6.599E+2
15	725	3.527E+4	6.303E+2	3.789E+4	6.514E+2
16	750	3.553E+4	6.336E+2	3.752E+4	6.472E+2
17	762.4	3.513E+4	6.287E+2	3.584E+4	6.347E+2
18	775	3.504E+4	6.284E+2	3.640E+4	6.390E+2
19	800	3.500E+4	6.292E+2	3.855E+4	6.557E+2
20	825	3.805E+4	6.538E+2	3.847E+4	6.564E+2
21	850	3.803E+4	6.549E+2	4.013E+4	6.686E+2
22	875	3.975E+4	6.677E+2	3.937E+4	6.637E+2
23	900	3.908E+4	6.636E+2	4.100E+4	6.756E+2
24	925	3.930E+4	6.641E+2	4.020E+4	6.706E+2
25	950	3.846E+4	6.586E+2	4.145E+4	6.792E+2
26	975	3.917E+4	6.631E+2	4.086E+4	6.760E+2
27	1000	3.924E+4	6.568E+2	3.987E+4	6.667E+2
28	1050	3.737E+4	6.496E+2	4.013E+4	6.688E+2
29	1100	3.558E+4	6.345E+2	3.748E+4	6.473E+2
30	1150	3.299E+4	6.121E+2	3.450E+4	6.221E+2
31	1200	2.937E+4	5.791E+2	3.174E+4	5.979E+2
32	1300	2.331E+4	5.193E+2	2.587E+4	5.425E+2
33	1400	1.585E+4	4.344E+2	1.771E+4	4.546E+2
34	1500	7.120E+3	3.064E+2	7.415E+3	3.097E+2
35	1600	2.774E+3	2.160E+2	2.725E+3	2.133E+2

Table 2-11 Results of Reactivity Measurement

Thickness of Aseismatic Plate (mm)	Critical D_2O Level (mm)	Coefficient of D_2O Level Reactivity (%ΔK/K/cm)	Difference of D_2O Level (mm)	Reactivity** (%ΔK/K)	Temperature of D_2O (°C)
0	1448.9 (1445)*	0.085	-24.8	0.203	18.5
Support Tube	1473.7 (1445)	0.085	0.0	0.0	16.0
5	1484.8 (1490)	0.084	11.1	0.091	15.0
20	1511.7 (1510)	0.086	38.0	0.312	14.5
40	1541.1 (1530)	0.076	67.4	0.553	14.0
80	1581.2 (1585)	0.077	107.5	0.882	14.0

*( ): Coolant Level ** Level Worth Coefficient: 0.082%ΔK/K/cm
β: 0.0073

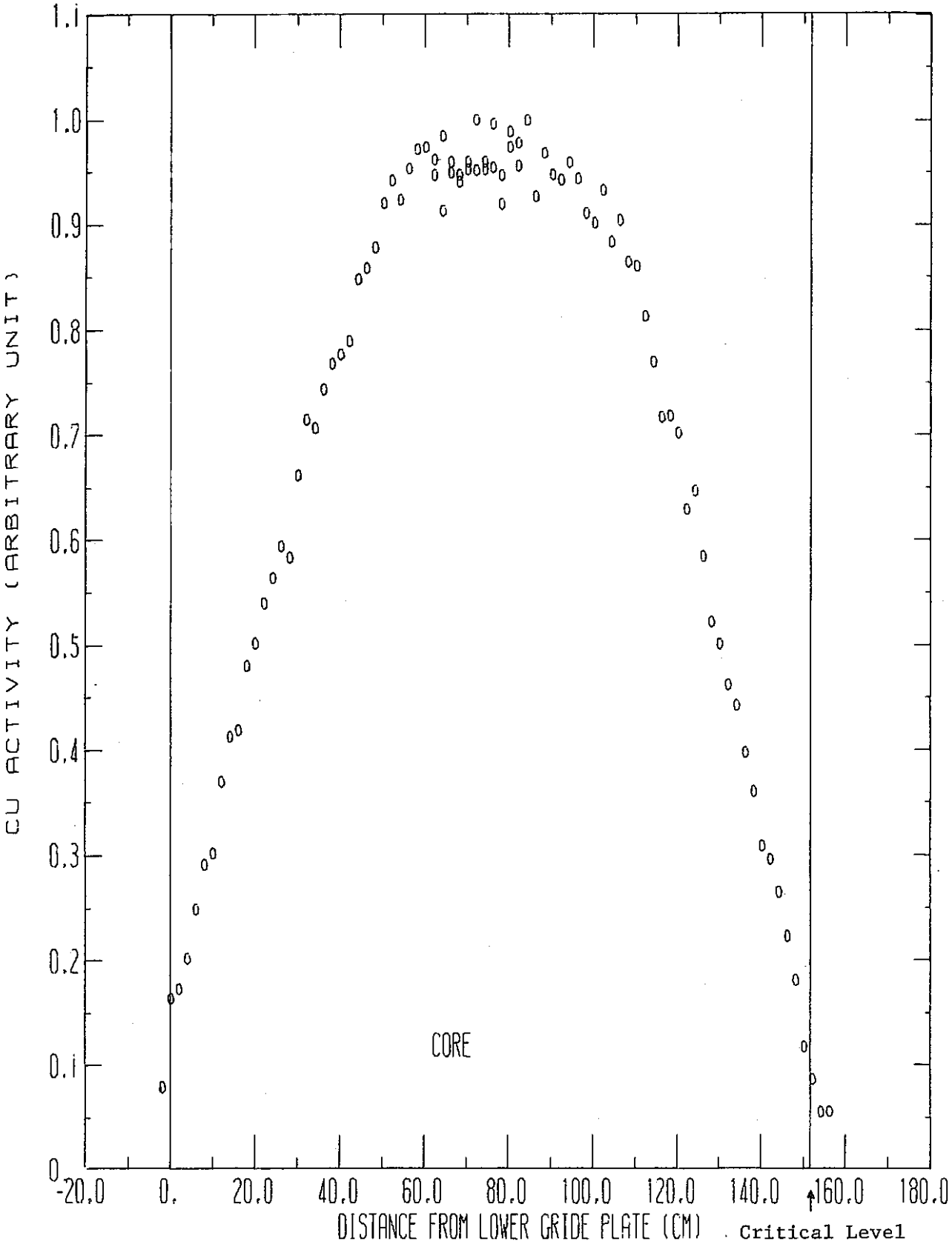


Fig. 2-1 Aseismatic Plate Experiment [THICKNESS=2.0 cm] CU-WIRE [OCH]

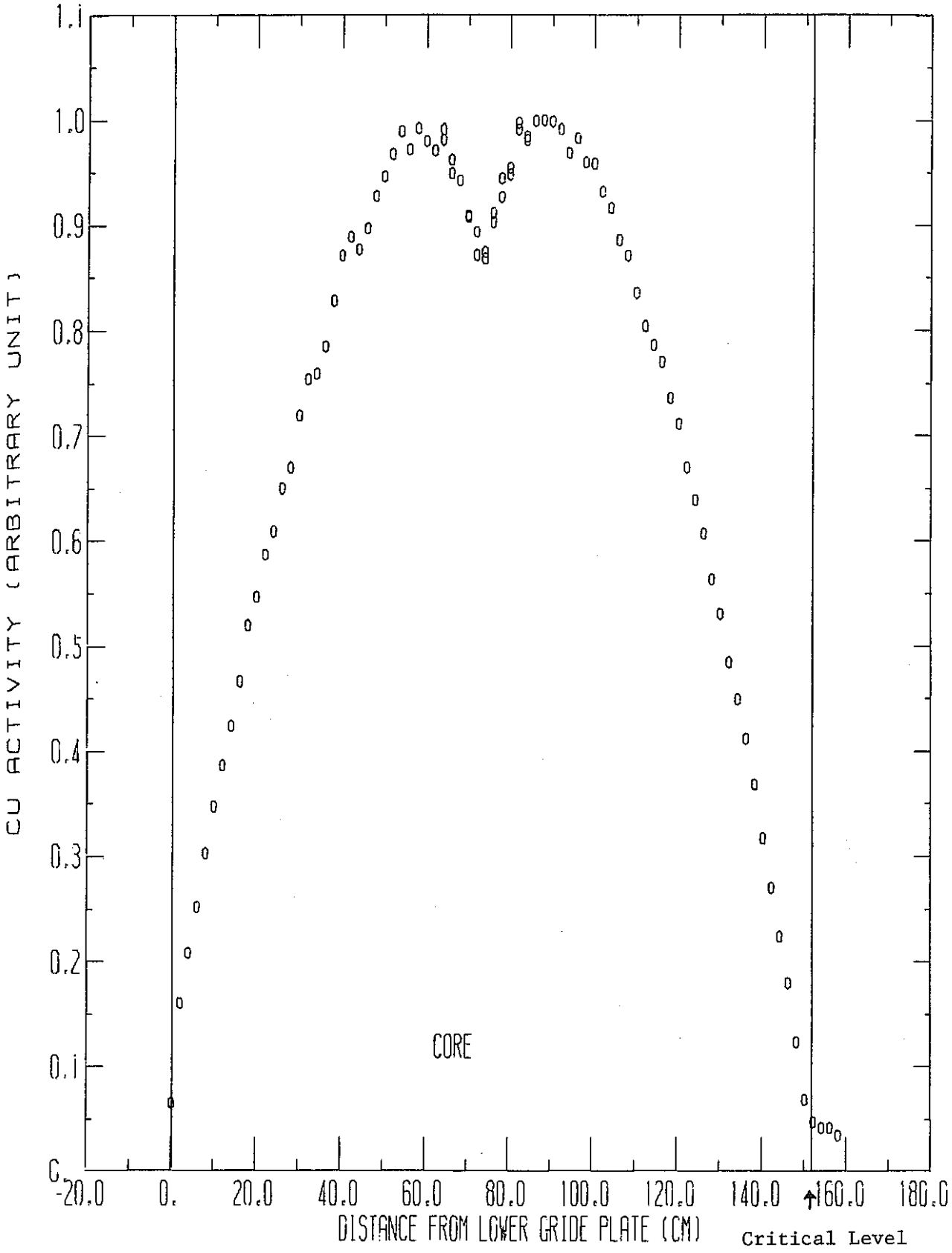


Fig. 2-2 Aseismatic Plate Experiment [THICKNESS=2.0 cm] CU-WIRE [1D1]

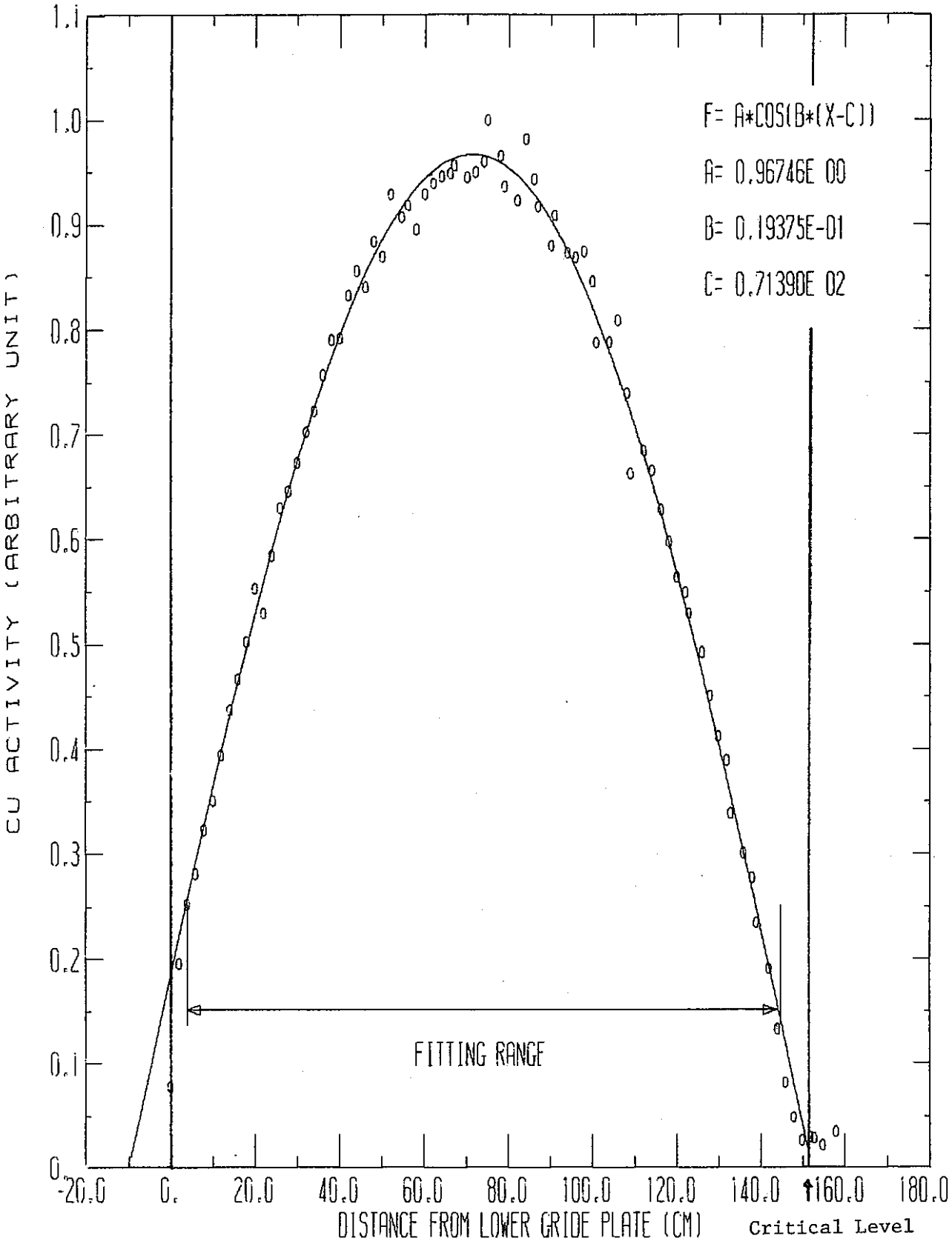


Fig. 2-3 Aseismatic Plate Experiment [THICKNESS=2.0 cm] CU-WIRE [5C1]

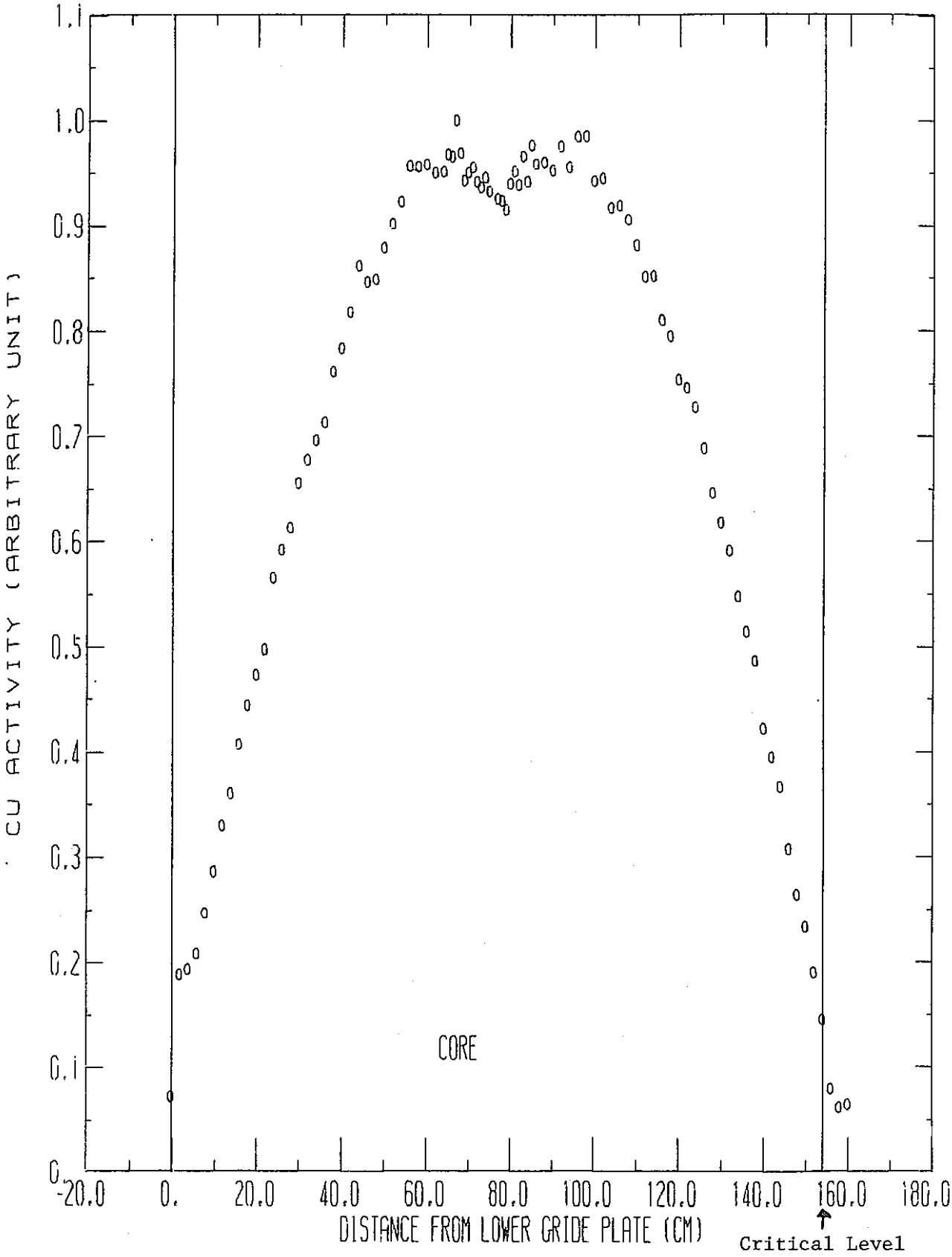


Fig. 2-4 Aseismatic Plate Experiment [THICKNESS=4.0 cm] CU-WIRE [OCH]

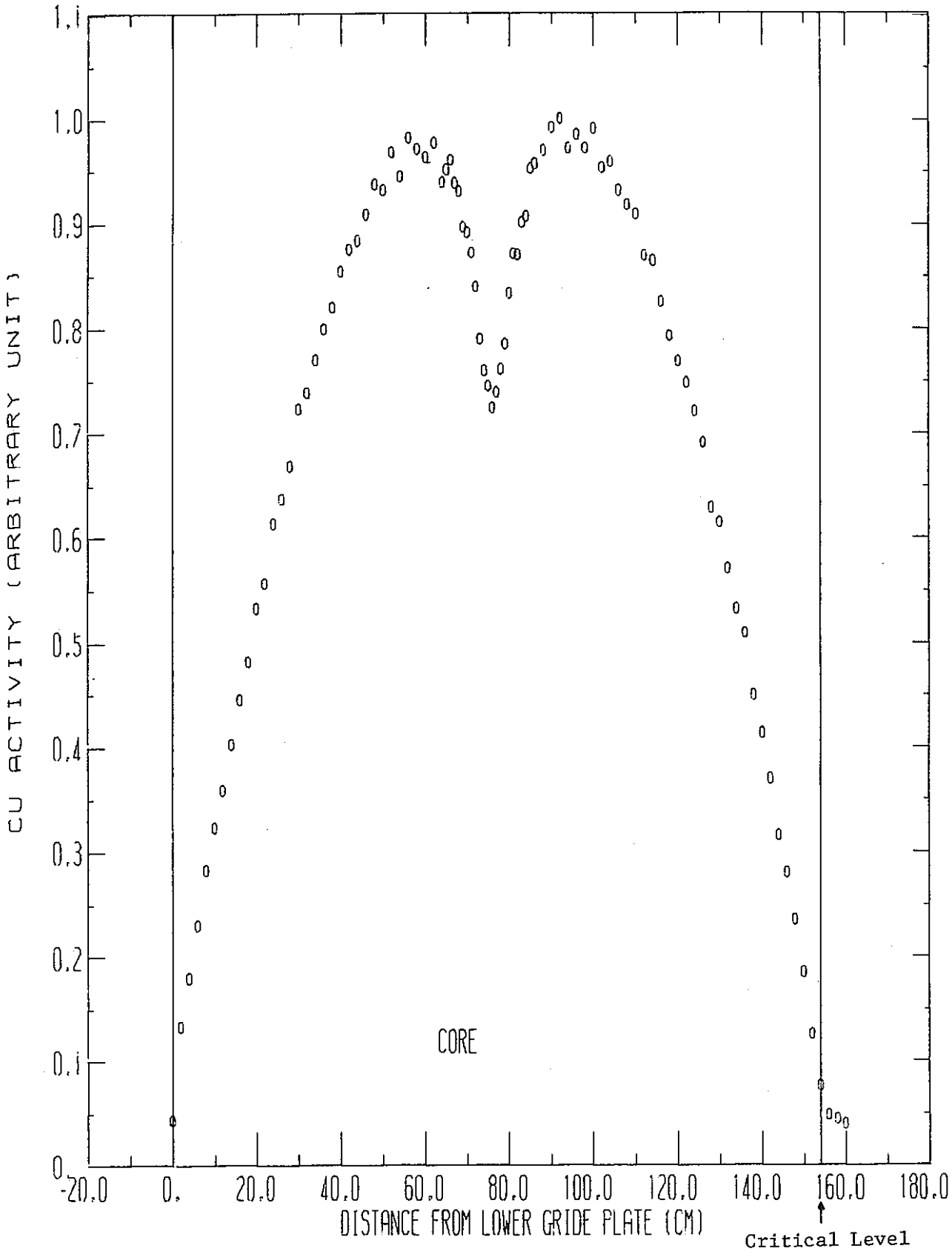


Fig. 2-5 Aseismatic Plate Experiment [THICKNESS=4.0 cm] CU-WIRE [1D1]

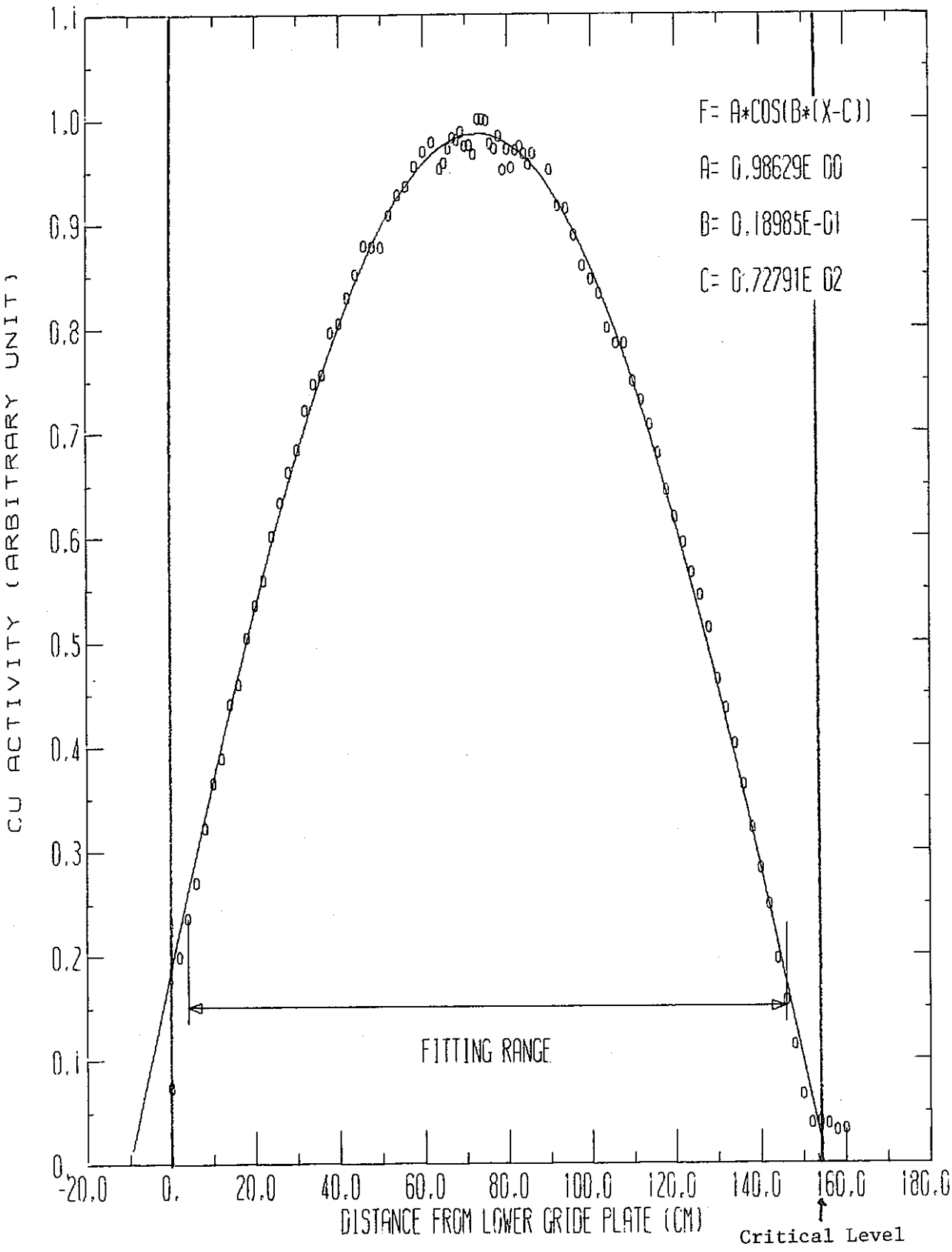


Fig. 2-6 Aseismatic Plate Experiment [THICKNESS=4.0 cm] CU-WIRE [5C1]

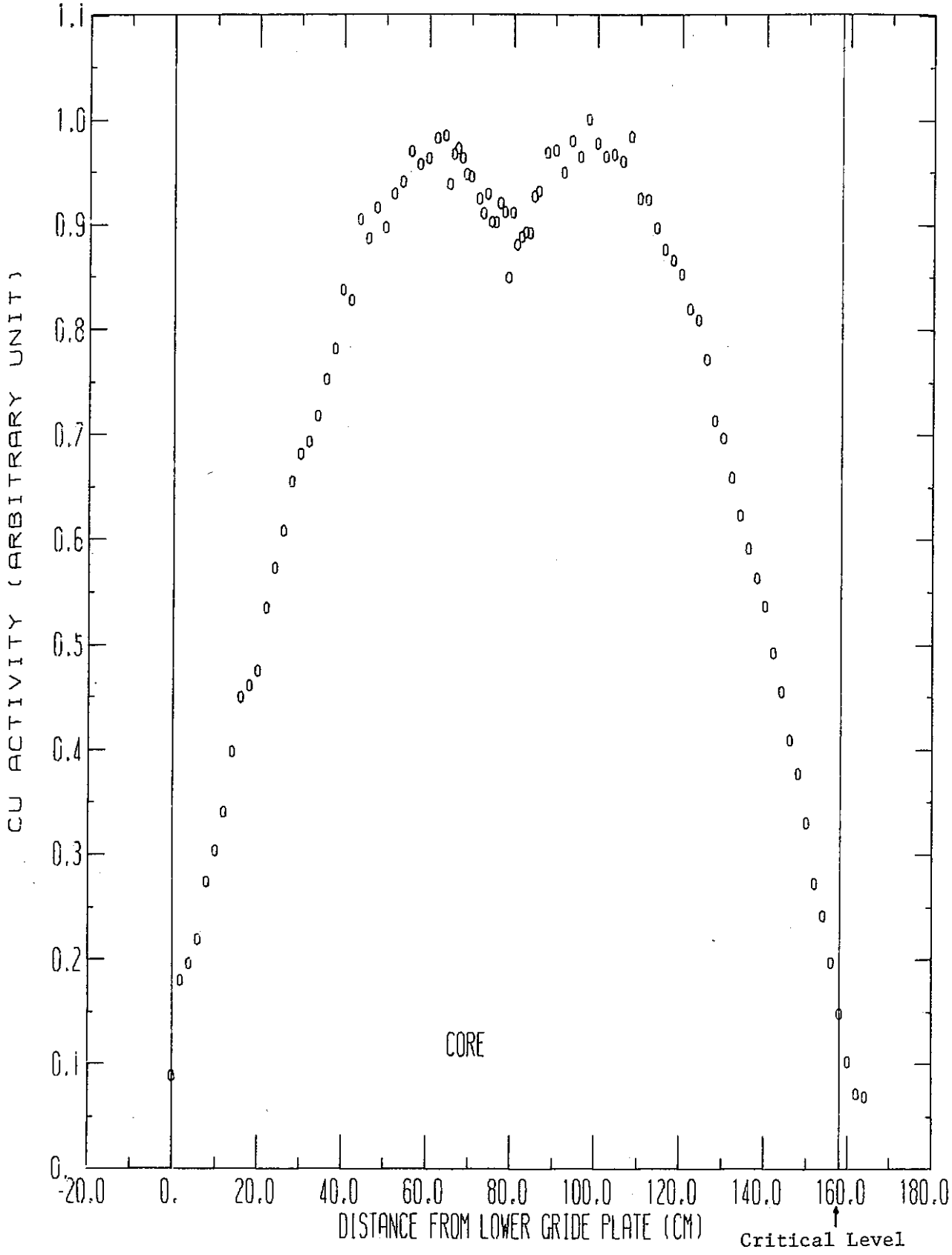


Fig. 2-7 Aseismatic Plate Experiment [THICKNESS=8.0 cm] CU-WIRE [OCH]

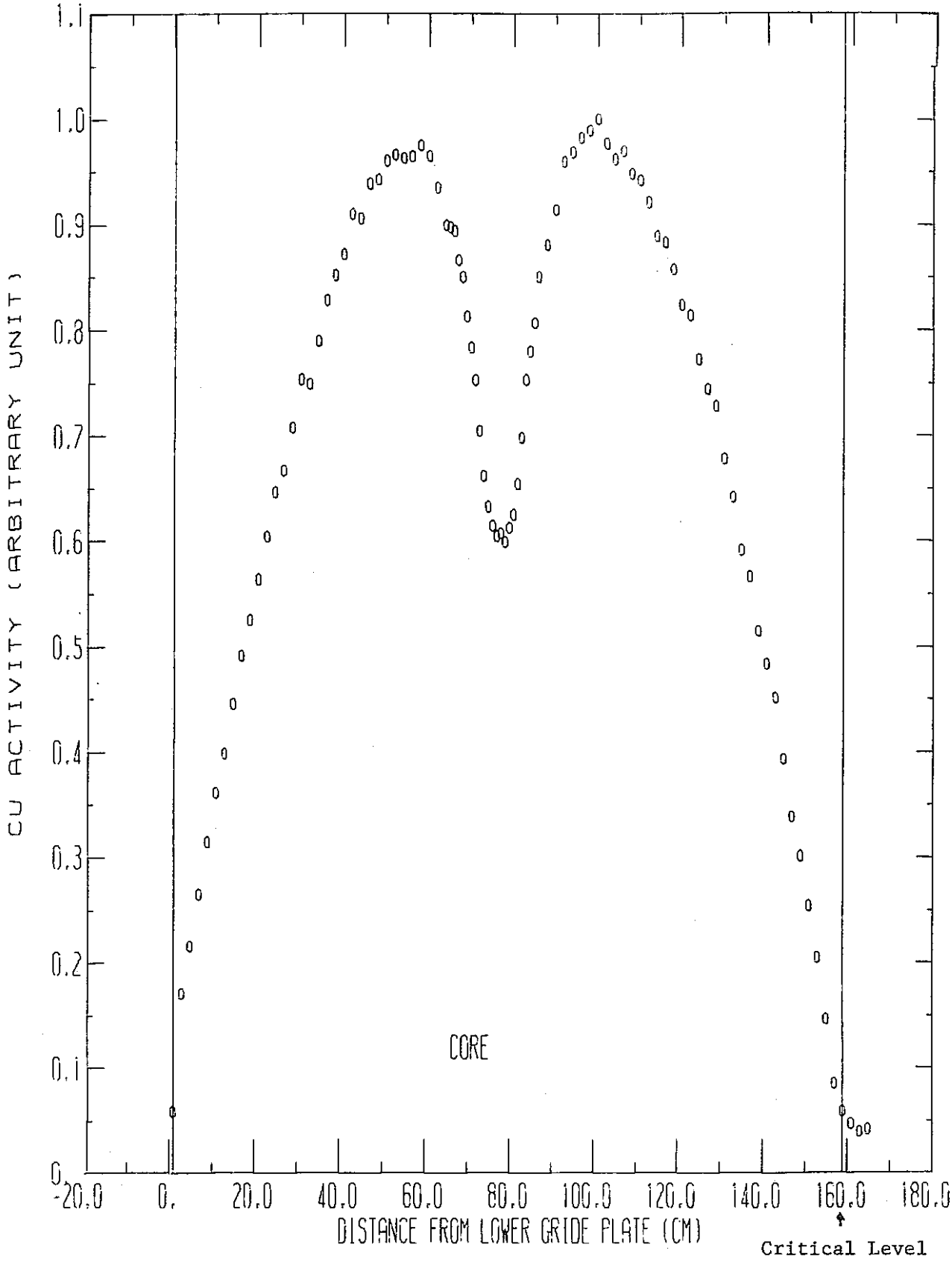


Fig. 2-8 Aseismatic Plate Experiment [THICKNESS=8.0 cm] CU-WIRE [1D1]

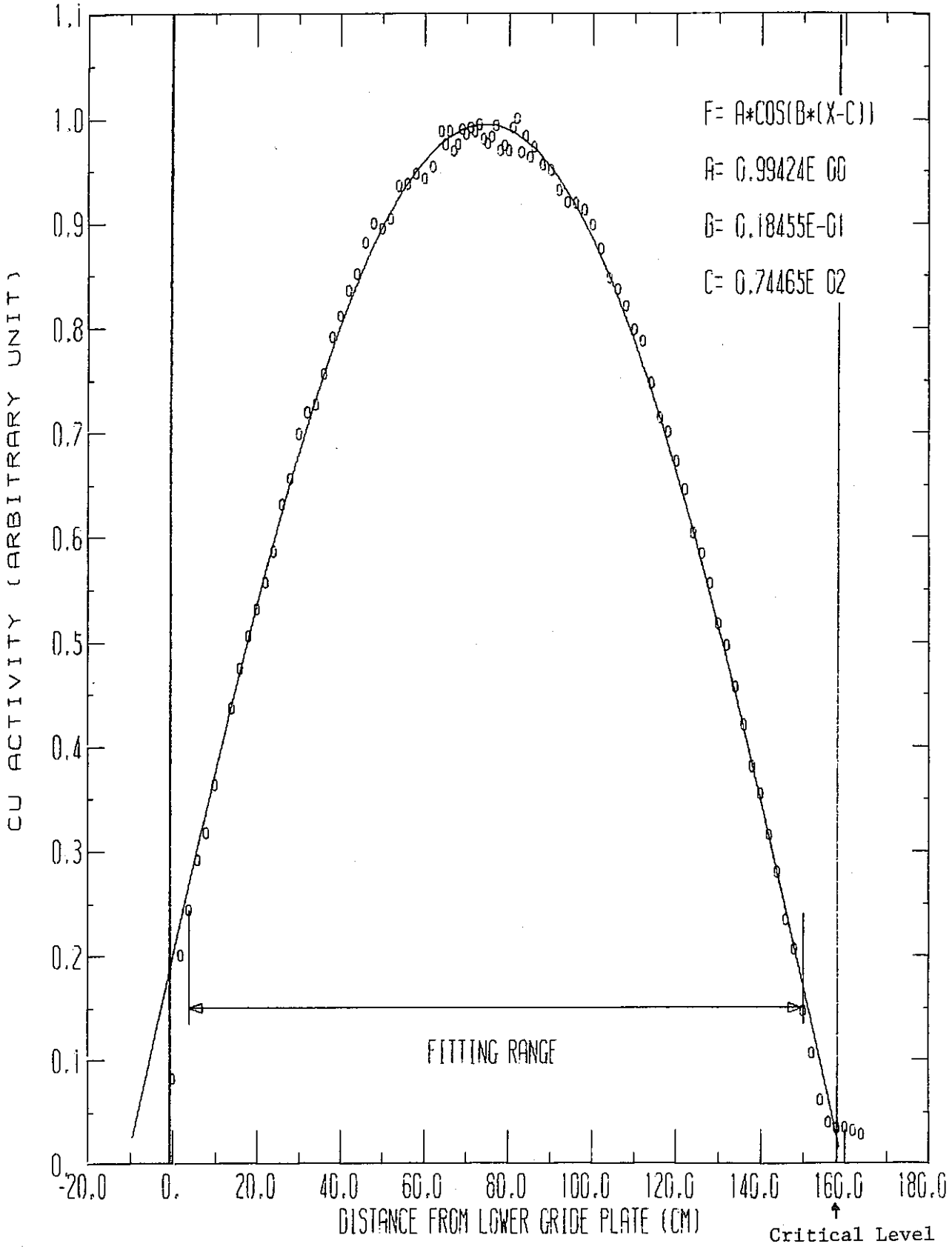


Fig. 2-9 Aseismatic Plate Experiment [THICKNESS=8.0 cm] CU-WIRE [5C1]

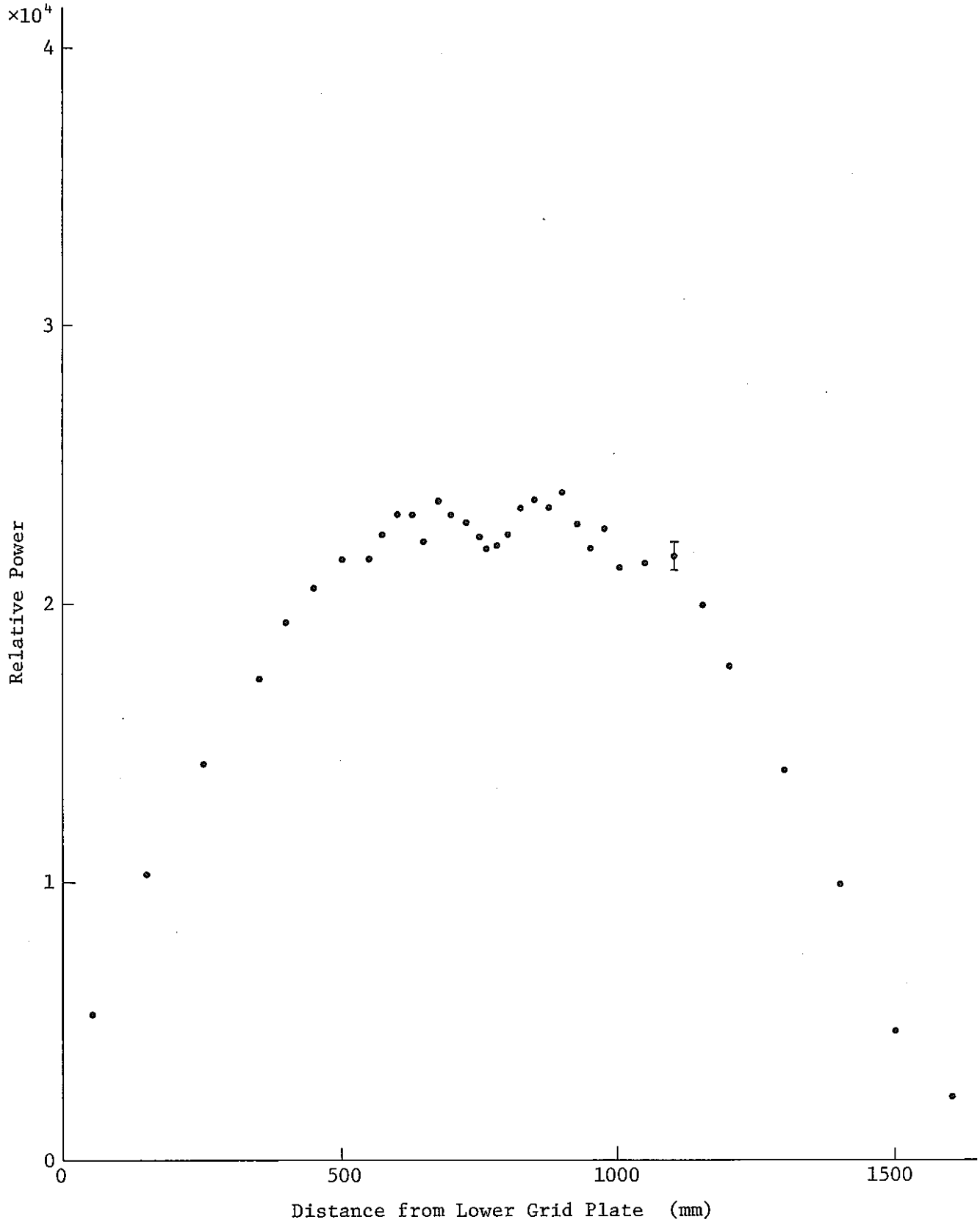


Fig. 2-10 Axial Power Distribution in a Fuel Pin
(1st ring, 40mm^{t} Thickness)

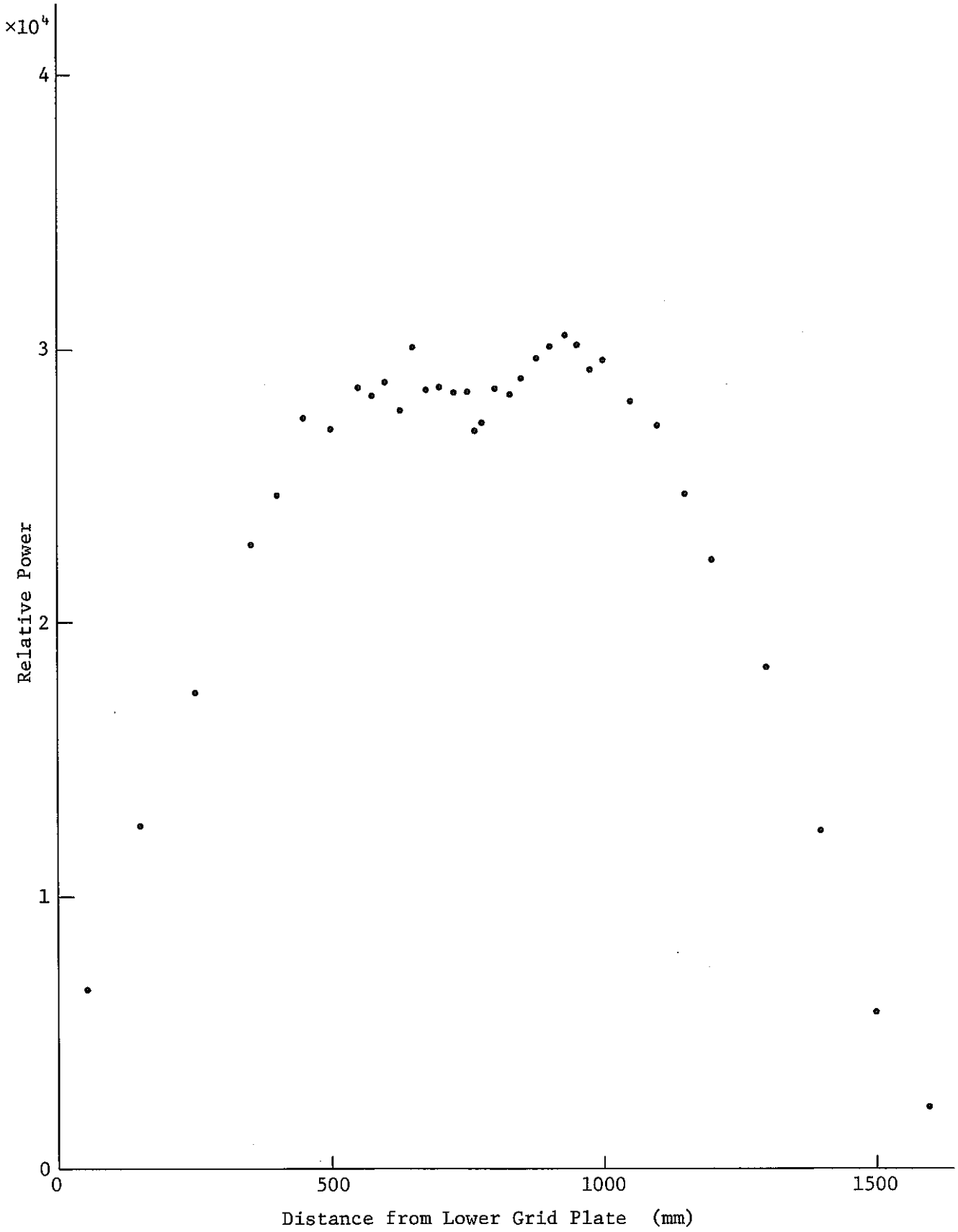


Fig. 2-11 Axial Power Distribution in a Fuel Pin
(2nd ring, 40mm^{t} Thickness)

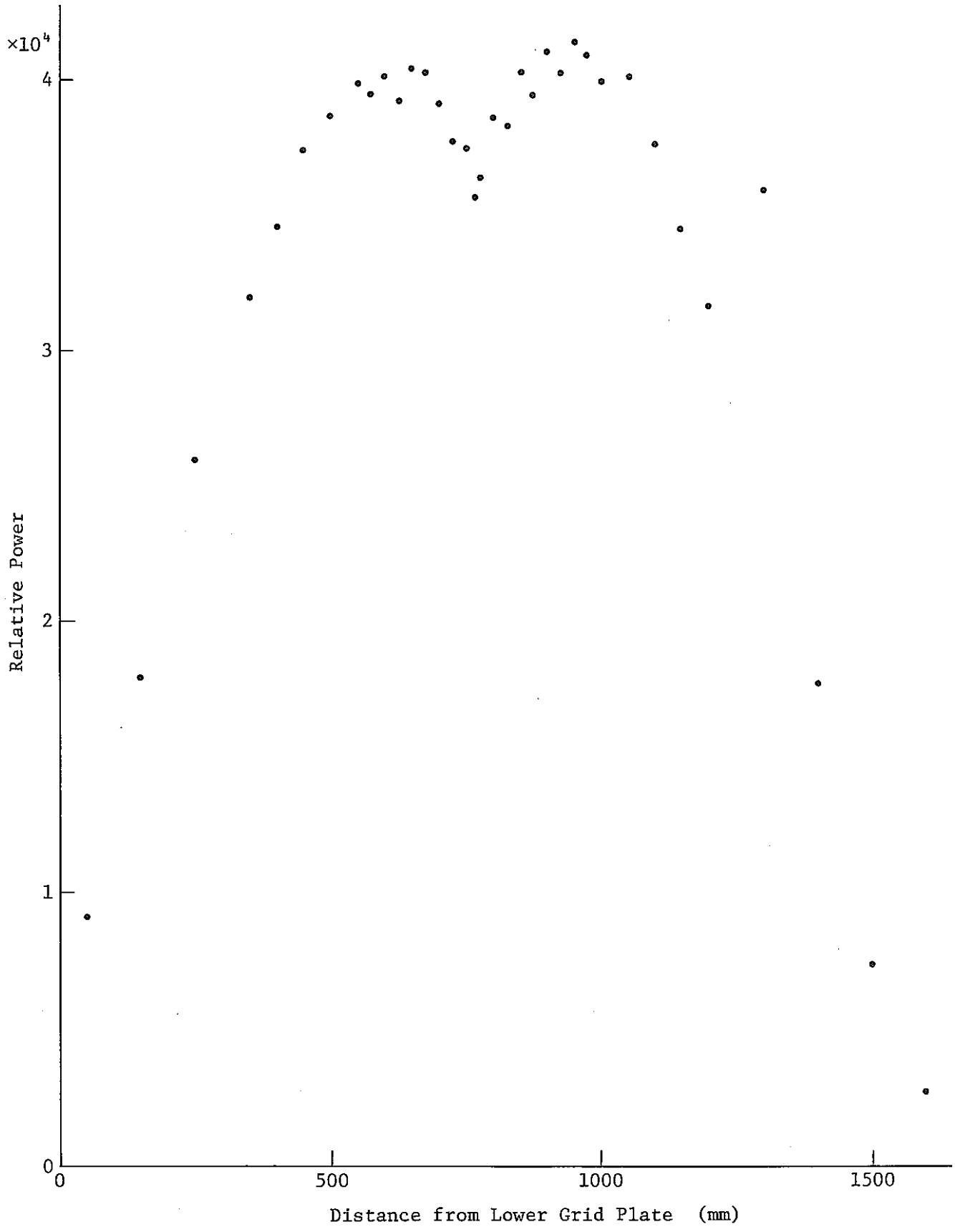


Fig. 2-12 Axial Power Distribution in a Fuel Pin
(3rd ring North-West, 40mm^{t} Thickness)

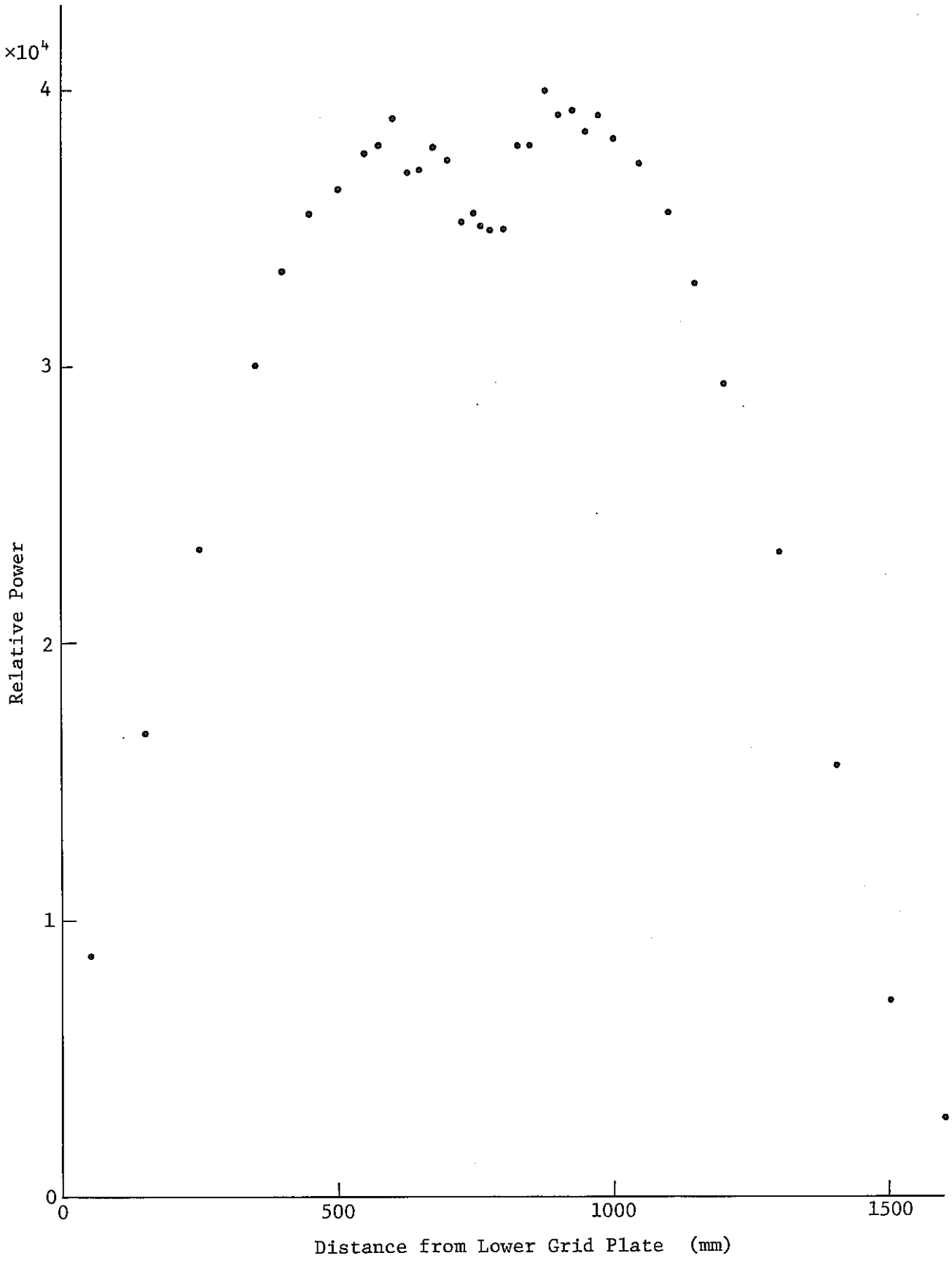


Fig. 2-13 Axial Power Distribution in a Fuel Pin
(3rd ring West, 40mm^{t} Thickness)

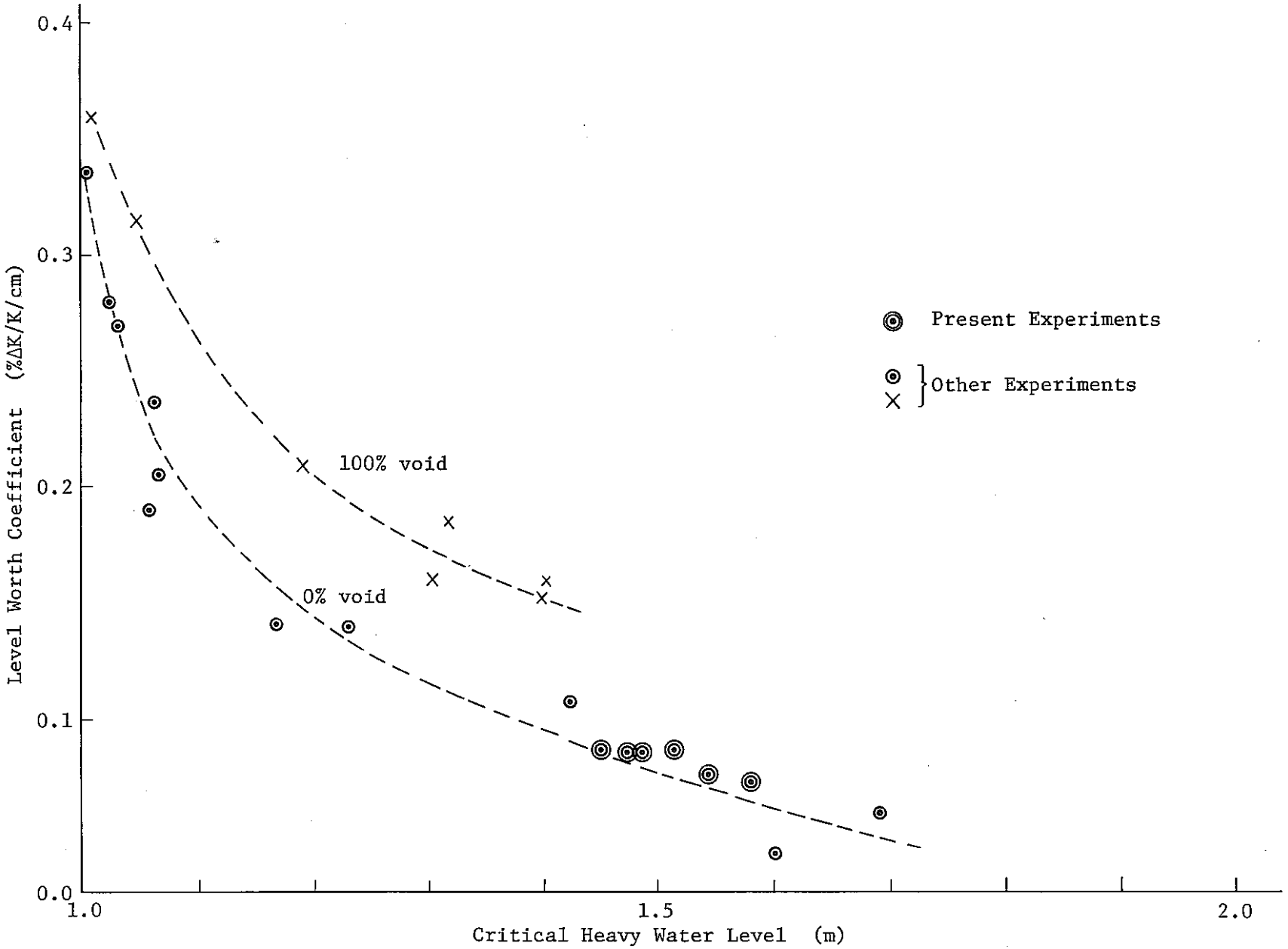


Fig. 2-14 Level Worth Coefficient Curve

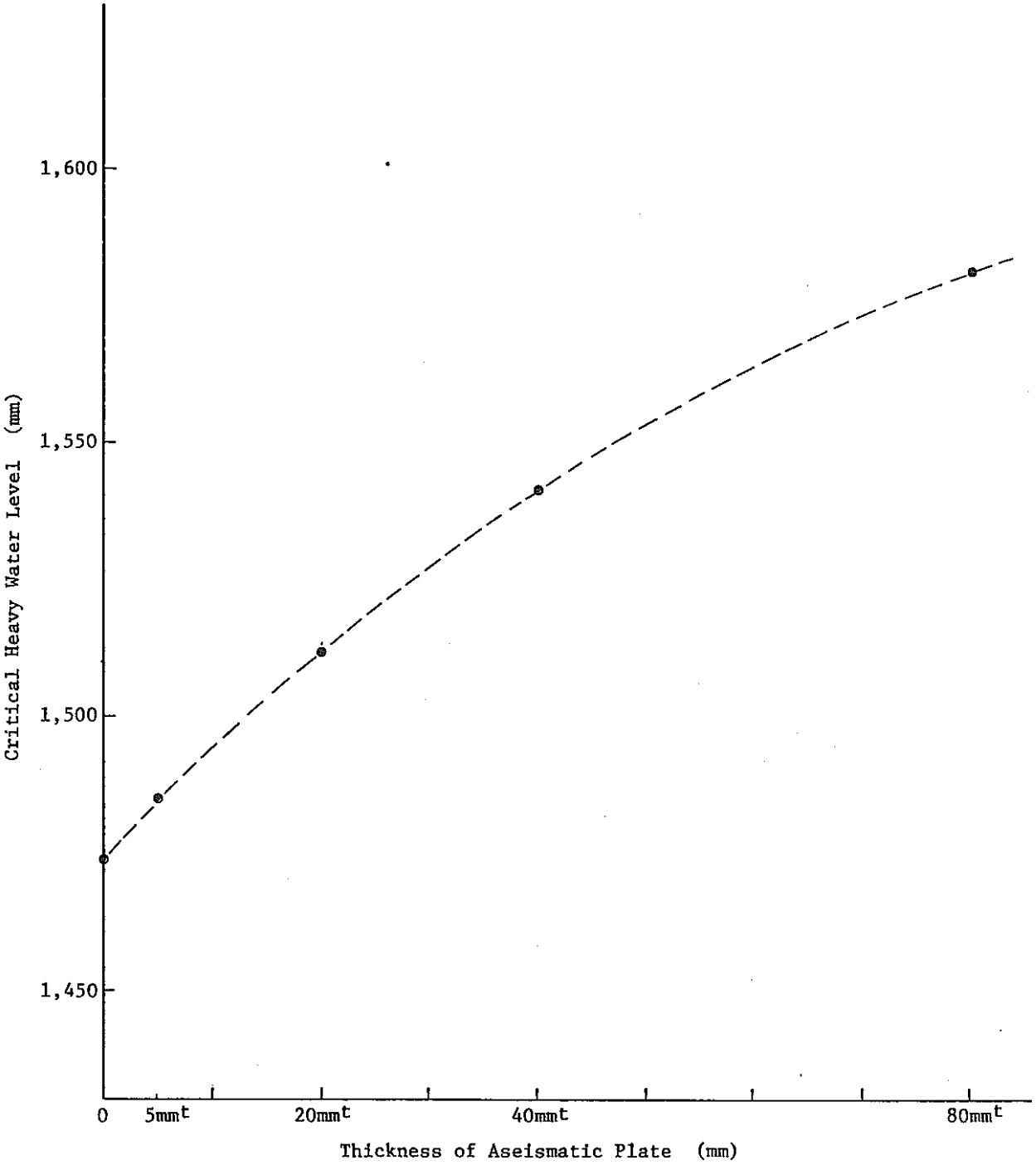


Fig. 2-15 Relation between Critical Level and Thickness of Aseismatic Plate

Appendix

Appendix 1 Chemical Analysis of ^{10}B Concentration in D_2O

Appendix 2 Mill Sheet of Aseismatic Plate

Appendix 1 Chemical Analysis of ^{10}B Concentration in D_2O

No. ———

富山薬品工業株式会社
103 東京都中央区日本橋本町2丁目1番12号
(日康ビル)
電話東京(242)5141(代)～6番

昭和56年6月19日

動力炉・核燃料開発事業団
大洗工学センターＤＣＡ殿

重水中のホウ酸濃度の測定について

拝啓　貴事業団益々ご隆盛のこととお慶び申し上げます。
平素は格別のご高配を賜り厚く御礼申し上げます。
先般、ＤＣＡから御依頼のありました試料につきましての分析結果がでましたので、ここに御報告致します。宜敷くご査収下さいます様、お願い申し上げます。

試料前処理日	昭和56年6月4日
試料	No.1 (3ppm)
	No.2 (0ppm)

富山薬品工業株式会社

工場　埼玉県富士見市水谷東3-11-1
〒354 電話志木0484-74-1911番(代)～3
関西営店　大阪市東区平野町2-9(アプチビル)
〒541 電話大阪(06)202-3266～7番

Determination of ^{10}B in D_2O

1. Concentration

	^{10}B (ppm)	B gross (ppm)
Sample No. 1 (3ppm)	3.143±0.003	17.05±0.01
Sample No. 2 (0ppm)	0.103±0.001	0.555±0.003

2. Ratio ($^{11}B/^{10}B$)

	Spiked	Unspiked
Sample No. 1 (3ppm)	0.8456±0.0002	4.026±0.002
Sample No. 2 (0ppm)	2.847±0.002	4.010±0.002

Tomiyama Pure Chemical Industries, Ltd.

Appendix 2 Mill sheet of Aseismatic Plate

規格	KSS	JIS H4000 A5052	製作 No.	00-4669	製品寸法	80; X 1525; X 3090;

試験項目 / 規格値 / チャージNo. (ニモツNO.) / ロットNo.	試験片 採取位置	試験片 厚さ mm	試験片 径又は径 mm	引張試験 引張強さ (KGF/MM2) 以上 以下	引張試験 耐力 (KGF/MM2) 以上 以下	引張試験 伸び % 以上 以下							ロットNo.
14453 (00-4669-01)	50.			22.2		29.2							6105140
	50.			21.8		36.0							

化学成分 (%) / 規格値 / チャージNo.	CU	MN	MG	ZN	CR	SI+FE	OTHERS TOTAL	AL					外観寸法検査
以上		0,10	0,10	2,2		0,15			RE					寸法検査 GOOD
以下				2,8	0,10	0,35	0,45	0,15						表面検査 GOOD
14453	0,02	0,06	2,62	0,01	0,24	0,35	0,03	RE						防振板(1)
														E01－1個
														55－4－3
														富士電機 大石

以上御指定の規格に合格していることを証明します。

株式会社 神戸製鋼所 真岡工場 技術課長
〒321－43 栃木県真岡市鬼怒ヶ丘15番地
TEL 02858-2-4111(代表)

規格	KS5	JIS H4000 A5052	製作No.	00-6313	製品寸法	40 X 1525. X 3050

試験項目 / 規格値 / チャージNo. (ニモツNO.) ロットNo.	試験片 標点距離 mm	試験片 厚さ mm	試験片 幅又は径 mm	引張試験 引張強さ (KGF/MM2) 以上 以下	引張試験 耐力 (KGF/MM2) 以上 以下	引張試験 伸び % 以上 以下	プレートNO.
24785 (00-6313-02)	50.			21.5		37.0	9052120
	50.			21.2		38.0	

化学成分(%) / 規格値 / チャージNo.	CU 以上 以下	MN 以上 以下	MG 以上 以下	ZN 以上 以下	CR 以上 以下	SI+FE 以上 以下	OTHERS TOTAL 以上 以下	AL 以上 以下
	0.10	0.10	2.2 2.8	0.10	0.15 0.35	0.45	0.15	RE
24785	0,04	0,07	2,55	0.02	0,22	0.33	0,03	RE

外観寸法検査	
寸法検査	GOOD
表面検査	GOOD

防振板(2)
E02−1個
55−4−3
富士電機 (大石)

以上御指定の規格に合格していることを証明します。

株式会社 神戸製鋼所 真岡工場 技術課長
〒321−43 栃木県真岡市鬼怒ヶ丘15番地
TEL 02858-2-4111(代表)

御納入先	アサヒソウコ K.K						
御注文主							
種類・質別	A5052P-H112	規格	JIS	発注元No.			
製作番号	01910-018,	寸法 (mm)	20. × 1000. × 2000.	数量	14	質量 (kg)	1495.4

	成分	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti		その他 個々	その他 合計	Al
化学成分(%)	規格					JIS							
	実測値	0.09	0.28	0.03	0.04	2.47	0.21	0.01	0.01		NORMAL	NORMAL	RE.
	実測値												

	項目	引張強さ (kgf/mm²)	耐力 (kgf/mm²)	伸び (%)			外観検査	寸法検査				
機械的性能	規格		JIS									
	実測値	20		43			GOOD	GOOD				
	実測値											

上記の材料は検査の結果 貴社指定の規格に合格した事を証明致します。

スカイアルミニウム株式会社 深谷工場 (JIS指定工場)

〒366 埼玉県深谷市上野台1351 TEL (0485) 72-1311

生産技術部品質管理課長

防振板(3) 55-4-3

E03-1個 富士電機 (大石)

材料検査成績書

発行年月日 S.59.10.12. 発行No. E1012015.

御納入先	ナメウケイトウK,K				
御注文主	マルヘニK,K / キヨウトウケイキンゾクK,K				
種類・質別	A5052P-H34	規格	JIS	発注元No.	TN0727-9

製作番号	01905-012	寸法 (mm)	5. × 1000. × 2000.	数量	76	質量 (kg)	2032.0

化学成分(%)	成分	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti		その他 個々	その他 合計	Al
	規格					JIS							
	実測値	0.09	0.27	0.03	0.02	2.55	0.19	0.02	0.01		NORMAL	NORMAL	RE.
	実測値												

機械的性能	項目	引張強さ (kgf/mm²)	耐力 (kgf/mm²)	伸び (%)		
	規格		JIS			
	実測値	25		15		
	実測値					

外観検査	寸法検査				
GOOD	GOOD				

上記の材料は検査の結果 貴社指定の規格に合格した事を証明致します。

スカイアルミニウム株式会社 深谷工場 (JIS指定工場)

〒366 埼玉県深谷市上野台1351 TEL (0485) 72−1311

生産技術部品質管理課長

防振板(4) 55−4−3

E04−1個 富士電機 (大石)