

36本クラス燃料装荷炉心の冷却材 喪失時ボイド反応度の測定

25cmピッチ格子炉心実験データ集

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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)

36本クラス燃料装荷炉心の冷却材 喪失時ボイド反応度の測定

—25cmピッチ格子炉心実験データ集—

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要 旨

25cmピッチ正方格子をもつDCA炉心において、28本クラスタの1.2wt%濃縮 UO_2 燃料一様炉心およびその炉心の中央部9チャンネル(3×3チャンネル)を36本クラスタの PuO_2-UO_2 燃料で置換した二領域炉心に関する冷却材喪失時ボイド反応度を臨界水位差法により測定した。ここで測定された冷却材喪失時ボイド反応度は、炉心内の全圧力管内の冷却材が喪失された場合および炉心中心の1本のみの圧力管内の冷却材が喪失された場合についてのものである。また、冷却材喪失前後における炉心内熱中性子束分布を銅ワイヤ放射化法により測定した。

実験に使用した36本クラスタのプルトニウム燃料のプルトニウム富化度は0.54wt%または0.87wt%で、プルトニウム中の核分裂性プルトニウムの割合は約91%である。燃料棒直径は、約16.7mmでいわゆる太径のものである。なお、パラメータとして減速材重水中のボロン(^{10}B)濃度を0および3.2ppmに選んだ。

測定された冷却材喪失時ボイド反応度を、28本クラスタのプルトニウム燃料装荷炉心におけるボイド反応度およびWIMS-CITATIONコードによる予測計算値とともに下表に示す。この結果36本クラスタのプルトニウム燃料を炉心中央に部分装荷した炉心では、冷却材喪失時ボイド反応度を28本クラスタのプルトニウム燃料を装荷した場合に比べて、20~30%負側へ移行させることが分った。また、36本クラスタ燃料装荷炉心における計算値は、実験値を70%以内で再現する。

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表 25 cm ピッチ炉心における冷却材喪失時ボイド反応度

重水中 ¹⁰ B濃度 (ppm)	冷却材喪失チャンネル数	(3×3) ch. PuO ₂ -UO ₂ 燃料 の富加度(wt%)	冷却材喪失時ボイド反応度(β)		
			36本クラス燃料(3×3)ch		28本クラス燃料(3×3)ch
			実験値	計算値	実験値*
0	97 (全)	(1.2wt%UO ₂)	-0.08 ± 0.31	0.38	-0.47 ± 0.12
		0.54	-2.84 ± 0.36	-2.77	-2.27 ± 0.36
		0.87	-7.38 ± 0.50	-6.65	-5.41 ± 0.60
	1 (中心)	(1.2wt%UO ₂)	0.14 ± 0.31	0.10	
		0.54	-0.05 ± 0.15	-0.14	
		0.87	-0.41 ± 0.21	-0.54	
3.2	97 (全)	(1.2wt%UO ₂)	3.14 ± 0.17		
		0.54	0.60 ± 0.22		
	1 (中心)	(1.2wt%UO ₂)	0.31 ± 0.05		
		0.54	0.10 ± 0.08		

*パルス中性子法による。

Aug., 1982

Measurement of loss-of-coolant reactivity of two-region
core using 36-rod plutonium fuel clusters

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Abstract

Loss-of-coolant reactivity of all channels and that of central channel have been measured in two-region core partially loaded with nine 36-rod PuO₂-UO₂ clusters. Lattice pitch is 25.0-cm throughout the core, and poison content in D₂O moderator is 0 or 3.2 ppm with ¹⁰B concentration. These 36-rod PuO₂-UO₂ clusters were placed in a central 3 × 3 channels of the core and the surrounding region was occupied with eighty-eight 28-rod 1.2 wt% enriched UO₂ clusters. Enrichment of plutonium in the 36-rod PuO₂-UO₂ fuel is 0.54 wt% or 0.87 wt%, and the fissile content in total plutonium of both PuO₂-UO₂ fuels is about 91 wt% (standard grade type plutonium). Neutron flux distributions were also measured by γ -counting of irradiated copper wire, in order to evaluate the change of neutron flux in the core before and after loss-of-coolant.

Reactivities due to loss-of-coolant were obtained by integrating the level reactivity coefficient of moderator ($\partial\rho/\partial H$) of the perturbed core between the critical levels at the non-voided core and at the perturbed core. Values of ($\partial\rho/\partial H$) were obtained by converting doubling time of neutron flux due to small rise of moderator level (ΔH) to small reactivity ($\Delta\rho$).

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Experimental result of loss-of-coolant reactivities ($\rho_{o \rightarrow v}$) is tabled as below together with the ones of the core loaded with nine 28-rod $\text{PuO}_2\text{-UO}_2$ clusters and calculated values by WIMS-CITATION code. The measured $\rho_{o \rightarrow v}$ were determined within 50 ¢ of uncertainty. If $\text{PuO}_2\text{-UO}_2$ clusters were placed in the central 3×3 channels of the core, 36-rod $\text{PuO}_2\text{-UO}_2$ clusters is more effective in shifting the $\rho_{o \rightarrow v}$ to the negative side in comparison with 28-rod $\text{PuO}_2\text{-UO}_2$ clusters ; the nine 36-rod $\text{PuO}_2\text{-UO}_2$ clusters makes the $\rho_{o \rightarrow v}$ to the more 20 ~ 30% negative side than the nine 28-rod $\text{PuO}_2\text{-UO}_2$ clusters.

The calculated values of $\rho_{o \rightarrow v}$ agree with each experimental ones within 70 ¢ discrepancy.

Table Result of loss-of-coolant reactivity

^{10}B content in D_2O (ppm)	No. of loss- of-coolant channel	Enrichment of (3×3) ch $\text{PuO}_2\text{-UO}_2$ (wt%)	Loss-of-coolant reactivity (ρ)		
			36-rod $\text{PuO}_2\text{-UO}_2$ (3×3ch)		28-rod $\text{PuO}_2\text{-UO}_2$ (3×3ch)
			Experiment	Calculation	Experiment*
0	97 (All)	(1.2wt% UO_2)	-0.08 ± 0.31	0.38	-0.47 ± 0.12
		0.54	-2.84 ± 0.36	-2.77	-2.27 ± 0.36
		0.87	-7.38 ± 0.50	-6.65	-5.41 ± 0.60
	1 (Central)	(1.2wt% UO_2)	0.14 ± 0.13	0.10	
		0.54	-0.05 ± 0.15	-0.14	
		0.87	-0.41 ± 0.21	-0.54	
3.2	97 (All)	(1.2wt% UO_2)	3.14 ± 0.17		
		0.54	0.60 ± 0.22		
	1 (Central)	(1.2wt% UO_2)	0.31 ± 0.05		
		0.54	0.10 ± 0.08		

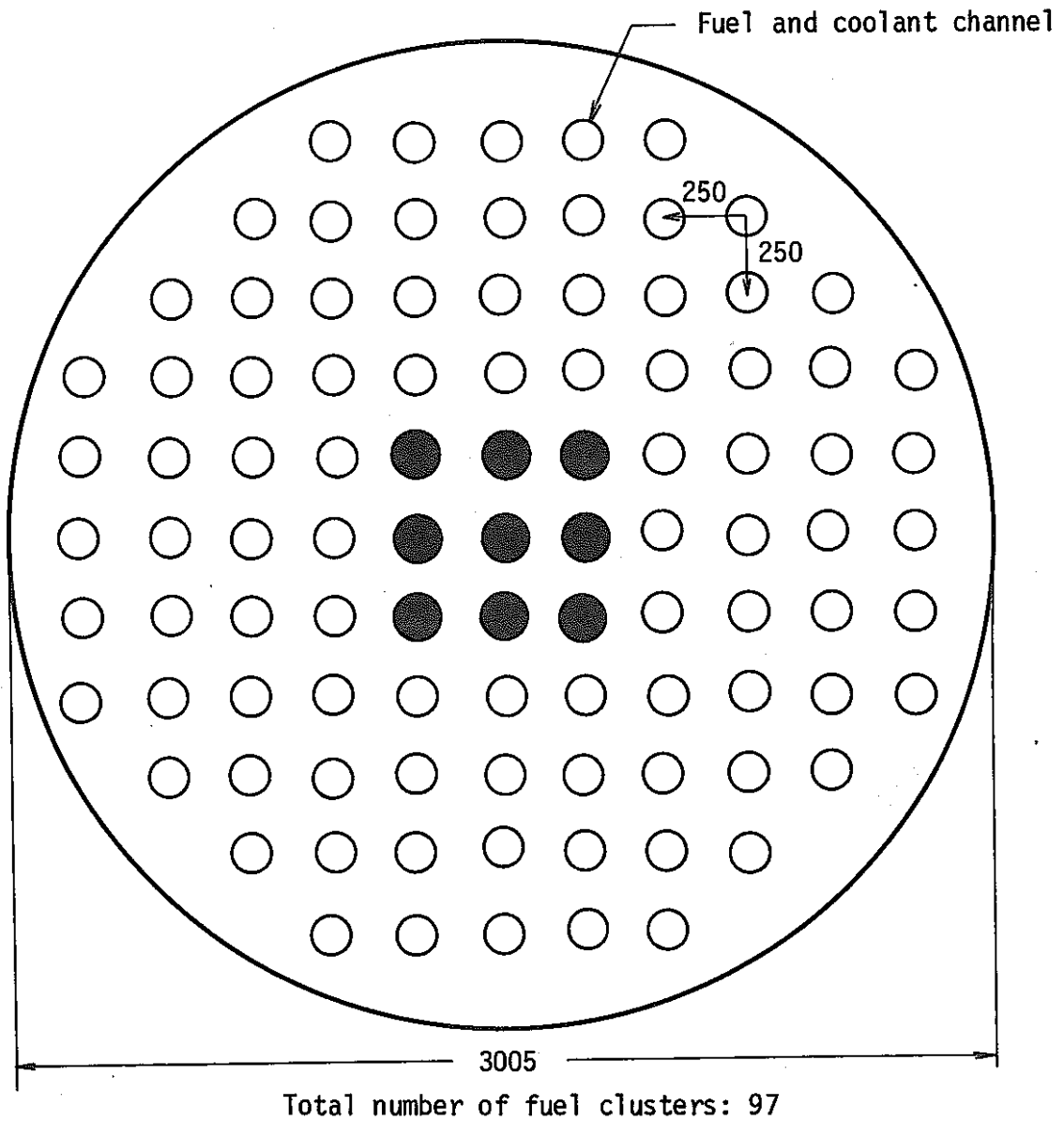
* by pulsed neutron method

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1. Experimental conditions

- Fig. 1-1 Configuration of DCA core having 25-cm pitch lattice.
- Fig. 1-2 Cross-sectional view of 36-rod $\text{PuO}_2\text{-UO}_2$ fuel assembly.
- Fig. 1-3 Cross-sectional view of 28-rod UO_2 fuel assembly.
- Fig. 1-4 Identification number of fuel channel and vertical experimental hole.
- Fig. 1-5 Measurement position of radial flux distribution by $3^\phi \times 10^L$ Cu sample.
- Table 1-1 Specification of fuel assembly and composed materials.
- Table 1-2 Composition of fuel pellet and sheath.
- Table 1-3 List of experiment for various parameters.



- 36-rod $\text{PuO}_2\text{-UO}_2$ channel
(0.54wt% or 0.87wt% $\text{PuO}_2\text{-UO}_2$)
- 28-rod 1.2wt% UO_2 channel

Fig. 1-1 Configuration of DCA core having 25-cm pitch lattice

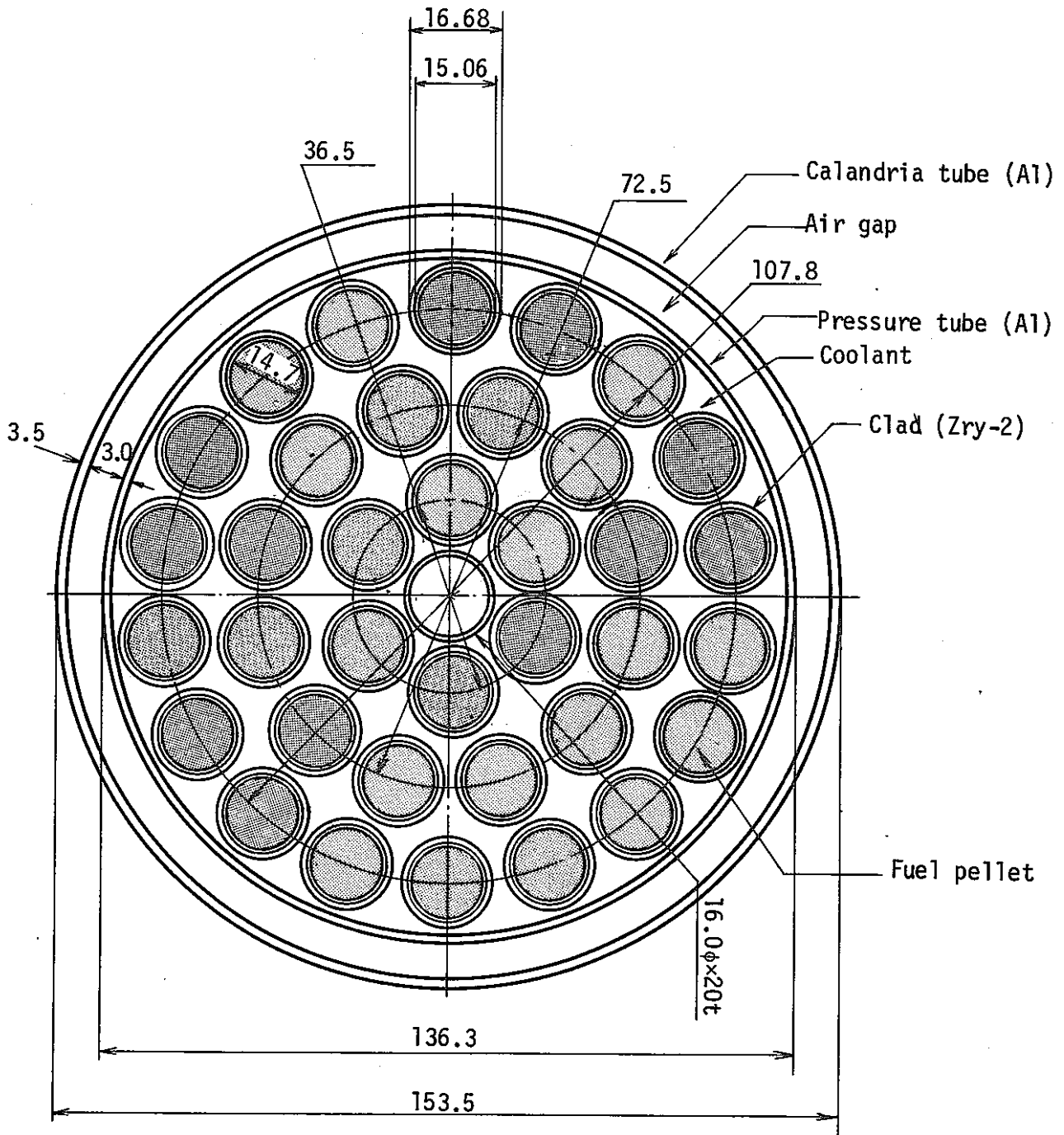


Fig. 1-2 Cross-sectional view of 36-rod PuO₂-UO₂ fuel assembly

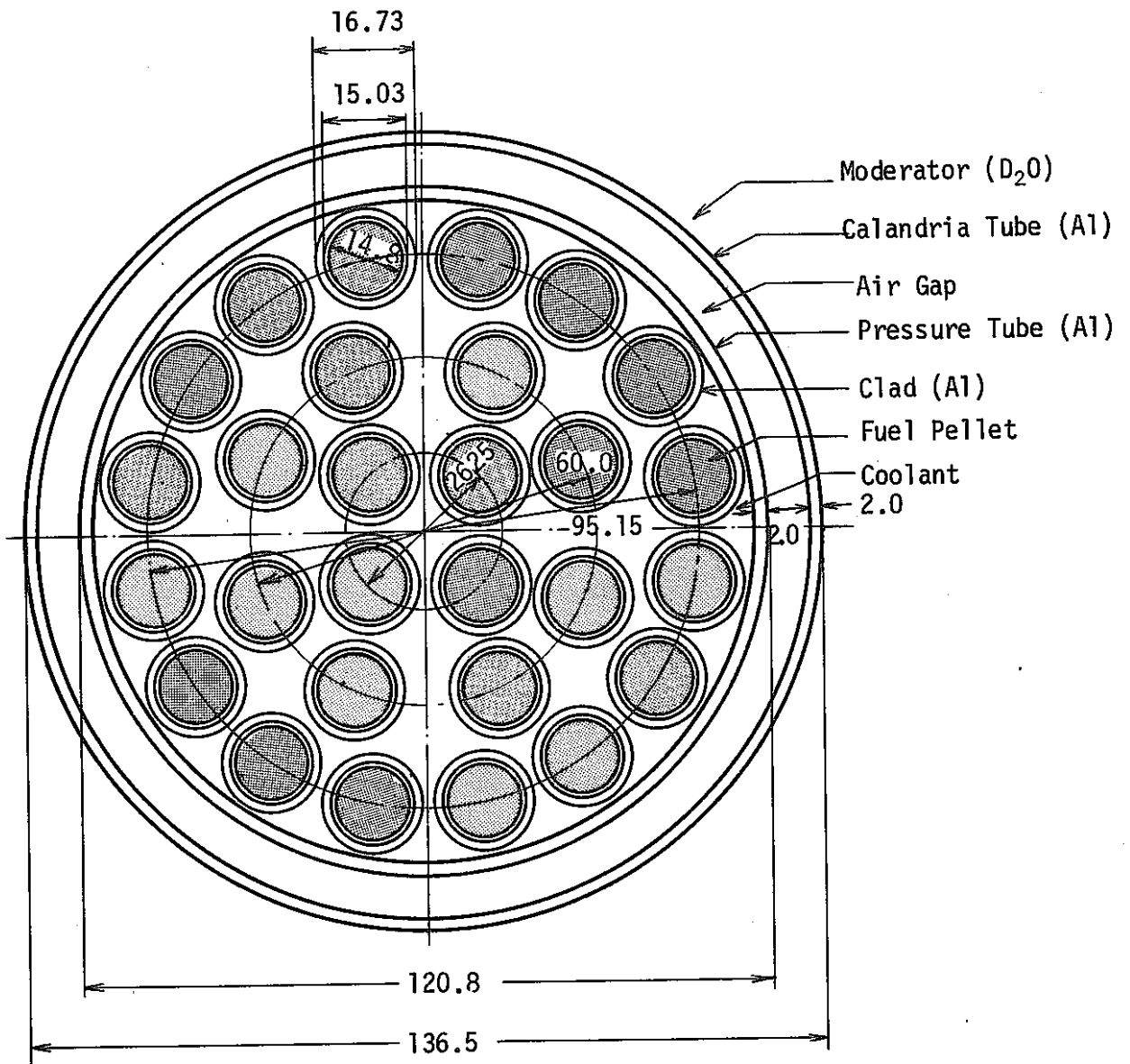


Fig. 1-3 Cross-sectional view of 28-rod UO_2 fuel assembly

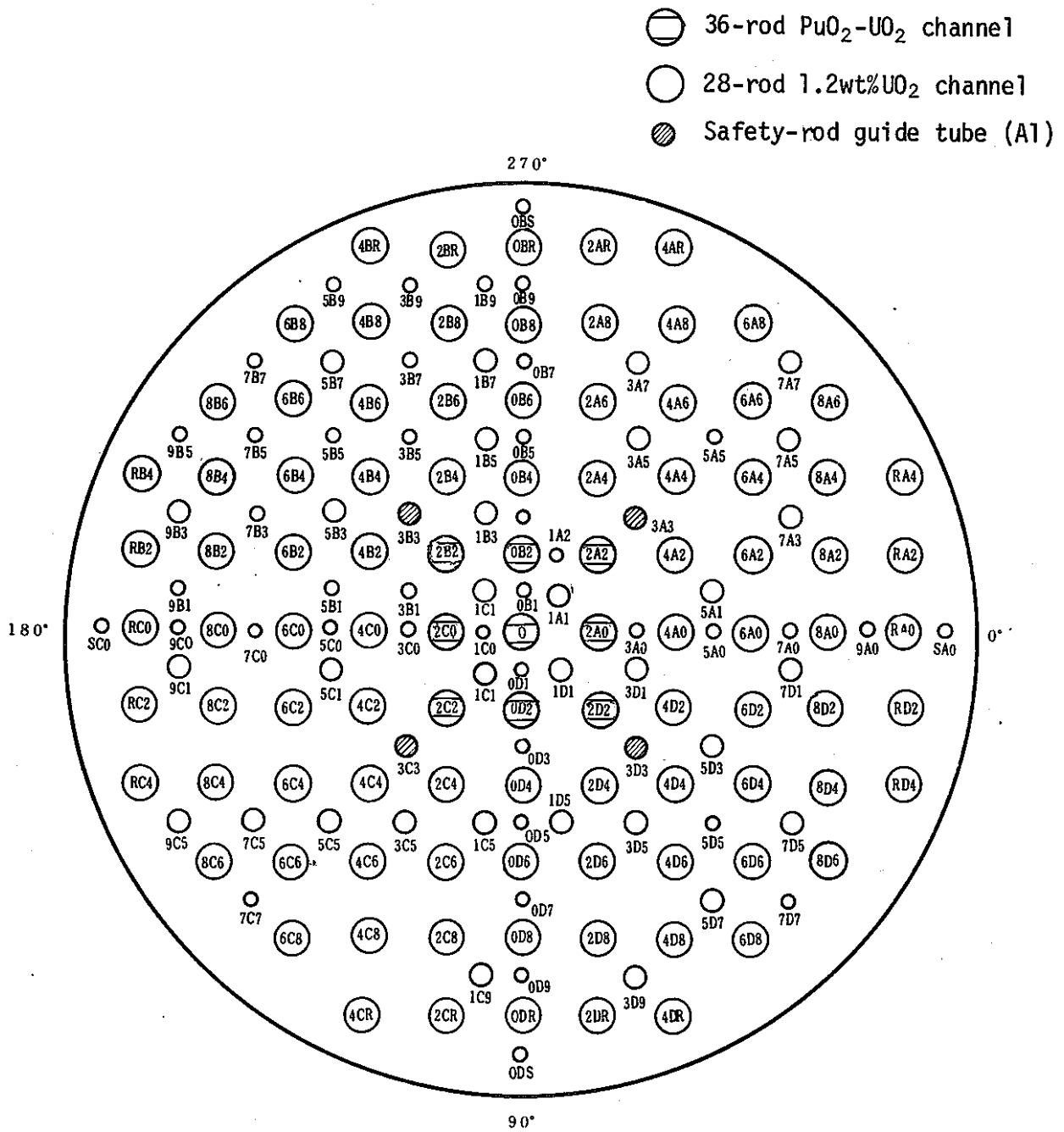


Fig. 1-4 Identification number of fuel channel and vertical experimental hole

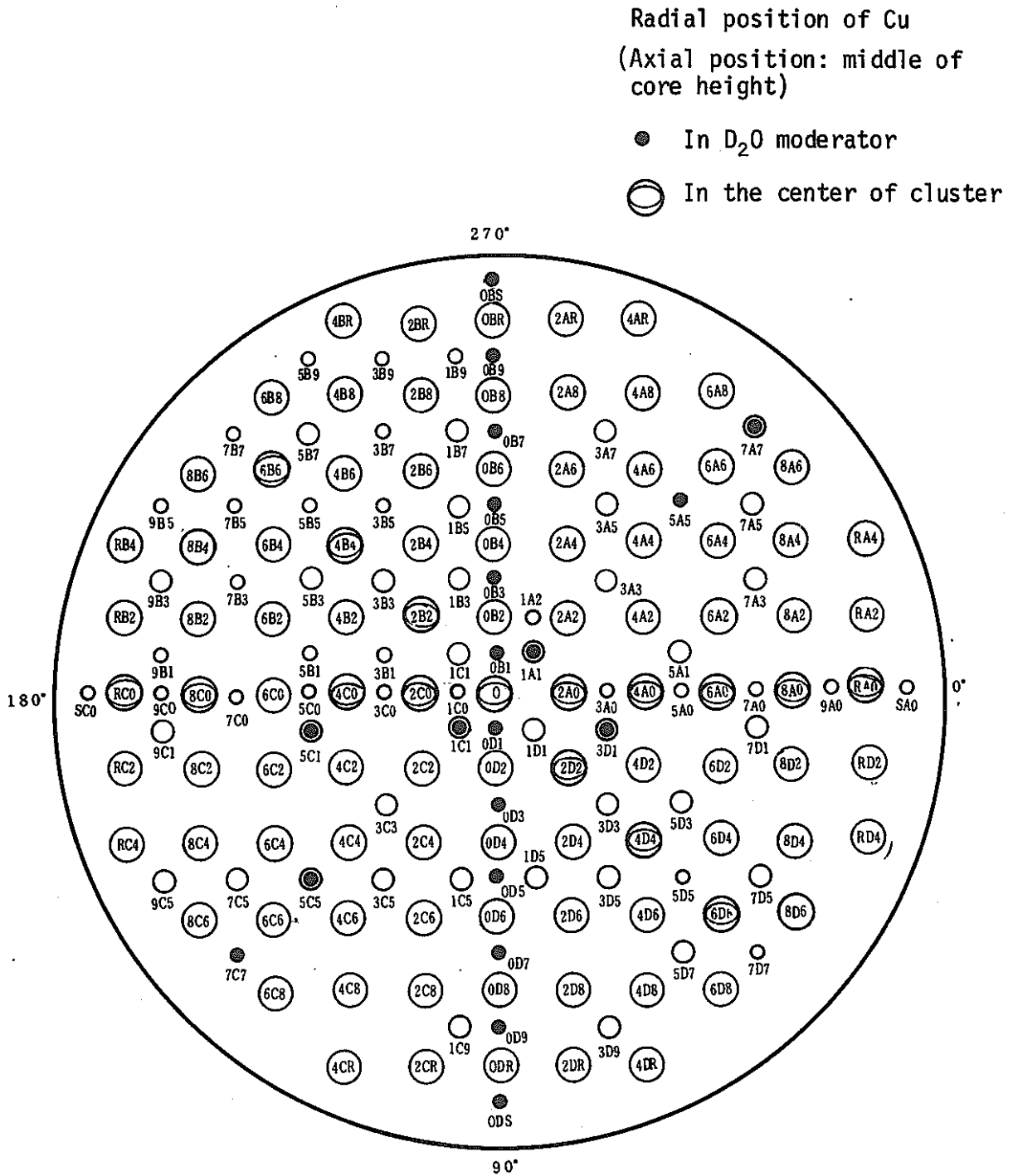


Fig. 1-5 Measurement position of radial flux distribution by $3\phi \times 10^4$ Cu sample

Table 1-1 Specification of fuel assembly and composed materials

(a) Fuel rod

Fuel rod	Name	Outer dia. (mm)	Material	Density (g/cm ³)
36-rod 0.54(0.87)wt% PuO ₂ -UO ₂	Pellet	14.80	Pu enriched PuO ₂ -UO ₂ *	10.17
	Gap	15.03	Helium	—
	Sheath	16.73	Zry-2	6.52
28-rod 1.2wt% UO ₂	Pellet	14.80	1.2wt% UO ₂	10.36
	Gap	15.03	Helium	—
	Sheath	16.73	Al-Mg alloy	2.674

$$* \frac{\text{Pu}}{\text{Pu}+\text{U}}$$

(b) Composed material

Fuel assembly	Name	Inner dia. (mm)	Thickness (mm)	Material	Density (g/cm ³)
36-rod 0.54(0.87)wt% PuO ₂ -UO ₂	Pressure tube	130.3	3.0	Al(A5052)	2.673
	Gap	136.3	5.1	Air	0.001
	Calandria tube	146.5	3.5	Al(A5052)	2.673
28-rod 1.2wt% UO ₂	Pressure tube	116.8	2.0	Al-Mg alloy	2.674
	Gap	120.8	5.9	Air	0.001
	Calandria tube	132.5	2.0	Al-Mg alloy	2.674
—	Moderator	136.5	—	99.45 mol% D ₂ O	1.1045
	Coolant	—	—	H ₂ O	0.9978

Table 1-2 Composition of fuel pellet and sheath

(a) Pellet

Pellet	Nuclide	Ingredient (wt%)		Atomic number density ($\times 10^{24}/\text{cm}^3$)
		Pu	whole	
0.54wt% PuO ₂ -UO ₂ (36-rod fuel)	U -235		0.6214	1.620×10^{-4}
	U -238		86.782	2.233×10^{-2}
	Pu-238	0.021	0.00010	$< 10^{-7}$
	Pu-239	90.360	0.4304	1.103×10^{-4}
	Pu-240	8.640	0.04115	1.050×10^{-5}
	Pu-241	0.915	0.00436	1.108×10^{-6}
	Pu-242	0.064	0.00030	$< 10^{-7}$
	O -16		12.12	4.640×10^{-2}
0.87wt% PuO ₂ -UO ₂ (36-rod fuel)	U -235		0.6194	1.615×10^{-4}
	U -238		86.503	2.226×10^{-2}
	Pu-238	0.019	0.00014	$< 10^{-7}$
	Pu-239	90.314	0.6849	1.755×10^{-4}
	Pu-240	8.682	0.06584	1.680×10^{-5}
	Pu-241	0.918	0.00696	1.769×10^{-6}
	Pu-242	0.067	0.00051	1.291×10^{-7}
	O -16		12.12	4.641×10^{-2}
1.2wt% UO ₂ (28-rod fuel)	U -235		1.057	0.00028
	U -238		86.793	0.02275
	O -16		12.150	0.04738

(b) Sheath

Fuel rod	Material	Nuclide	Ingredient (wt%)
36-rod 0.54(0.87)wt% PuO ₂ -UO ₂	Zry-2	Zr	98.22
		Sn	1.48
		Fe	0.14
		Cr	0.10
		Ni	0.06
28-rod 1.2wt% UO ₂	Al-Mg alloy	Al	96.98
		Ag	2.60
		Inpurity	0.42

Table 1-3 List of experiment for various parameters

^{10}B content in D_2O (ppm)	Enrichment of Pu in $\text{PuO}_2\text{-UO}_2$ (wt%)	No. of loaded fuel clusters		No. of region	Item of experiment
		$\text{PuO}_2\text{-UO}_2$	1.2wt% UO_2		
0	—	0	97	(Uniform)	(1) Loss-of-coolant reactivity (All channel and central channel) (2) Neutron flux at non-voided and 100%-voided core (Radial and axial distribution)
	0.54 0.87	9	88	2-region	
3.2	—	0	97	(Uniform)	(1) Loss-of-coolant reactivity (All channel and central channel) (2) Neutron flux at non-voided and 100%-voided core (Radial and axial distribution)
	0.54	9	88	2-region	

2. Result of loss-of-coolant reactivity

Table 2-1 Result of measurement for critical level and level reactivity coefficient of moderator.

Table 2-2 Experimental value of reactivity due to loss-of-coolant of full core or central channel.

Table 2-3 Void reactivity based on the modified one-group diffusion theory.

Fig. 2-1 Relation between level reactivity coefficient of moderator and critical moderator level in the non-voided core with unpoisoned D₂O.

Fig. 2-2 Relation between level reactivity coefficient of moderator and critical moderator level in the 100%-voided core with unpoisoned D₂O.

Fig. 2-3 Relation between level reactivity coefficient of moderator and critical moderator level in the core contained ¹⁰B-poison in D₂O.

Table 2-1 Result of measurement for critical level and level reactivity coefficient of moderator.

^{10}B content in D_2O (ppm)	Core Fuel and number of loaded clusters	Coolant		Critical moderator level (mm)	Level reactivity coefficient (ρ/cm)	Moderator temperature ($^\circ\text{C}$)
		Void fraction (%)	Coolant level (mm)			
0	1.2wt% $\text{UO}_2/97$ (Uniform core)	0	1073	1077.9	31.2 ± 1.8	19.5
		(1ch/100) (Others/0)	(1ch/0) (Others/1073)	1073.1	29.8 ± 1.2	19.5
		100	0	1059.9	45.4 ± 1.8	19.0
	36rod 0.54wt% $\text{PuO}_2\text{-UO}_2/9$ & 1.2wt% $\text{UO}_2/88$	0	1010	1004.0	39.8 ± 1.2	17.5
		(1ch/100) (Others/0)	(1ch/0) (Others/1010)	1005.7	36.8 ± 2.0	17.0
		100	0	1044.1	48.9 ± 2.8	17.5
	36rod 0.87wt% $\text{PuO}_2\text{-UO}_2/9$ & 1.2wt% $\text{UO}_2/88$	0	897	896.3	47.1 ± 0.8	14.2
		(1ch/100) (Others/0)	(1ch/0) (Others/905)	904.5	49.4 ± 0.8	14.0
		100	0	988.5	54.8 ± 0.7	14.4
3.2	1.2wt% $\text{UO}_2/97$ (Uniform core)	0	1445	1448.9	12.5 ± 0.3	18.5
		(1ch/100) (Others/0)	(1ch/0) (Others/1420)	1426.4	14.3 ± 0.4	14.5
		100	0	1279.1	29.1 ± 0.7	14.5
	36rod 0.54wt% $\text{PuO}_2\text{-UO}_2/9$ & 1.2wt% $\text{UO}_2/88$	0	1280	1269.3	20.0 ± 0.6	16.5
		(1ch/100) (Others/0)	(1ch/0) (Others/1270)	1265.5	20.4 ± 0.6	16.0
		100	0	1241.4	32.4 ± 1.2	15.0

Table 2-2 Experimental value of reactivity due to loss-of-coolant of all channel or central channel.

Constant value at reactivity change	¹⁰ B content in D ₂ O (ppm)	No. of loss-of-coolant channel	Enrichment of 36-rod PuO ₂ -UO ₂ (wt%)	No. of loaded fuel clusters		Loss-of-coolant reactivity (\$) (δ)
				PuO ₂ -UO ₂	1.2wt%UO ₂	
H (Core height)	0	97 (All)	—	0	97	0.77 ± 0.06
			0.54	9	88	-1.99 ± 0.07
			0.87	9	88	-6.19 ± 0.12
	3.2	1 (Central)	—	0	97	0.14 ± 0.04
			0.54	9	88	-0.05 ± 0.05
			0.87	9	88	-0.41 ± 0.07
B _z ² (Axial buckling)	0	97 (All)	—	0	97	-0.08 ± 0.31
			0.54	9	88	-2.84 ± 0.36
			0.87	9	88	-7.38 ± 0.50
	3.2	1 (Central)	—	0	97	0.14 ± 0.13
			0.54	9	88	-0.05 ± 0.15
			0.87	9	88	-0.41 ± 0.21
3.2	97 (All)	—	0	97	3.14 ± 0.17	
		0.54	9	88	0.60 ± 0.22	
		0.87	9	88	0.29 ± 0.05	
3.2	1 (Central)	—	0	97	0.29 ± 0.05	
		0.54	9	88	0.10 ± 0.08	
		0.87	9	88	0.10 ± 0.08	

Table 2-3 Void reactivity based on the modified one-group diffusion theory.

(1) Level reactivity coefficient of core height ($B_r^2 = \text{const.}$)

$$\frac{\partial \rho}{\partial B_z^2} = - \frac{M_z^2}{\beta k_\infty} \quad [\$/\text{cm}^{-2}]$$

$$\frac{\partial \rho}{\partial H} = \frac{2\pi^2 M_z^2}{\beta k_\infty} \cdot \frac{1}{(H+\lambda)^3} \quad [\$/\text{cm}]$$

(2) Void reactivity $\rho_{0 \rightarrow v}$ evaluated from the differences of critical core heights due to coolant voiding

H_0, λ_0, B_{z0}^2 : Critical level, axial extrapolation length, axial buckling before coolant voiding

H_v, λ_v, B_{zv}^2 : Critical level, axial extrapolation length, axial buckling after coolant voiding

① When core height (H) is constant

$$\rho_{0 \rightarrow v} = \int_{H_v}^{H_0} \left(\frac{\partial \rho}{\partial H} \right)_v dH = \frac{\pi^2 M_z^2}{\beta k_\infty} \left\{ \frac{1}{(H_v + \lambda_v)^2} - \frac{1}{(H_0 + \lambda_v)^2} \right\} \quad [\$]$$

② When axial buckling (B_z^2) is constant

$$\begin{aligned} \rho_{0 \rightarrow v} &= \int_{B_{zv}^2}^{B_{z0}^2} \left(\frac{\partial \rho}{\partial B_z^2} \right)_v dB_z^2 = \frac{M_z^2}{\beta k_\infty} (B_{zv}^2 - B_{z0}^2) \quad [\$] \\ &= \frac{\pi^2 M_z^2}{\beta k_\infty} \left\{ \frac{1}{(H_v + \lambda_v)^2} - \frac{1}{(H_0 + \lambda_0)^2} \right\} \quad [\$] \end{aligned}$$

If $\lambda_v = \lambda_0 + \delta\lambda$,

$$(H_0 + \lambda_0)^2 = (H_0 + \lambda_v - \delta\lambda)^2 \approx (H_0 + \lambda_v)^2 - 2\delta\lambda(H_0 + \lambda_v)$$

$$\frac{1}{(H_0 + \lambda_0)^2} \approx \frac{1}{(H_0 + \lambda_v)^2} \left\{ 1 + \frac{2\delta\lambda}{(H_0 + \lambda_v)} \right\}$$

$$\therefore \rho_{0 \rightarrow v} \approx \frac{\pi^2 M_z^2}{\beta k_\infty} \left\{ \frac{1}{(H_v + \lambda_v)^2} - \frac{1}{(H_0 + \lambda_v)^2} - \frac{2\delta\lambda}{(H_0 + \lambda_v)^3} \right\}$$

$$= \rho_{0 \rightarrow v} (H=\text{const}) - \frac{2\pi^2 M_z^2}{\beta k_\infty} \cdot \frac{\delta\lambda}{(H_0 + \lambda_v)^3}$$

here

$$\frac{2\pi^2 M_z^2}{\beta k_\infty} \text{ is given by least-squares fitting of } \frac{\partial \rho}{\partial H} \text{ vs. } H$$

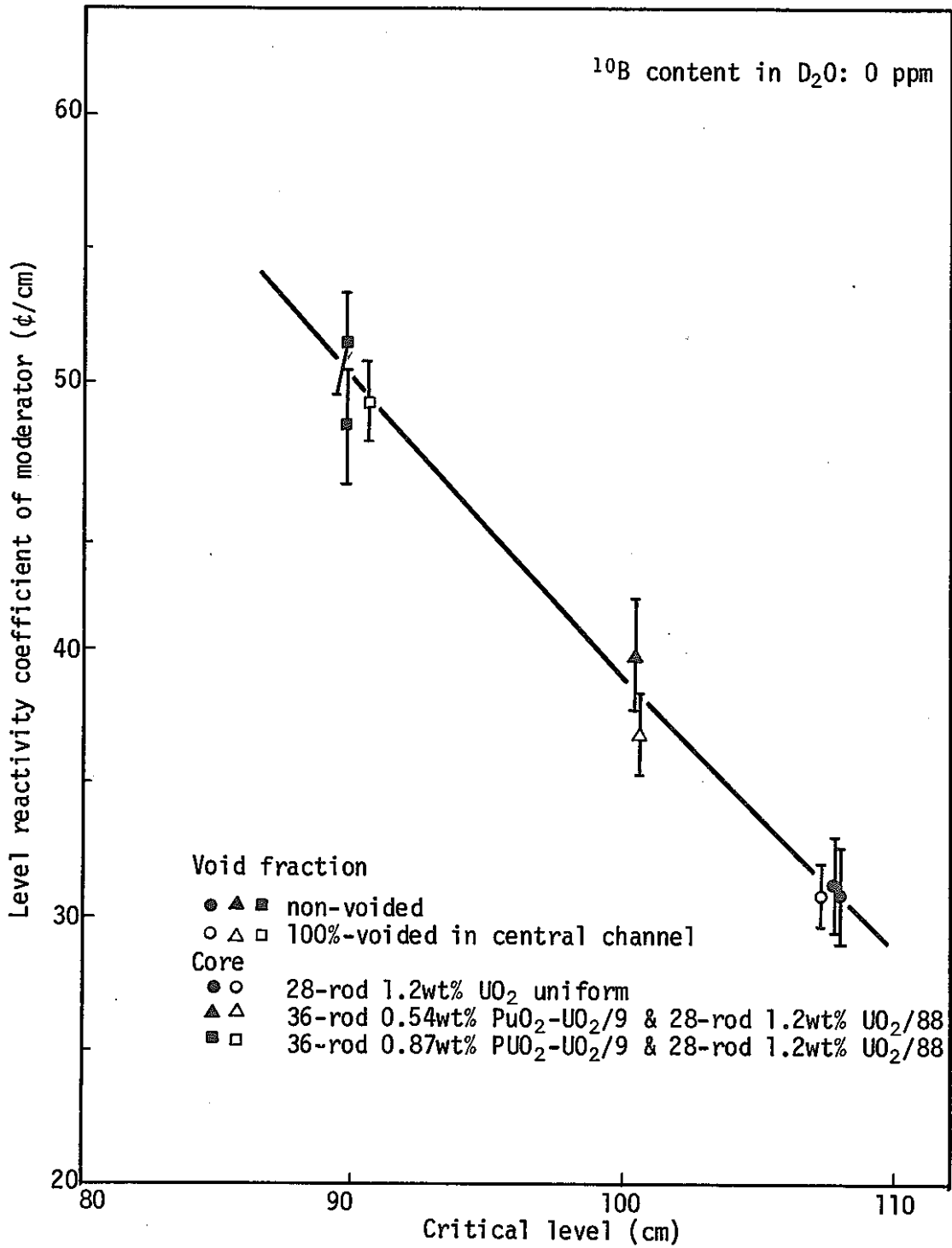


Fig. 2-1 Relation between level reactivity coefficient of moderator and critical moderator level in the non-voided core, and 100%-voided core in central channel alone with unpoisoned D₂O.

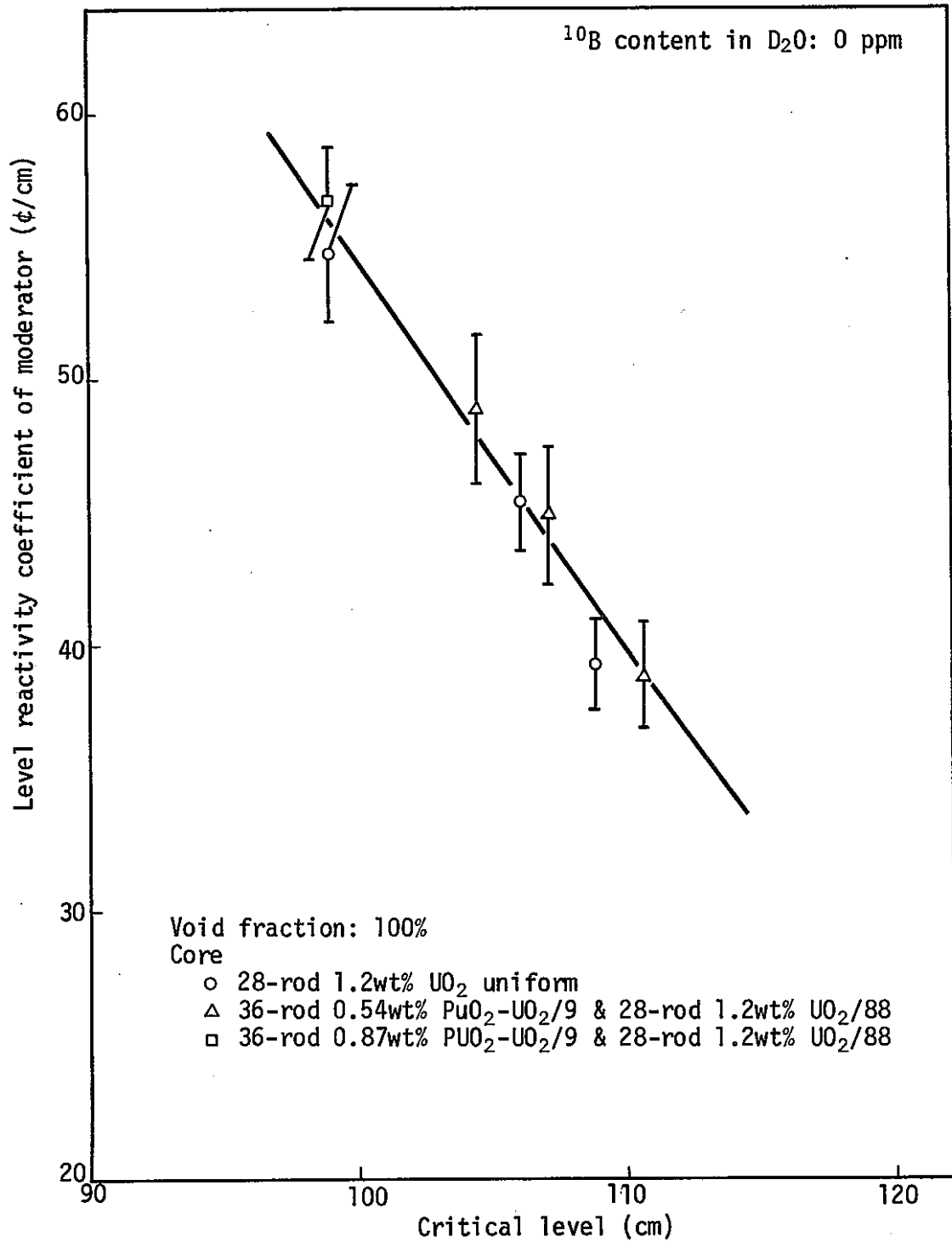


Fig. 2-2 Relation between level reactivity coefficient of moderator and critical moderator level in the 100%-voided core with unpoisoned D_2O .

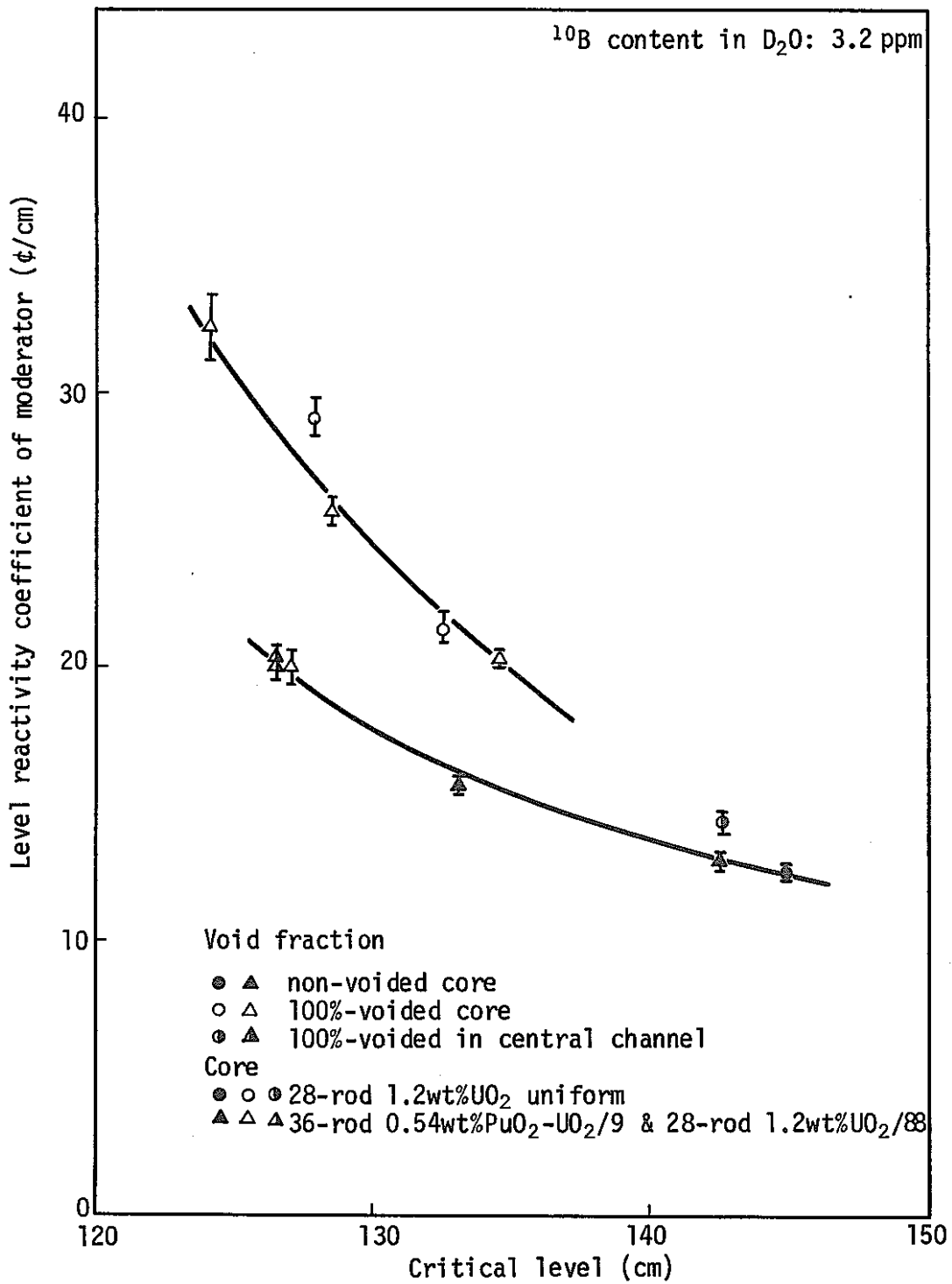


Fig. 2-3 Relation between level reactivity coefficient of moderator and critical moderator level in the core with ¹⁰B-poison in D₂O.

3. Measurement of axial flux distribution

- Table 3-1 Result of measured axial buckling and axial extrapolation length in various position.
- Table 3-2 Dependence of axial buckling on fitting range in various measurement position (1) ~ (7)
- Table 3-3 Measurement of axial flux distribution by Cu wire in the core uniformly loaded with 28-rod 1.2wt%UO₂ clusters (1) ~ (2).
- Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters (1) ~ (2).
- Table 3-5 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters (1) ~ (2).
-
- Fig. 3-1 Dependence of axial buckling on fitting range in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters (1) ~ (2).
- Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters (1) ~ (2).
- Fig. 3-3 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.
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- Fig. 3-5 Axial flux distribution in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

Table 3-1 Result of measured axial buckling and axial extrapolation length in various position.

^{10}B content in D_2O (ppm)	Fuel cluster of central (9ch) region	Void fraction (%)	Measurement cell	Position	B_z^2 (m^{-2})	λ_z (cm)
0	36-rod 0.54wt% $\text{PuO}_2\text{-UO}_2$	0	36-rod $\text{PuO}_2\text{-UO}_2$	0	7.58 ± 0.08	14.0 ± 0.6
				1D1	7.74 ± 0.07	12.8 ± 0.5
			28-rod UO_2	5A1	8.11 ± 0.07	10.2 ± 0.5
		100	36-rod $\text{PuO}_2\text{-UO}_2$	0	6.90 ± 0.08	15.3 ± 0.7
				1D1	6.95 ± 0.07	14.9 ± 0.6
			28-rod UO_2	5A1	7.25 ± 0.05	12.4 ± 0.4
	36-rod 0.87wt% $\text{PuO}_2\text{-UO}_2$	0	36-rod $\text{PuO}_2\text{-UO}_2$	0	9.63 ± 0.10	11.8 ± 0.5
				1D1	9.87 ± 0.07	10.6 ± 0.4
				2A0	9.69 ± 0.12	11.5 ± 0.6
		100	—	—	—	—
	28-rod 1.2wt% UO_2	0	28-rod UO_2	2C2	$6.62 \pm 0.05^*$	8.1 ± 0.5
				1D1	7.09 ± 0.04	10.2 ± 0.3
1B3				$6.47 \pm 0.04^*$	8.1 ± 0.4	
100		28-rod UO_2	0	7.25 ± 0.04	10.8 ± 0.3	
			1D1	7.13 ± 0.03	11.8 ± 0.3	
			—	—	—	
3.2	36-rod 0.54wt% $\text{PuO}_2\text{-UO}_2$	0	36-rod $\text{PuO}_2\text{-UO}_2$	0	5.21 ± 0.03	10.6 ± 0.4
				1D1	5.20 ± 0.02	10.8 ± 0.3
			28-rod UO_2	5A1	5.20 ± 0.10	10.8 ± 1.3
				—	—	—
		100	36-rod $\text{PuO}_2\text{-UO}_2$	0	5.27 ± 0.04	12.8 ± 0.5
				1D1	5.16 ± 0.04	14.2 ± 0.5
			28-rod UO_2	5A1	5.19 ± 0.04	13.8 ± 0.5
				—	—	—

* Fuel cluster is unloaded in 0ch.

Table 3-2 Dependence of axial buckling on fitting range
in various measurement position

(1) Core : 28-rod 1.2wt%UO₂ : 97 (Uniform core)

Void fraction : 0% Critical level : 1077.8 mm

¹⁰B content in D₂O : 0 ppm

Position	Fitting range (mm)	B _z ² (m ⁻²)	
		Measured	Averaged
1D1	20 - 1060	7.455 ± 0.023	7.09 ± 0.04
	20 - 1040	7.391 ± 0.023	
	40 - 1020	7.296 ± 0.023	
	60 - 1000	7.236 ± 0.025	
	80 - 980	7.176 ± 0.027	
	100 - 960	7.092 ± 0.028	
	120 - 940	7.079 ± 0.032	
	140 - 920	6.988 ± 0.032	
2C2*	40 - 1140	6.636 ± 0.021	6.62 ± 0.05
	40 - 1120	6.616 ± 0.023	
	60 - 1100	6.624 ± 0.027	
	80 - 1080	6.621 ± 0.032	
	100 - 1060	6.594 ± 0.038	
	120 - 1040	6.606 ± 0.042	
	140 - 1020	6.608 ± 0.049	
	160 - 1000	6.665 ± 0.056	
1B3*	20 - 1120	6.701 ± 0.020	6.47 ± 0.04
	40 - 1100	6.601 ± 0.019	
	60 - 1080	6.523 ± 0.017	
	80 - 1060	6.489 ± 0.020	
	100 - 1040	6.474 ± 0.022	
	120 - 1020	6.466 ± 0.025	
	140 - 1000	6.458 ± 0.029	
	160 - 980	6.427 ± 0.034	

* Fuel cluster is unloaded in 0ch. (Critical level : 113.98 mm)

(2) Core : 28-rod 1.2wt%UO₂ : 97 (Uniform core)

Void fraction : 100% Critical level : 1059.0 mm

¹⁰B content in D₂O : 0 ppm

Position	Fitting range (mm)	B ₂ ² (m ⁻²)	
		Measured	Averaged
0ch	40 - 1060	7.248 ± 0.034	7.25 ± 0.04
	40 - 1040	7.206 ± 0.036	
	60 - 1020	7.252 ± 0.032	
	80 - 1000	7.257 ± 0.033	
	100 - 980	7.281 ± 0.031	
	120 - 960	7.296 ± 0.035	
	140 - 940	7.336 ± 0.041	
	160 - 920	7.415 ± 0.046	
1D1	20 - 1040	7.488 ± 0.027	7.13 ± 0.03
	20 - 1020	7.420 ± 0.026	
	40 - 1000	7.298 ± 0.024	
	60 - 980	7.212 ± 0.024	
	80 - 960	7.149 ± 0.025	
	100 - 940	7.107 ± 0.028	
	120 - 920	7.053 ± 0.031	
	140 - 900	7.020 ± 0.037	

(3) Core : 36-rod 0.54wt%(S) PuO₂-UO₂ : 9 & 1.2wt% UO₂ : 88
 Void fraction : 0% Critical level : 1001.0 mm
¹⁰B content in D₂O : 0 ppm

Position	Fitting range (mm)	B_z^2 (m ⁻²)	
		Measured	Averaged
0ch	40 - 980	8.022 ± 0.027	7.58 ± 0.08
	60 - 960	7.957 ± 0.028	
	80 - 940	7.871 ± 0.027	
	100 - 920	7.793 ± 0.028	
	120 - 900	7.743 ± 0.032	
	140 - 880	7.653 ± 0.033	
	160 - 860	7.577 ± 0.037	
	180 - 840	7.580 ± 0.045	
	200 - 820	7.602 ± 0.054	
	220 - 800	7.583 ± 0.067	
	240 - 780	7.569 ± 0.083	
1D1	20 - 960	8.389 ± 0.024	7.74 ± 0.07
	40 - 940	8.276 ± 0.022	
	60 - 920	8.199 ± 0.023	
	80 - 900	8.120 ± 0.024	
	100 - 880	8.059 ± 0.026	
	120 - 860	8.001 ± 0.027	
	140 - 840	7.958 ± 0.032	
	160 - 820	7.886 ± 0.035	
	180 - 800	7.810 ± 0.040	
	200 - 780	7.741 ± 0.047	
	220 - 760	7.733 ± 0.059	
240 - 740	7.748 ± 0.075		
5A1	20 - 980	8.497 ± 0.026	8.12 ± 0.07
	40 - 960	8.383 ± 0.024	
	60 - 940	8.292 ± 0.023	
	80 - 920	8.244 ± 0.025	
	100 - 900	8.208 ± 0.029	
	120 - 880	8.172 ± 0.034	
	140 - 860	8.145 ± 0.042	
	160 - 840	8.115 ± 0.049	
	180 - 820	8.115 ± 0.060	
	200 - 800	8.104 ± 0.074	
	220 - 780	8.068 ± 0.091	

(4) Core : 36-rod 0.54wt%(S) PuO₂-UO₂ : 9 & 1.2wt% UO₂ : 88
 Void fraction : 100% Critical level : 1042.6 mm
¹⁰B content in D₂O : 0 ppm

Position	Fitting range (mm)	B _Z ² (m ⁻²)	
		Measured	Averaged
0ch	60 - 960	7.097 ± 0.024	6.90 ± 0.08
	80 - 960	7.058 ± 0.024	
	100 - 960	7.036 ± 0.026	
	120 - 940	6.978 ± 0.028	
	140 - 920	6.925 ± 0.031	
	160 - 900	6.880 ± 0.036	
	180 - 880	6.866 ± 0.043	
	200 - 860	6.935 ± 0.047	
	220 - 840	6.938 ± 0.057	
	240 - 820	6.873 ± 0.069	
	260 - 800	6.875 ± 0.087	
	280 - 780	6.922 ± 0.109	
1D1	20 - 1000	7.481 ± 0.025	6.95 ± 0.07
	40 - 980	7.373 ± 0.023	
	60 - 960	7.280 ± 0.022	
	80 - 940	7.203 ± 0.021	
	100 - 920	7.154 ± 0.023	
	120 - 900	7.121 ± 0.027	
	140 - 880	7.100 ± 0.030	
	160 - 860	7.063 ± 0.036	
	180 - 840	6.977 ± 0.039	
	200 - 820	6.968 ± 0.047	
	220 - 800	6.943 ± 0.055	
	240 - 780	6.938 ± 0.068	
5A1	20 - 1000	7.560 ± 0.025	7.25 ± 0.05
	40 - 980	7.426 ± 0.019	
	60 - 960	7.345 ± 0.017	
	80 - 940	7.279 ± 0.016	
	100 - 920	7.252 ± 0.018	
	120 - 900	7.241 ± 0.022	
	140 - 880	7.259 ± 0.026	
	160 - 860	7.254 ± 0.032	
	180 - 840	7.255 ± 0.038	
	200 - 820	7.225 ± 0.046	
	220 - 800	7.283 ± 0.055	
	240 - 780	7.356 ± 0.067	

(5) Core : 36-rod 0.87wt%(S) PuO₂-UO₂ : 9 & 1.2wt% UO₂ : 88
 Void fraction : 0% Critical level : 894.4 mm
¹⁰B content in D₂O : 0 ppm

Position	Fitting range (mm)	B ₂ ² (m ⁻²)	
		Measured	Averaged
0ch	40 - 900	9.675 ± 0.036	9.63 ± 0.10
	60 - 880	9.706 ± 0.044	
	80 - 860	9.669 ± 0.054	
	100 - 840	9.642 ± 0.063	
	120 - 820	9.586 ± 0.076	
	140 - 800	9.521 ± 0.089	
	160 - 780	9.539 ± 0.111	
	180 - 760	9.670 ± 0.134	
	200 - 740	9.469 ± 0.163	
	220 - 720	9.729 ± 0.191	
1D1	40 - 900	10.349 ± 0.036	9.87 ± 0.07
	60 - 880	10.173 ± 0.032	
	80 - 860	10.043 ± 0.029	
	100 - 840	10.017 ± 0.032	
	120 - 820	9.924 ± 0.035	
	140 - 800	9.870 ± 0.041	
	160 - 780	9.867 ± 0.048	
	180 - 760	9.869 ± 0.060	
	200 - 740	9.953 ± 0.071	
	220 - 720	9.821 ± 0.085	
2A0	40 - 880	9.748 ± 0.066	9.69 ± 0.12
	60 - 860	9.673 ± 0.059	
	80 - 840	9.725 ± 0.069	
	100 - 820	9.673 ± 0.085	
	120 - 800	9.667 ± 0.104	
	140 - 780	9.728 ± 0.122	
	160 - 760	9.975 ± 0.139	
	180 - 740	9.714 ± 0.163	
	200 - 720	9.470 ± 0.200	
	220 - 700	9.445 ± 0.257	

(6) Core : 36-rod 0.54wt%(S) PuO₂-UO₂ : 9 & 1.2wt% UO₂ : 88
 Void fraction : 0% Critical level : 1270.7 mm
¹⁰B content in D₂O : 3.2 ppm

Position	Fitting range (mm)	B_z^2 (m ⁻²)	
		Measured	Averaged
0ch	20 - 1220	5.214 ± 0.010	5.21 ± 0.03
	40 - 1200	5.200 ± 0.010	
	60 - 1180	5.208 ± 0.013	
	80 - 1160	5.208 ± 0.014	
	100 - 1140	5.216 ± 0.016	
	120 - 1120	5.242 ± 0.018	
	140 - 1100	5.216 ± 0.020	
	160 - 1080	5.219 ± 0.023	
	180 - 1060	5.164 ± 0.024	
	200 - 1040	5.163 ± 0.028	
1D1	20 - 1220	5.322 ± 0.012	5.20 ± 0.02
	40 - 1200	5.261 ± 0.010	
	60 - 1180	5.240 ± 0.010	
	80 - 1160	5.212 ± 0.011	
	100 - 1140	5.218 ± 0.012	
	120 - 1120	5.197 ± 0.013	
	140 - 1100	5.178 ± 0.015	
	160 - 1080	5.163 ± 0.017	
	180 - 1060	5.155 ± 0.020	
	200 - 1040	5.113 ± 0.021	
5A1	20 - 1240	5.383 ± 0.015	5.20 ± 0.10
	20 - 1220	5.325 ± 0.013	
	40 - 1200	5.278 ± 0.013	
	60 - 1180	5.237 ± 0.014	
	80 - 1160	5.198 ± 0.014	
	100 - 1140	5.161 ± 0.015	
	120 - 1120	5.124 ± 0.015	
	140 - 1100	5.090 ± 0.016	
	160 - 1080	5.065 ± 0.018	
	180 - 1060	5.039 ± 0.020	

(7) Core : 36-rod 0.54wt%(S) PuO₂-UO₂ : 9 & 1.2wt% UO₂ : 88
 Void fraction : 100% Critical level : 1240.9 mm
¹⁰B content in D₂O : 3.2 ppm

Position	Fitting range (mm)	B _Z ² (m ⁻²)	
		Measured	Average
0ch	0 - 1220	5.278 ± 0.018	5.27 ± 0.04
	0 - 1200	5.272 ± 0.019	
	20 - 1180	5.271 ± 0.023	
	40 - 1160	5.233 ± 0.026	
	60 - 1140	5.202 ± 0.029	
	80 - 1120	5.133 ± 0.031	
	100 - 1100	5.075 ± 0.035	
	120 - 1080	5.020 ± 0.039	
	140 - 1060	4.958 ± 0.041	
	160 - 1040	4.895 ± 0.045	
1D1	20 - 1200	5.427 ± 0.024	5.16 ± 0.04
	20 - 1180	5.341 ± 0.020	
	40 - 1160	5.278 ± 0.021	
	60 - 1140	5.221 ± 0.022	
	80 - 1120	5.181 ± 0.024	
	100 - 1100	5.156 ± 0.027	
	120 - 1080	5.148 ± 0.031	
	140 - 1060	5.136 ± 0.036	
	160 - 1040	5.058 ± 0.039	
	180 - 1020	5.035 ± 0.044	
5A1	20 - 1220	5.549 ± 0.020	5.19 ± 0.04
	20 - 1200	5.474 ± 0.018	
	40 - 1180	5.379 ± 0.015	
	60 - 1160	5.339 ± 0.015	
	80 - 1140	5.301 ± 0.016	
	100 - 1120	5.267 ± 0.017	
	120 - 1100	5.231 ± 0.018	
	140 - 1080	5.200 ± 0.020	
	160 - 1060	5.173 ± 0.023	
	180 - 1040	5.194 ± 0.026	
	200 - 1020	5.197 ± 0.029	

Table 3-3 Measurement of axial flux distribution by Cu wire in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

(1) Void fraction : 0%

¹⁰B content in D₂O : 0 ppm

(a) Position : 1D1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	1042.7	2980	11383	0.166
		2	1178.8	2542	10966	
2	40	1	1043.4	4085	15644	0.228
		2	1179.6	3625	15687	
3	60	1	1044.2	5180	19872	0.289
		2	1180.3	4562	19779	
4	80	1	1045.4	6109	23476	0.342
		2	1181.1	5326	23122	
5	100	1	1046.2	7061	27168	0.395
		2	1181.8	6204	26968	
6	120	1	1047.0	8006	30838	0.449
		2	1182.6	7029	30587	
7	140	1	1047.8	8745	33717	0.491
		2	1183.3	7868	34274	
8	160	1	1048.6	9666	37305	0.543
		2	1184.1	8502	37068	
9	180	1	1049.4	10386	40120	0.584
		2	1184.8	9201	40152	
10	200	1	1050.2	11060	43860	0.638
		2	1185.6	9942	43423	
11	220	1	1051.0	11969	46319	0.674
		2	1186.3	10721	46867	
12	240	1	1051.8	12528	48522	0.706
		2	1187.1	10981	48038	
13	260	1	1052.6	12866	49872	0.726
		2	1187.8	11965	52389	
14	280	1	1053.4	13766	53406	0.777
		2	1188.6	12226	53570	
15	300	1	1054.3	14386	55861	0.813
		2	1189.3	12607	55282	
16	320	1	1055.1	14805	57535	0.837
		2	1190.1	13142	57671	
17	340	1	1056.0	15242	59281	0.863
		2	1190.8	13522	59384	
18	360	1	1056.8	15924	61986	0.902
		2	1191.6	13823	60749	
19	380	1	1057.6	16022	62415	0.908
		2	1192.3	14264	62734	
20	400	1	1058.4	16525	64424	0.937
		2	1193.1	14728	64822	
21	420	1	1059.3	16906	65963	0.960
		2	1193.8	14881	65542	
22	440	1	1060.1	16847	65780	0.957
		2	1194.6	15202	67005	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
23	460	1	1060.9	17065	66680	0.970
		2	1195.3	15185	66974	
24	480	1	1061.7	17267	67521	0.983
		2	1196.1	15286	67467	
25	500	1	1062.5	17468	68359	0.995
		2	1196.8	15268	67432	
26	520	1	1063.3	17165	67221	0.978
		2	1197.6	15366	67913	
27	540	1	1064.1	17465	68448	0.996
		2	1198.3	15289	67617	
28	560	1	1065.0	17521	68724	1.000
		2	1199.1	15300	67712	
29	580	1	1065.8	17207	67537	0.983
		2	1199.8	15440	68379	
30	600	1	1066.6	17324	68046	0.990
		2	1200.6	15068	66774	
31	620	1	1067.4	17168	67481	0.982
		2	1201.3	15101	66965	
32	640	1	1075.6	16723	66216	0.964
		2	1202.1	14788	65619	
33	660	1	1076.4	16228	64296	0.936
		2	1202.8	14587	64769	
34	680	1	1077.4	16221	62760	0.913
		2	1203.6	14287	63478	
35	700	1	1078.3	15606	61934	0.901
		2	1204.3	14145	62887	
36	720	1	1079.1	15242	60530	0.881
		2	1205.1	13629	60630	
37	740	1	1079.9	14627	58124	0.846
		2	1205.8	13005	57887	
38	760	1	1080.7	14268	56738	0.826
		2	1206.6	12680	56476	
39	780	1	1081.5	13682	54443	0.792
		2	1207.3	12229	54499	
40	800	1	1082.4	13040	51922	0.756
		2	1208.1	11921	53160	
41	820	1	1083.2	12428	49516	0.721
		2	1208.8	11261	50244	
42	840	1	1084.0	11880	47362	0.689
		2	1209.6	10589	47271	
43	860	1	1084.8	11068	44150	0.642
		2	1210.3	9960	44486	
44	880	1	1085.6	10661	42553	0.619
		2	1211.1	9361	42908	
45	900	1	1086.3	9629	38451	0.560
		2	1211.8	8705	38919	
46	920	1	1087.2	8923	35652	0.519
		2	1212.6	7841	35070	
47	940	1	1088.0	8002	31985	0.465
		2	1213.3	7089	30942	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
48	960	1	1088.8	7140	28551	0.415
		2	1214.1	6408	29419	
49	980	1	1089.6	6063	24249	0.353
		2	1236.6	5268	24045	
50	1000	1	1090.5	5163	20653	0.301
		2	1237.4	4424	20191	
51	1020	1	1091.3	4140	16556	0.241
		2	1238.2	3620	16517	
52	1040	1	1092.1	3061	12228	0.178
		2	1239.0	2649	12069	
53	1060	1	1092.9	1887	7513	0.109
		2	1239.9	1668	7572	
54	1080	1	1093.8	1009	3982	0.058
		2	1240.7	980	4414	

Table 3-3 Measurement of axial flux distribution by Cu wire in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

(1) Void fraction : 0%

¹⁰B content in D₂O : 0 ppm

(b) Position : 2C2 ch (in cluster)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	972.9	806	2767	0.176
		2	1021.6	702	2573	
2	40	1	973.7	883	3118	0.198
		2	1022.4	847	3122	
3	60	1	974.5	1048	3717	0.236
		2	1023.1	1022	3786	
4	80	1	975.2	1225	4360	0.277
		2	1023.9	1265	4707	
5	100	1	976.0	1409	5029	0.319
		2	1024.6	1405	5240	
6	120	1	976.7	1725	6177	0.392
		2	1025.4	1505	5622	
7	140	1	977.5	1882	6751	0.428
		2	1026.1	1725	6459	
8	160	1	978.2	2061	7405	0.470
		2	1026.9	1986	7453	
9	180	1	979.0	2226	8009	0.508
		2	1027.7	2185	8213	
10	200	1	979.7	2520	9083	0.576
		2	1028.4	2308	8686	
11	220	1	980.5	2563	9245	0.587
		2	1029.2	2542	9581	
12	240	1	981.2	2680	9677	0.614
		2	1029.9	2763	10427	
13	260	1	982.0	2906	10507	0.667
		2	1030.7	2684	10134	
14	280	1	982.7	3122	11301	0.717
		2	1031.4	3026	11443	
15	300	1	983.5	3244	11753	0.746
		2	1032.2	3101	11737	
16	320	1	984.2	3448	12506	0.794
		2	1032.9	3226	12221	
17	340	1	985.0	3543	12861	0.816
		2	1033.7	3441	13050	
18	360	1	985.7	3704	13458	0.854
		2	1034.4	3581	13593	
19	380	1	986.5	3764	13686	0.868
		2	1035.2	3540	13446	
20	400	1	987.2	3824	13915	0.883
		2	1035.9	3663	13925	
21	420	1	988.0	3963	14434	0.916
		2	1036.7	3862	14696	
22	440	1	988.7	3923	14297	0.907
		2	1037.4	3782	14399	
23	460	1	989.5	4141	15106	0.959
		2	1038.2	4045	15417	
24	480	1	990.2	4123	15050	0.955
		2	1038.9	3982	15185	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	991.0	4229	15450	0.980
		2	1039.7	4104	15664	
26	520	1	991.7	4308	15750	0.999
		2	1040.4	4065	15525	
27	540	1	992.5	4260	15585	0.989
		2	1041.2	4082	15601	
28	560	1	993.2	4283	15680	0.995
		2	1041.9	4125	15390	
29	580	1	994.0	4302	15760	1.000
		2	1042.7	4089	15649	
30	600	1	994.7	4288	15719	0.997
		2	1043.4	4044	15486	
31	620	1	995.5	4188	15361	0.975
		2	1044.2	4089	15670	
32	640	1	996.2	4267	15663	0.994
		2	1044.9	4006	15361	
33	660	1	997.0	3989	14648	0.929
		2	1045.7	3861	14812	
34	680	1	997.8	4028	14802	0.939
		2	1046.4	3762	14440	
35	700	1	998.5	3929	14446	0.917
		2	1047.2	3726	14310	
36	720	1	999.3	3946	14519	0.921
		2	1047.9	3707	14247	
37	740	1	1000.0	3729	13725	0.871
		2	1048.7	3585	13784	
38	760	1	1000.8	3648	13435	0.852
		2	1049.4	3404	13093	
39	780	1	1001.5	3629	13373	0.849
		2	1050.2	3340	12854	
40	800	1	1002.3	3487	12856	0.816
		2	1050.9	3246	12499	
41	820	1	1003.0	3262	12029	0.763
		2	1051.7	3125	12038	
42	840	1	1003.8	3204	11822	0.750
		2	1052.4	3148	12136	
43	860	1	1004.5	3027	11172	0.709
		2	1053.2	2923	11270	
44	880	1	1005.3	2825	10429	0.662
		2	1053.9	2781	10726	
45	900	1	1006.0	2749	10153	0.644
		2	1054.7	2607	10057	
46	920	1	1006.8	2700	9978	0.633
		2	1055.4	2467	9519	
47	940	1	1007.5	2440	9015	0.572
		2	1056.2	2382	9194	
48	960	1	1008.3	2307	8526	0.541
		2	1056.9	2222	8577	
49	980	1	1009.0	2165	8002	0.508
		2	1057.7	2000	7718	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	1009.8	2009	7425	0.471
		2	1058.4	1865	7196	
51	1020	1	1010.5	1825	6742	0.428
		2	1135.2	1780	7357	
52	1040	1	1011.3	1507	5558	0.353
		2	1135.9	1488	6141	
53	1060	1	1012.0	1444	5326	0.338
		2	1136.7	1369	5647	
54	1080	1	1012.8	1124	4132	0.262
		2	1137.4	1203	4955	
55	1100	1	1013.5	929	3405	0.216
		2	1138.2	1027	4221	
56	1120	1	1014.3	700	2549	0.162
		2	1138.9	809	3309	
57	1140	1	1015.0	464	1665	0.106
		2	1139.7	622	2527	
58	1160	1				
		2	1140.4	389	1550	
59	1180	1				
		2	1141.2	283	1105	

Table 3-3 Measurement of axial flux distribution by Cu wire in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

(1) Void fraction : 0%

¹⁰B content in D₂O : 0 ppm(c) Position : 1B3 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	1148.3	1787	7475	0.147
		2	1235.5	2425	11007	
2	40	1	1149.1	2567	10782	0.213
		2	1236.3	3047	13863	
3	60	1	1149.8	3262	13734	0.271
		2	1237.0	3741	17054	
4	80	1	1150.6	3901	16452	0.324
		2	1237.8	4280	19538	
5	100	1	1151.3	4487	18950	0.374
		2	1238.5	4728	21608	
6	120	1	1152.1	5066	21421	0.422
		2	1239.3	5182	23707	
7	140	1	1152.8	5643	23888	0.471
		2	1240.0	5688	26050	
8	160	1	1153.6	6322	26135	0.515
		2	1240.8	6181	28335	
9	180	1	1154.3	6703	28430	0.561
		2	1241.5	6561	30104	
10	200	1	1155.1	7268	30856	0.608
		2	1242.3	6983	32069	
11	220	1	1155.8	7746	32914	0.649
		2	1243.0	7481	34387	
12	240	1	1156.6	8040	34190	0.674
		2	1243.8	7824	35992	
13	260	1	1157.3	8605	36624	0.722
		2	1244.5	8349	38441	
14	280	1	1158.1	8885	37845	0.746
		2	1245.3	8668	39940	
15	300	1	1158.8	9406	40097	0.791
		2	1246.0	9068	41818	
16	320	1	1159.6	9624	41057	0.810
		2	1246.8	9260	42734	
17	340	1	1160.3	10040	42865	0.845
		2	1247.5	9600	44338	
18	360	1	1161.1	10307	44038	0.868
		2	1248.3	9767	45141	
19	380	1	1161.8	10586	45263	0.892
		2	1249.0	10145	46925	
20	400	1	1162.6	11009	47109	0.929
		2	1249.8	10282	47591	
21	420	1	1163.3	10981	47020	0.927
		2	1250.5	10489	48586	
22	440	1	1164.1	11341	48599	0.958
		2	1251.3	10487	48608	
23	460	1	1164.8	11463	49155	0.969
		2	1252.0	10540	48889	
24	480	1	1165.6	11547	49551	0.977
		2	1252.8	10847	50349	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	1166.3	11546	49579	0.978
		2	1253.5	10863	50459	
26	520	1	1167.1	11666	50130	0.988
		2	1254.3	10885	50595	
27	540	1	1167.8	11742	50491	0.996
		2	1255.0	11064	51464	
28	560	1	1168.6	11787	50720	1.000
		2	1255.8	10904	50752	
29	580	1	1169.3	11768	50672	0.999
		2	1256.5	10542	49096	
30	600	1	1170.1	11747	50616	0.998
		2	1257.3	10706	49896	
31	620	1	1170.8	11681	50365	0.993
		2	1258.0	10766	50210	
32	640	1	1171.6	11609	50088	0.988
		2	1258.8	10641	49660	
33	660	1	1172.3	11341	48962	0.965
		2	1259.5	10205	47652	
34	680	1	1173.1	11200	48385	0.954
		2	1262.0	10141	47458	
35	700	1	1173.8	11168	48278	0.952
		2	1263.0	10161	47593	
36	720	1	1174.6	11045	47778	0.942
		2	1263.8	9802	45941	
37	740	1	1175.3	10628	46001	0.907
		2	1264.6	9747	45717	
38	760	1	1176.1	10502	45486	0.897
		2	1265.4	9224	43289	
39	780	1	1176.8	10105	43791	0.863
		2	1266.2	8928	41926	
40	800	1	1177.6	9763	42334	0.835
		2	1267.0	8748	41107	
41	820	1	1178.4	9262	40184	0.792
		2	1267.8	8367	39342	
42	840	1	1179.1	9080	39418	0.777
		2	1268.6	8183	38503	
43	860	1	1179.9	8623	37455	0.739
		2	1269.4	7704	36269	
44	880	1	1180.6	8107	35231	0.695
		2	1270.2	7163	33739	
45	900	1	1181.4	7808	33951	0.669
		2	1271.0	6729	31710	
46	920	1	1182.1	7285	31691	0.625
		2	1271.8	6249	29462	
47	940	1	1182.9	6869	29897	0.589
		2	1272.6	5768	27206	
48	960	1	1183.6	6361	27697	0.546
		2	1273.4	5343	25212	
49	980	1	1184.4	5768	25123	0.495
		2	1274.2	4780	22561	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	1185.1	5320	23180	0.457
		2	1275.0	4305	20323	
51	1020	1	1185.9	4824	21025	0.415
		2	1275.8	3728	17599	
52	1040	1	1186.6	4088	17815	0.351
		2	1276.5	3161	14918	
53	1060	1	1187.4	3466	15101	0.298
		2	1277.3	2624	12376	
54	1080	1	1188.1	2827	12308	0.243
		2	1278.1	1809	8508	
55	1100	1	1188.9	2083	9052	0.179
		2	1278.9	1180	5521	
56	1120	1	1189.6	1323	5721	0.113
		2	1279.8	688	3182	
57	1140	1	1190.4	742	3172	0.063
		2				
58	1160	1	1191.1	628	2673	0.053
		2				

Table 3-3 Measurement of axial flux distribution by Cu wire in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

(2) Void fraction : 100%

¹⁰B content in D₂O : 0 ppm

(a) Position : 0 ch (in cluster)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	169.1	2626	4556	0.255
		2	217.1	2664	4827	
2	40	1	169.8	2841	4935	0.276
		2	217.9	2462	4461	
3	60	1	170.6	3364	5854	0.327
		2	218.6	2724	4943	
4	80	1	171.3	3664	6383	0.357
		2	219.4	3104	5642	
5	100	1	172.1	4089	7133	0.399
		2	220.1	3447	6273	
6	120	1	172.8	4602	8038	0.449
		2	220.9	3849	7014	
7	140	1	173.6	5100	8918	0.499
		2	221.6	4267	7785	
8	160	1	174.3	5268	9219	0.515
		2	222.4	4704	8592	
9	180	1	175.1	5848	10245	0.573
		2	223.1	5249	9599	
10	200	1	175.8	6302	11050	0.618
		2	223.9	5648	10339	
11	220	1	176.6	6627	11630	0.650
		2	224.6	5929	10862	
12	240	1	177.3	7388	12979	0.726
		2	225.4	6469	11863	
13	260	1	178.1	7424	13052	0.730
		2	226.1	6900	12665	
14	280	1	178.8	7987	14054	0.786
		2	226.9	7329	13464	
15	300	1	179.6	8069	14208	0.794
		2	227.6	7601	13975	
16	320	1	180.3	8601	14787	0.827
		2	228.4	7863	14468	
17	340	1	181.1	8920	15732	0.879
		2	229.1	8348	15373	
18	360	1	181.9	9109	16078	0.899
		2	229.9	8529	15718	
19	380	1	182.6	9247	16333	0.913
		2	230.6	8727	15701	
20	400	1	183.4	9585	16943	0.947
		2	231.4	8944	16507	
21	420	1	184.1	9705	17167	0.960
		2	232.2	9124	16852	
22	440	1	184.9	9989	17683	0.989
		2	232.9	9227	17054	
23	460	1	185.6	9945	17616	0.985
		2	233.7	9460	17498	
24	480	1	186.4	9966	17666	0.988
		2	234.4	9561	17697	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	187.1	10085	17889	1.000
		2	235.2	9648	17871	
26	520	1	187.9	9941	17645	0.986
		2	235.9	9700	17979	
27	540	1	188.6	10028	17812	0.996
		2	236.7	9526	17668	
28	560	1	189.4	10060	17881	1.000
		2	237.4	9709	18020	
29	580	1	190.1	9985	17759	0.993
		2	238.2	9383	17426	
30	600	1	190.9	10045	17879	0.999
		2	238.9	9546	17741	
31	620	1	191.6	10026	17857	0.998
		2	239.7	9564	17787	
32	640	1	192.4	9606	17119	0.957
		2	240.4	9360	17418	
33	660	1	193.1	9525	16985	0.950
		2	241.2	9189	17111	
34	680	1	193.9	9103	16242	0.908
		2	241.9	9169	17085	
35	700	1	194.6	8987	16045	0.897
		2	242.7	9024	16826	
36	720	1	195.4	8827	15770	0.882
		2	243.4	8646	16130	
37	740	1	196.1	8408	15029	0.840
		2	244.2	8485	15839	
38	760	1	196.9	8147	14571	0.815
		2	244.9	8069	15071	
39	780	1	197.6	7849	14046	0.785
		2	245.7	7844	14659	
40	800	1	198.4	7444	13328	0.745
		2	246.4	7408	13851	
41	820	1	199.1	7047	12624	0.706
		2	247.2	7189	13450	
42	840	1	199.9	6667	11949	0.668
		2	247.9	6807	12741	
43	860	1	200.6	6400	11477	0.642
		2	248.7	6560	12286	
44	880	1	201.4	5968	10707	0.599
		2	249.4	6061	11356	
45	900	1	202.1	5343	9588	0.536
		2	250.2	5649	10588	
46	920	1	202.9	5088	9135	0.511
		2	250.9	5208	9765	
47	940	1	203.6	4568	8203	0.459
		2	251.7	4802	9007	
48	960	1	204.4	3944	7082	0.396
		2	252.4	4241	7955	
49	980	1	205.1	3329	5976	0.334
		2	253.2	3724	6986	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	205.9	2747	4928	0.276
		2	253.9	3228	6054	
51	1020	1	206.6	2227	3991	0.223
		2	254.7	2669	5002	
52	1040	1	207.4	1683	3009	0.168
		2	255.4	2129	3985	
53	1060	1	208.1	1346	2401	0.134
		2	256.2	1629	3042	
54	1080	1	256.9	1223	2276	
		2				
55	1100	1	257.7	980	1818	
		2				

Table 3-3 Measurement of axial flux distribution by Cu wire in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

(2) Void fraction : 100%

¹⁰B content in D₂O : 0 ppm(b) Position : 1D1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	272.6	6648	12723	0.262
		2	323.2	6405	12829	
2	40	1	273.3	8047	15420	0.318
		2	324.0	7568	15177	
3	60	1	274.1	9442	18113	0.374
		2	324.7	9188	18449	
4	80	1	274.8	10761	20664	0.426
		2	325.5	10521	21147	
5	100	1	275.6	12184	23419	0.483
		2	326.2	11701	23540	
6	120	1	276.3	13368	25717	0.530
		2	327.0	12708	25589	
7	140	1	277.1	14264	27464	0.566
		2	327.7	13728	27666	
8	160	1	277.8	15341	29562	0.610
		2	328.5	14728	29706	
9	180	1	278.6	16684	32177	0.664
		2	329.2	15747	31787	
10	200	1	279.3	17341	33469	0.690
		2	330.0	16803	33946	
11	220	1	280.1	18447	35633	0.735
		2	330.7	17769	35926	
12	240	1	280.8	19523	37741	0.778
		2	331.5	18563	37560	
13	260	1	281.6	20284	39242	0.809
		2	332.2	19182	38841	
14	280	1	282.3	20907	40477	0.835
		2	333.0	19827	40177	
15	300	1	283.1	21129	40936	0.844
		2	333.7	20647	41870	
16	320	1	283.8	22063	42777	0.882
		2	334.5	20709	42025	
17	340	1	284.6	22609	43868	0.905
		2	335.2	21604	43874	
18	360	1	285.3	23163	44975	0.927
		2	336.0	22025	44762	
19	380	1	286.1	23625	45906	0.947
		2	336.7	22585	45933	
20	400	1	286.8	23983	46634	0.962
		2	337.5	22726	46252	
21	420	1	287.6	24000	46699	0.963
		2	338.2	23122	47091	
22	440	1	288.3	24149	47021	0.970
		2	339.0	22961	46795	
23	460	1	289.1	24266	48496	1.000
		2	339.7	23108	47126	
24	480	1	289.8	24607	47980	0.989
		2	340.5	23386	47727	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	290.6	24182	47181	0.973
		2	341.2	23483	47957	
26	520	1	291.3	23996	46791	0.965
		2	342.0	23067	47139	
27	540	1	292.1	24107	47098	0.971
		2	342.7	23100	47237	
28	560	1	292.8	23783	46496	0.959
		2	343.5	22825	46706	
29	580	1	293.6	23762	46486	0.959
		2	344.2	22681	46442	
30	600	1	294.3	23225	45465	0.938
		2	345.0	22423	45944	
31	620	1	295.1	22964	44982	0.928
		2	345.7	21862	44822	
32	640	1	295.8	22409	43924	0.906
		2	346.5	21349	43798	
33	660	1	296.6	21628	42418	0.875
		2	347.2	20981	43070	
34	680	1	297.3	21221	41647	0.859
		2	348.0	20427	41960	
35	700	1	298.1	20467	40191	0.829
		2	348.7	19969	41044	
36	720	1	298.8	19945	39191	0.808
		2	349.5	18982	39039	
37	740	1	299.6	19403	38149	0.787
		2	350.2	18248	37551	
38	760	1	300.3	18569	36531	0.753
		2	351.0	17887	36832	
39	780	1	301.1	17688	34818	0.718
		2	351.7	17088	35207	
40	800	1	301.8	16744	32979	0.680
		2	352.5	16067	33122	
41	820	1	302.6	15805	31146	0.642
		2	353.2	15148	31245	
42	840	1	303.3	14965	29508	0.609
		2	354.0	14266	29442	
43	860	1	304.1	13965	27550	0.568
		2	354.7	13341	27547	
44	880	1	304.8	12605	24879	0.513
		2	355.5	12267	25342	
45	900	1	305.6	11407	22524	0.465
		2	356.2	11080	22900	
46	920	1	306.3	10208	20165	0.416
		2	357.0	9803	20269	
47	940	1	307.1	9040	17864	0.368
		2	357.7	8483	17544	
48	960	1	307.8	7580	14982	0.309
		2	358.5	7200	14894	
49	980	1	308.6	5961	11780	0.243
		2	359.2	5906	12217	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	309.3	4366	8623	0.178
		2	360.0	4181	8642	
51	1020	1	310.1	2827	5573	0.115
		2	360.7	2688	5544	
52	1040	1	310.8	1686	3310	0.068
		2	361.5	1521	3121	
53	1060	1	311.6	1361	2666	0.055
		2	362.2	1309	2682	
54	1080	1	312.3	1269	2485	0.051
		2				

Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

(1) Void fraction : 0%

¹⁰B content in D₂O : 0 ppm

(a) Position : 0 ch (in cluster)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	169.6	4665	8124	0.204
		2	235.6	4387	8107	
2	40	1	170.3	5464	9528	0.239
		2	236.4	5164	9556	
3	60	1	171.1	6643	11600	0.291
		2	237.1	6244	11571	
4	80	1	171.8	7800	13637	0.342
		2	237.9	7462	13846	
5	100	1	172.6	8983	15722	0.394
		2	238.6	8481	15753	
6	120	1	173.3	10246	17951	0.450
		2	239.4	9509	17680	
7	140	1	174.1	11283	19786	0.496
		2	240.1	10841	20177	
8	160	1	174.8	12606	22126	0.555
		2	240.9	11925	22214	
9	180	1	175.6	13562	23824	0.598
		2	241.6	12903	24056	
10	200	1	176.3	14441	25388	0.637
		2	242.4	13942	26016	
11	220	1	177.1	15385	27070	0.679
		2	243.1	15000	28013	
12	240	1	177.8	16461	28987	0.727
		2	243.9	15688	29321	
13	260	1	178.6	17065	30073	0.754
		2	244.6	16868	31552	
14	280	1	179.3	17662	31148	0.781
		2	245.4	17225	32243	
15	300	1	180.1	18628	32878	0.825
		2	246.1	17949	33624	
16	320	1	180.8	18946	33463	0.839
		2	246.9	18609	34887	
17	340	1	181.6	19789	34979	0.877
		2	247.6	19303	36214	
18	360	1	182.3	20388	36064	0.905
		2	248.4	19685	36958	
19	380	1	183.1	20660	36571	0.917
		2	249.1	20420	38366	
20	400	1	183.8	21302	37735	0.947
		2	249.9	20582	38698	
21	420	1	184.6	21622	38329	0.961
		2	250.6	21009	39529	
22	440	1	185.3	21881	38815	0.974
		2	251.4	21322	40146	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
23	460	1	186.1	21928	38926	0.976
		2	252.1	21529	40564	
24	480	1	186.8	22261	38578	0.968
		2	252.9	21323	40203	
25	500	1	187.6	21866	39866	1.000
		2	253.6	21427	40426	
26	520	1	188.3	21840	38848	0.975
		2	254.4	21145	40946	
27	540	1	189.1	21744	38703	0.971
		2	255.2	21187	40027	
28	560	1	189.8	21847	38913	0.976
		2	255.9	21207	40092	
29	580	1	190.6	21548	38405	0.963
		2	256.7	21028	39780	
30	600	1	191.3	21200	37810	0.948
		2	257.4	20765	39308	
31	620	1	192.1	20981	37443	0.939
		2	258.2	20224	38308	
32	640	1	192.8	20349	36338	0.912
		2	258.9	20106	38109	
33	660	1	193.6	19966	35676	0.895
		2	259.7	19584	37144	
34	680	1	194.3	19488	34845	0.874
		2	260.4	19428	36871	
35	700	1	195.1	18927	33862	0.849
		2	261.2	18748	35603	
36	720	1	195.8	18281	32727	0.821
		2	261.9	18003	34208	
37	740	1	196.6	17422	31207	0.783
		2	262.7	17522	33315	
38	760	1	197.3	17107	30662	0.769
		2	263.4	16741	31849	
39	780	1	198.1	16329	29285	0.735
		2	264.2	15985	30429	
40	800	1	198.8	15307	27467	0.689
		2	264.9	15244	29034	
41	820	1	199.6	14421	25891	0.649
		2	265.7	14222	27103	
42	840	1	200.3	13607	24444	0.613
		2	266.4	13327	25410	
43	860	1	201.1	12547	22550	0.566
		2	267.2	12346	23552	
44	880	1	201.8	11301	20320	0.510
		2	267.9	11488	21926	
45	900	1	202.6	9922	17847	0.447
		2	268.7	10242	19556	
46	920	1	203.3	9004	16203	0.406
		2	269.4	9062	17309	
47	940	1	204.1	7509	13514	0.339
		2	270.2	7705	14721	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
48	960	1	204.8	6003	10803	0.271
		2	270.9	6488	12397	
49	980	1	205.6	4687	84321	0.212
		2	271.7	4927	9411	
50	1000	1	206.3	2948	5293	0.133
		2	272.4	3408	6501	
51	1020	1	207.1	1860	3329	
		2				
52	1040	1	209.3	1709	3062	
		2				

Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

(1) Void fraction : 0%

¹⁰B content in D₂O : 0 ppm(b) Position : 1D1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction (per 40 sec)	Normalized value (max=1.0)
1	20	1	421.5	10302	22581	0.190
		2	500.9	9742	22936	
2	40	1	422.3	13968	30659	0.258
		2	501.6	13303	31364	
3	60	1	423.0	17486	38425	0.324
		2	502.4	16246	38345	
4	80	1	423.8	20667	45460	0.383
		2	503.1	19328	45666	
5	100	1	424.5	23662	52098	0.439
		2	503.9	21809	51575	
6	120	1	425.3	26524	58452	0.492
		2	504.6	24947	59052	
7	140	1	426.0	29068	65762	0.554
		2	505.4	27120	64251	
8	160	1	426.8	32124	70919	0.597
		2	506.1	29620	70233	
9	180	1	427.5	34028	75182	0.633
		2	506.9	31947	75815	
10	200	1	428.3	36905	81611	0.688
		2	507.7	34365	81623	
11	220	1	429.0	39028	86374	0.728
		2	508.4	36446	86635	
12	240	1	429.8	41187	91228	0.769
		2	509.2	37965	90317	
13	260	1	430.5	43008	95335	0.803
		2	509.9	39761	94663	
14	280	1	431.3	44562	98858	0.833
		2	510.7	41483	98842	
15	300	1	432.0	46180	102520	0.864
		2	511.4	43145	102880	
16	320	1	432.8	48206	107110	0.902
		2	512.2	44444	106060	
17	340	1	433.5	48884	108690	0.916
		2	512.9	45726	109200	
18	360	1	434.3	50049	111370	0.938
		2	513.7	46320	110700	
19	380	1	435.0	50980	113520	0.956
		2	514.4	47045	112510	
20	400	1	435.8	51380	114490	0.965
		2	515.2	48263	115510	
21	420	1	436.5	52346	116770	0.984
		2	515.9	48447	116030	
22	440	1	437.3	52560	117290	0.988
		2	516.7	48524	116300	
23	460	1	438.0	52981	118310	0.997
		2	517.4	49089	117730	
24	480	1	438.8	52864	118130	0.995
		2	518.2	48607	116650	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction (per 40 sec)	Normalized value (max=1.0)
25	500	1	439.5	53085	118700	1.000
		2	518.9	49420	118690	
26	520	1	440.3	53021	118640	0.995
		2	519.7	49242	118340	
27	540	1	441.0	52903	118450	0.998
		2	520.4	48687	117080	
28	560	1	441.8	52026	116570	0.982
		2	523.3	48301	116450	
29	580	1	442.5	51606	115700	0.975
		2	524.1	47960	115710	
30	600	1	443.3	50680	113700	0.958
		2	524.9	46846	113100	
31	620	1	444.0	49842	111880	0.943
		2	525.8	46322	111920	
32	640	1	444.8	48361	108630	0.915
		2	533.2	44485	108190	
33	660	1	445.5	47486	106720	0.899
		2	533.9	42983	104600	
34	680	1	446.3	45502	102320	0.862
		2	534.8	42284	102980	
35	700	1	447.0	44361	99818	0.841
		2	535.6	40725	99243	
36	720	1	447.8	42349	95345	0.803
		2	536.5	38827	94678	
37	740	1	448.5	40408	91025	0.767
		2	537.3	37100	90527	
38	760	1	449.3	38666	87151	0.734
		2	538.4	35489	86668	
39	780	1	450.0	36327	81921	0.690
		2	539.2	33501	81864	
40	800	1	450.8	34026	76774	0.647
		2	540.0	31305	76543	
41	820	1	451.5	31263	70573	0.595
		2	540.8	28984	70908	
42	840	1	452.3	28968	65426	0.551
		2	541.6	26528	64934	
43	860	1	453.0	26068	58902	0.496
		2	542.5	23987	58747	
44	880	1	453.8	23201	52448	0.442
		2	543.3	21724	53232	
45	900	1	454.5	20108	45473	0.383
		2	544.1	18663	45750	
46	920	1	455.3	17306	39152	0.330
		2	544.9	15687	38471	
47	940	1	456.0	13748	31108	0.262
		2	545.8	12683	31115	
48	960	1	456.8	10162	22994	0.194
		2	546.6	9365	22975	
49	980	1	457.5	6641	15018	0.127
		2	547.5	6040	14809	
50	1000	1	458.3	3584	8089	0.068
		2	548.3	3386	8286	

Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

(1) Void fraction : 0%

¹⁰B content in D₂O : 0 ppm(c) Position : 5A1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	296.1	8525	16677	0.185
		2	334.5	7901	15999	
2	40	1	296.8	11528	22585	0.250
		2	335.3	11206	22728	
3	60	1	297.6	14426	28295	0.313
		2	336.0	13760	27940	
4	80	1	298.3	16963	33306	0.369
		2	336.8	16329	33191	
5	100	1	299.1	19384	38094	0.422
		2	337.5	18661	37966	
6	120	1	299.8	21764	42811	0.474
		2	338.3	21363	43505	
7	140	1	300.6	24227	47698	0.528
		2	339.0	23345	47582	
8	160	1	301.3	26507	52233	0.578
		2	339.8	25481	51980	
9	180	1	302.1	28440	56087	0.621
		2	340.5	27808	56775	
10	200	1	302.8	30000	59212	0.656
		2	341.3	29523	60326	
11	220	1	303.6	32309	63822	0.707
		2	342.0	31245	63895	
12	240	1	304.3	34141	67496	0.747
		2	342.8	32700	66924	
13	260	1	305.1	35823	70876	0.785
		2	343.5	34468	70597	
14	280	1	305.8	37164	73586	0.815
		2	344.3	35942	73674	
15	300	1	306.6	38820	76924	0.852
		2	345.0	36909	75711	
16	320	1	307.3	40003	79329	0.878
		2	345.8	37968	77943	
17	340	1	308.1	40929	81224	0.899
		2	346.5	39448	81042	
18	360	1	308.8	41246	81911	0.907
		2	347.3	40144	82533	
19	380	1	309.6	42185	81787	0.905
		2	348.0	41009	84372	
20	400	1	310.3	43689	86892	0.962
		2	348.8	41563	85574	
21	420	1	311.1	43502	86579	0.958
		2	349.5	42423	87407	
22	440	1	311.8	44027	87685	0.971
		2	350.3	42705	88050	
23	460	1	312.6	44808	89306	0.989
		2	351.0	43369	89482	
24	480	1	313.3	44903	89555	0.991
		2	351.8	43441	89693	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	314.1	45262	90336	1.000
		2	352.5	43340	89543	
26	520	1	314.8	45048	89967	0.996
		2	353.3	43740	90434	
27	540	1	315.6	44922	89777	0.994
		2	354.0	43382	89752	
28	560	1	316.3	44546	89082	0.986
		2	354.8	42987	88994	
29	580	1	317.1	44022	88093	0.975
		2	355.5	42344	87718	
30	600	1	317.8	43129	86358	0.956
		2	356.3	41667	86371	
31	620	1	318.6	42386	84925	0.940
		2	357.0	40769	84561	
32	640	1	319.3	41404	83008	0.919
		2	357.8	39720	82437	
33	660	1	320.1	39942	80125	0.887
		2	358.5	38380	79702	
34	680	1	320.8	38961	78204	0.866
		2	359.3	37664	78265	
35	700	1	321.6	37146	74604	0.826
		2	360.0	36020	74891	
36	720	1	322.3	35820	71982	0.797
		2	360.8	34868	72540	
37	740	1	323.1	34260	68888	0.763
		2	361.5	33248	69208	
38	760	1	323.8	32526	65437	0.724
		2	362.3	31502	65611	
39	780	1	324.6	30667	61731	0.683
		2	363.0	29505	61484	
40	800	1	325.3	28969	58345	0.646
		2	363.8	27588	57521	
41	820	1	326.1	26746	53896	0.597
		2	364.5	26025	54291	
42	840	1	326.8	24620	49636	0.550
		2	365.3	23723	49514	
43	860	1	327.6	22187	44752	0.495
		2	366.0	21568	45037	
44	880	1	328.3	20047	40454	0.448
		2	366.8	19609	40967	
45	900	1	329.1	17485	35299	0.391
		2	367.5	16863	35243	
46	920	1	329.8	14863	30016	0.332
		2	402.3	13567	29244	
47	940	1	330.6	12102	24446	0.271
		2	403.8	9885	21322	
48	960	1	331.3	8845	17865	0.198
		2	404.8	8288	17884	
49	980	1	332.1	5764	11634	0.129
		2	405.6	5240	11298	
50	1000	1	332.8	3329	67057	0.074
		2	406.5	2926	62939	

Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

(2) Void fraction : 100%

¹⁰B content in D₂O : 0 ppm

(a) Position : 0 ch (in cluster)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	209.3	2741	4932	0.237
		2	357.4	2525	5190	
2	40	1	210.0	2885	5196	0.250
		2	358.1	2605	5359	
3	60	1	210.8	3449	6224	0.299
		2	358.9	2920	6016	
4	80	1	211.5	4027	7278	0.350
		2	359.6	3500	7225	
5	100	1	212.3	4582	8292	0.399
		2	360.4	3983	8233	
6	120	1	213.0	5141	9315	0.448
		2	361.1	4428	9164	
7	140	1	213.8	5622	10197	0.490
		2	361.9	4962	10282	
8	160	1	214.5	6160	11184	0.538
		2	362.6	5468	11343	
9	180	1	215.3	6704	12184	0.586
		2	363.4	6063	12591	
10	200	1	216.0	7081	12880	0.619
		2	364.1	6268	13026	
11	220	1	216.8	7546	13738	0.661
		2	364.9	6564	13653	
12	240	1	217.5	7962	14507	0.698
		2	365.6	6986	14544	
13	260	1	218.3	8464	15435	0.742
		2	366.4	7321	15254	
14	280	1	219.0	8843	16139	0.776
		2	367.1	7625	15900	
15	300	1	219.8	9228	16856	0.811
		2	367.9	7947	16585	
16	320	1	220.5	9386	17156	0.825
		2	368.6	8222	17172	
17	340	1	221.3	9803	17933	0.862
		2	369.4	8462	17686	
18	360	1	222.0	9949	18213	0.876
		2	370.1	8668	18130	
19	380	1	222.8	10184	18657	0.897
		2	370.9	9008	18856	
20	400	1	223.5	10301	18884	0.908
		2	371.6	9107	19077	
21	420	1	224.3	10641	19523	0.939
		2	372.4	9085	19044	
22	440	1	225.0	10746	19729	0.949
		2	373.1	9306	19521	
23	460	1	225.8	10884	19997	0.962
		2	373.9	9381	19693	
24	480	1	226.5	10966	20161	0.969
		2	374.6	9404	19754	

(continued)

Position No.	height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	227.3	11021	20797	1.000
		2	375.4	9660	20307	
26	520	1	228.1	10886	20041	0.964
		2	376.1	9541	20070	
27	540	1	228.8	10820	19932	0.958
		2	376.9	9685	20388	
28	560	1	229.6	10944	20175	0.970
		2	377.6	9568	20154	
29	580	1	230.3	10887	20083	0.966
		2	378.4	9508	20041	
30	600	1	231.1	10960	20232	0.973
		2	379.1	9329	19676	
31	620	1	231.8	10745	19848	0.954
		2	379.9	9207	19431	
32	640	1	232.6	10406	19233	0.925
		2	380.6	9101	19220	
33	660	1	233.3	10121	18718	0.900
		2	381.4	9027	19076	
34	680	1	234.1	10021	18545	0.892
		2	382.1	8720	18438	
35	700	1	234.8	9984	18489	0.889
		2	382.9	8568	18128	
36	720	1	235.6	9583	17756	0.854
		2	383.6	8507	18011	
37	740	1	236.3	9309	17259	0.830
		2	384.4	7928	16793	
38	760	1	237.1	9243	17148	0.825
		2	385.1	7764	16456	
39	780	1	237.8	8709	16166	0.777
		2	385.9	7585	16086	
40	800	1	238.6	8186	15203	0.731
		2	386.6	7264	15414	
41	820	1	239.3	7869	14622	0.703
		2	387.4	6889	14626	
42	840	1	240.1	7426	13806	0.664
		2	388.1	6469	13740	
43	860	1	240.8	6909	12850	0.618
		2	388.9	6125	13016	
44	880	1	241.6	6427	11959	0.575
		2	389.6	5722	12164	
45	900	1	242.3	5861	10910	0.525
		2	390.4	5327	11329	
46	920	1	243.1	5464	10175	0.489
		2	391.1	4861	10341	
47	940	1	243.8	4921	9165	0.441
		2	391.9	4426	9418	
48	960	1	244.6	4265	7944	0.382
		2	392.6	3863	8220	
49	980	1	245.3	3706	6902	0.332
		2				

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	246.1	3140	5846	0.281
		2				
51	1020	1	246.8	2544	4732	0.228
		2				
52	1040	1	247.6	1903	3533	0.170
		2				

Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

(2) Void fraction : 100%

¹⁰B content in D₂O : 0 ppm(b) Position : 1D1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	260.1	6766	12804	0.208
		2	306.6	6429	12687	
2	40	1	260.8	8887	16843	0.273
		2	307.4	8724	17243	
3	60	1	261.6	10946	20771	0.337
		2	308.1	10462	20702	
4	80	1	262.3	13029	24749	0.401
		2	308.9	12262	24290	
5	100	1	263.1	14743	28032	0.454
		2	309.6	14006	27771	
6	120	1	263.8	16160	30752	0.499
		2	310.4	15563	31085	
7	140	1	264.6	17803	33909	0.550
		2	311.1	17223	34210	
8	160	1	265.3	19121	36449	0.591
		2	311.9	18360	36499	
9	180	1	266.1	20742	39573	0.641
		2	312.7	20028	39848	
10	200	1	266.8	21964	41937	0.680
		2	313.4	21184	42181	
11	220	1	267.6	23305	44533	0.722
		2	314.2	22484	44806	
12	240	1	268.3	24627	47096	0.763
		2	314.9	23383	46632	
13	260	1	269.1	25489	50035	0.811
		2	315.7	24445	48788	
14	280	1	269.8	26321	50411	0.817
		2	316.4	25384	50700	
15	300	1	270.6	27063	51870	0.841
		2	317.2	26406	52782	
16	320	1	271.3	28106	53910	0.874
		2	317.9	27183	54374	
17	340	1	272.1	28988	55643	0.902
		2	318.7	27808	55666	
18	360	1	272.8	29709	57069	0.925
		2	319.4	28386	56863	
19	380	1	273.6	30421	58479	0.948
		2	320.2	28905	57945	
20	400	1	274.3	30920	59481	0.964
		2	320.9	29543	59266	
21	420	1	275.1	31223	60105	0.974
		2	321.7	29929	60083	
22	440	1	275.8	31483	60649	0.983
		2	322.4	30168	60604	
23	460	1	276.6	31544	60807	0.986
		2	323.2	30362	61037	
24	480	1	277.3	31982	61696	1.000
		2	323.9	30388	61130	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	278.1	31769	61324	0.994
		2	324.7	30480	61358	
26	520	1	278.8	31782	61392	0.995
		2	325.4	30583	61606	
27	540	1	279.6	31805	61477	0.997
		2	326.2	30482	61445	
28	560	1	280.3	31422	60777	0.985
		2	326.9	30224	60964	
29	580	1	281.1	31386	60748	0.985
		2	327.7	29721	59989	
30	600	1	281.8	30420	58915	0.955
		2	328.4	29422	59423	
31	620	1	282.6	30401	58917	0.955
		2	329.2	29029	58669	
32	640	1	283.3	29544	57292	0.929
		2	329.9	28526	57688	
33	660	1	284.1	29025	56321	0.913
		2	330.7	27823	56302	
34	680	1	284.8	28505	55348	0.897
		2	331.4	27040	54751	
35	700	1	285.6	27600	53622	0.869
		2	332.2	26447	53585	
36	720	1	286.3	26427	51374	0.833
		2	332.9	25525	51747	
37	740	1	287.1	25842	50268	0.815
		2	333.7	24985	50685	
38	760	1	287.8	25021	48702	0.789
		2	334.4	24103	48925	
39	780	1	288.6	23686	46128	0.748
		2	335.2	22789	46284	
40	800	1	289.3	22682	44200	0.716
		2	335.9	21788	44276	
41	820	1	290.1	21487	41894	0.679
		2	336.7	20704	42098	
42	840	1	290.8	20240	39486	0.640
		2	337.4	19289	39242	
43	860	1	291.6	18500	36108	0.585
		2	338.2	17888	36411	
44	880	1	292.3	17206	33601	0.545
		2	338.9	16629	33866	
45	900	1	293.1	15985	31233	0.506
		2	339.7	15081	30728	
46	920	1	293.8	14162	27683	0.449
		2	340.4	13628	27780	
47	940	1	294.6	12400	24248	0.393
		2	341.2	12103	24682	
48	960	1	295.3	10624	20782	0.337
		2	341.9	10081	20563	
49	980	1	296.1	8781	17180	0.279
		2	342.7	8247	16825	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	296.8	6783	13270	0.215
		2	343.4	6362	12977	
51	1020	1	297.6	4346	8492	0.138
		2	344.2	4109	8372	
52	1040	1	298.3	2388	4651	0.075
		2	344.9	2229	4525	
53	1060	1	299.1	1826	3549	0.058
		2	345.7	1862	3776	

Table 3-4 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

(2) Void fraction : 100%

¹⁰B content in D₂O : 0 ppm(c) Position : 5A1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	400.2	5366	11514	0.198
		2	447.7	5201	11647	
2	40	1	400.9	7302	15696	0.270
		2	448.4	7041	15796	
3	60	1	401.7	8941	19243	0.331
		2	449.2	8622	19367	
4	80	1	402.4	10623	22888	0.394
		2	449.9	10268	23091	
5	100	1	403.2	12029	25943	0.446
		2	450.7	11528	25949	
6	120	1	403.9	13406	28939	0.498
		2	451.4	12904	29074	
7	140	1	404.7	14529	31391	0.540
		2	452.2	13908	31362	
8	160	1	405.4	15808	34183	0.588
		2	452.9	15022	34773	
9	180	1	406.2	16823	36407	0.626
		2	453.7	16446	37148	
10	200	1	406.9	18100	39202	0.674
		2	454.4	17327	39168	
11	220	1	407.7	18967	41113	0.707
		2	455.2	18107	40964	
12	240	1	408.4	19924	43220	0.743
		2	455.9	19021	43064	
13	260	1	409.2	20504	44511	0.765
		2	456.7	20006	45330	
14	280	1	409.9	21602	46931	0.807
		2	457.4	20481	46439	
15	300	1	410.7	22182	48227	0.829
		2	458.2	21168	48034	
16	320	1	411.4	23149	50367	0.866
		2	458.9	22261	50552	
17	340	1	412.2	23664	51525	0.886
		2	459.7	22728	51651	
18	360	1	412.9	24505	53396	0.918
		2	460.4	23083	52494	
19	380	1	413.7	24541	53511	0.920
		2	461.2	23884	54357	
20	400	1	414.4	25406	55438	0.953
		2	461.9	24107	54902	
21	420	1	415.2	25806	56352	0.969
		2	462.7	24720	56340	
22	440	1	415.9	25869	56527	0.972
		2	463.4	24647	56210	
23	460	1	416.7	26063	56991	0.980
		2	464.2	24861	56738	
24	480	1	417.4	26421	57814	0.994
		2	464.9	24981	57051	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	418.2	26360	57720	0.993
		2	465.7	25365	57970	
26	520	1	418.9	26540	58154	1.000
		2	466.4	25300	57859	
27	540	1	419.7	26220	57491	0.989
		2	467.2	25182	57628	
28	560	1	420.4	26228	57547	0.990
		2	467.9	24702	56565	
29	580	1	421.2	25902	56869	0.978
		2	468.7	24607	56386	
30	600	1	421.9	25208	55379	0.952
		2	469.4	24247	55596	
31	620	1	422.7	24784	54483	0.937
		2	470.2	23946	54943	
32	640	1	423.4	24363	53591	0.922
		2	470.9	23523	54006	
33	660	1	424.2	24028	52890	0.910
		2	471.7	22768	52305	
34	680	1	424.9	23369	51470	0.885
		2	472.4	22166	50953	
35	700	1	425.7	22845	50349	0.866
		2	473.2	21885	50341	
36	720	1	426.4	22086	48705	0.838
		2	473.9	21167	48718	
37	740	1	427.2	21229	46844	0.806
		2	474.7	20503	47220	
38	760	1	427.9	20567	45410	0.781
		2	475.4	19867	45782	
39	780	1	428.7	19304	42645	0.733
		2	476.2	18782	43307	
40	800	1	429.4	18583	41077	0.706
		2	476.9	17864	41214	
41	820	1	430.2	17503	38712	0.666
		2	477.7	16708	38568	
42	840	1	430.9	16228	35910	0.618
		2	478.4	15745	36365	
43	860	1	431.7	15141	33523	0.577
		2	479.2	14602	33743	
44	880	1	432.4	14066	31159	0.536
		2	479.9	13504	31221	
45	900	1	433.2	12946	28692	0.493
		2	480.7	12287	28421	
46	920	1	433.9	11588	25693	0.412
		2	481.4	10929	25290	
47	940	1	434.7	10201	22627	0.389
		2	482.2	9842	22784	
48	960	1	435.4	8648	19186	0.330
		2	482.9	8305	19230	
49	980	1	436.2	7086	15723	0.270
		2	483.7	6647	15391	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
50	1000	1	436.9	5249	11642	0.200
		2	484.4	5108	11824	
51	1020	1	437.7	3442	7623	0.131
		2	485.2	3402	7864	
52	1040	1	438.4	1923	4241	0.073
		2	485.9	1807	4157	
53	1060	1	439.2	1565	3446	0.059
		2	486.7	1447	3322	

Table 3-5 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

Void fraction : 0%

¹⁰B content in D₂O : 0 ppm

(a) Position : 0 ch (in cluster)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 20 sec)	Counts after time correction C (per 20 sec)	Normalized value (max=1.0)
1	20	1	320.8	720	2846	0.255
		2	1411.5	642	3336	
2	40	1	321.3	764	3024	0.271
		2	1412.2	624	3242	
3	60	1	321.7	904	3586	0.321
		2	1413.0	765	4001	
4	80	1	322.1	1109	4410	0.395
		2	1413.7	842	4418	
5	100	1	322.5	1229	4894	0.435
		2	1414.5	943	4964	
6	120	1	322.9	1344	5358	0.490
		2	1415.2	1100	5813	
7	140	1	323.3	1567	6256	0.543
		2	1416.0	1265	6705	
8	160	1	323.8	1727	6901	0.595
		2	1416.7	1283	6807	
9	180	1	324.2	1806	7222	0.643
		2	1417.5	1440	7658	
10	200	1	324.6	1967	7872	0.690
		2	1418.2	1462	7782	
11	220	1	325.0	2064	8265	0.733
		2	1419.0	1584	8446	
12	240	1	325.4	2201	8820	0.774
		2	1419.7	1722	9198	
13	260	1	325.8	2249	9017	0.812
		2	1420.5	1782	9529	
14	280	1	326.3	2446	9814	0.846
		2	1421.2	1882	10337	
15	300	1	326.7	2488	9987	0.878
		2	1422.0	1965	10533	
16	320	1	327.1	2489	9995	0.906
		2	1422.7	1967	10551	
17	340	1	328.9	2627	10569	0.930
		2	1423.5	2026	10878	
18	360	1	329.4	2682	10795	0.951
		2	1424.2	2045	10988	
19	380	1	330.0	2765	11137	0.969
		2	1425.0	2089	11235	
20	400	1	330.5	2867	11554	0.982
		2	1425.7	2145	11546	
21	420	1	330.9	2784	11224	0.992
		2	1426.5	2163	11652	
22	440	1	331.4	2801	11297	0.998
		2	1427.2	2148	11578	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 20 sec)	Counts after time correction C (per 20 sec)	Normalized value (max=1.0)
23	460	1	331.9	2767	11164	1.000
		2	1428.0	2141	11548	
24	480	1	332.4	2747	11088	0.998
		2	1428.7	2225	12014	
25	500	1	332.8	2724	10999	0.993
		2	1429.5	2120	11449	
26	520	1	333.3	2720	10988	0.983
		2	1430.2	2086	11272	
27	540	1	333.7	2726	11017	0.970
		2	1431.0	2047	11066	
28	560	1	334.2	2702	10924	0.953
		2	1431.7	2023	10943	
29	580	1	334.6	2647	10705	0.932
		2	1432.5	2064	11174	
30	600	1	335.1	2527	10221	0.908
		2	1433.2	1928	10438	
31	620	1	335.5	2402	9718	0.880
		2	1434.0	1740	9416	
32	640	1	345.4	2406	9821	0.849
		2	1434.7	1808	9794	
33	660	1	345.8	2264	9242	0.815
		2	1435.5	1745	9456	
34	680	1	346.2	2148	8770	0.777
		2	1436.2	1629	8826	
35	700	1	346.6	1981	8088	0.737
		2	1437.0	1542	8354	
36	720	1	347.1	1925	7861	0.693
		2	1437.7	1464	7931	
37	740	1	347.5	1867	7626	0.647
		2	1438.5	1329	7195	
38	760	1	347.9	1609	6569	0.599
		2	1439.2	1324	7172	
39	780	1	348.3	1544	6304	0.548
		2	1440.0	1185	6412	
40	800	1	348.7	1380	5632	0.495
		2	1440.7	1066	5618	
41	820	1	349.1	1249	5095	0.440
		2	1441.5	984	5313	
42	840	1	349.7	1042	4246	0.383
		2	1442.3	841	4528	
43	860	1	350.2	848	3449	0.309
		2	1443.0	742	3984	
44	880	1	350.6	707	2870	0.257
		2	1443.8	583	3109	
45	900	1	351.1	569	2303	0.206
		2	1444.5	485	2570	
46	920	1	351.6	322	1286	0.115
		2	1445.3	309	1598	
47	940	1	352.0	200	783	0.070
		2				

Table 3-5 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

Void fraction : 0%

¹⁰B content in D₂O : 0 ppm(b) Position : 1D1 (in D₂O)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	1291.8	1266	5999	0.121
		2	1567.3	904	5457	
2	40	1	1292.6	2021	9642	0.195
		2	1568.0	1501	9149	
3	60	1	1293.3	2846	13626	0.276
		2	1568.8	2064	12637	
4	80	1	1294.6	3168	15196	0.307
		2	1569.5	2720	16704	
5	100	1	1295.3	3642	17497	0.354
		2	1570.3	3269	20115	
6	120	1	1296.7	4268	20546	0.416
		2	1571.0	3820	23542	
7	140	1	1297.5	4887	23559	0.482
		2	1571.8	4101	25301	
8	160	1	1298.3	5468	26391	0.534
		2	1572.5	4685	28941	
9	180	1	1299.1	6060	29280	0.588
		2	1573.3	5085	31445	
10	200	1	1299.9	6440	31145	0.638
		2	1574.0	5569	34474	
11	220	1	1300.7	6984	33811	0.683
		2	1574.8	5808	35984	
12	240	1	1301.5	7509	36387	0.727
		2	1575.5	6182	38335	
13	260	1	1302.3	8026	38928	0.769
		2	1576.3	6547	40635	
14	280	1	1303.1	8165	39632	0.808
		2	1577.0	6781	42120	
15	300	1	1303.9	8588	41720	0.843
		2	1577.8	7005	43546	
16	320	1	1304.7	8942	43477	0.875
		2	1578.5	7121	44299	
17	340	1	1305.5	9302	45264	0.906
		2	1579.3	7566	47109	
18	360	1	1306.3	9600	46751	0.929
		2	1580.0	7742	48240	
19	380	1	1307.1	9563	46604	0.950
		2	1580.8	7780	48511	
20	400	1	1307.9	9846	48021	0.968
		2	1581.5	7909	49350	
21	420	1	1308.6	9982	48720	0.982
		2	1582.3	8006	49992	
22	440	1	1309.4	10104	49353	0.992
		2	1583.0	7987	49906	
23	460	1	1310.3	10101	49372	0.998
		2	1583.8	7961	49777	
24	480	1	1311.0	10104	49422	1.000
		2	1584.5	8108	50733	

(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	1311.8	10100	49437	0.998
		2	1585.3	8006	50128	
26	520	1	1312.5	9920	48588	0.992
		2	1586.0	7781	48747	
27	540	1	1313.3	9920	48622	0.983
		2	1586.8	7804	48925	
28	560	1	1314.1	9747	47806	0.969
		2	1587.5	7663	48071	
29	580	1	1314.9	9628	47256	0.952
		2	1588.3	7481	46958	
30	600	1	1315.7	9281	45582	0.930
		2	1589.0	7242	45483	
31	620	1	1316.6	9180	45118	0.905
		2	1589.8	6988	43913	
32	640	1	1330.1	8722	43386	0.878
		2	1590.5	6701	42132	
33	660	1	1331.0	8562	42623	0.846
		2	1591.3	6346	39920	
34	680	1	1331.8	7968	39688	0.810
		2	1592.0	6202	39037	
35	700	1	1332.6	7700	38378	0.772
		2	1592.8	5824	36675	
36	720	1	1333.4	7345	35734	0.731
		2	1593.5	5380	33891	
37	740	1	1334.2	6780	33828	0.686
		2	1594.3	5085	32047	
38	760	1	1335.1	6260	31248	0.639
		2	1596.0	4645	29309	
39	780	1	1335.8	5926	29596	0.590
		2	1596.9	4227	26680	
40	800	1	1336.6	5348	26718	0.538
		2	1597.8	3900	24626	
41	820	1	1337.5	4861	24294	0.484
		2	1598.6	3306	20871	
42	840	1	1338.3	4207	21027	0.425
		2	1599.4	2845	17955	
43	860	1	1339.1	3466	17318	0.350
		2	1600.2	2340	14756	
44	880	1	1339.9	2845	14207	0.287
		2	1601.0	1689	10623	
45	900	1	1340.8	2129	10614	0.215
		2	1601.8	1109	6936	
46	920	1	1341.6	1404	6970	0.141
		2	1602.7	604	3723	
47	940	1	1342.4	720	3528	0.071
		2	1603.6	484	2960	

Table 3-5 Measurement of axial flux distribution by Cu wire in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

Void fraction : 0%

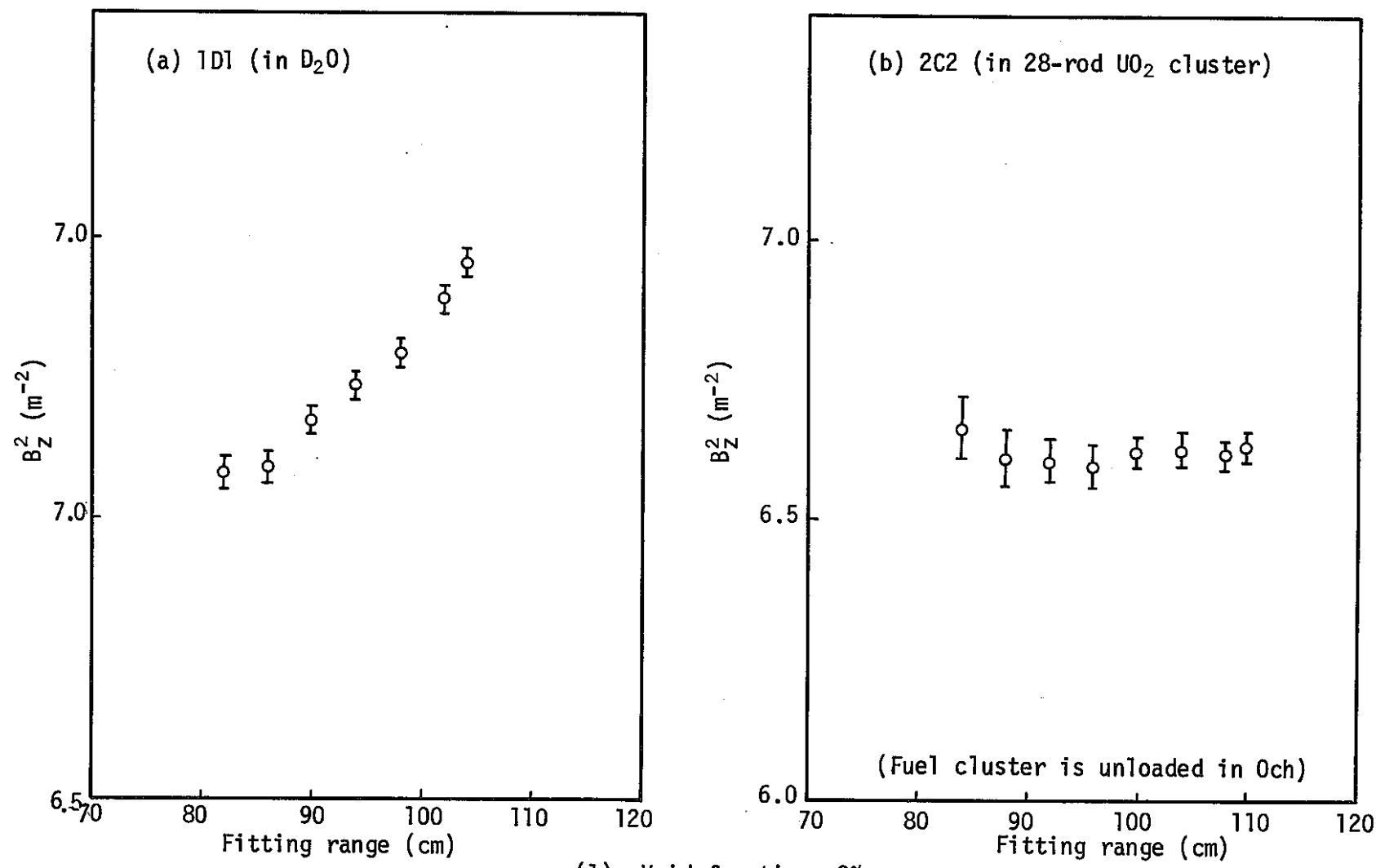
¹⁰B content in D₂O : 0 ppm

(c) Position : 2A0 (in cluster)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
1	20	1	1453.0	566	3041	0.262
		2	1493.4	464	2564	
2	40	1	1453.8	584	3143	0.297
		2	1494.1	522	2901	
3	60	1	1454.5	663	3586	0.310
		2	1494.9	585	3267	
4	80	1	1455.3	784	4263	0.369
		2	1495.6	642	3600	
5	100	1	1456.0	845	4607	0.426
		2	1496.4	741	4175	
6	120	1	1456.8	943	5157	0.481
		2	1497.1	829	4688	
7	140	1	1457.5	1042	5715	0.535
		2	1497.9	983	5584	
8	160	1	1458.3	1143	6284	0.586
		2	1498.6	1000	5687	
9	180	1	1459.0	1105	6075	0.636
		2	1499.4	1088	6202	
10	200	1	1459.8	1249	6886	0.682
		2	1500.1	1204	6880	
11	220	1	1460.5	1322	7300	0.727
		2	1500.9	1267	7251	
12	240	1	1461.3	1425	7883	0.768
		2	1501.6	1323	7582	
13	260	1	1462.0	1425	7888	0.806
		2	1502.4	1381	7925	
14	280	1	1462.8	1546	8574	0.841
		2	1503.1	1509	8676	
15	300	1	1463.5	1645	9136	0.873
		2	1503.9	1527	8787	
16	320	1	1464.3	1606	8923	0.902
		2	1504.6	1522	8763	
17	340	1	1465.0	1648	9165	0.927
		2	1505.4	1606	9260	
18	360	1	1465.8	1661	9245	0.949
		2	1506.1	1660	9582	
19	380	1	1466.5	1761	9815	0.966
		2	1506.9	1725	9968	
20	400	1	1467.3	1806	10075	0.981
		2	1507.6	1668	9641	
21	420	1	1468.0	1744	9732	0.991
		2	1508.4	1649	9537	
22	440	1	1468.8	1762	9840	0.997
		2	1509.1	1728	10006	
23	460	1	1469.5	1800	10062	1.000
		2	1509.9	1687	9773	
24	480	1	1470.3	1761	9848	0.999
		2	1510.6	1728	10020	

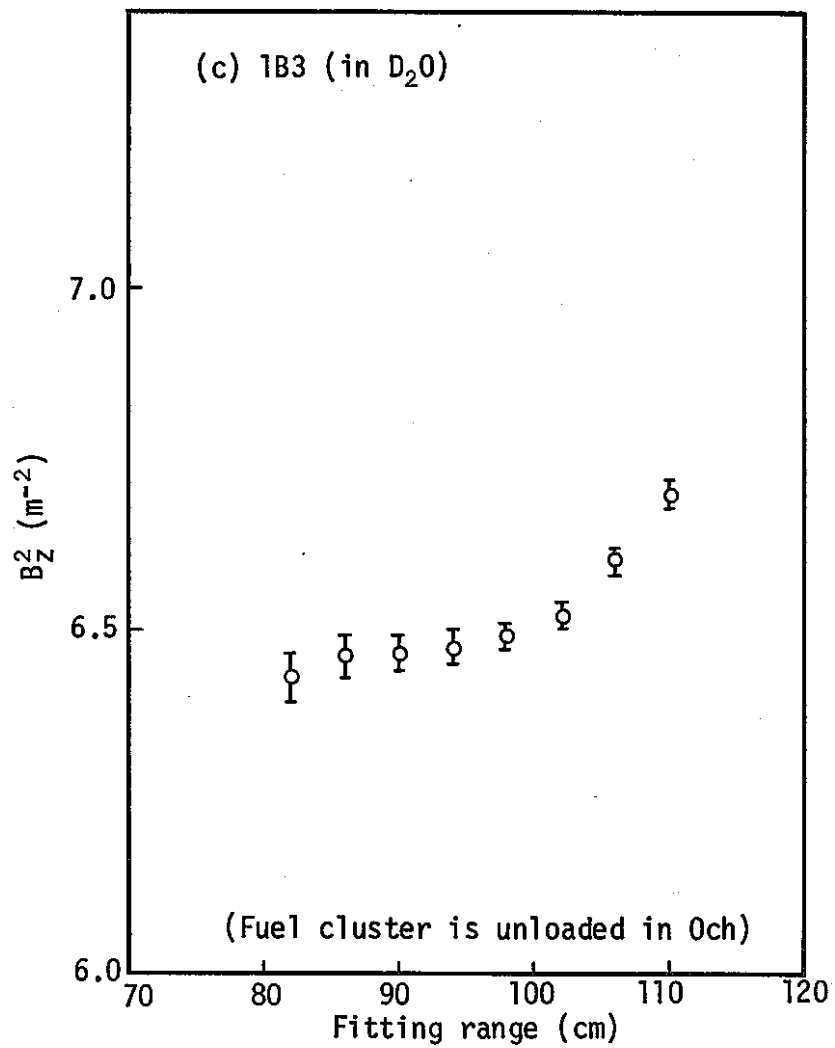
(continued)

Position No.	Height from core bottom Z (mm)	Turn No.	Time after shutdown (min)	Measured counts Co (per 40 sec)	Counts after time correction C (per 40 sec)	Normalized value (max=1.0)
25	500	1	1471.0	1760	9849	0.994
		2	1511.4	1720	9979	
26	520	1	1471.8	1745	9771	0.985
		2	1512.2	1725	10016	
27	540	1	1472.5	1743	9766	0.972
		2	1512.9	1600	9288	
28	560	1	1473.3	1748	9801	0.955
		2	1513.7	1640	9529	
29	580	1	1474.0	1622	9092	0.935
		2	1514.4	1605	9330	
30	600	1	1474.8	1607	9013	0.911
		2	1515.2	1602	9318	
31	620	1	1475.5	1625	9122	0.884
		2	1515.9	1520	8841	
32	640	1	1476.3	1541	8650	0.853
		2	1516.7	1507	8771	
33	660	1	1477.0	1463	8212	0.819
		2	1517.4	1426	8298	
34	680	1	1477.8	1347	7557	0.782
		2	1518.2	1341	7802	
35	700	1	1478.5	1308	7340	0.742
		2	1518.9	1268	7376	
36	720	1	1479.3	1184	6638	0.699
		2	1519.7	1200	6979	
37	740	1	1480.1	1169	6557	0.653
		2	1520.4	1100	6391	
38	760	1	1480.8	1048	5870	0.604
		2	1521.2	981	5691	
39	780	1	1481.6	980	5486	0.554
		2	1521.9	966	5606	
40	800	1	1482.3	881	4923	0.501
		2	1522.7	902	5230	
41	820	1	1483.1	781	4354	0.446
		2	1523.4	780	4510	
42	840	1	1483.8	707	3933	0.389
		2	1524.2	660	3800	
43	860	1	1484.6	562	3105	0.331
		2	1524.9	569	3262	
44	880	1	1485.3	428	2339	0.221
		2	1525.7	384	2164	
45	900	1	1486.1	285	1520	0.152
		2	1526.4	269	1482	
46	920	1	1486.8	205	1062	0.100
		2	1527.2	184	976	



(1) Void fraction: 0%

Fig. 3-1 Dependence of axial buckling on fitting range in the core uniformly loaded with 28-rod 1.2wt%UO₂ clusters.



(1) Void fraction: 0%

Fig. 3-1 Dependence of axial buckling on fitting range in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

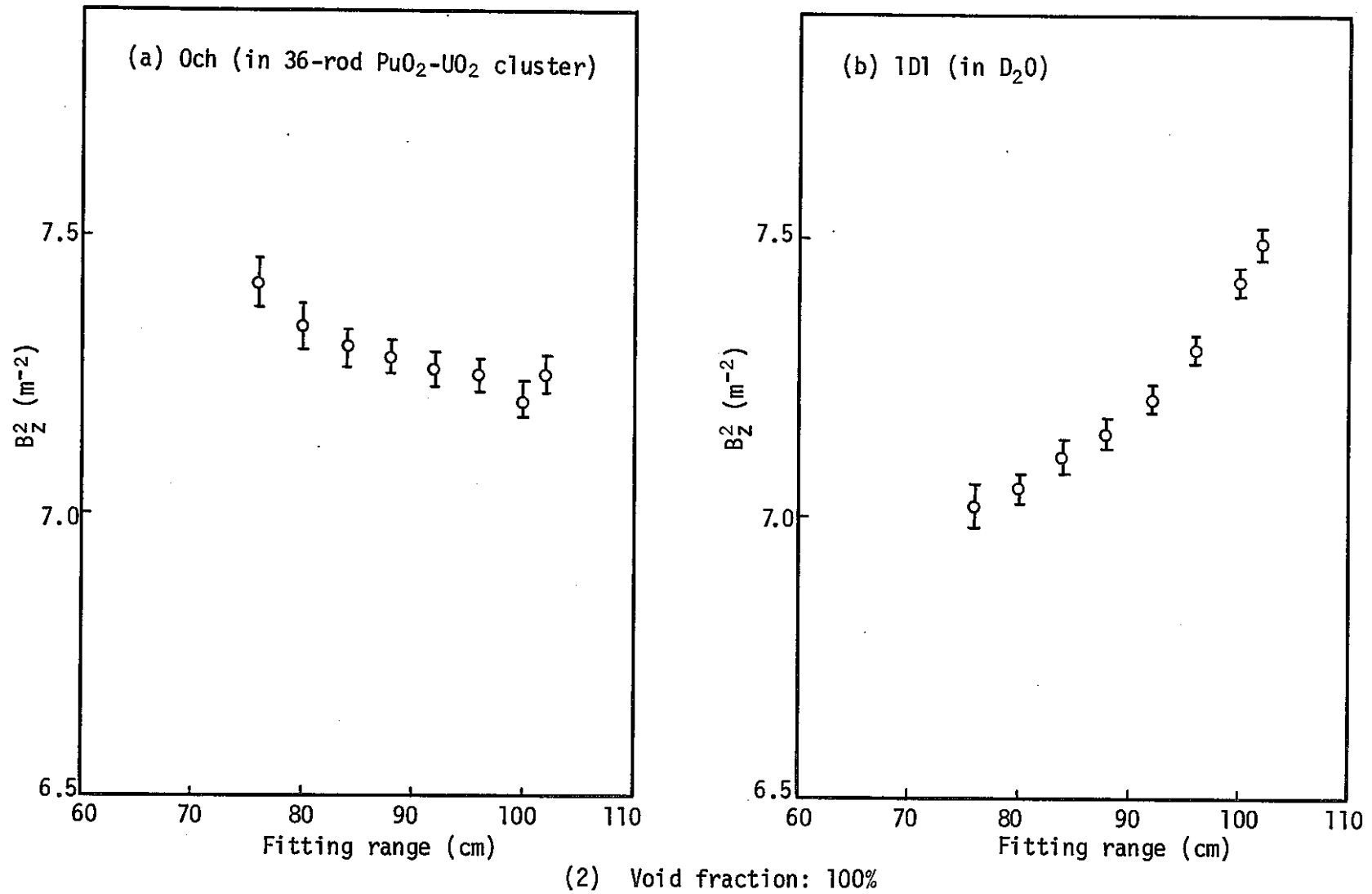


Fig. 3-1 Dependence of axial buckling on fitting range in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

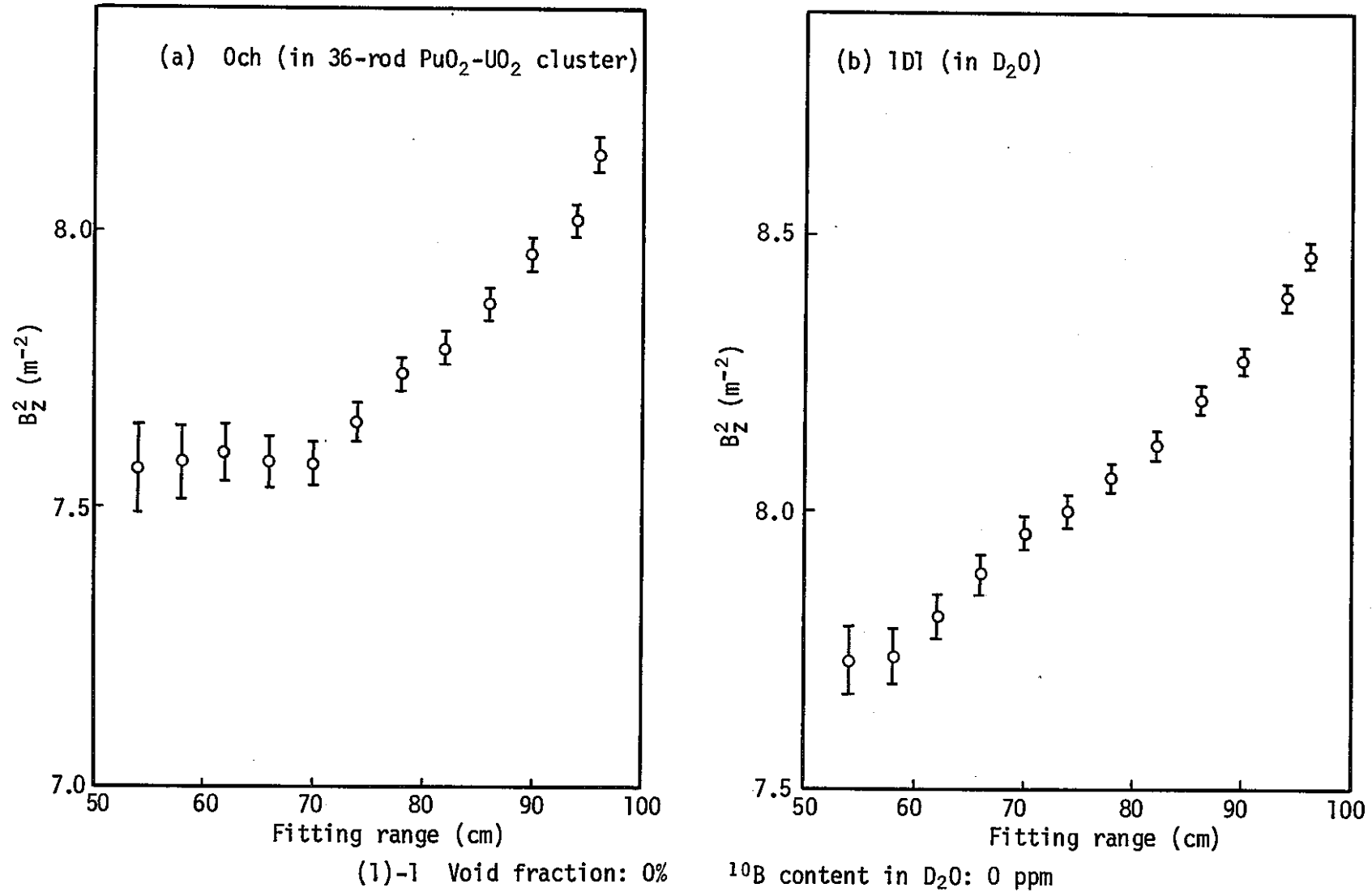
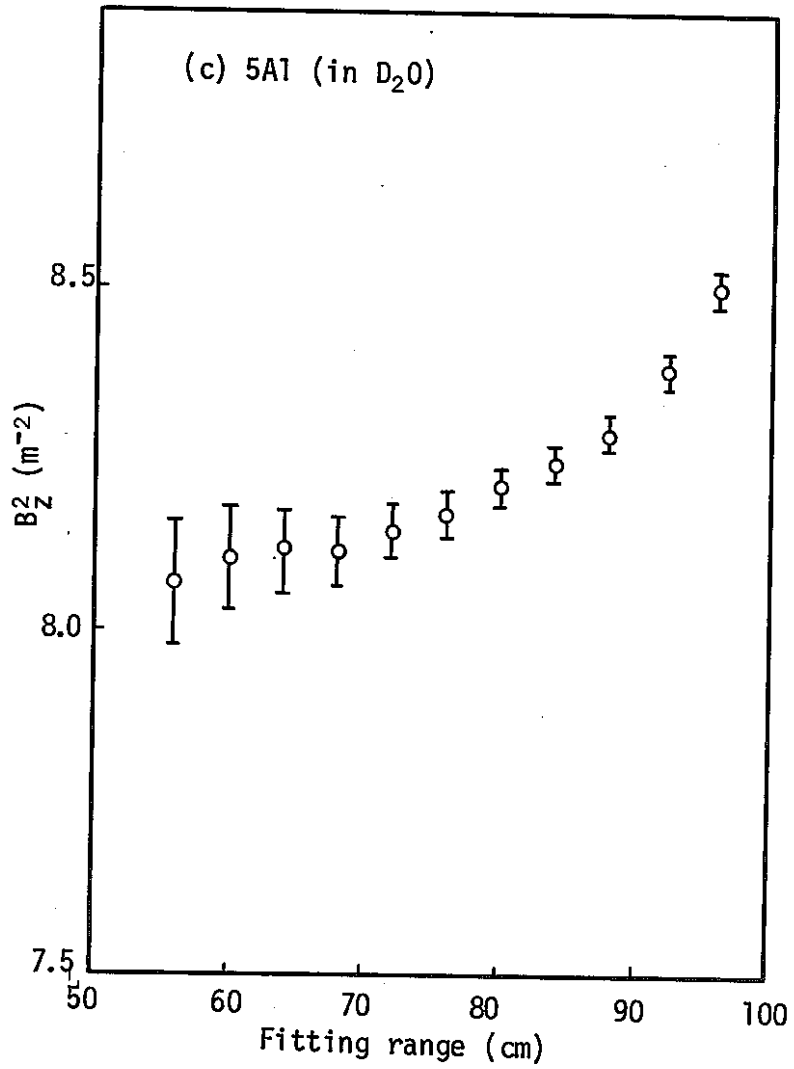
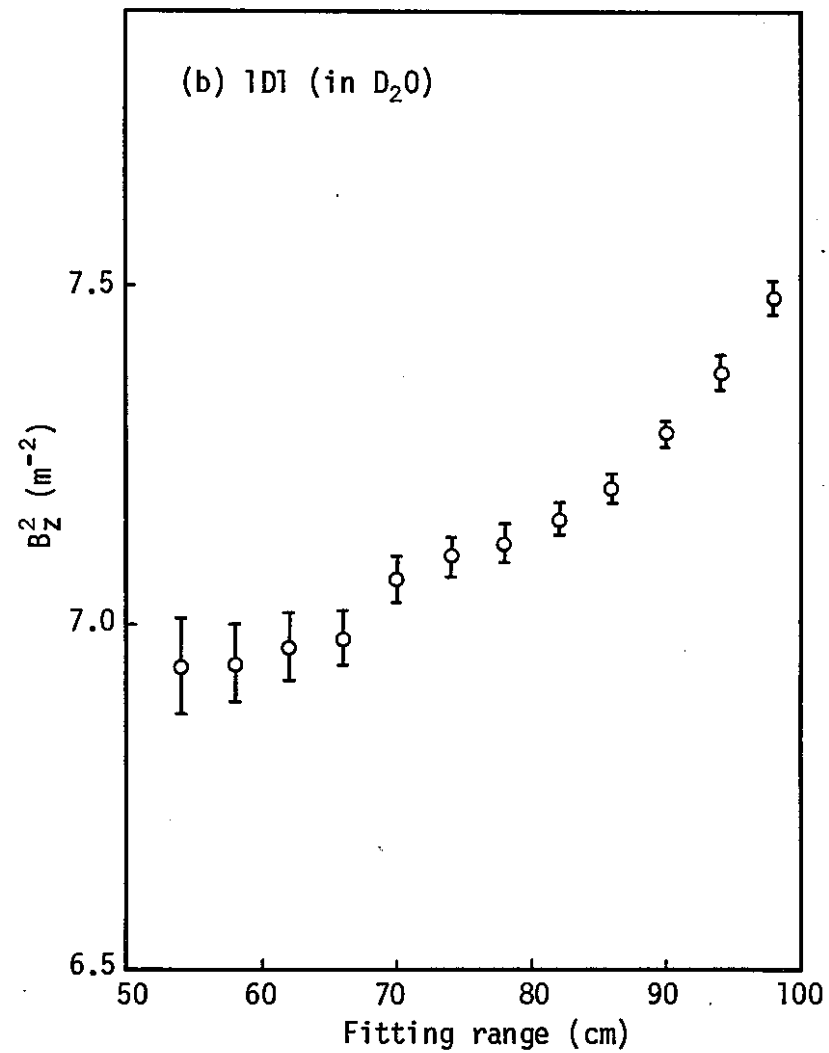
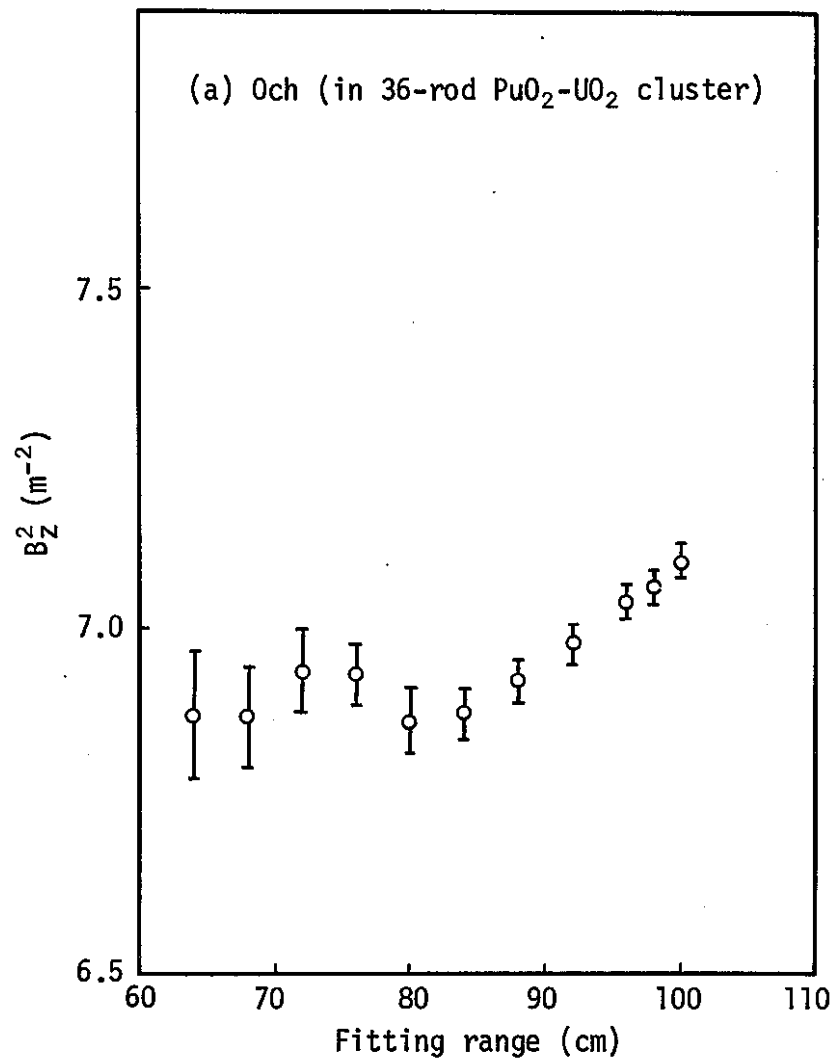


Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(1) Void fraction: 0% ¹⁰B content in D₂O: 0 ppm

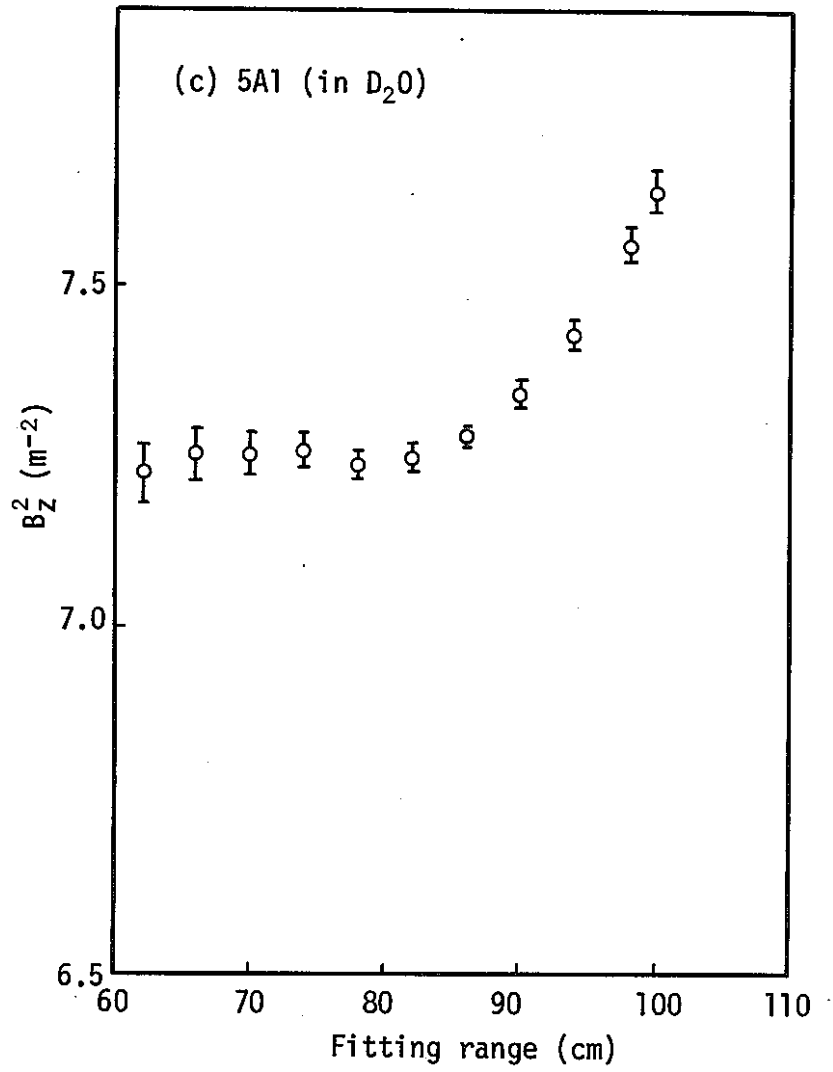
Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(1)-2 Void fraction: 100%

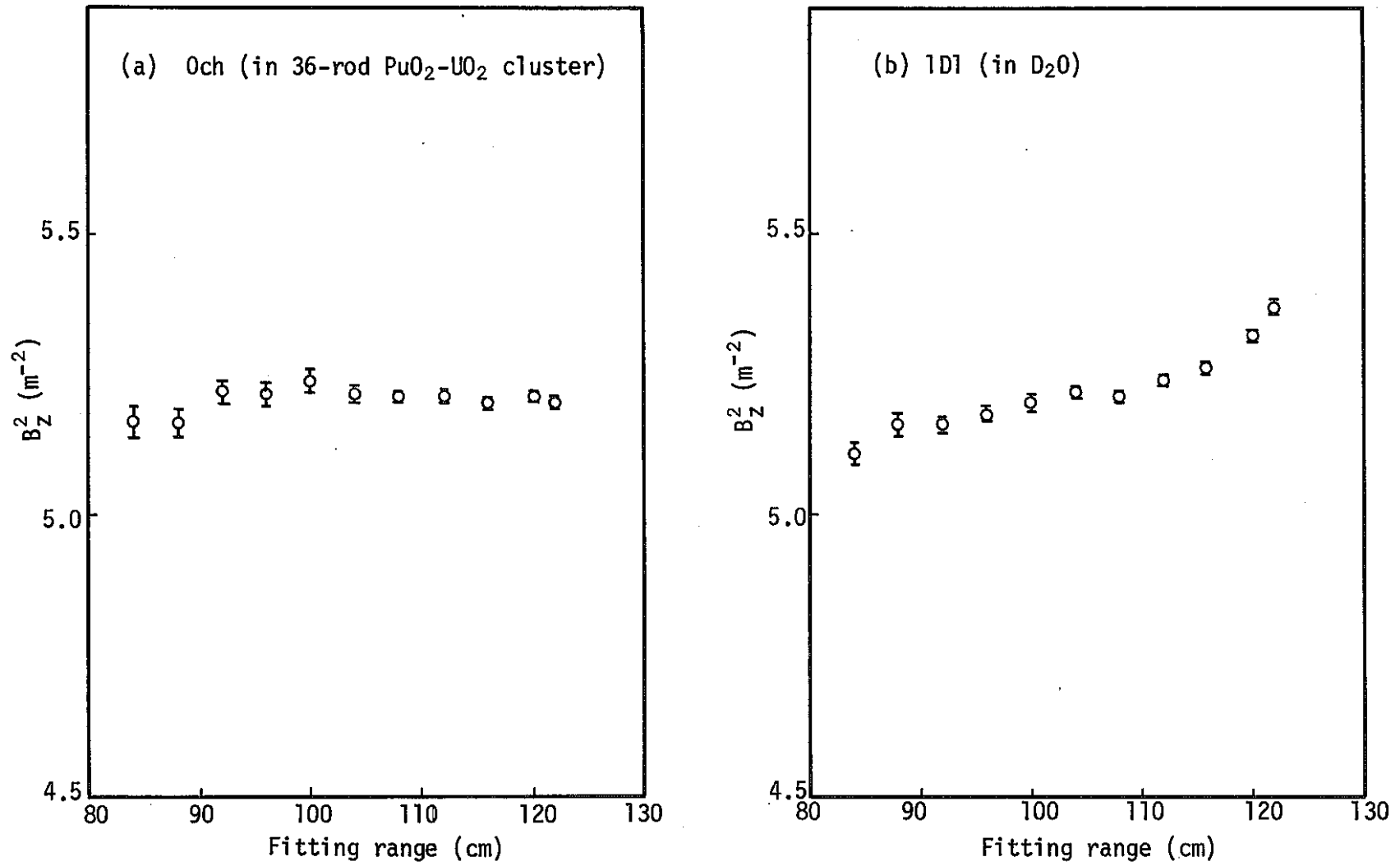
^{10}B content in D_2O : 0 ppm

Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% $\text{PuO}_2\text{-UO}_2$ clusters.



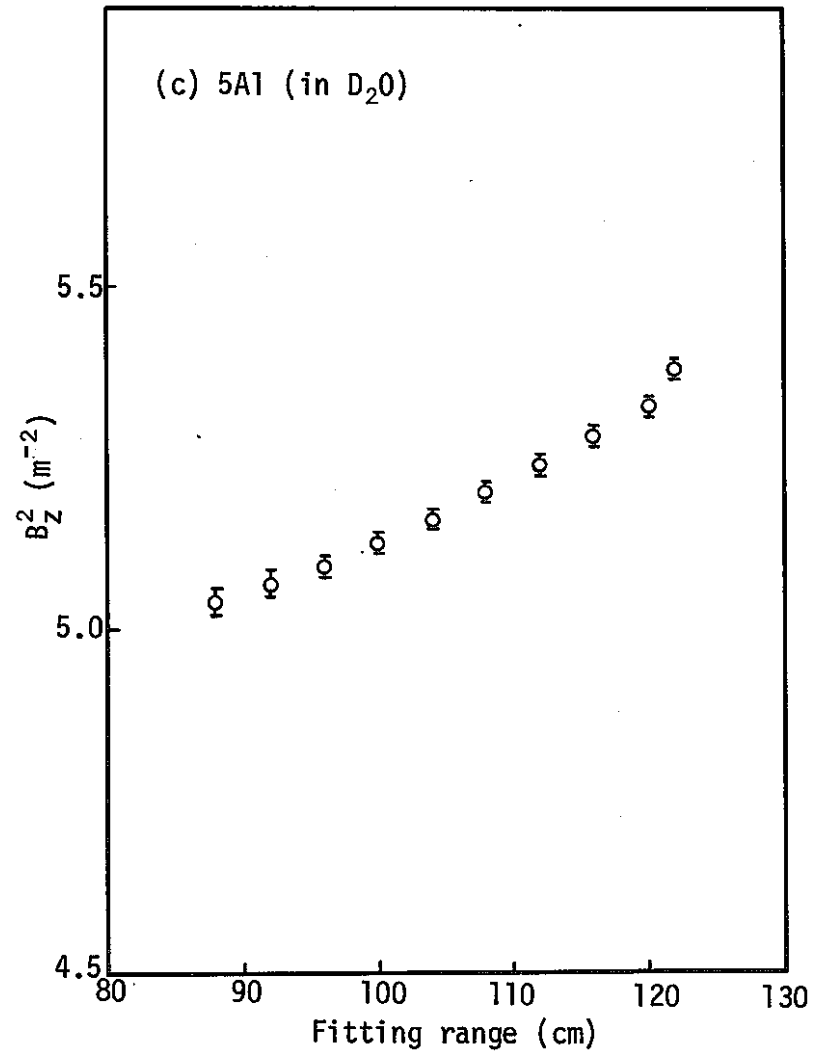
(1)-2 Void fraction: 100% ¹⁰B content in D₂O: 0 ppm

Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



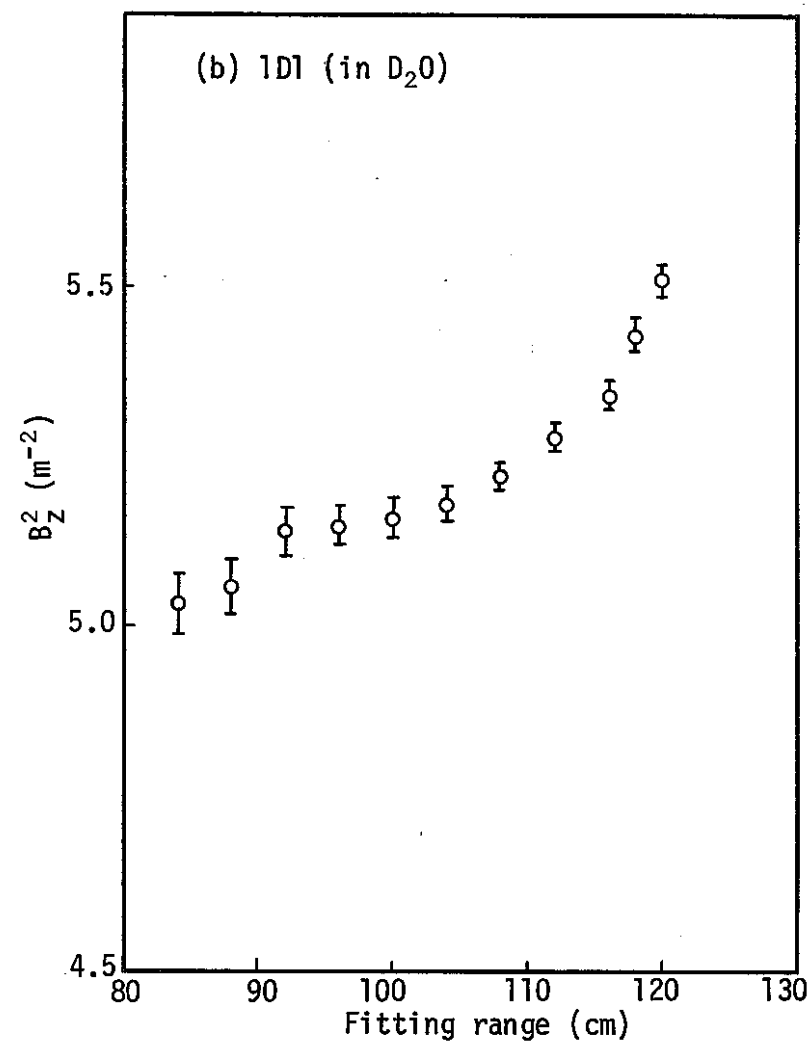
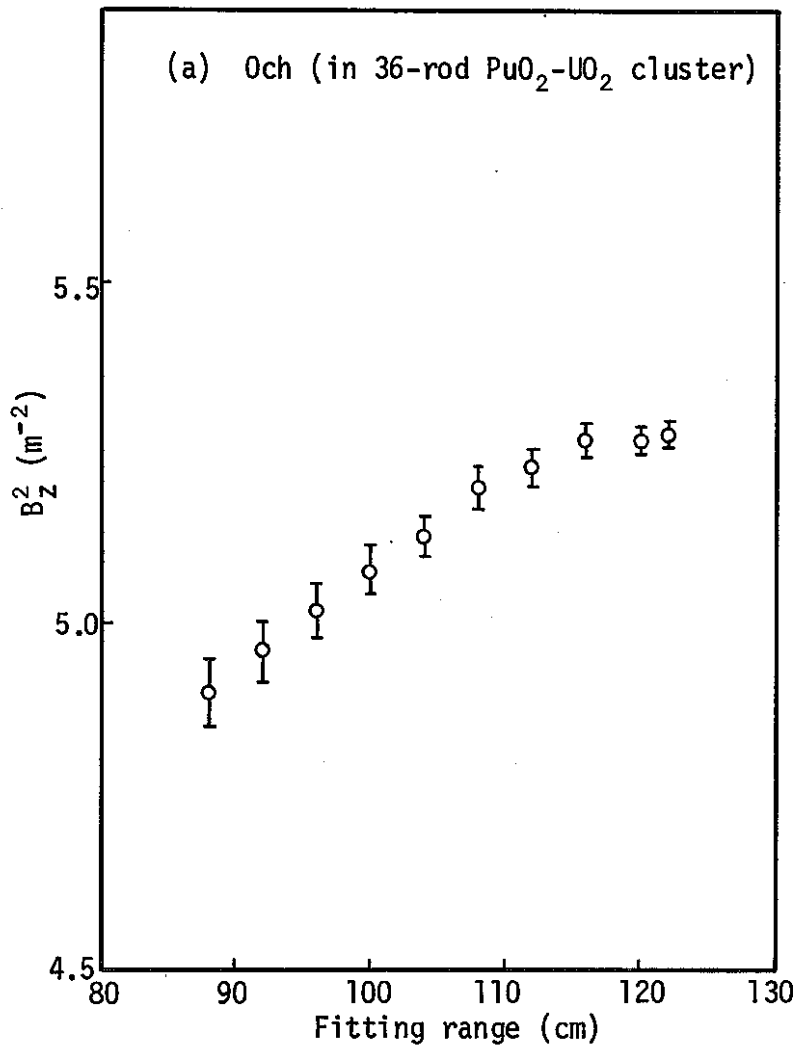
(2)-1 Void fraction: 0% ¹⁰B content in D₂O: 3.2 ppm

Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



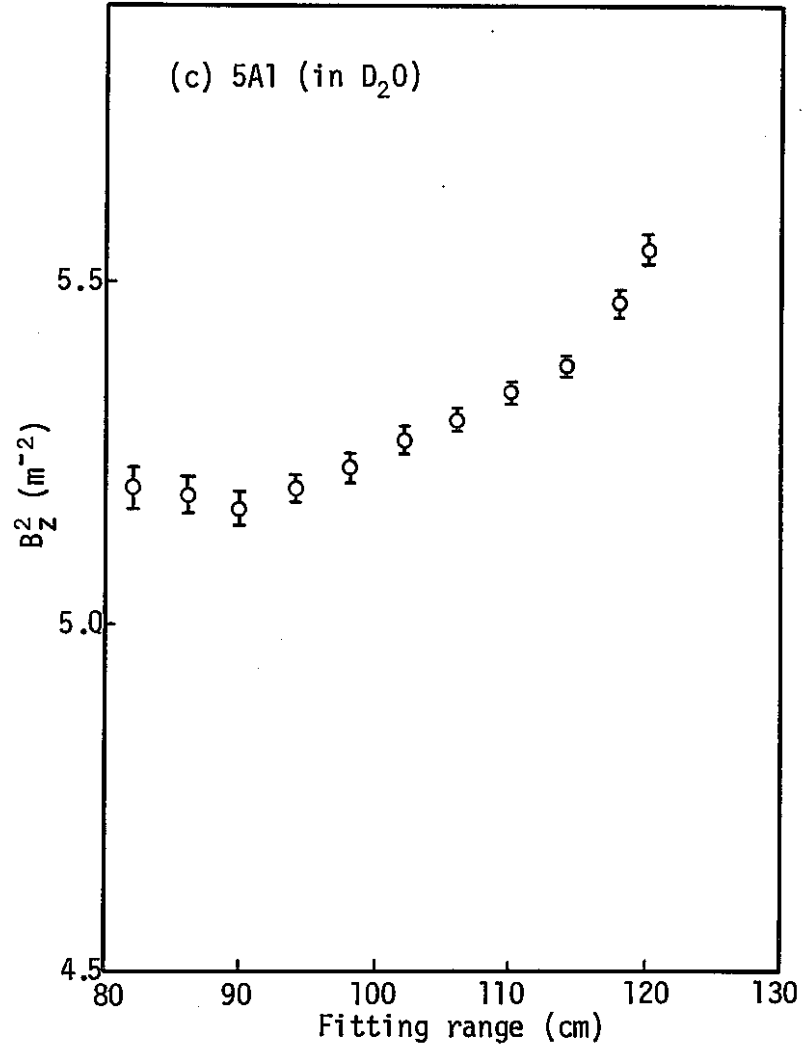
(2)-1 Void fraction: 0% ¹⁰B content in D₂O: 3.2 ppm

Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(2)-2 Void fraction: 100% ^{10}B content in D_2O : 3.2 ppm

Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% $\text{PuO}_2\text{-UO}_2$ clusters.



(2)-2 Void fraction: 100% ¹⁰B content in D₂O: 3.2 ppm

Fig. 3-2 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

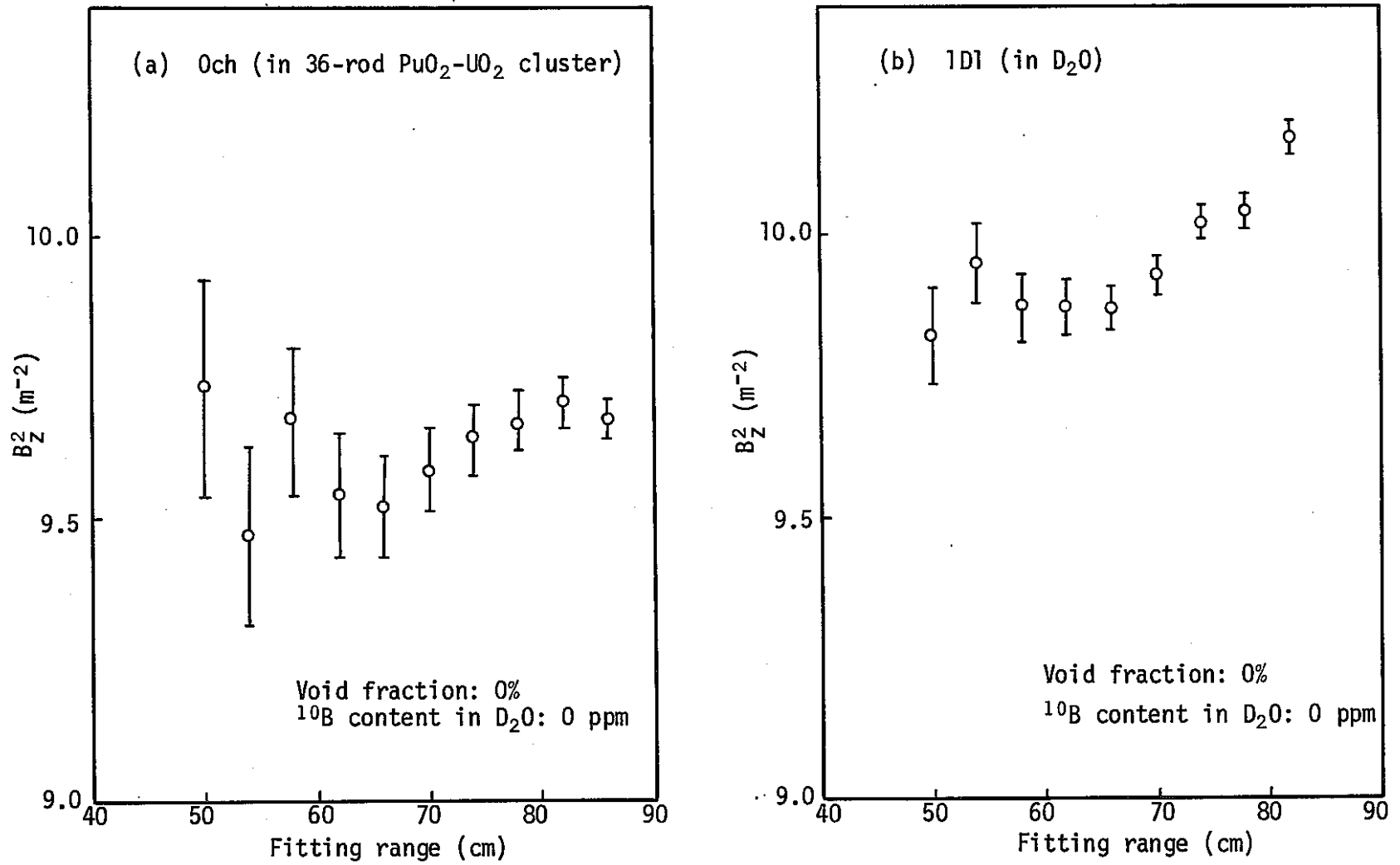


Fig. 3-3 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

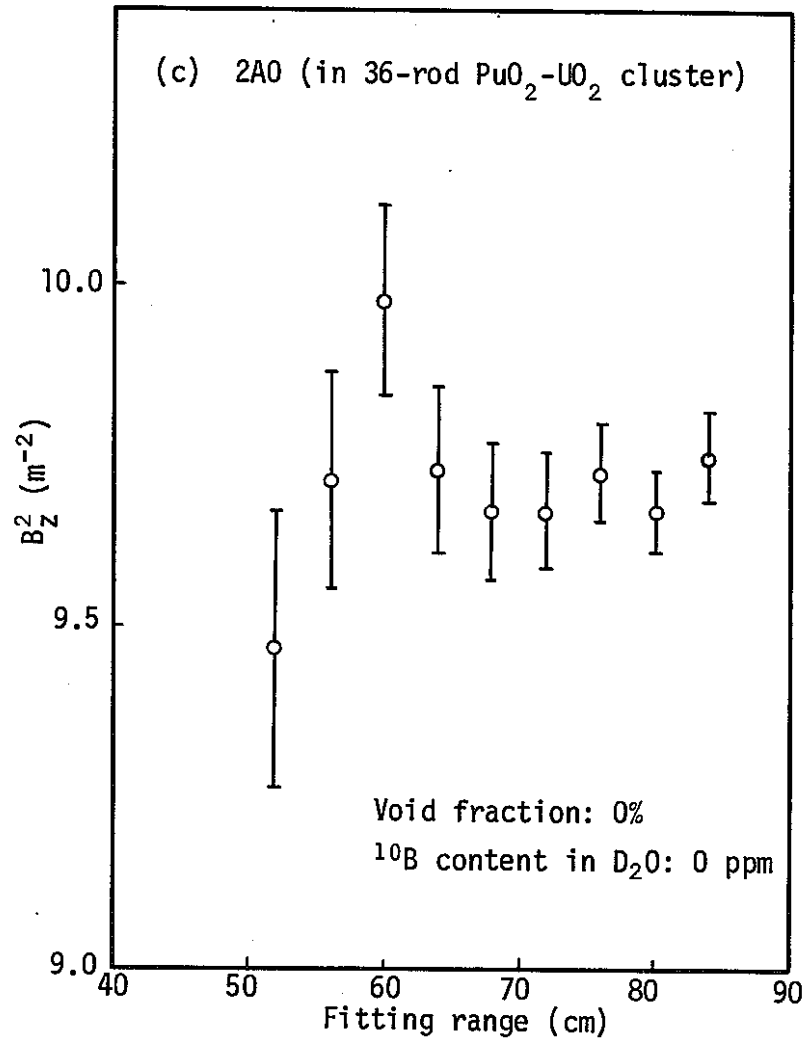


Fig. 3-3 Dependence of axial buckling on fitting range in the core partially loaded with 36-rod 0.87wt% $\text{PuO}_2\text{-UO}_2$ clusters.

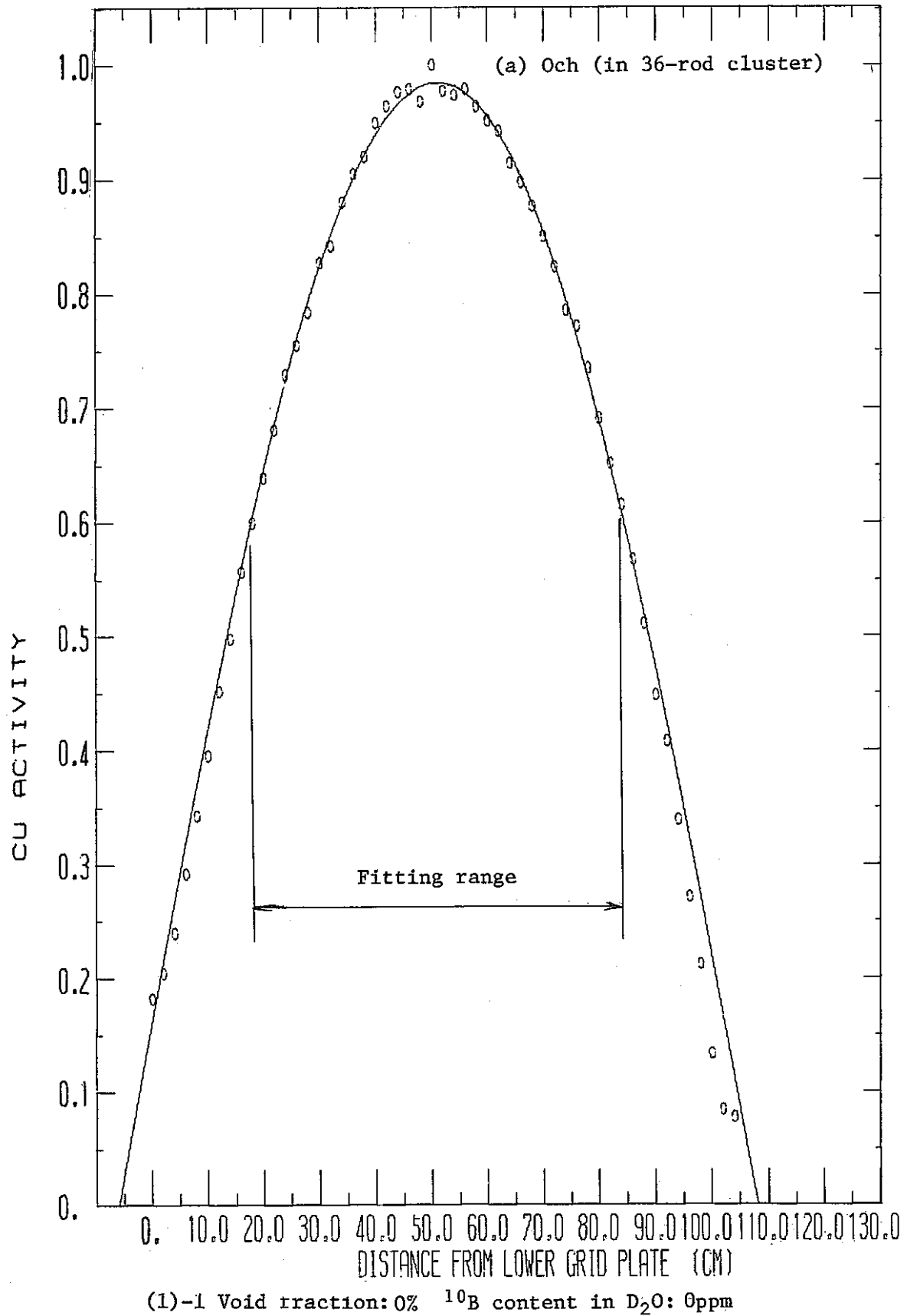
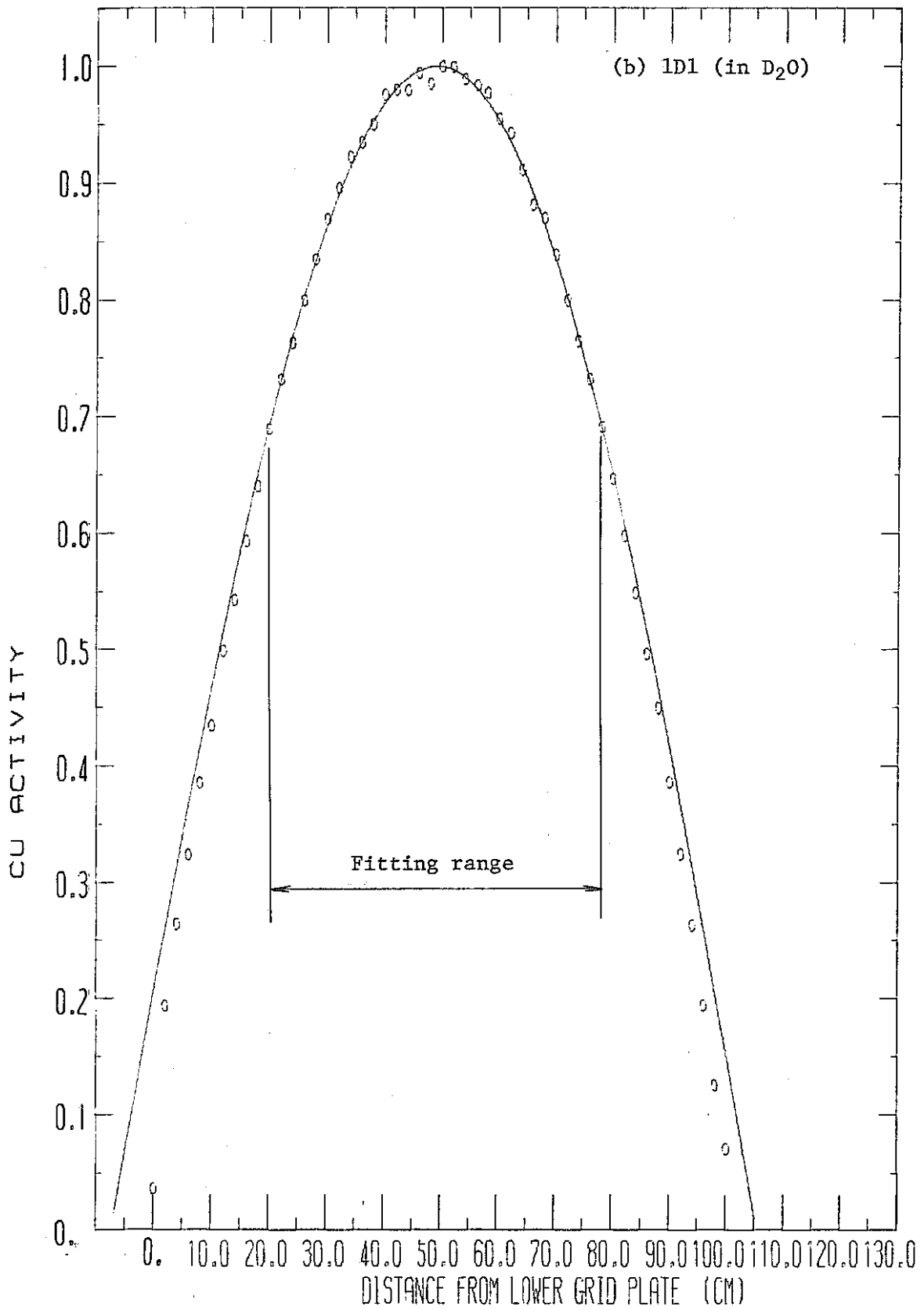
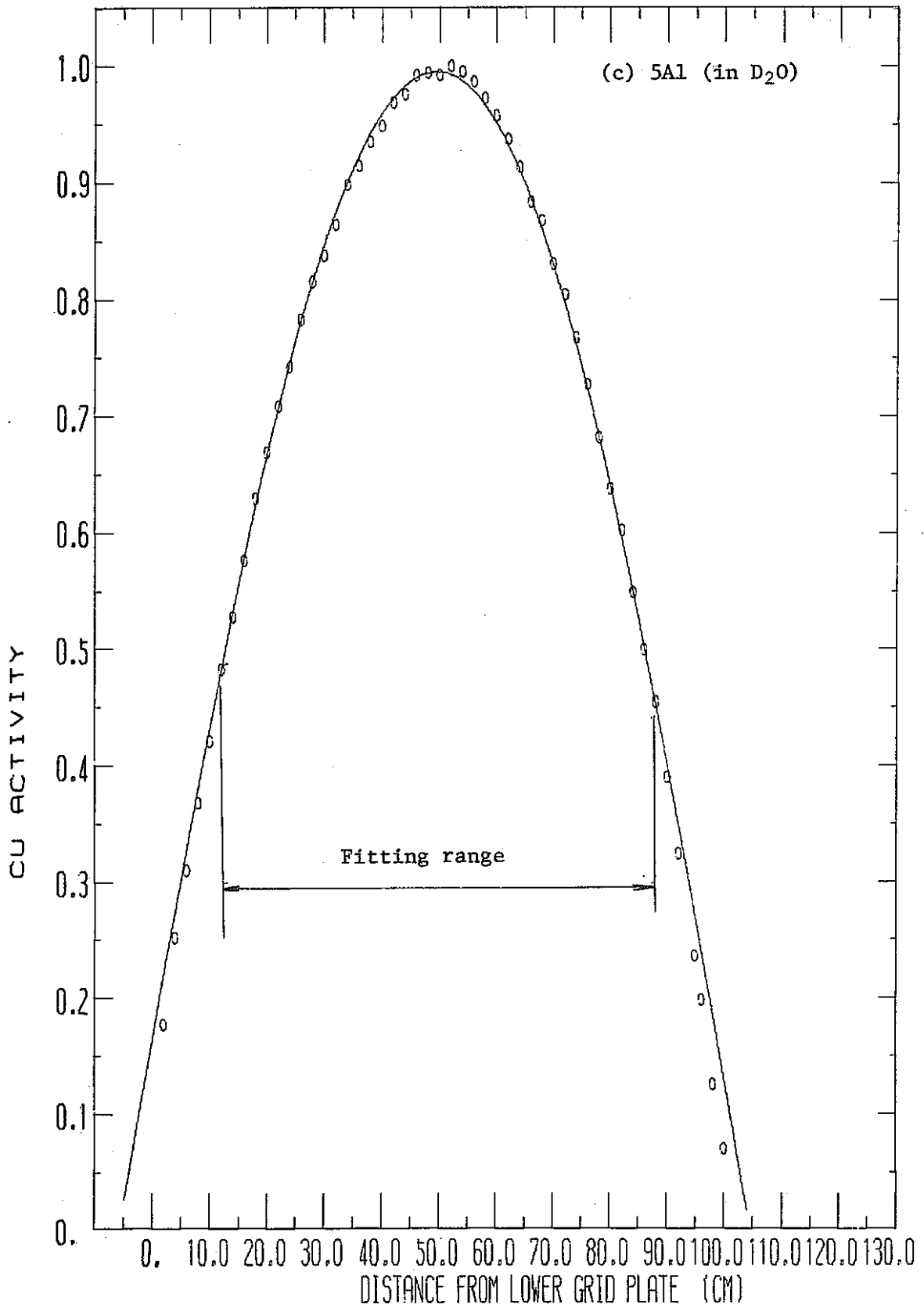


Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



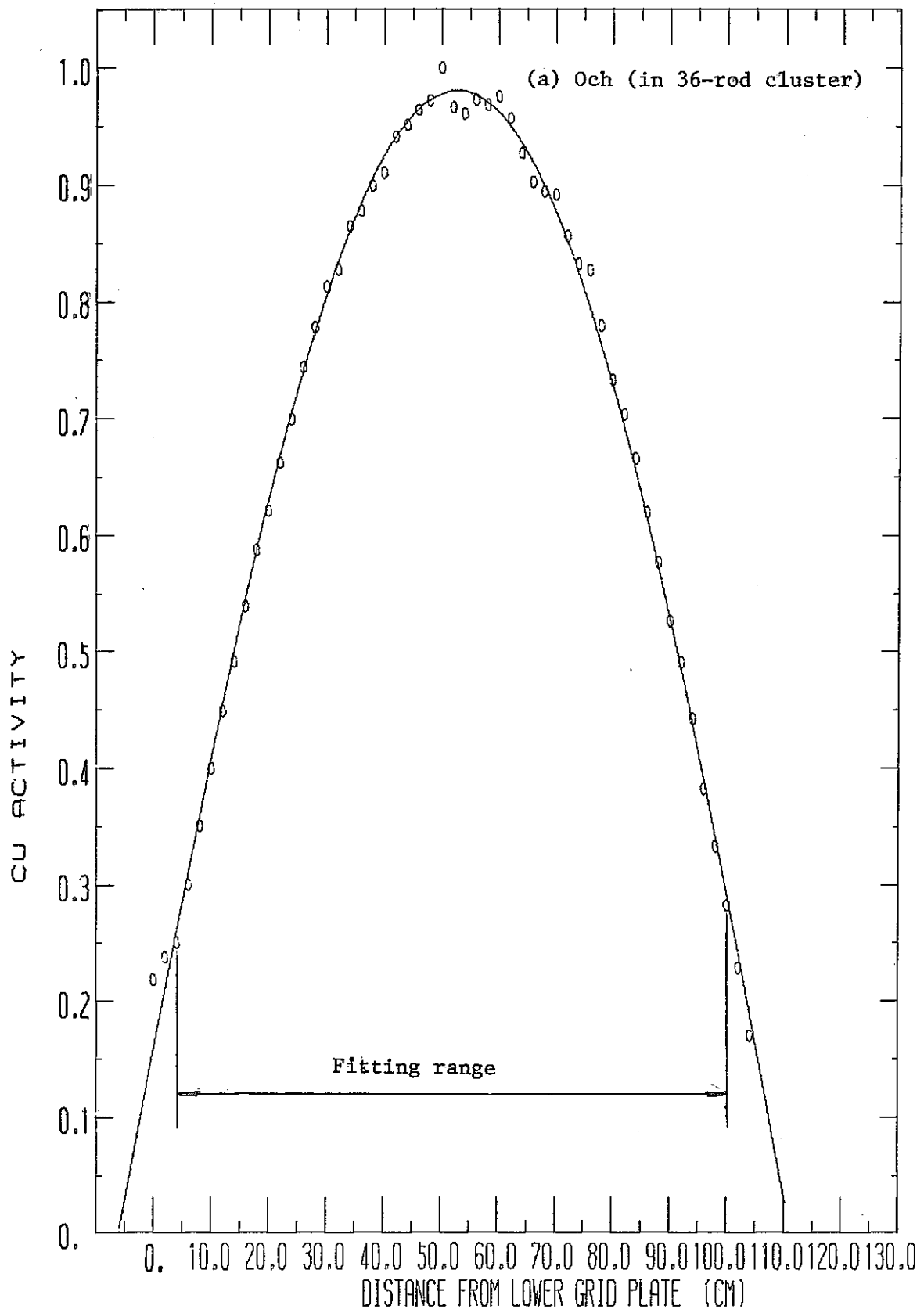
(1)-1 Void fraction: 0% ¹⁰B content in D₂O: 0ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



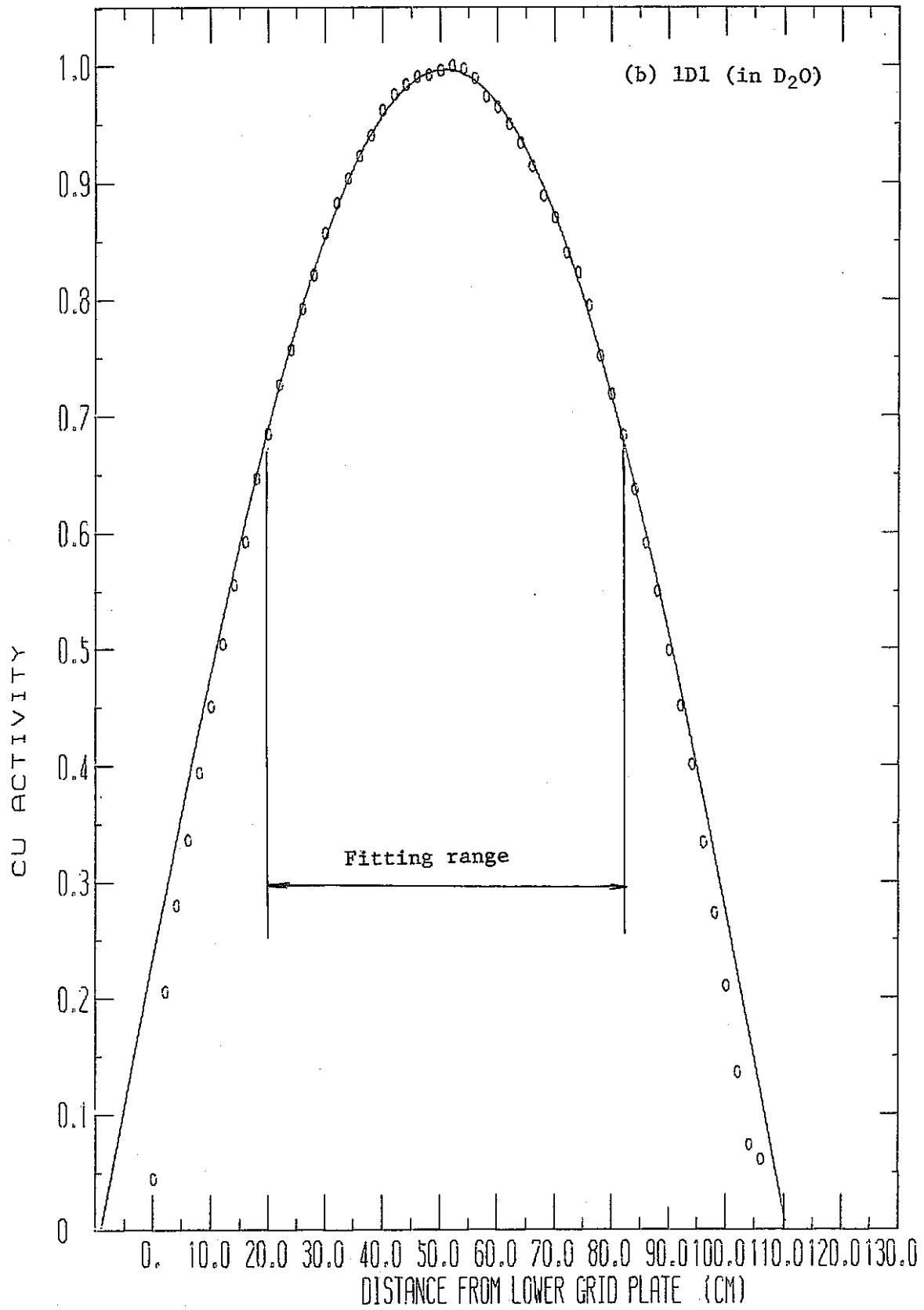
(1)-1 Void fraction: 0% ¹⁰B content in D₂O: 0ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



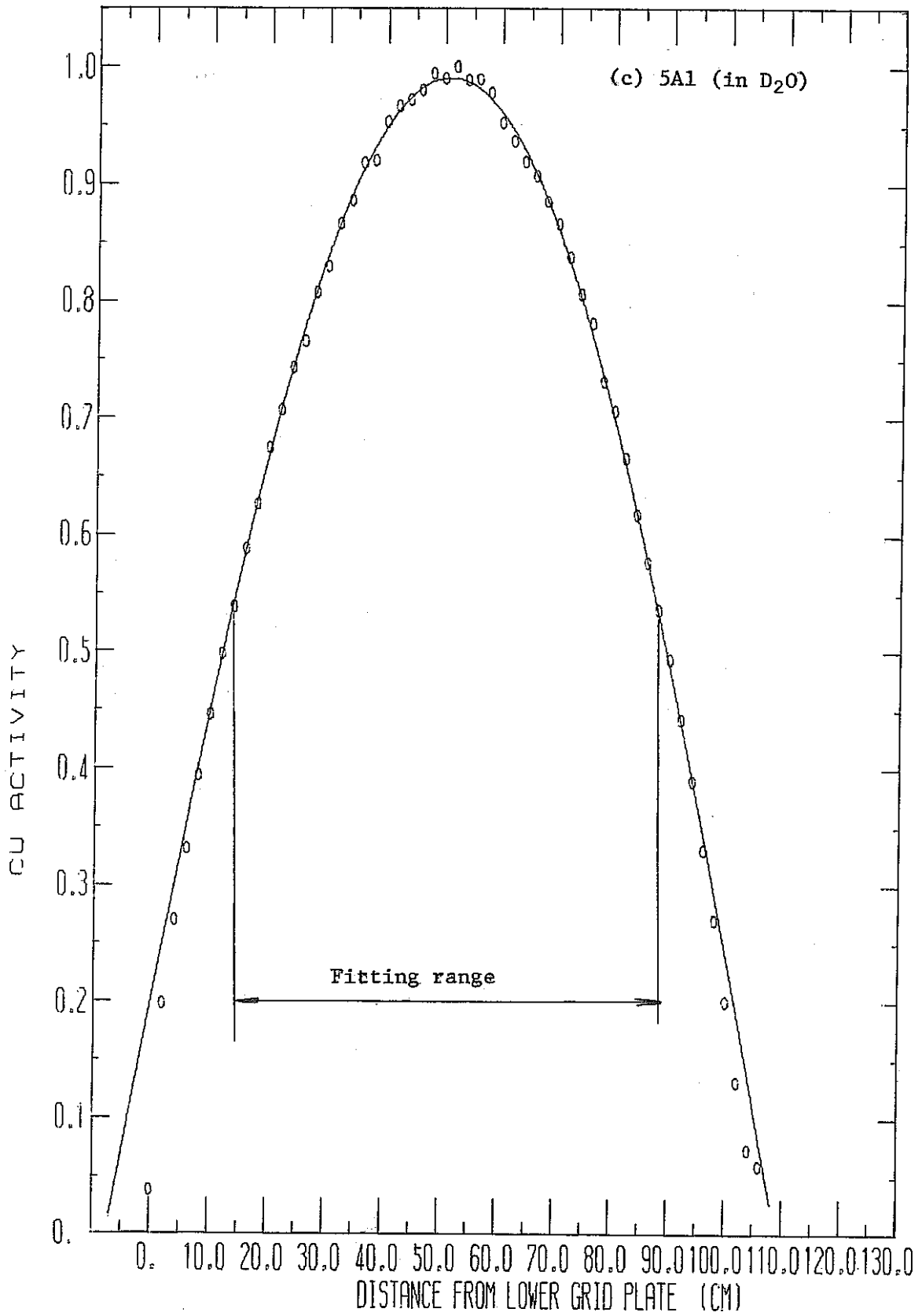
(1)-2 Void fraction: 100% ¹⁰B content in D₂O: 0ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



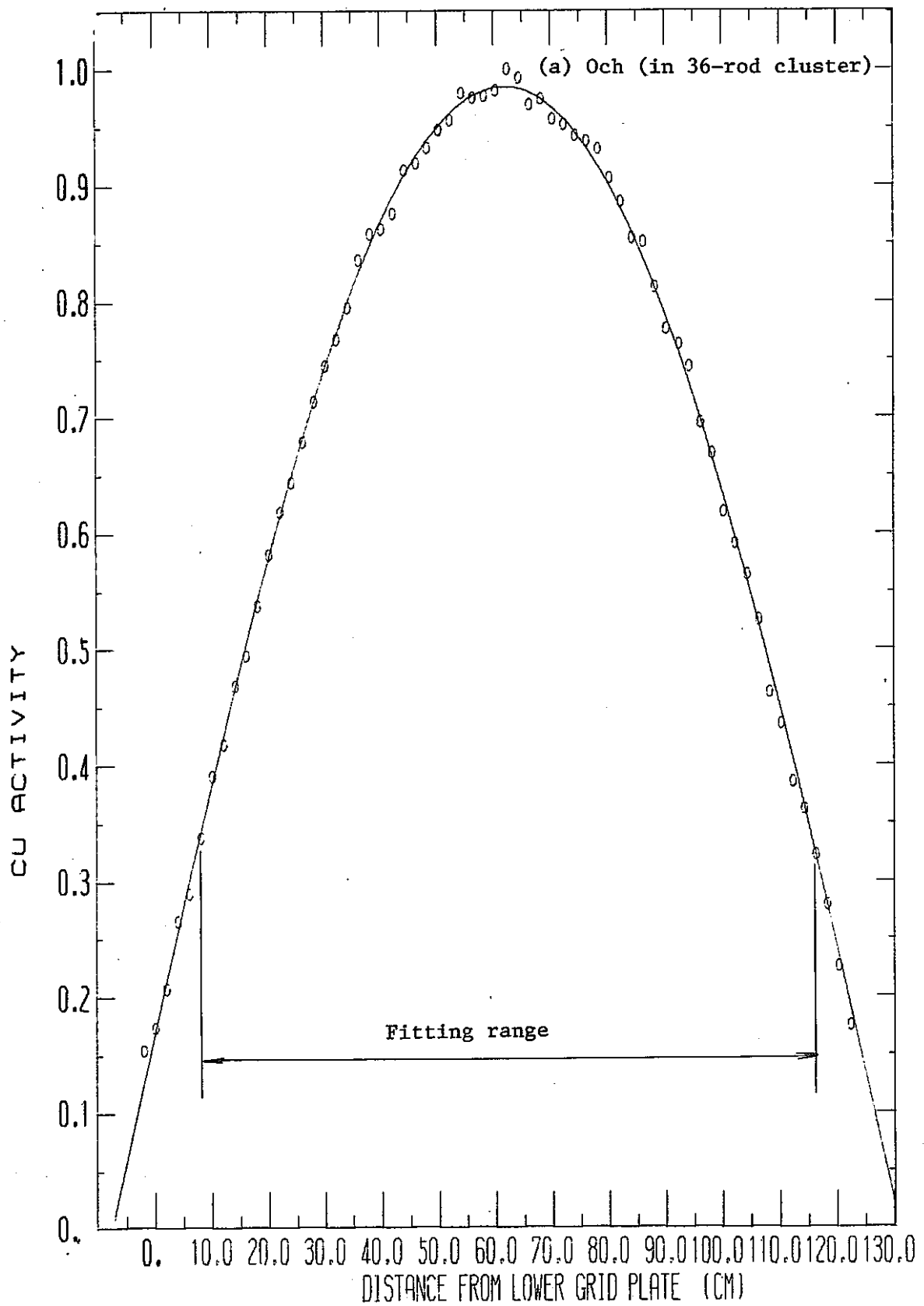
(1)-2 Void fraction:100% ¹⁰B content in D₂O:0ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



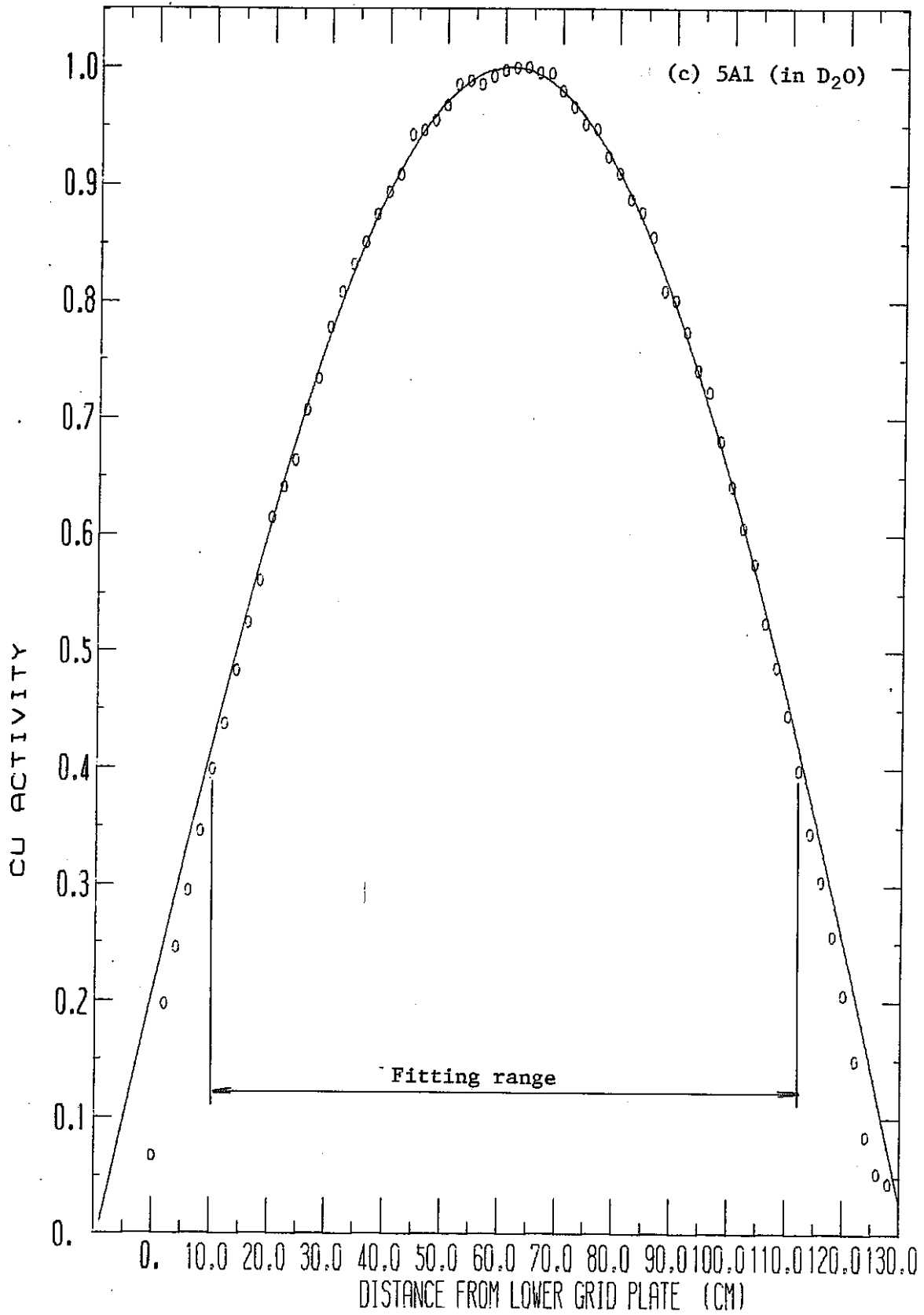
(1)-2 Void fraction: 100% ¹⁰B content in D₂O: 0ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



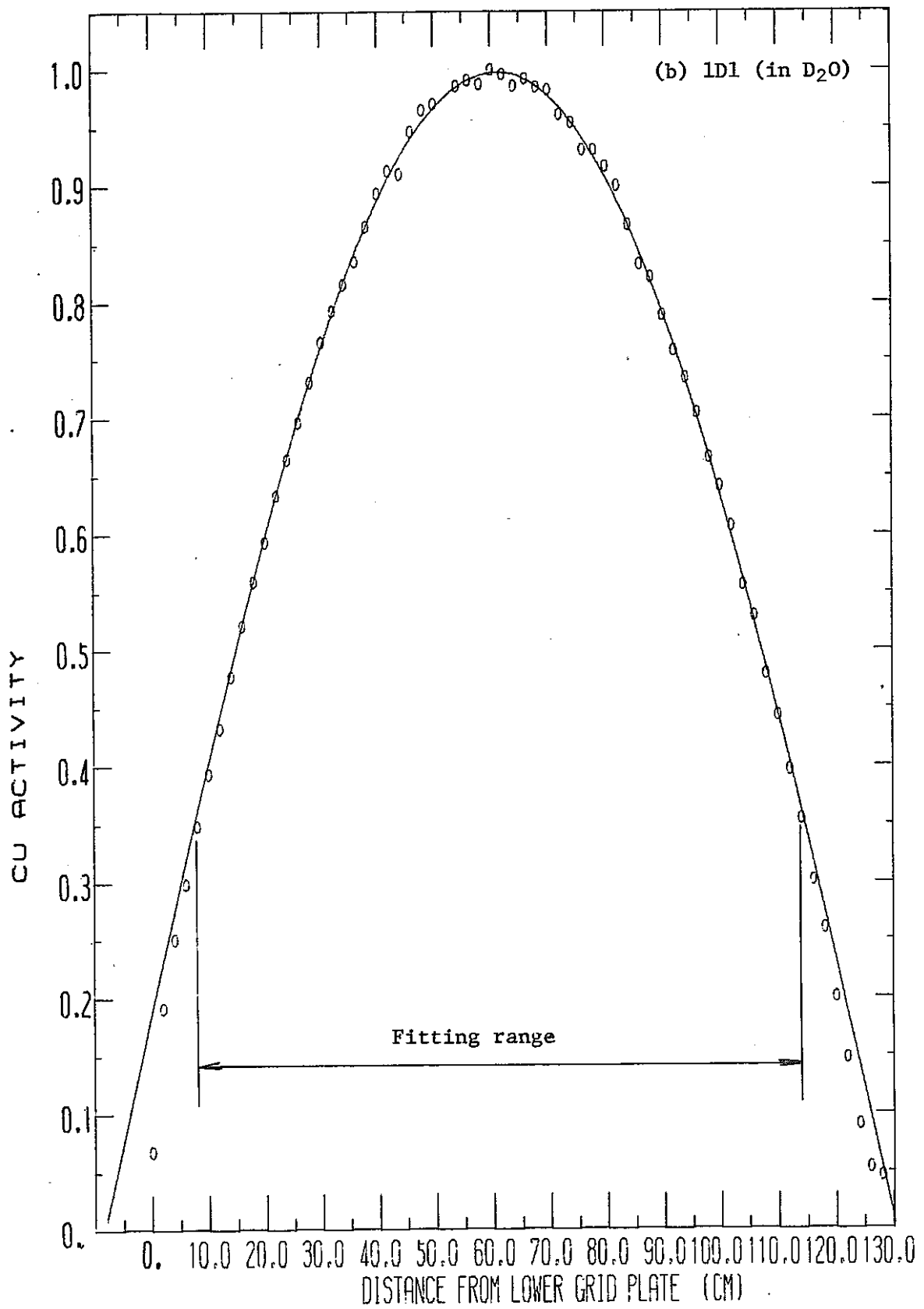
(2)-1 Void fraction: 0% ^{10}B content in D_2O : 3.2ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% $\text{PuO}_2\text{-UO}_2$ clusters.



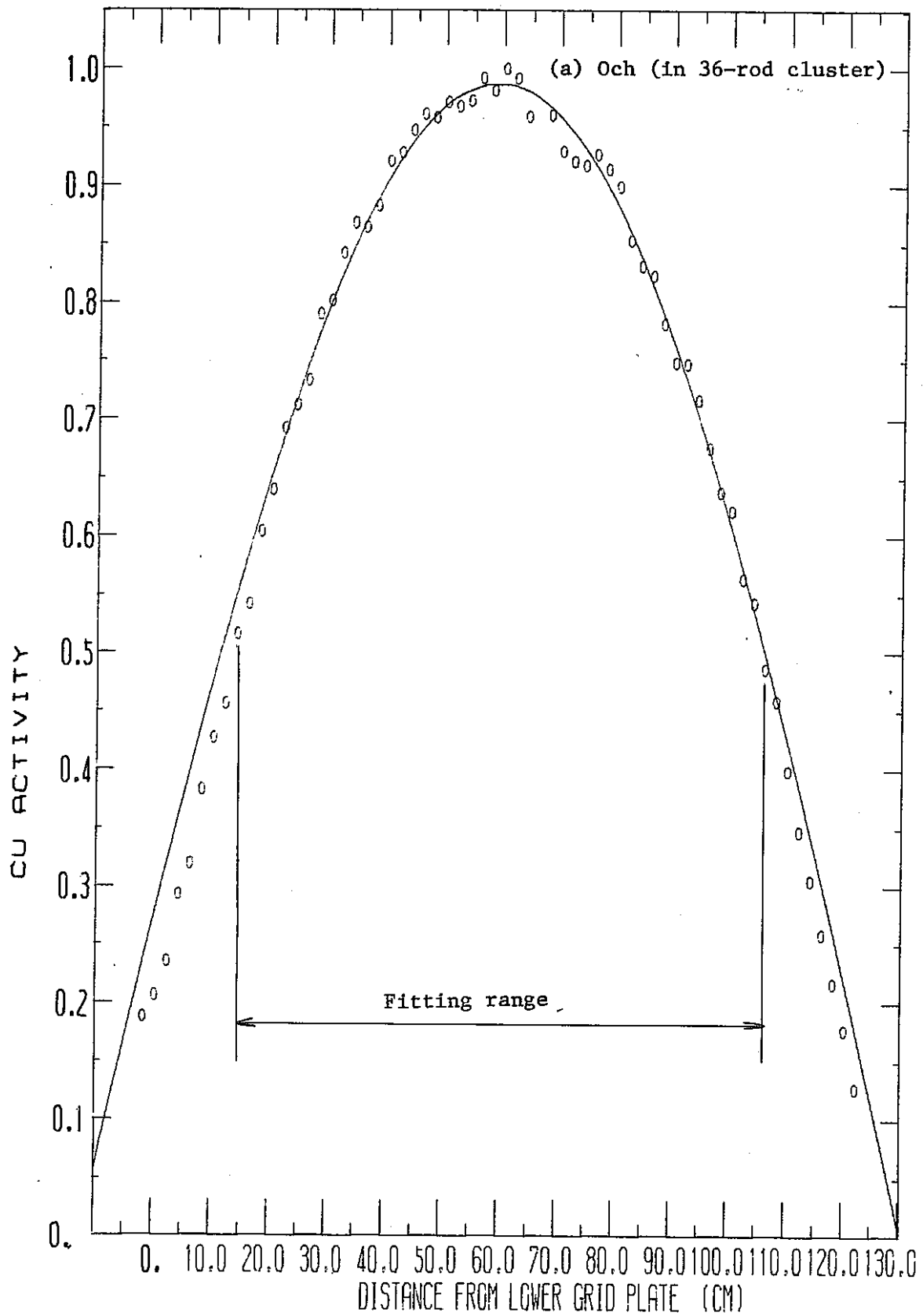
(2)⁻¹ Void fraction: 0% ¹⁰B content in D₂O: 3.2ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



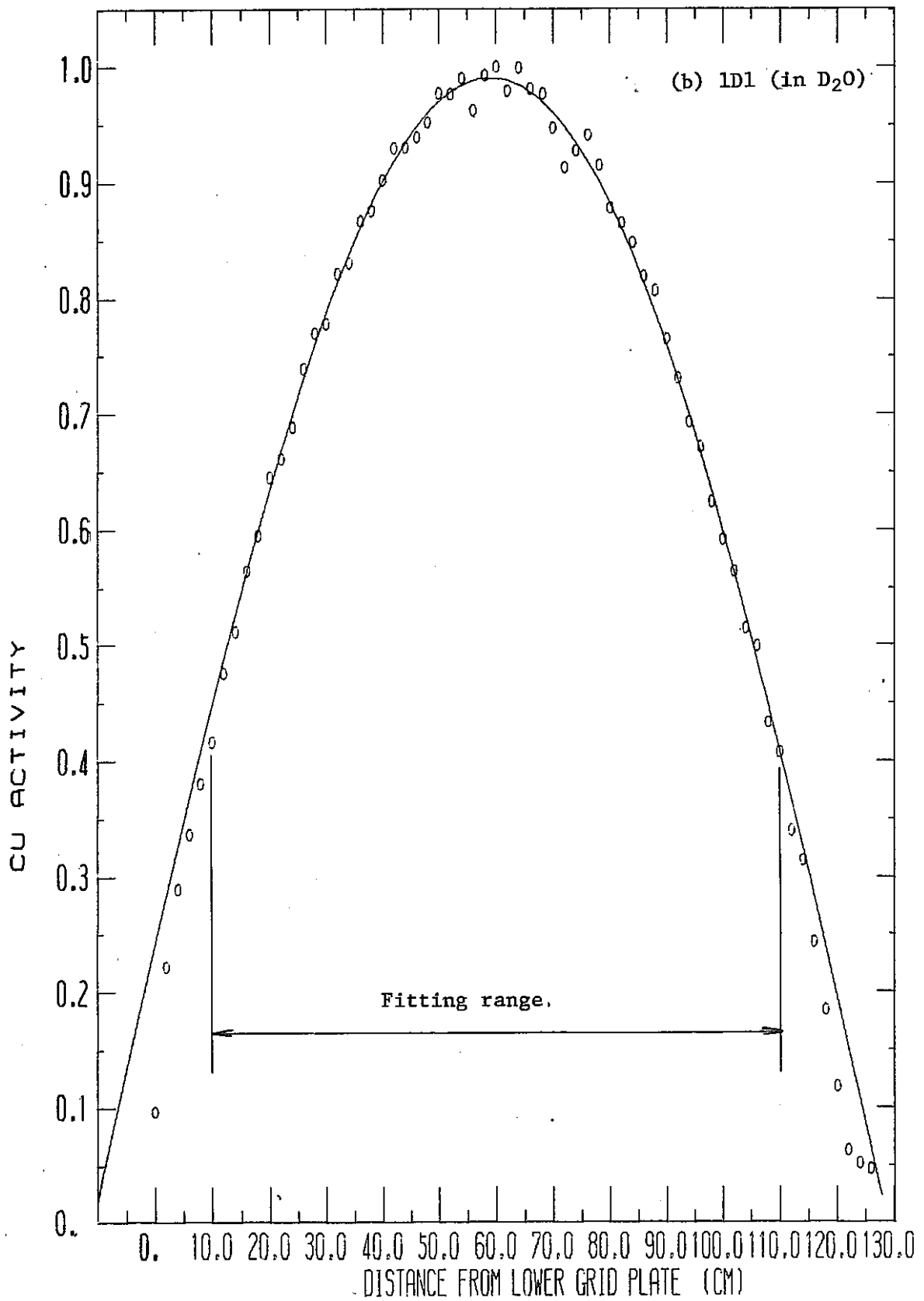
(2)-1 Void fraction: 0% ¹⁰B content in D₂O: 3.2ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



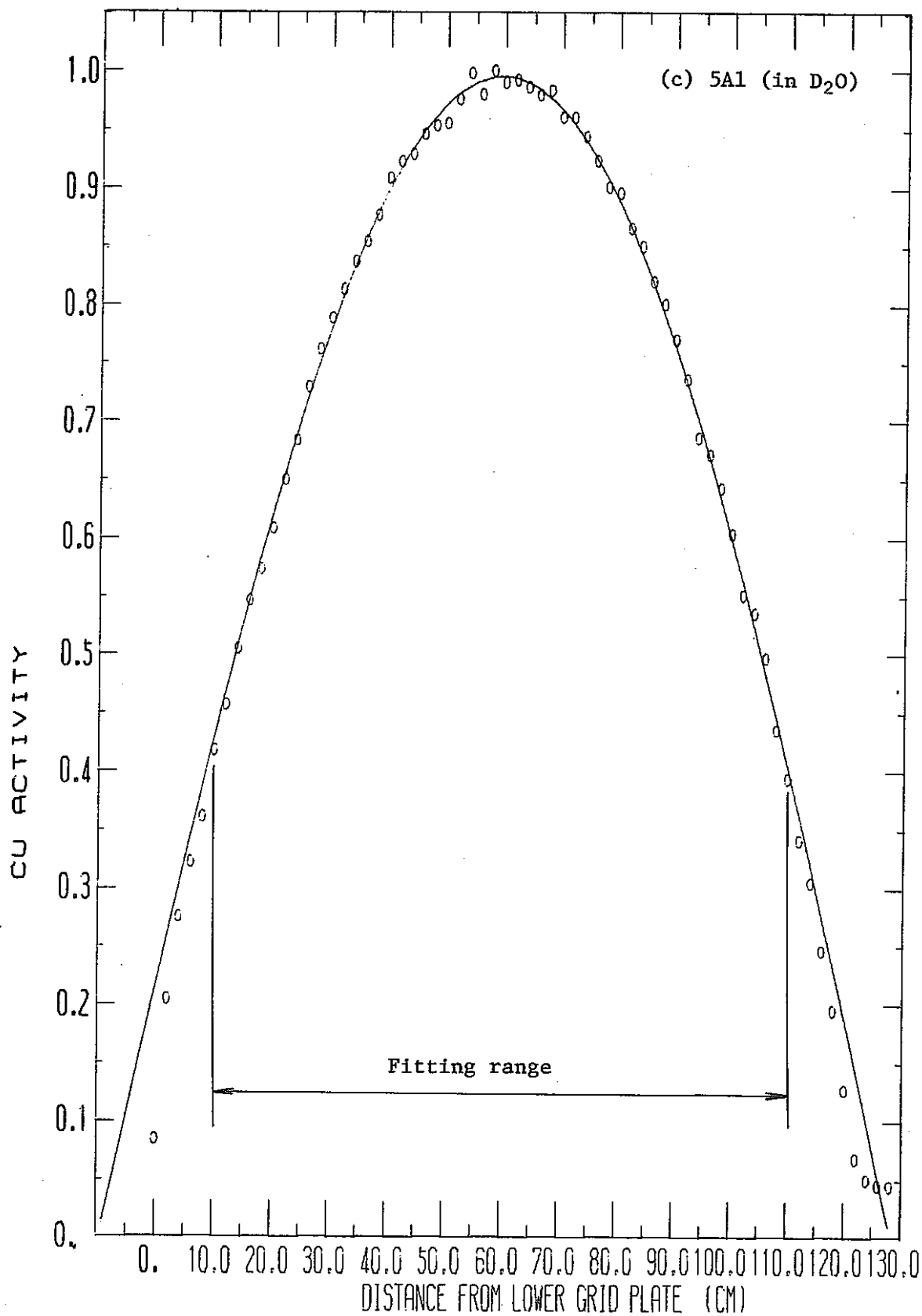
(2)-2 Void fraction: 100% ^{10}B content in D_2O : 3.2ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% $\text{PuO}_2\text{-UO}_2$ clusters.



(2)-2 Void fraction: 100% ¹⁰B content in D₂O: 3.2ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(2)-2 Void fraction: 100% ¹⁰B content in D₂O: 3.2ppm

Fig. 3-4 Axial flux distribution in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

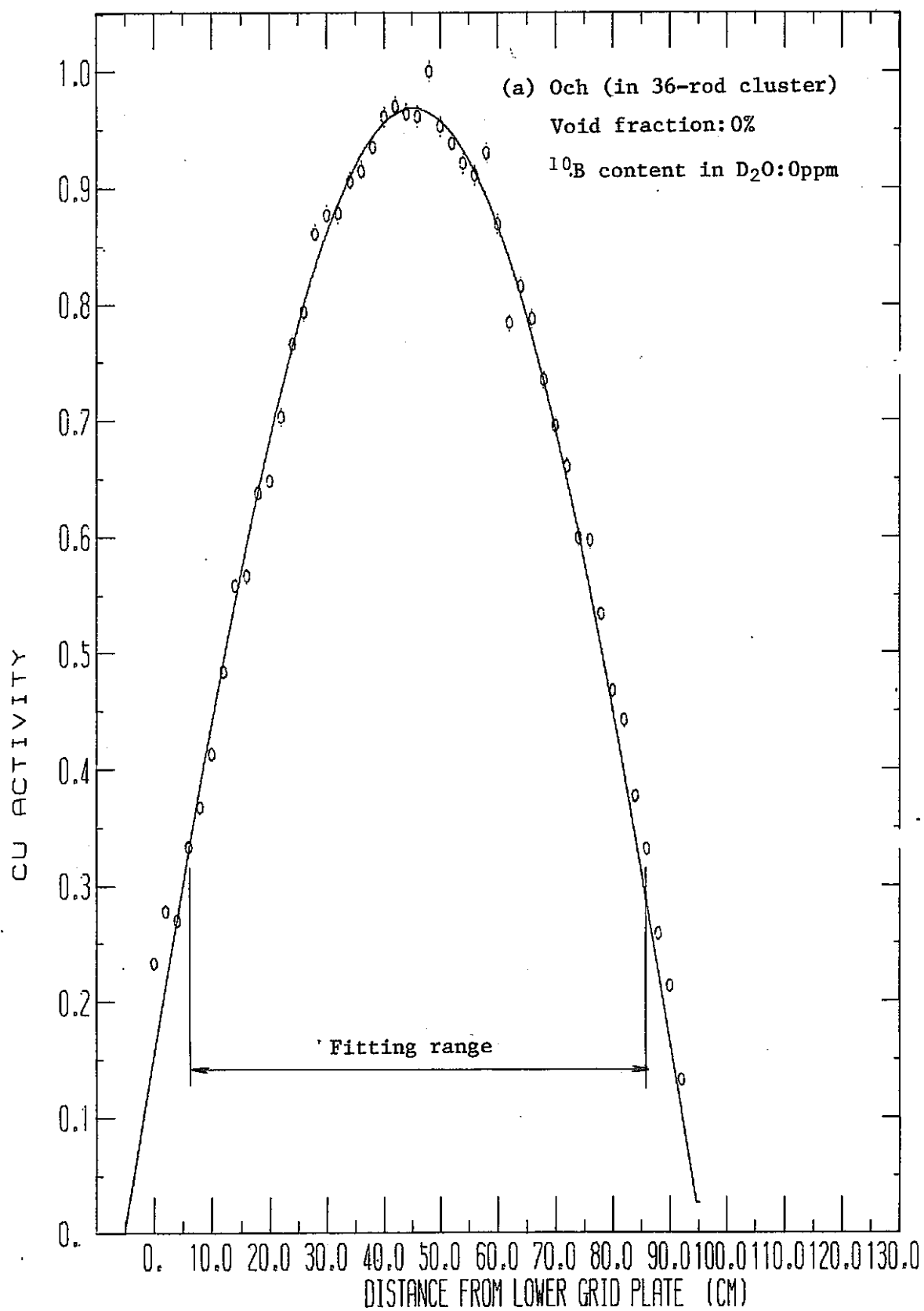


Fig. 3-5 Axial flux distribution in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

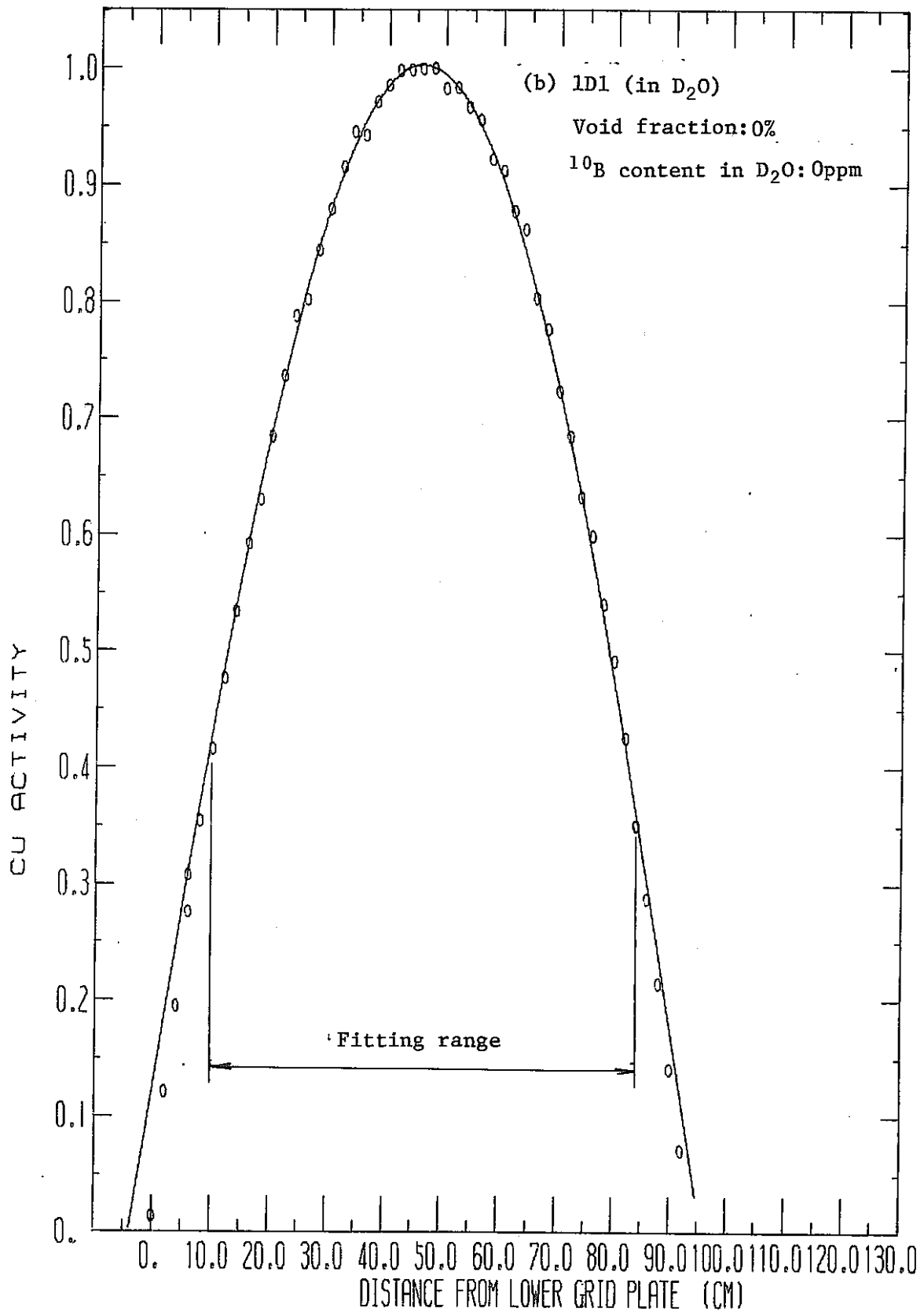


Fig. 3-5 Axial flux distribution in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

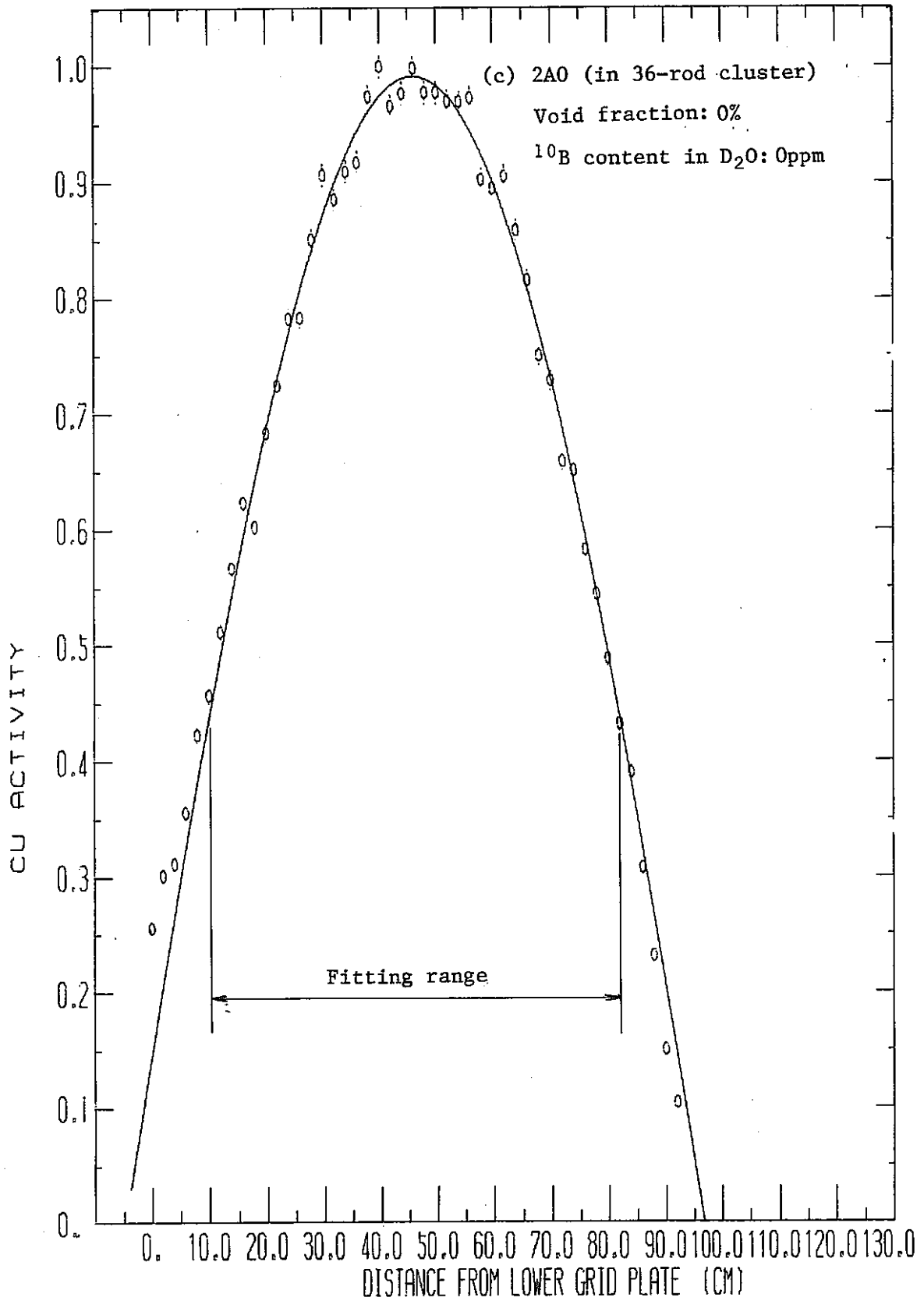


Fig. 3-5 Axial flux distribution in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

4. Measurement of radial flux distribution

- Table 4-1 Result of radial buckling and effective core radius measured in the 28-rod 1.2wt% UO₂ uniform core.
- Table 4-2 Measurement of radial flux distribution by Cu sample in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters (1) ~ (2).
- Table 4-3 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters (1) ~ (4).
- Table 4-4 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters (1) ~ (3).
- Fig. 4-1 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters (1) ~ (2).
- Fig. 4-2 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters (1) ~ (4).
- Fig. 4-3 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters (1) ~ (4).
- Fig. 4-4 Radial flux distribution normalized to the core center in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters (1) ~ (2).
- Fig. 4-5 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters (1) ~ (4).
- Fig. 4-6 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters (1) ~ (3).

Table 4-1 Result of radial buckling and effective core radius measured in the 28-rod 1.2wt% UO₂ uniform core.

(1) Fitting result

Void fraction (%)	Fitting region	Direction to core axis	No. of data	B_r^2 (m ⁻²)	R_{eff} (cm)
0	Center of fuel cluster	0°	11	2.462 ± 0.017	153.2 ± 0.5
		45°	7	2.438 ± 0.020	154.0 ± 0.6
		0°&45°	17	2.452 ± 0.014	153.6 ± 0.4
	Moderator	0°	12	2.449 ± 0.042	153.7 ± 0.1
45°		8	2.429 ± 0.040	154.3 ± 0.1	
100	Center of fuel cluster	0°	11	2.353 ± 0.009	156.8 ± 0.3
		45°	7	2.318 ± 0.026	157.9 ± 0.9
		0°&45°	17	2.342 ± 0.010	157.1 ± 0.3
	Moderator	0°	12	2.274 ± 0.004	159.5 ± 0.1
45°		8	2.290 ± 0.012	158.9 ± 0.4	

(2) Average value

Void fraction (%)	Region	B_r^2 (m ⁻²)	R_{eff} (cm)
0	Fuel Moderator	2.451 ± 0.013	153.6 ± 0.4
		2.439 ± 0.010	154.0 ± 0.3
	Homoginized core	2.445 ± 0.010	153.8 ± 0.3
100	Fuel Moderator	2.343 ± 0.025	157.1 ± 0.8
		2.278 ± 0.012	159.3 ± 0.4
	Homoginized core	2.310 ± 0.020	158.2 ± 0.7

Table 4-2 Measurement of radial flux distribution by Cu sample in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters

(1) Void fraction: 0%

¹⁰B content in D₂O: 0 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per 40 sec)	Counts after time & weight correction C(per 40 sec)	Normalized value (Core center=1.0)
RCO (908.2)	1	981.6	5379	21.5	0.244
	2	1017.8	5383	22.2	
	3	1054.0	5078	21.6	
	4	1090.2	5135	22.6	
8CO (889.1)	1	982.5	10687	43.7	0.491
	2	1018.7	10499	44.4	
	3	1054.9	10317	45.0	
	4	1091.1	9805	44.2	
6CO (907.9)	1	983.4	15803	63.4	0.704
	2	1019.6	15223	63.1	
	3	1055.8	14888	63.8	
	4	1092.0	14403	63.7	
4CO (908.8)	1	984.3	19254	77.3	0.856
	2	1020.5	18535	76.9	
	3	1056.7	17948	76.9	
	4	1092.9	17624	78.0	
2CO (823.5)	1	985.2	19924	88.3	0.990
	2	1021.4	19477	89.2	
	3	1057.6	18959	89.7	
	4	1093.8	18405	90.0	
0 (909.3)	1	986.1	22622	90.9	1.000
	2	1022.3	21531	89.4	
	3	1058.5	20944	89.8	
	4	1094.7	20486	90.8	
2A0 (830.2)	1	987.0	19998	88.1	0.990
	2	1023.2	19696	89.6	
	3	1059.4	19237	90.4	
	4	1095.6	18380	89.3	
4A0 (833.7)	1	987.9	17955	78.8	0.882
	2	1024.1	17623	79.9	
	3	1060.3	17112	80.2	
	4	1096.5	16461	79.7	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per 40 sec)	Counts after time & weight correction C(per 40 sec)	Normalized value (Core center=1.0)
6A0 (912.2)	1	988.8	15859	63.6	0.705
	2	1025.0	15351	63.6	
	3	1061.2	14914	63.9	
	4	1097.4	14310	63.3	
8A0 (904.6)	1	989.7	10891	44.1	0.491
	2	1025.9	10754	45.0	
	3	1062.1	10158	43.9	
	4	1098.3	9906	44.2	
RA0 (911.7)	1	990.6	5487	22.0	0.246
	2	1026.8	5487	22.7	
	3	1063.0	5119	21.9	
	4	1099.2	5011	22.2	
6B6 (916.6)	1	991.5	9694	38.6	0.424
	2	1027.7	9254	38.3	
	3	1063.9	9037	38.6	
	4	1100.1	8563	37.8	
4B4 (908.1)	1	992.4	16604	67.2	0.740
	2	1028.6	15876	66.3	
	3	1064.8	15393	66.5	
	4	1101.0	15067	67.2	
2B2 (903.3)	1	993.3	20610	83.9	0.933
	2	1029.5	20076	84.4	
	3	1065.7	19303	83.9	
	4	1101.9	18810	84.5	
2D2 (863.8)	1	994.2	19692	83.9	0.938
	2	1030.4	19288	84.9	
	3	1066.6	18730	85.2	
	4	1102.8	18025	84.7	
4D4 (915.4)	1	995.1	16289	65.5	0.728
	2	1031.3	15747	65.4	
	3	1067.5	15379	66.0	
	4	1103.7	14857	65.9	
6D6 (912.7)	1	996.0	9470	38.2	0.423
	2	1032.2	9132	38.0	
	3	1068.4	9021	38.8	
	4	1104.6	8483	37.7	
OBS (920.2)	1	996.9	11441	45.8	0.516
	2	1033.1	11222	46.4	
	3	1069.3	10908	46.6	
	4	1105.5	10716	47.3	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per40sec)	Counts after time & weight correction C (per40sec)	Normalized value (Core center=1.0)
OB9 (919.3)	1	997.8	30344	122.0	1.345
	2	1034.1	29103	120.9	
	3	1070.2	28319	121.5	
	4	1106.4	27338	121.2	
OB7 (906.0)	1	998.8	46728	191.0	2.134
	2	1035.0	45898	193.8	
	3	1071.1	44478	194.0	
	4	1107.3	42537	191.7	
OB5 (911.0)	1	999.7	63945	260.4	2.893
	2	1035.9	61824	260.1	
	3	1072.0	60237	261.8	
	4	1108.2	58394	262.2	
OB3 (830.6)	1	1000.6	68209	304.9	3.377
	2	1036.8	65798	303.9	
	3	1073.0	63954	305.2	
	4	1109.1	61868	304.9	
OB1 (918.5)	1	1001.5	81490	330.0	3.662
	2	1037.7	79077	330.8	
	3	1073.9	76466	330.4	
	4	1110.0	74125	330.9	
OD1 (908.9)	1	1002.4	80441	329.4	3.648
	2	1038.6	77583	328.2	
	3	1074.8	75373	329.4	
	4	1110.9	73021	329.6	
OD3 (850.7)	1	1003.3	70608	309.0	3.442
	2	1039.5	68990	311.9	
	3	1075.7	66680	311.5	
	4	1111.8	64294	310.2	
OD5 (913.3)	1	1004.2	63433	258.7	2.868
	2	1040.4	61258	258.1	
	3	1076.6	59576	259.3	
	4	1112.8	57663	259.3	
OD7 (899.0)	1	1005.1	47716	197.7	2.193
	2	1041.3	46308	198.2	
	3	1077.5	44861	198.4	
	4	1113.7	43245	197.5	
OD9 (908.5)	1	1006.0	29810	122.2	1.354
	2	1042.2	28932	122.5	
	3	1078.4	27839	121.8	
	4	1114.6	27096	122.4	
ODS (913.9)	1	1006.9	11134	45.3	0.503
	2	1043.1	10762	45.2	
	3	1079.3	10504	45.6	
	4	1115.5	10120	45.4	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per40sec)	Counts after time & weight correction C (per40sec)	Normalized value (Core center=1.0)
7A7 (906.6)	1	1007.8	23701	97.4	1.084
	2	1044.0	22994	97.7	
	3	1080.2	22228	97.5	
	4	1116.4	21740	98.6	
5A5 (913.7)	1	1008.7	52607	215.2	2.394
	2	1044.9	51543	217.8	
	3	1081.1	49091	214.3	
	4	1117.3	48084	216.9	
3D1 (899.3)	1	1009.6	80518	335.4	3.707
	2	1045.8	78027	335.8	
	3	1082.0	75045	333.6	
	4	1118.2	72588	333.4	
1A1 (918.6)	1	1010.5	88325	360.6	4.008
	2	1046.7	86086	363.1	
	3	1082.9	82961	361.5	
	4	1119.1	80340	361.7	
1C1 (912.7)	1	1011.4	87436	359.6	3.996
	2	1047.6	84617	359.5	
	3	1083.8	82348	361.4	
	4	1120.0	79791	361.8	
5C1 (913.4)	1	1012.3	69146	284.1	3.156
	2	1048.5	66933	284.1	
	3	1084.7	65102	285.5	
	4	1120.9	62979	285.3	
5C5 (911.7)	1	1013.2	51866	213.5	2.371
	2	1049.4	50201	213.5	
	3	1085.6	48856	214.6	
	4	1121.8	47275	214.6	
7C7 (906.2)	1	1014.1	23564	97.5	1.082
	2	1050.3	23091	98.7	
	3	1086.5	21952	96.9	
	4	1122.7	21343	97.4	
B.G (—)	1	1015.0	16		
	2	1051.2	22		
	3	1087.4	19		
	4	1123.6	20		

Fig. 4-2 Measurement of radial flux distribution by Cu sample in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters

(2) Void fraction: 100%

¹⁰B content in D₂O: 0 ppm

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RCO (911.7)	1	312.5	5038	22.0	0.267
	2	362.6	4844	22.1	
	3	386.1	4630	21.6	
	4	409.6	4591	21.8	
8CO (911.7)	1	313.1	9439	41.1	0.505
	2	363.2	9147	41.6	
	3	386.7	8966	41.7	
	4	410.2	8635	41.0	
6CO (920.3)	1	313.7	13067	56.6	0.702
	2	363.8	12735	57.7	
	3	387.3	12447	57.6	
	4	410.7	12257	57.9	
4CO (911.7)	1	314.2	16006	70.0	0.860
	2	364.3	15567	71.2	
	3	387.8	15129	70.7	
	4	411.3	14571	69.6	
2CO (908.3)	1	314.8	17752	78.0	0.957
	2	364.9	17231	79.2	
	3	388.4	16826	79.0	
	4	411.9	16109	77.3	
0 (921.7)	1	315.4	18743	81.2	1.000
	2	365.5	18120	82.1	
	3	389.0	17717	82.0	
	4	412.4	17358	82.1	
2A0 (916.5)	1	315.9	17965	78.3	0.952
	2	366.1	17040	77.7	
	3	389.5	16848	78.5	
	4	413.0	16204	77.1	
4A0 (830.3)	1	316.5	14609	70.3	0.863
	2	366.6	14034	70.7	
	3	390.1	13759	70.7	
	4	413.6	13503	70.9	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
6A0 (898.7)	1	317.1	12924	57.5	0.706
	2	367.2	12294	57.2	
	3	390.7	12136	57.7	
	4	414.2	12118	58.8	
8A0 (914.9)	1	317.6	9333	40.8	0.496
	2	367.8	8746	40.0	
	3	391.2	8641	40.3	
	4	414.7	8691	41.4	
RA0 (908.0)	1	318.2	5083	22.4	0.275
	2	368.3	5009	23.0	
	3	391.8	4762	22.4	
	4	415.3	4667	22.4	
6B6 (912.3)	1	318.8	8039	35.2	0.432
	2	368.9	7535	34.6	
	3	392.4	7521	35.2	
	4	415.9	7589	36.3	
4B4 (909.1)	1	319.4	13623	60.0	0.726
	2	369.5	12864	59.3	
	3	393.0	12521	58.9	
	4	416.4	12393	59.6	
2B2 (910.3)	1	319.9	16972	74.7	0.913
	2	370.0	16119	74.3	
	3	393.5	15907	74.9	
	4	417.0	15641	75.2	
2D2 (911.7)	1	320.5	16786	73.9	0.905
	2	370.6	16234	74.7	
	3	394.1	15624	73.5	
	4	417.6	15460	74.2	
4D4 (915.1)	1	321.1	13514	59.2	0.739
	2	371.2	13382	61.4	
	3	394.7	13013	61.0	
	4	418.1	12619	60.4	
6D6 (856.6)	1	321.6	7871	36.8	0.444
	2	371.7	7429	36.4	
	3	395.2	7259	36.3	
	4	418.7	7020	35.9	
OBS (819.6)	1	322.2	7851	38.4	0.471
	2	372.3	7499	38.4	
	3	395.8	7378	38.6	
	4	419.3	7256	38.8	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
OB9 (901.8)	1	322.8	18286	81.5	1.005
	2	372.9	17677	82.4	
	3	396.4	17211	82.0	
	4	419.9	17129	83.3	
OB7 (919.2)	1	323.3	29051	127.3	1.557
	2	373.5	27809	127.5	
	3	396.9	27048	126.6	
	4	420.4	26932	128.8	
OB5 (913.4)	1	323.9	38161	168.5	2.050
	2	374.0	36405	168.2	
	3	397.5	35369	166.9	
	4	421.0	34822	167.8	
OB3 (929.8)	1	324.5	45244	196.5	2.395
	2	374.6	43171	196.2	
	3	398.1	42352	196.5	
	4	421.6	41208	195.3	
OB1 (909.0)	1	325.0	48097	213.9	2.603
	2	375.2	45539	211.8	
	3	398.6	44728	212.5	
	4	422.1	44164	214.3	
OD1 (909.4)	1	325.6	46911	208.6	2.553
	2	375.7	44844	208.6	
	3	399.2	44106	209.5	
	4	422.7	43115	209.2	
OD3 (908.0)	1	326.2	43897	195.5	2.407
	2	376.3	42410	197.6	
	3	399.8	41513	197.6	
	4	423.3	40665	197.7	
OD5 (909.1)	1	326.8	37564	167.1	2.047
	2	376.9	36075	167.9	
	3	400.4	35117	166.9	
	4	423.8	34717	168.5	
OD7 (869.7)	1	327.3	27974	130.0	1.583
	2	377.4	26485	128.7	
	3	400.9	26297	130.6	
	4	424.4	25495	129.3	
OD9 (911.1)	1	327.9	18361	81.4	1.005
	2	378.0	17849	82.8	
	3	401.5	17487	82.8	
	4	425.0	16965	82.1	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown. (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
ODS (905.2)	1	328.5	8825	39.3	0.476
	2	378.6	8296	38.7	
	3	402.1	8166	38.9	
	4	425.5	8002	38.9	
7A7 (920.7)	1	329.0	17734	77.9	0.953
	2	379.2	17134	78.7	
	3	402.6	16436	77.1	
	4	426.1	16374	78.5	
5A5 (905.0)	1	329.6	33873	151.7	1.855
	2	379.7	32425	151.7	
	3	403.2	31755	151.9	
	4	426.7	31121	152.1	
3D1 (914.4)	1	330.2	52235	232.1	2.834
	2	380.3	49933	232.1	
	3	403.8	49047	232.8	
	4	427.3	47660	231.0	
1A1 (906.7)	1	330.7	55466	248.7	3.040
	2	380.9	52848	247.9	
	3	404.3	52043	249.3	
	4	427.8	51067	249.9	
1C1 (830.6)	1	331.3	50902	249.2	3.056
	2	381.4	49012	251.0	
	3	404.9	47815	250.1	
	4	428.4	46889	250.5	
5C1 (863.9)	1	331.9	42311	199.1	2.439
	2	382.0	40587	199.8	
	3	405.5	39823	200.2	
	4	429.0	38920	199.8	
5C5 (850.0)	1	332.5	31607	151.1	1.854
	2	382.6	30280	151.4	
	3	406.0	29779	152.0	
	4	429.5	29274	152.7	
7C7 (847.0)	1	333.0	16393	78.5	0.958
	2	383.1	15744	78.9	
	3	406.6	15065	77.1	
	4	430.1	15145	79.2	
B.G (—)	1	333.6	7		
	2	383.7	10		
	3	407.2	5		
	4	430.7	7		

Table 4-3 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters

(1) Void fraction: 0%

¹⁰B content in D₂O: 0 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RCO (908.2)	1	340.3	7465	33.5	0.179
	2	363.8	7476	34.3	
	3	387.3	7224	33.8	
	4	410.8	7103	34.0	
8CO (889.1)	1	340.9	15173	69.7	0.371
	2	364.4	14757	69.2	
	3	387.9	14746	70.7	
	4	411.4	14425	70.6	
6CO (907.9)	1	341.5	23154	104.3	0.558
	2	365.0	22776	104.8	
	3	388.4	22650	106.5	
	4	411.9	22047	105.9	
4CO (908.8)	1	342.1	31849	143.6	0.764
	2	365.5	31372	144.5	
	3	389.0	30574	143.8	
	4	412.5	30361	145.9	
2CO (823.5)	1	342.6	32583	162.2	0.862
	2	366.1	31986	162.6	
	3	389.6	31660	164.4	
	4	413.1	30660	162.6	
0 (909.3)	1	343.2	41647	188.1	1.000
	2	366.7	40955	188.9	
	3	390.2	40087	188.9	
	4	413.6	39559	190.3	
2A0 (830.2)	1	343.8	32266	159.5	0.853
	2	367.2	31718	160.1	
	3	390.7	31516	162.5	
	4	414.2	30919	162.9	
4A0 (833.7)	1	344.3	29008	142.8	0.766
	2	367.8	28630	144.0	
	3	391.3	28290	145.3	
	4	414.8	27981	146.8	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
6A0 (912.2)	1	344.9	22829	102.7	0.549
	2	368.4	22456	103.2	
	3	391.9	22361	105.0	
	4	415.4	21701	104.0	
8A0 (904.6)	1	345.5	14792	67.1	0.361
	2	369.0	14887	68.9	
	3	392.4	14406	68.1	
	4	415.9	14267	68.9	
RA0 (911.7)	1	346.0	7755	34.9	0.183
	2	369.5	7504	34.5	
	3	393.0	7480	35.1	
	4	416.5	7152	34.3	
6B6 (916.6)	1	346.6	13393	60.0	0.317
	2	370.1	13153	60.2	
	3	393.6	12801	59.8	
	4	417.1	12570	60.0	
4B4 (908.1)	1	347.2	23331	105.7	0.563
	2	370.7	23021	106.5	
	3	394.1	22544	106.5	
	4	417.6	22146	106.9	
2B2 (903.3)	1	347.7	33081	150.8	0.796
	2	371.2	32022	149.1	
	3	394.7	31792	151.2	
	4	418.2	31011	150.7	
2D2 (863.8)	1	348.3	31185	148.8	0.789
	2	371.8	30646	149.3	
	3	395.3	29896	148.8	
	4	418.8	29504	150.0	
4D4 (915.4)	1	348.9	24361	109.6	0.581
	2	372.4	23949	110.1	
	3	395.9	23392	109.8	
	4	419.3	22988	110.2	
6D6 (912.7)	1	349.5	13080	59.0	0.314
	2	372.9	12880	59.4	
	3	396.4	12520	58.9	
	4	419.9	12568	60.4	
OBS (920.2)	1	350.0	15740	70.5	0.370
	2	373.5	15291	69.9	
	3	397.0	15009	70.1	
	4	420.5	14543	69.4	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
OB9 (919.3)	1	350.6	40856	183.7	0.984
	2	374.1	40397	185.5	
	3	397.6	39823	186.8	
	4	421.1	39151	187.6	
OB7 (906.0)	1	351.2	66890	306.1	1.626
	2	374.6	65594	306.6	
	3	398.1	64304	307.0	
	4	421.6	63497	310.0	
OB5 (911.0)	1	351.7	97444	445.1	2.366
	2	375.2	95681	446.4	
	3	398.7	94102	448.3	
	4	422.2	92279	449.0	
OB3 (830.6)	1	352.3	105254	528.1	2.801
	2	375.8	102929	527.3	
	3	399.3	101150	529.2	
	4	422.8	99685	532.7	
OB1 (918.5)	1	352.9	125550	571.1	3.039
	2	376.4	123717	574.7	
	3	399.8	121330	575.5	
	4	423.3	118996	576.4	
OD1 (908.9)	1	343.4	120519	554.0	2.943
	2	376.9	118515	556.3	
	3	400.4	116242	557.2	
	4	423.9	113905	557.6	
OD3 (850.7)	1	354.0	110354	541.7	2.882
	2	377.5	108847	545.6	
	3	401.5	106188	543.6	
	4	424.5	104784	547.8	
OD5 (913.3)	1	354.6	96219	439.5	2.335
	2	378.1	95183	444.1	
	3	401.5	92457	440.4	
	4	425.0	90741	441.4	
OD7 (899.0)	1	355.1	66655	308.5	1.640
	2	378.6	65938	311.7	
	3	402.1	63949	308.7	
	4	425.6	63096	311.1	
OD9 (908.5)	1	355.7	40789	186.4	0.987
	2	379.2	40098	187.2	
	3	402.7	39160	186.7	
	4	426.2	38261	186.3	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
ODS (913.9)	1	356.3	15382	69.7	0.368
	2	379.8	14841	68.7	
	3	403.3	14676	69.4	
	4	426.7	14548	70.3	
7A7 (906.6)	1	356.9	32198	147.5	0.782
	2	380.3	31580	147.7	
	3	403.8	31045	148.3	
	4	427.3	30216	147.5	
5A5 (913.7)	1	357.4	75070	342.9	1.821
	2	380.9	73955	345.0	
	3	404.4	72436	345.1	
	4	427.9	70571	343.4	
3D1 (899.3)	1	358.0	124002	578.7	3.074
	2	381.5	121639	579.7	
	3	405.0	119668	582.4	
	4	428.5	117264	582.8	
1A1 (918.6)	1	358.6	140138	641.6	3.412
	2	382.1	138376	647.0	
	3	405.5	135164	645.3	
	4	429.0	132470	645.8	
1C1 (912.7)	1	359.1	138326	637.6	3.365
	2	382.6	134606	633.5	
	3	406.1	132111	634.9	
	4	429.6	129948	637.8	
5C1 (913.4)	1	359.7	105960	486.7	2.578
	2	383.2	104229	488.9	
	3	406.7	101534	486.3	
	4	430.2	99583	487.1	
5C5 (911.7)	1	360.3	74170	340.4	1.808
	2	383.8	73069	342.5	
	3	407.2	71640	342.9	
	4	430.7	69858	341.5	
7C7 (906.2)	1	360.8	32626	150.1	0.792
	2	384.3	31697	148.9	
	3	407.8	31250	149.9	
	4	431.3	30612	150.0	
B.G (—)	1	361.4	12		
	2	384.9	16		
	3	408.4	14		
	4	431.9	18		

Table 4-3 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters

(2) Void fraction: 100%

¹⁰B content in D₂O: 0 ppm

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RCO (911.7)	1	396.1	7063	33.2	0.404
	2	419.5	6707	32.2	
	3	443.0	6733	33.0	
	4	466.4	6625	33.2	
8CO (914.5)	1	396.7	13078	61.4	0.755
	2	420.1	12772	61.3	
	3	443.6	12675	62.1	
	4	467.0	12233	61.2	
6CO (920.3)	1	397.2	18455	86.2	1.078
	2	420.7	18334	87.5	
	3	444.1	18101	88.2	
	4	467.6	17904	89.1	
4CO (911.7)	1	397.8	22417	105.8	1.306
	2	421.2	21812	105.2	
	3	444.7	21691	106.8	
	4	468.1	21363	107.5	
2CO (908.3)	1	398.4	16021	75.9	0.949
	2	421.8	16027	77.5	
	3	445.3	15601	77.1	
	4	468.7	15534	78.4	
0 (921.7)	1	398.9	17206	80.4	1.000
	2	422.4	17161	81.9	
	3	445.8	16737	81.6	
	4	469.3	16436	81.8	
2A0 (916.5)	1	399.5	16382	77.0	0.939
	2	423.0	15784	75.8	
	3	446.4	15565	76.3	
	4	469.8	15339	76.8	
4A0 (830.3)	1	400.1	20379	105.8	1.308
	2	423.5	20104	106.6	
	3	447.0	19763	107.1	
	4	470.4	19268	106.6	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
6A0 (898.7)	1	400.6	17726	85.1	1.044
	2	424.1	17323	84.9	
	3	447.5	16969	84.9	
	4	471.0	16640	85.1	
8A0 (914.9)	1	401.2	12915	60.9	0.744
	2	424.7	12523	60.3	
	3	448.1	12251	60.2	
	4	471.5	12150	61.0	
RA0 (908.0)	1	401.8	7027	33.3	0.410
	2	425.2	6799	33.0	
	3	448.7	6762	33.5	
	4	472.1	6677	33.8	
6B6 (912.3)	1	402.4	11495	54.4	0.667
	2	425.8	11247	54.3	
	3	449.2	10915	53.9	
	4	472.7	10813	54.5	
4B4 (909.1)	1	402.9	18991	90.3	1.111
	2	426.4	18522	89.9	
	3	449.8	18222	90.4	
	4	473.2	17994	91.1	
2B2 (910.3)	1	403.5	16096	76.4	0.941
	2	426.9	15748	76.4	
	3	450.4	15397	76.3	
	4	473.8	15281	77.3	
2D2 (911.7)	1	404.1	15314	72.6	0.899
	2	427.5	15036	72.8	
	3	450.9	14975	74.1	
	4	474.4	14449	73.0	
4D4 (915.1)	1	404.6	18881	89.3	1.114
	2	428.1	18873	91.2	
	3	451.5	18502	91.3	
	4	474.9	18027	90.8	
6D6 (856.6)	1	405.2	10877	54.9	0.677
	2	428.6	10673	55.0	
	3	452.1	10301	54.3	
	4	475.5	10419	56.1	
OBS (819.6)	1	405.8	10954	57.8	0.223
	2	429.2	10514	56.7	
	3	452.6	10500	57.8	
	4	476.1	10159	57.2	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
OB9 (901.8)	1	406.3	25391	122.2	1.505
	2	429.8	24847	122.1	
	3	453.2	24364	122.3	
	4	476.7	24106	123.6	
OB7 (919.2)	1	406.9	40686	192.5	2.365
	2	430.3	39625	191.4	
	3	453.8	39114	193.0	
	4	477.2	38331	193.2	
OB5 (913.4)	1	407.5	53405	254.7	3.134
	2	430.9	52346	255.0	
	3	454.3	51257	255.0	
	4	477.8	50332	255.7	
OB3 (929.8)	1	408.0	52216	244.7	3.009
	2	431.5	51290	245.5	
	3	454.9	49940	244.1	
	4	478.4	49205	245.7	
OB1 (909.0)	1	408.6	53215	255.3	3.131
	2	432.0	52005	254.8	
	3	455.5	51020	255.3	
	4	478.9	49775	254.3	
OD1 (909.4)	1	409.2	52704	252.9	3.131
	2	432.6	52175	255.7	
	3	456.1	51231	256.4	
	4	479.5	49815	254.6	
OD3 (908.0)	1	409.7	59045	284.0	3.487
	2	433.2	57881	284.4	
	3	456.6	56625	284.1	
	4	480.1	55223	283.0	
OD5 (909.1)	1	410.3	54852	263.6	3.245
	2	433.8	53863	264.3	
	3	457.2	52847	264.9	
	4	480.6	51601	264.1	
OD7 (869.7)	1	410.9	39078	196.1	2.424
	2	434.3	38278	196.1	
	3	457.8	38124	199.5	
	4	481.2	36925	197.4	
OD9 (911.1)	1	411.4	25748	123.2	1.522
	2	434.9	25592	125.1	
	3	458.3	24839	124.0	
	4	481.8	24217	123.4	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
ODS (905.2)	1	412.0	12402	59.6	0.729
	2	435.5	12078	59.3	
	3	458.9	11789	59.1	
	4	482.3	11550	59.2	
7A7 (920.7)	1	412.6	24737	117.2	1.442
	2	436.0	24092	116.6	
	3	459.5	23870	118.0	
	4	482.9	23333	117.8	
5A5 (905.0)	1	413.2	47150	228.0	2.804
	2	436.6	45895	226.6	
	3	460.0	45477	229.4	
	4	483.5	44527	229.4	
3D1 (914.4)	1	413.7	67810	325.4	4.027
	2	437.2	67307	329.9	
	3	460.6	65900	329.8	
	4	484.0	63808	326.1	
1A1 (906.7)	1	414.3	66952	324.1	3.981
	2	437.7	65159	322.1	
	3	461.2	64217	324.2	
	4	484.6	63218	326.0	
1C1 (830.6)	1	414.9	62068	328.0	4.019
	2	438.3	60675	327.5	
	3	461.7	59526	328.1	
	4	485.2	57797	325.3	
5C1 (863.9)	1	415.4	59735	303.6	3.751
	2	438.9	58807	305.3	
	3	462.3	57973	307.3	
	4	485.7	56400	305.3	
5C5 (850.0)	1	416.0	44502	229.6	2.833
	2	439.4	43860	231.1	
	3	462.9	42758	230.1	
	4	486.3	42109	231.5	
7C7 (847.0)	1	416.6	22779	117.7	1.452
	2	440.0	22540	119.0	
	3	463.4	22108	119.2	
	4	486.9	21195	116.7	
B.G (—)	1	417.1	9		
	2	440.6	10		
	3	464.0	9		
	4	487.5	5		

Table 4-3 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters

(3) Void fraction: 0%
¹⁰B content in D₂O: 3.2 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per30sec)	Counts after time & weight correction C (per30sec)	Normalized value (Core center=1.0)
RCO (906.2)	1	333.4	12160	36.3	0.195
	2	363.2	11676	35.8	
	3	507.8	10128	35.3	
	4	537.6	10196	36.5	
8CO (911.7)	1	334.1	25083	74.5	0.407
	2	364.0	24561	74.9	
	3	508.6	21614	75.1	
	4	538.4	21222	75.8	
6CO (914.5)	1	334.9	38397	113.9	0.622
	2	364.7	37585	114.0	
	3	509.3	33417	116.0	
	4	539.1	32240	114.9	
4CO (920.3)	1	335.6	53106	156.8	0.856
	2	365.5	51866	157.3	
	3	510.0	45858	158.4	
	4	539.9	45008	159.7	
2CO (911.7)	1	336.3	55233	164.7	0.904
	2	366.2	54507	167.0	
	3	510.8	47807	166.8	
	4	540.6	47095	168.8	
0 (908.3)	1	337.1	61098	183.1	1.000
	2	366.9	59986	184.7	
	3	511.5	53065	186.0	
	4	541.3	51191	184.3	
2A0 (921.7)	1	337.8	57151	168.9	0.920
	2	367.7	56029	170.1	
	3	512.2	48933	169.1	
	4	542.1	48154	171.0	
4A0 (916.5)	1	338.5	54067	160.7	0.872
	2	368.4	52665	160.8	
	3	513.0	46092	160.3	
	4	542.8	45197	161.4	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per30sec)	Counts after time & weight correction C (per30sec)	Normalized value (Core center=1.0)
6A0 (830.3)	1	339.3	35103	115.1	0.626
	2	369.1	34351	115.7	
	3	513.7	30357	116.5	
	4	543.5	29172	115.0	
8A0 (898.7)	1	340.0	24918	75.5	0.409
	2	369.9	23927	74.4	
	3	514.5	21561	76.4	
	4	544.3	20820	75.8	
RA0 (914.9)	1	340.8	12145	36.1	0.197
	2	370.6	12014	36.7	
	3	517.2	10276	35.7	
	4	545.0	10233	36.6	
6B6 (908.0)	1	341.5	21389	64.2	0.351
	2	371.4	21245	65.5	
	3	515.9	18435	64.7	
	4	545.7	17945	64.7	
4B4 (912.3)	1	342.2	40454	121.1	0.660
	2	372.1	39656	121.9	
	3	516.7	34678	121.5	
	4	546.5	34044	122.5	
2B2 (909.1)	1	343.0	51082	153.7	0.837
	2	372.8	49832	154.0	
	3	517.4	43716	153.8	
	4	547.2	43342	156.7	
2D2 (910.3)	1	343.7	51286	154.2	0.839
	2	373.6	50114	154.8	
	3	518.1	44188	155.4	
	4	548.0	42812	154.7	
4D4 (911.7)	1	344.4	40438	121.4	0.661
	2	374.3	39209	120.9	
	3	518.9	35309	124.0	
	4	548.7	33807	121.9	
6D6 (915.1)	1	345.2	21629	64.6	0.349
	2	375.0	20949	64.3	
	3	519.6	18414	64.4	
	4	549.4	17884	64.2	
OBS (856.6)	1	345.9	22340	71.3	0.377
	2	375.8	21757	71.4	
	3	520.3	19182	71.7	
	4	550.2	18435	70.8	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per30sec)	Counts after time & weight correction C (per30sec)	Normalized value (Core center=1.0)
OB9 (819.6)	1	346.7	58287	195.2	1.035
	2	376.5	57194	196.8	
	3	521.1	49698	194.7	
	4	550.9	48428	194.9	
OB7 (901.8)	1	347.4	104861	320.5	1.697
	2	377.3	102659	322.3	
	3	521.8	90508	323.4	
	4	551.6	87973	322.9	
OB5 (919.2)	1	348.1	155510	468.2	2.485
	2	378.0	152933	472.9	
	3	522.6	135309	476.2	
	4	522.4	132195	477.8	
OB3 (913.4)	1	348.9	185329	563.0	2.969
	2	378.7	179965	561.4	
	3	523.3	159472	566.1	
	4	553.1	155005	565.0	
OB1 (929.8)	1	349.6	205694	615.1	3.259
	2	379.5	201563	619.1	
	3	524.0	177418	619.8	
	4	553.8	172981	620.6	
OD1 (909.0)	1	350.3	201889	617.8	3.265
	2	380.2	196905	618.8	
	3	524.8	174103	622.4	
	4	554.6	169668	622.9	
OD3 (909.4)	1	351.1	190857	583.7	3.077
	2	380.9	185197	581.7	
	3	525.5	164842	589.1	
	4	555.3	161011	590.9	
OD5 (908.0)	1	351.8	152629	466.6	2.464
	2	381.7	148503	466.3	
	3	526.2	131541	470.0	
	4	556.1	127948	469.6	
OD7 (909.1)	1	352.6	107973	328.9	1.738
	2	382.4	105244	329.3	
	3	527.0	92130	328.2	
	4	556.8	90070	329.5	
OD9 (869.7)	1	353.3	61329	194.8	1.027
	2	383.2	59446	194.0	
	3	527.7	52567	195.3	
	4	557.5	50952	194.4	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per30sec)	Counts after time & weight correction C (per30sec)	Normalized value (Core center=1.0)
ODS (911.1)	1	354.0	23386	70.7	0.373
	2	383.9	22661	70.4	
	3	528.4	19853	70.3	
	4	558.3	19400	70.5	
7A7 (920.7)	1	354.8	49265	147.9	0.782
	2	384.6	48057	148.2	
	3	529.2	42428	149.0	
	4	559.0	41504	149.7	
5A5 (920.7)	1	355.5	119177	359.7	1.900
	2	385.4	116043	359.8	
	3	529.9	102439	361.5	
	4	559.7	100422	364.0	
3D1 (905.0)	1	356.2	201613	623.0	3.296
	2	386.1	197005	625.2	
	3	530.7	174083	628.5	
	4	560.5	169915	630.0	
1A1 (914.4)	1	357.0	226891	695.6	3.674
	2	386.8	221067	695.9	
	3	531.4	195285	699.2	
	4	561.2	190484	700.4	
1C1 (906.7)	1	357.7	224723	695.1	3.668
	2	387.6	218535	694.1	
	3	532.1	193464	698.9	
	4	561.9	187974	697.3	
5C1 (850.0)	1	358.5	155346	510.5	2.699
	2	388.3	151596	511.6	
	3	532.9	133630	513.2	
	4	562.7	131247	517.8	
5C5 (847.0)	1	359.2	108738	357.7	1.893
	2	389.0	106345	359.3	
	3	533.6	93385	359.2	
	4	563.4	90996	359.5	
7C7 (863.9)	1	359.9	47659	153.2	0.806
	2	389.8	46043	152.0	
	3	534.3	40822	153.5	
	4	564.2	39248	151.6	
B.G (—)	1	360.7	19		
	2	390.5	22		
	3	535.1	20		
	4	564.9	16		

Table 4-3 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters

(4) Void fraction : 100%

¹⁰B content in D₂O: 3.2 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per50sec)	Counts after time & weight correction C (per50sec)	Normalized value (Core center=1.0)
RCO (908.2)	1	257.5	19619	32.7	0.378
	2	299.0	18894	32.7	
	3	340.4	18107	32.5	
	4	381.8	17544	32.7	
8CO (889.1)	1	258.6	36282	61.9	0.719
	2	300.0	35055	62.1	
	3	341.4	34043	62.6	
	4	382.8	32479	62.0	
6CO (907.9)	1	259.7	52981	88.7	1.030
	2	301.1	50886	88.4	
	3	342.5	49685	89.6	
	4	383.9	47708	89.3	
4CO (908.8)	1	260.8	65542	109.8	1.271
	2	302.2	63176	109.9	
	3	343.6	60715	109.6	
	4	385.0	58751	110.1	
2CO (823.5)	1	261.8	46137	85.3	1.007
	2	303.2	44348	85.1	
	3	344.7	42676	85.0	
	4	386.1	41074	84.9	
0 (909.3)	1	262.9	50237	84.2	1.000
	2	304.3	48647	84.6	
	3	345.7	46692	84.3	
	4	387.1	45146	84.6	
2A0 (830.2)	1	264.0	46385	85.2	1.010
	2	305.4	44659	85.2	
	3	346.8	42914	85.0	
	4	388.2	41830	86.0	
4A0 (833.7)	1	265.0	59949	109.9	1.280
	2	306.5	58120	110.6	
	3	347.9	56147	110.9	
	4	389.3	54139	111.0	
6A0 (912.2)	1	266.1	52780	88.5	1.022
	2	307.5	50813	88.4	
	3	348.9	48833	88.2	
	4	390.3	47058	88.2	
8A0 (904.6)	1	267.2	36186	61.2	0.711
	2	308.6	35042	61.5	
	3	350.0	33635	61.3	
	4	391.4	32770	61.9	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown: (min)	Counts Co (per50sec)	Counts after time & weight correction C (per50sec)	Normalized value (Core center=1.0)
RAO (911.7)	1	268.2	19790	33.2	0.385
	2	309.7	18978	33.0	
	3	351.1	18370	33.2	
	4	392.5	17876	33.5	
6B6 (916.6)	1	269.3	32337	54.0	0.632
	2	310.7	31501	54.6	
	3	352.1	30470	54.9	
	4	393.6	29388	54.9	
4B4 (908.1)	1	270.4	54678	92.4	1.072
	2	311.8	52923	92.9	
	3	353.2	51068	93.0	
	4	394.6	48912	92.5	
2B2 (903.3)	1	271.5	48097	81.8	0.974
	2	312.9	46535	82.1	
	3	354.3	44908	82.3	
	4	395.7	43560	82.8	
2D2 (863.8)	1	272.5	45728	81.4	0.962
	2	313.9	43851	81.0	
	3	355.4	42456	81.4	
	4	396.8	40723	81.0	
4D4 (915.4)	1	273.6	55372	93.1	1.076
	2	315.0	53072	92.6	
	3	356.4	51604	93.5	
	4	397.8	49327	92.8	
6D6 (912.7)	1	274.7	32498	54.8	0.635
	2	316.1	31414	55.0	
	3	357.5	30218	54.9	
	4	398.9	29140	55.0	
OBS (920.2)	1	276.8	33647	56.4	0.647
	2	318.2	32796	57.0	
	3	359.6	31580	57.0	
	4	401.0	30258	56.7	
OB9 (919.3)	1	277.9	72796	122.5	1.397
	2	319.3	70165	122.5	
	3	360.7	67732	122.8	
	4	402.1	65365	123.0	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per50sec)	Counts after time & weight correction C (per50sec)	Normalized value (Core center=1.0)
OB7 (906.0)	1	279.0	111584	191.0	2.180
	2	320.4	107602	191.2	
	3	361.8	104201	192.1	
	4	403.2	100227	191.8	
OB5 (911.0)	1	280.0	153712	262.4	2.999
	2	321.4	148436	262.9	
	3	362.9	143662	264.1	
	4	404.3	138533	264.4	
OB3 (830.6)	1	281.1	146914	275.2	3.141
	2	322.5	142081	276.2	
	3	363.9	137366	277.2	
	4	405.3	131330	275.0	
OB1 (915.5)	1	282.2	157498	268.1	3.058
	2	323.6	152002	268.5	
	3	365.0	146769	269.1	
	4	406.4	141235	268.7	
OD1 (908.9)	1	283.2	154610	265.3	3.022
	2	324.7	148974	265.3	
	3	366.1	143471	265.2	
	4	407.5	138536	265.7	
OD3 (850.7)	1	284.3	155748	285.8	3.257
	2	325.7	149409	284.5	
	3	367.1	145219	287.0	
	4	408.5	139955	287.1	
OD5 (913.3)	1	285.4	151935	259.9	2.969
	2	326.8	147127	261.2	
	3	368.2	141787	261.3	
	4	409.6	136376	260.8	
OD7 (899.0)	1	286.5	111502	193.6	2.210
	2	327.9	107589	193.9	
	3	369.3	103989	194.6	
	4	410.7	100082	194.3	
OD9 (908.5)	1	287.5	72220	124.0	1.414
	2	328.9	69610	124.1	
	3	370.3	67134	124.2	
	4	411.8	64853	124.5	
ODS (913.9)	1	288.6	33657	57.4	0.651
	2	330.0	32196	57.0	
	3	371.4	31203	57.3	
	4	412.8	29931	57.1	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown. (min)	Counts Co (per50sec)	Counts after time & weight correction C (per50sec)	Normalized value (Core center=1.0)
7A7 (906.6)	1	289.7	67007	115.5	1.314
	2	331.1	64583	115.6	
	3	372.5	62566	116.2	
	4	413.9	59407	114.5	
5A5 (913.7)	1	290.7	134028	230.1	2.621
	2	332.2	129778	231.3	
	3	373.6	124491	230.3	
	4	415.0	119445	229.3	
3D1 (899.3)	1	291.8	175539	307.0	3.503
	2	333.2	170282	309.1	
	3	374.6	163075	307.2	
	4	416.0	157197	307.3	
1A1 (918.6)	1	275.7	200833	339.3	3.873
	2	317.2	193701	339.6	
	3	358.6	187214	340.7	
	4	400.0	180769	341.4	
1C1 (912.7)	1	292.9	195392	337.4	3.845
	2	334.3	189505	339.6	
	3	375.7	181052	336.7	
	4	417.1	174763	337.2	
5C1 (913.4)	1	293.9	177290	305.9	3.493
	2	335.4	171792	307.7	
	3	376.8	164940	306.6	
	4	418.2	159147	307.0	
5C5 (911.7)	1	295.0	132305	228.5	2.599
	2	336.4	127217	228.1	
	3	377.8	122487	227.9	
	4	419.2	118529	228.9	
B.G (—)	1	296.1	25		
	2	337.5	24		
	3	378.9	23		
	4	420.3	26		

Table 4-4 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters

(1) Void fraction : 0%
¹⁰B content in D₂O : 0 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per 20 sec)	Counts after time & weight correction C (per 20 sec)	Normalized value (Core center=1.0)
RCO (863.2)	1	349.6	3170	15.1	0.132
	2	373.2	3085	15.0	
	3	396.8	3159	15.7	
	4	420.3	2901	14.7	
8CO (863.7)	1	350.2	6931	33.0	0.288
	2	373.8	6778	33.0	
	3	397.3	6649	33.0	
	4	420.9	6505	33.0	
6CO (863.5)	1	350.7	11486	54.8	0.479
	2	374.3	11300	55.1	
	3	397.9	11007	54.8	
	4	421.5	10797	54.9	
4CO (863.4)	1	351.3	17936	85.7	0.747
	2	374.9	17491	85.4	
	3	398.5	17139	85.4	
	4	422.1	16916	86.1	
2CO (863.3)	1	351.9	20012	95.7	0.837
	2	375.5	19834	96.9	
	3	399.1	19068	95.1	
	4	422.6	18864	96.1	
0 (862.9)	1	352.5	24054	115.2	1.000
	2	376.0	23608	115.5	
	3	399.6	22591	112.9	
	4	423.2	22502	114.8	
2A0 (863.1)	1	353.0	20029	95.9	0.838
	2	376.6	19715	96.4	
	3	400.2	19213	96.0	
	4	423.8	18795	95.9	
4A0 (863.4)	1	353.6	17817	85.3	0.743
	2	377.2	17346	84.8	
	3	400.8	17234	86.1	
	4	424.4	16580	84.6	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per 20 sec)	Counts after time & weight correction C (per 20 sec)	Normalized value (Core center=1.0)
6A0 (862.6)	1	354.2	11117	53.2	0.467
	2	377.8	10897	53.3	
	3	401.3	10758	53.8	
	4	424.9	10507	53.6	
8A0 (863.0)	1	354.8	6758	32.3	0.283
	2	378.3	6646	32.5	
	3	401.9	6437	32.1	
	4	425.5	6403	32.7	
RA0 (862.3)	1	355.3	3087	14.8	0.129
	2	378.9	3054	14.9	
	3	402.5	2913	14.5	
	4	426.1	2950	15.0	
6B6 (863.6)	1	355.9	5909	28.3	0.244
	2	379.5	5767	28.2	
	3	403.1	5494	27.4	
	4	426.6	5452	27.8	
4B4 (862.3)	1	356.5	12105	58.1	0.508
	2	380.0	11875	58.2	
	3	403.6	11662	58.4	
	4	427.2	11357	58.1	
2B2 (862.5)	1	357.0	18106	87.0	0.771
	2	380.6	18038	88.6	
	3	404.2	17866	89.6	
	4	427.8	17150	87.9	
2D2 (862.8)	1	357.6	17802	85.6	0.751
	2	381.2	17478	85.8	
	3	404.8	17310	86.8	
	4	428.4	16717	85.7	
4D4 (863.0)	1	358.2	12131	58.3	0.515
	2	381.8	12091	59.4	
	3	405.3	11858	59.5	
	4	428.9	11522	59.0	
6D6 (862.4)	1	358.8	5647	27.1	0.237
	2	382.3	5569	27.3	
	3	405.9	5424	27.2	
	4	429.5	5234	26.8	
OBS (862.3)	1	338.2	6439	30.4	0.266
	2	361.7	6248	30.1	
	3	385.3	6315	31.1	
	4	408.9	6080	30.6	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per 20 sec)	Counts after time & weight correction C (per 20 sec)	Normalized value (Core center=1.0)
OB9 (863.3)	1	338.7	17669	83.5	0.741
	2	362.3	17806	85.9	
	3	385.9	17283	85.2	
	4	409.5	16861	84.9	
OB7 (862.5)	1	339.3	31901	151.2	1.333
	2	362.9	31488	152.4	
	3	386.5	31105	153.8	
	4	410.1	30458	153.8	
OB5 (862.4)	1	339.9	51178	243.2	2.127
	2	363.5	50560	245.4	
	3	387.0	49041	243.1	
	4	410.6	48121	243.6	
OB3 (863.0)	1	340.5	69630	331.4	2.902
	2	364.0	68227	331.7	
	3	387.6	67132	333.3	
	4	411.2	65845	333.9	
OB1 (863.2)	1	341.0	79829	380.5	3.328
	2	364.6	78551	382.4	
	3	388.2	76500	380.3	
	4	411.8	75270	382.2	
OD1 (863.1)	1	341.6	78928	376.4	3.288
	2	365.2	77422	377.1	
	3	388.8	75588	376.0	
	4	412.3	74310	377.5	
OD3 (863.4)	1	342.2	71408	340.3	2.970
	2	365.7	70132	341.4	
	3	389.3	68272	339.4	
	4	412.9	67072	340.6	
OD5 (863.2)	1	342.7	51073	243.1	2.114
	2	366.3	49601	241.1	
	3	389.9	48738	242.0	
	4	413.5	47883	242.8	
OD7 (862.4)	1	343.3	32422	154.2	1.344
	2	366.9	31527	153.2	
	3	390.5	30996	153.8	
	4	414.1	30528	154.8	
OD9 (862.8)	1	343.9	17832	84.7	0.743
	2	367.5	17813	86.4	
	3	391.0	17199	85.2	
	4	414.6	16644	84.2	

(continued)

Position (Weight of Cu : mg)	Turn No.	Time after shutdown (min)	Counts Co (per 20 sec)	Counts after time & weight correction C (per 20 sec)	Normalized value (Core center=1.0)
ODS (862.4)	1	344.5	6487	30.8	0.264
	2	368.0	6211	30.1	
	3	391.6	6060	30.0	
	4	415.2	5939	30.0	
7A7 (863.1)	1	345.0	14066	66.8	0.588
	2	368.6	13926	67.6	
	3	392.2	13661	67.7	
	4	415.8	13308	67.4	
5A5 (863.2)	1	345.6	35623	169.7	1.471
	2	369.2	34529	168.0	
	3	392.8	33923	168.6	
	4	416.3	33089	168.0	
3D1 (863.2)	1	346.2	77382	370.5	3.242
	2	369.7	75904	371.1	
	3	393.3	74453	371.8	
	4	416.9	73026	372.5	
1A1 (862.7)	1	346.7	90509	434.3	3.775
	2	370.3	88754	435.0	
	3	393.9	86097	430.9	
	4	417.5	84167	430.3	
1C1 (863.1)	1	347.3	89481	429.4	3.753
	2	370.9	87547	429.1	
	3	394.5	85853	429.7	
	4	418.1	84518	432.1	
5C1 (862.8)	1	347.9	55872	267.4	2.340
	2	371.5	54834	268.1	
	3	395.0	53916	269.2	
	4	418.6	52567	268.1	
5C5 (863.4)	1	348.5	34988	167.1	1.455
	2	372.0	34219	166.9	
	3	395.6	33459	166.7	
	4	419.2	32771	166.8	
7C7 (862.9)	1	349.0	14088	67.2	0.587
	2	372.6	13877	67.6	
	3	396.2	13374	66.5	
	4	419.8	13335	67.8	
B.G (—)	1	359.3	4		
	2	382.9	8		
	3	406.5	1		
	4	430.1	12		

Table 4-4 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters

(2) Void fraction: 100%

¹⁰B content in D₂O: 0 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RCO (863.2)	1	314.1	3244	14.9	0.405
	2	337.7	3137	14.7	
	3	361.2	3110	14.9	
	4	384.7	2934	14.4	
8CO (863.7)	1	314.7	6262	28.9	0.786
	2	338.2	6042	28.5	
	3	361.8	5984	28.8	
	4	385.3	5779	28.4	
6CO (863.5)	1	315.3	9080	41.9	1.160
	2	338.8	9075	42.8	
	3	362.3	8736	42.1	
	4	385.9	8562	42.1	
4CO (863.4)	1	315.8	11855	54.8	1.511
	2	339.4	11631	54.9	
	3	362.9	11569	55.8	
	4	386.4	11059	54.5	
2CO (863.3)	1	316.4	7629	35.3	0.948
	2	339.9	7297	34.4	
	3	363.5	6995	33.7	
	4	387.0	7022	34.6	
0 (862.9)	1	317.0	7904	36.6	1.000
	2	340.5	7682	36.3	
	3	364.1	7676	37.1	
	4	387.6	7240	35.7	
2A0 (863.1)	1	317.5	7602	35.2	0.957
	2	341.1	7350	34.7	
	3	364.6	7194	34.7	
	4	388.1	7049	34.8	
4A0 (863.4)	1	318.1	11898	55.1	1.515
	2	341.7	11721	55.5	
	3	365.2	11416	55.2	
	4	388.7	11108	54.8	
6A0 (862.6)	1	318.7	9043	41.9	1.170
	2	342.2	9050	42.9	
	3	365.8	8850	42.8	
	4	389.3	8640	42.7	
8A0 (863.0)	1	319.3	6184	28.7	0.785
	2	342.8	5939	28.1	
	3	366.3	6035	29.2	
	4	389.9	5747	28.4	

(continued)

Position' (Weight of Cu) : mg	Turn No.	Time after shutdown. (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RAO (862.3)	1	319.8	3223	14.9	0.413
	2	343.4	3226	15.3	
	3	366.9	3036	14.7	
	4	390.4	3084	15.2	
6B6 (863.6)	1	320.4	5417	25.1	0.694
	2	343.9	5433	25.7	
	3	367.5	5157	24.9	
	4	391.0	5127	25.3	
4B4 (862.3)	1	321.0	9652	44.9	1.227
	2	344.5	9396	44.6	
	3	368.0	9224	44.7	
	4	391.6	8976	44.5	
2B2 (862.5)	1	321.5	7111	33.0	0.916
	2	345.1	6993	33.2	
	3	368.6	6880	33.4	
	4	392.1	6796	33.7	
2D2 (862.8)	1	322.1	7082	32.9	0.913
	2	345.7	7021	33.3	
	3	369.2	6856	33.2	
	4	392.7	6728	33.3	
4D4 (863.0)	1	322.7	9409	43.8	1.214
	2	346.2	9164	43.5	
	3	369.8	9220	44.7	
	4	393.3	9010	44.7	
6D6 (862.4)	1	323.3	5447	25.3	0.681
	2	346.8	5159	24.5	
	3	370.3	5043	24.5	
	4	393.9	5022	24.9	
OBS (862.3)	1	302.7	5459	24.9	0.686
	2	326.2	5451	25.4	
	3	349.8	5155	24.6	
	4	373.3	5132	25.0	
OB9 (863.3)	1	303.3	12098	55.3	1.515
	2	326.8	11587	54.1	
	3	350.4	11639	55.5	
	4	373.9	11431	55.7	
OB7 (862.5)	1	303.8	19623	89.9	2.467
	2	327.4	19161	89.7	
	3	350.9	18833	90.0	
	4	374.5	18342	89.6	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
OB5 (862.4)	1	304.4	27465	126.1	3.484
	2	328.0	26963	126.4	
	3	351.5	26397	126.4	
	4	375.0	26208	128.2	
OB3 (863.0)	1	305.0	30245	138.9	3.802
	2	328.5	29377	137.7	
	3	352.1	28948	138.7	
	4	375.6	28312	138.5	
OB1 (863.2)	1	305.6	29289	134.5	3.717
	2	329.1	28938	135.7	
	3	352.6	28370	135.9	
	4	376.2	27572	134.9	
OD1 (863.1)	1	306.1	29994	137.8	3.786
	2	329.7	29312	137.6	
	3	353.2	28622	137.2	
	4	376.7	28288	138.5	
OD3 (863.4)	1	306.7	30586	140.6	3.871
	2	330.2	29969	140.7	
	3	353.8	29425	141.1	
	4	377.3	28812	141.1	
OD5 (863.2)	1	307.3	27549	126.7	3.473
	2	330.8	26812	125.9	
	3	354.3	26129	125.3	
	4	377.9	26082	127.8	
OD7 (862.4)	1	307.8	19786	91.0	2.521
	2	331.4	19486	91.6	
	3	354.9	19189	92.1	
	4	378.4	18835	92.3	
OD9 (862.8)	1	308.4	12020	55.2	1.521
	2	332.0	11783	55.3	
	3	355.5	11659	55.9	
	4	379.0	11247	55.1	
ODS (862.4)	1	309.0	5491	25.2	0.698
	2	332.5	5392	25.3	
	3	356.1	5428	26.0	
	4	379.6	5123	25.1	
7A7 (863.1)	1	309.6	11524	53.0	1.463
	2	333.1	11399	53.5	
	3	356.6	11018	52.9	
	4	380.2	10954	53.7	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
5A5 (863.2)	1	310.1	23364	107.7	2.975
	2	333.7	23077	108.6	
	3	357.2	22458	108.0	
	4	380.7	22177	108.9	
3D1 (863.2)	1	310.7	32761	151.2	4.187
	2	334.2	32360	152.5	
	3	357.8	31618	152.2	
	4	381.3	31223	153.5	
1A1 (862.7)	1	311.3	37835	174.9	4.797
	2	334.8	37026	174.8	
	3	358.3	36165	174.4	
	4	381.9	35419	174.5	
1C1 (863.1)	1	311.8	38335	177.2	4.885
	2	335.4	37347	176.3	
	3	358.9	36953	178.2	
	4	382.4	36430	179.5	
5C1 (862.8)	1	312.4	32695	151.2	4.154
	2	335.9	31764	150.0	
	3	359.5	31598	152.4	
	4	383.0	30704	151.2	
5C5 (863.4)	1	313.0	23028	106.4	2.931
	2	336.5	22795	107.5	
	3	360.1	22050	106.2	
	4	383.6	21686	106.7	
7C7 (862.9)	1	313.6	11638	53.7	1.470
	2	337.1	11302	53.3	
	3	360.6	11122	53.6	
	4	384.2	10859	53.4	
B.G (—)	1	323.8	7		
	2	347.4	7		
	3	370.9	2		
	4	394.4	9		

Table 4-4 Measurement of radial flux distribution by Cu sample in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters

(3) Void fraction: Central channel/100% others/0%
¹⁰B content in D₂O: 0 ppm

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RCO (864.1)	1	352.4	3160	15.0	0.211
	2	376.0	3146	15.3	
	3	399.5	3131	15.5	
	4	423.1	2989	15.2	
8CO (863.4)	1	353.0	6706	32.0	0.446
	2	376.6	6519	31.8	
	3	400.1	6585	32.8	
	4	423.6	6310	32.1	
6CO (864.7)	1	353.6	11368	54.3	0.752
	2	377.1	11100	54.1	
	3	400.7	10963	54.6	
	4	424.2	10649	54.2	
4CO (864.0)	1	354.1	17370	83.1	1.157
	2	377.7	17167	83.9	
	3	401.2	16672	83.2	
	4	424.8	16442	83.9	
2CO (864.0)	1	354.7	19054	91.3	1.271
	2	378.3	19030	93.1	
	3	401.8	18205	91.0	
	4	425.3	17935	91.5	
O (864.6)	1	355.3	15120	72.4	1.000
	2	378.8	14775	72.2	
	3	402.4	14324	71.5	
	4	425.9	14234	72.6	
2A0 (863.6)	1	355.9	19486	93.5	1.287
	2	379.4	18971	93.0	
	3	403.0	18458	92.4	
	4	426.5	18162	92.8	
4A0 (864.0)	1	356.4	17470	83.8	1.148
	2	380.0	16967	83.1	
	3	403.5	16643	83.3	
	4	427.1	15903	81.3	
6A0 (864.9)	1	357.0	10922	52.3	0.719
	2	380.6	10516	51.4	
	3	404.1	10411	52.0	
	4	427.6	10176	51.9	
8A0 (864.2)	1	357.6	6731	32.2	0.447
	2	381.1	6462	31.6	
	3	404.7	6546	32.7	
	4	428.2	6384	32.6	

(continued)

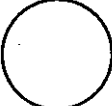


Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
RAO (864.5)	1	358.1	3178	15.2	0.209
	2	381.7	3067	15.0	
	3	405.2	3042	15.2	
	4	428.8	2916	14.9	
6B6 (863.9)	1	358.7	5718	27.4	0.385
	2	382.3	5636	27.6	
	3	405.8	5587	28.0	
	4	429.3	5524	28.2	
4B4 (864.1)	1	359.3	12326	59.2	0.818
	2	382.8	11980	58.8	
	3	406.4	11645	58.4	
	4	429.9	11702	59.9	
2B2 (864.4)	1	359.9	17247	82.9	1.151
	2	383.4	17217	84.6	
	3	406.9	16313	81.8	
	4	430.5	16208	83.1	
2D2 (863.6)	1	360.4	17272	83.2	1.146
	2	384.0	16812	82.7	
	3	407.5	16471	82.8	
	4	431.1	16049	82.4	
4D4 (864.2)	1	361.0	12108	58.3	0.807
	2	384.5	11917	58.6	
	3	408.1	11469	57.6	
	4	431.6	11429	58.6	
6D6 (863.8)	1	361.6	5841	28.1	0.380
	2	385.1	5559	27.3	
	3	408.7	5358	26.9	
	4	432.2	5367	27.5	
OBS (864.5)	1	341.0	6545	30.9	0.422
	2	364.6	6330	30.5	
	3	388.1	6109	30.1	
	4	411.6	6027	30.3	
OB9 (864.4)	1	341.6	17529	82.9	1.167
	2	365.1	17664	85.3	
	3	388.7	17173	84.8	
	4	412.2	16664	84.0	
OB7 (864.0)	1	342.1	31772	150.7	2.074
	2	365.7	30992	150.1	
	3	389.2	30165	149.2	
	4	412.8	29456	148.9	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
OB5 (864.1)	1	342.7	50736	241.2	3.322
	2	366.3	49247	239.1	
	3	389.8	48225	239.2	
	4	413.4	47299	239.6	
OB3 (863.9)	1	343.3	67174	320.1	4.443
	2	366.8	66451	323.5	
	3	390.4	64231	319.3	
	4	413.9	62967	319.7	
OB1 (864.1)	1	343.9	62435	297.5	4.124
	2	367.4	61301	298.3	
	3	391.0	59912	297.8	
	4	414.5	58538	297.2	
OD1 (864.1)	1	344.4	63971	305.0	4.248
	2	368.0	62958	306.6	
	3	391.5	61882	307.8	
	4	415.0	60428	307.0	
OD3 (864.0)	1	345.0	68912	329.0	4.551
	2	368.6	67653	329.9	
	3	392.1	65682	327.0	
	4	415.6	64542	328.2	
OD5 (864.7)	1	345.6	50117	238.7	3.315
	2	369.1	49260	239.6	
	3	392.7	48209	239.5	
	4	416.2	47165	239.4	
OD7 (864.2)	1	346.1	31911	151.9	2.114
	2	369.7	31465	153.0	
	3	393.2	30749	152.7	
	4	416.8	30199	153.1	
OD9 (864.2)	1	346.7	17772	84.5	1.170
	2	370.3	17261	83.8	
	3	393.8	16988	84.2	
	4	417.4	16816	85.2	
ODS (864.0)	1	347.3	6336	30.1	0.415
	2	370.8	6128	29.7	
	3	394.4	6134	30.4	
	4	417.9	5844	29.6	
7A7 (864.2)	1	347.9	13946	66.3	0.922
	2	371.4	13675	66.4	
	3	395.0	13493	67.0	
	4	418.5	13127	66.5	

(continued)

Position (Weight of Cu) : mg	Turn No.	Time after shutdown (min)	Counts Co (per20sec)	Counts after time & weight correction C (per20sec)	Normalized value (Core center=1.0)
5A5 (864.2)	1	348.4	34723	165.6	2.301
	2	372.0	34173	166.5	
	3	395.5	33272	165.6	
	4	419.1	32771	166.6	
3D1 (864.8)	1	349.0	74801	358.2	4.961
	2	372.6	73117	357.7	
	3	396.1	71864	359.0	
	4	419.6	70084	357.6	
1A1 (864.3)	1	349.6	79258	380.2	5.272
	2	373.1	77217	378.3	
	3	396.7	76034	380.4	
	4	420.2	74940	383.0	
1C1 (864.0)	1	350.1	80227	385.2	5.326
	2	373.7	78268	383.8	
	3	397.2	76718	384.2	
	4	420.8	75130	384.3	
5C1 (864.3)	1	350.7	54902	263.0	3.640
	2	374.3	53812	263.3	
	3	397.8	52316	261.4	
	4	421.4	51544	263.0	
5C5 (864.1)	1	351.3	34209	163.6	2.271
	2	374.8	33632	164.3	
	3	398.4	32730	163.3	
	4	421.9	32227	164.2	
7C7 (864.5)	1	351.9	13825	66.0	0.923
	2	375.4	13875	67.6	
	3	399.0	13386	66.6	
	4	422.5	13004	66.1	
B.G (—)	1	362.1	10		
	2	385.7	7		
	3	409.2	12		
	4	432.8	8		

-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator (0 ppm ¹⁰B)
-  Safety-rod guide tube

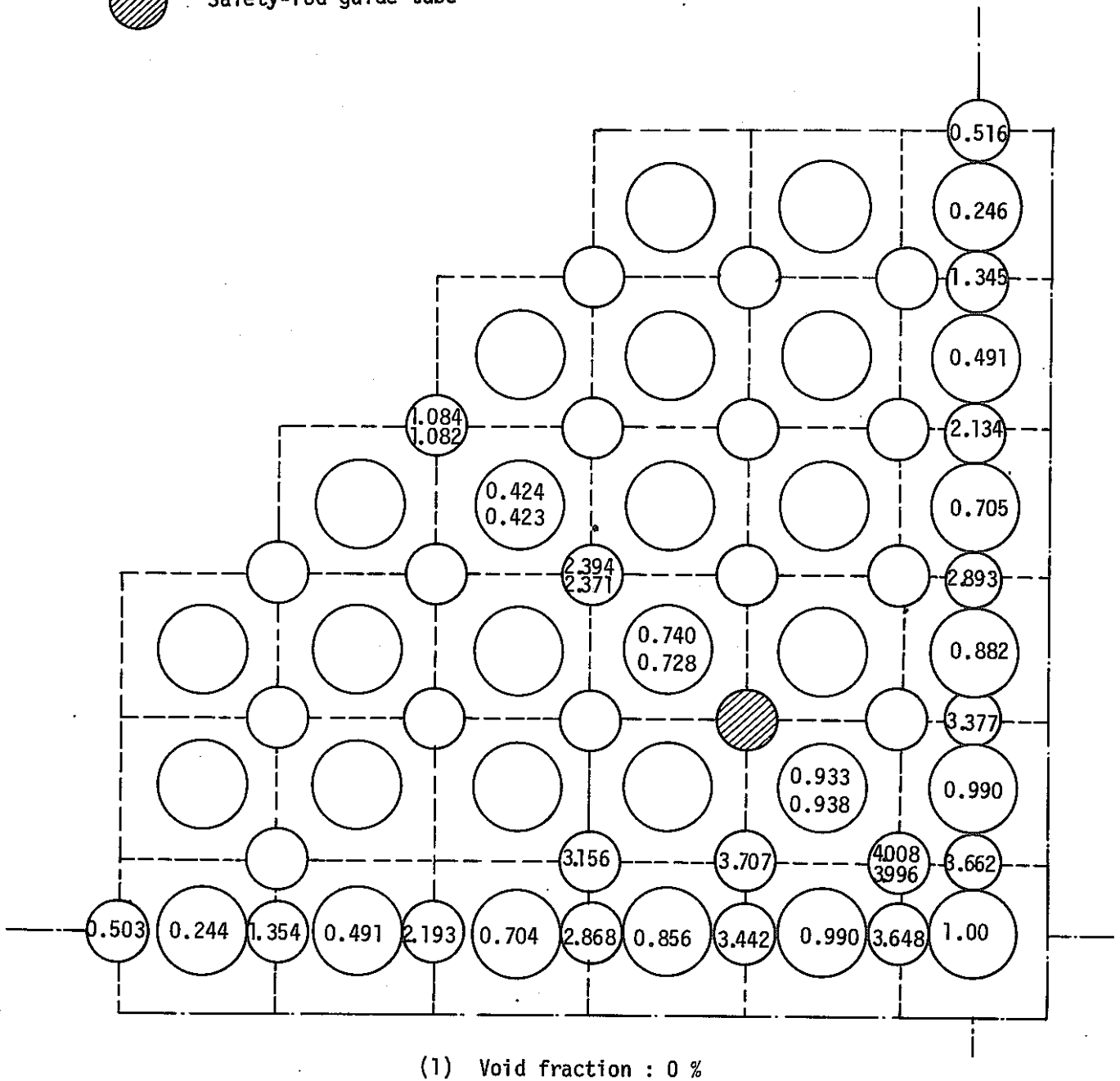
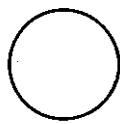




Fig. 4-1 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator (0 ppm ¹⁰B)
-  Safety-rod guide tube

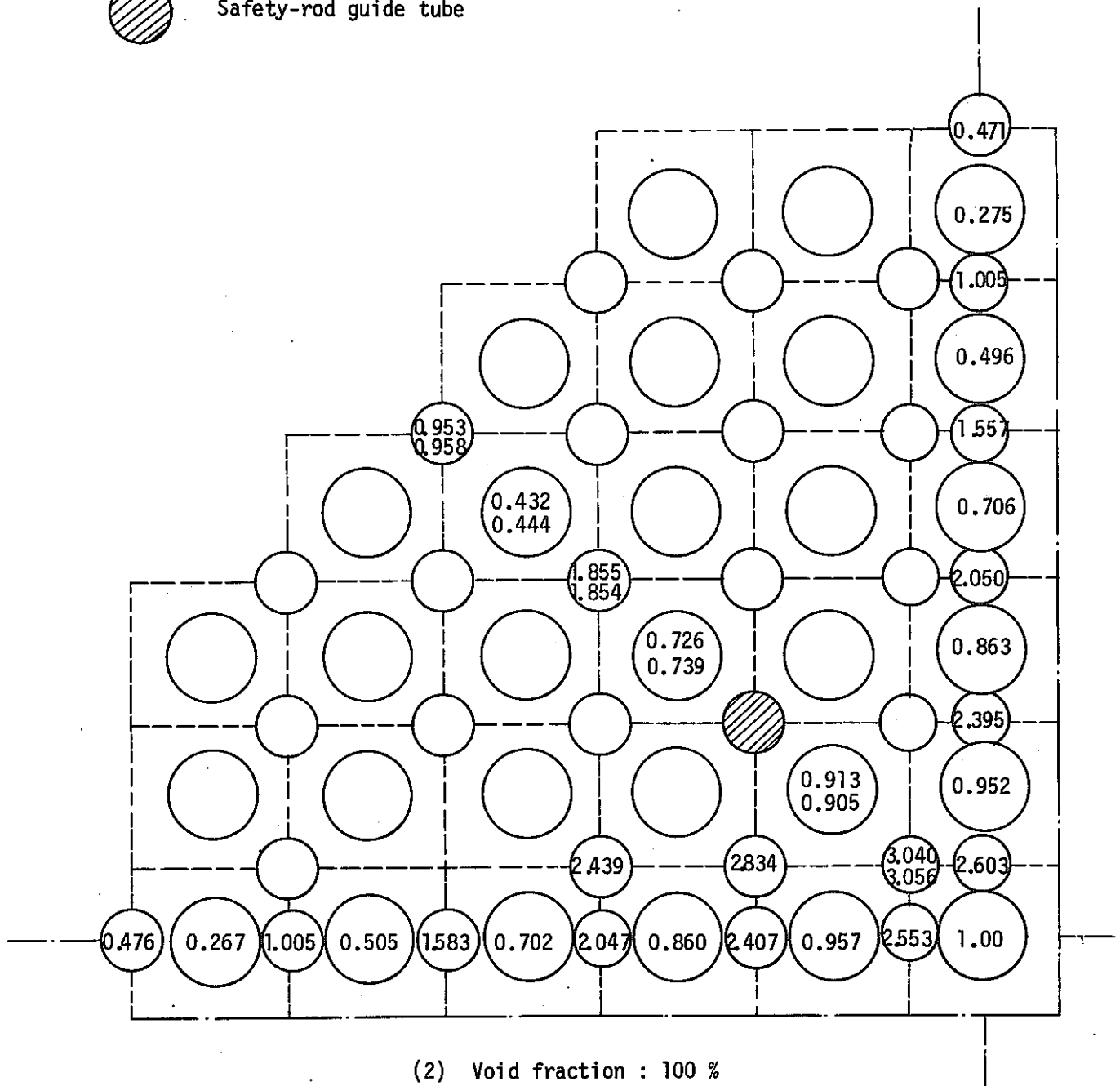
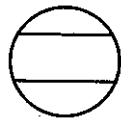
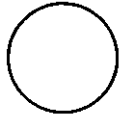




Fig. 4-1 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core uniformly loaded with 28-rod 1.2wt% UO₂ clusters.

-  36-rod 0.54wt% PuO₂-UO₂ cluster
-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator
-  Safety-rod guide tube

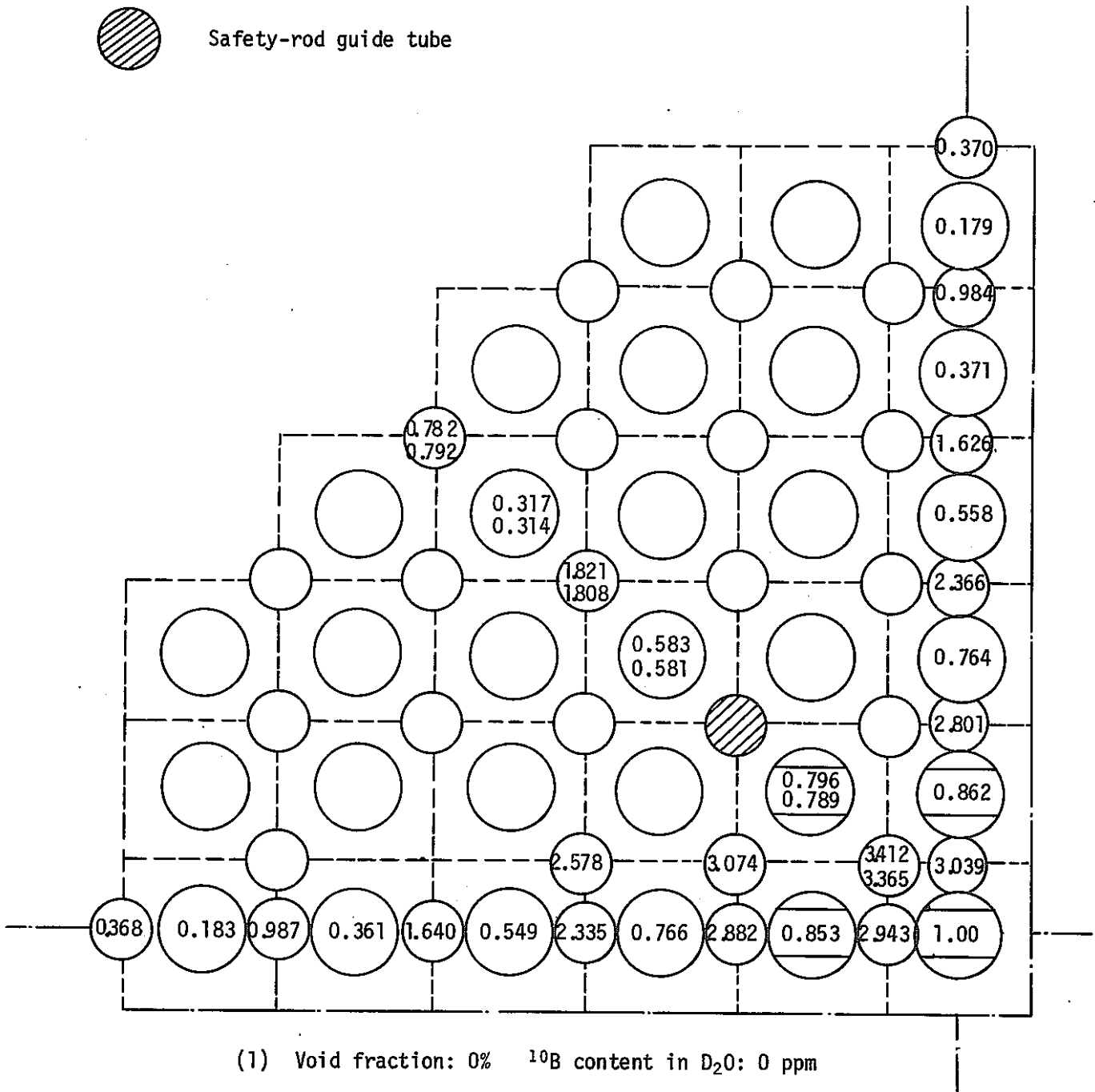
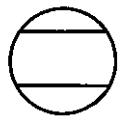
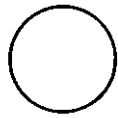




Fig. 4-2 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters

-  36-rod 0.54wt% PuO₂-UO₂ cluster
-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator
-  Safety-rod guide tube

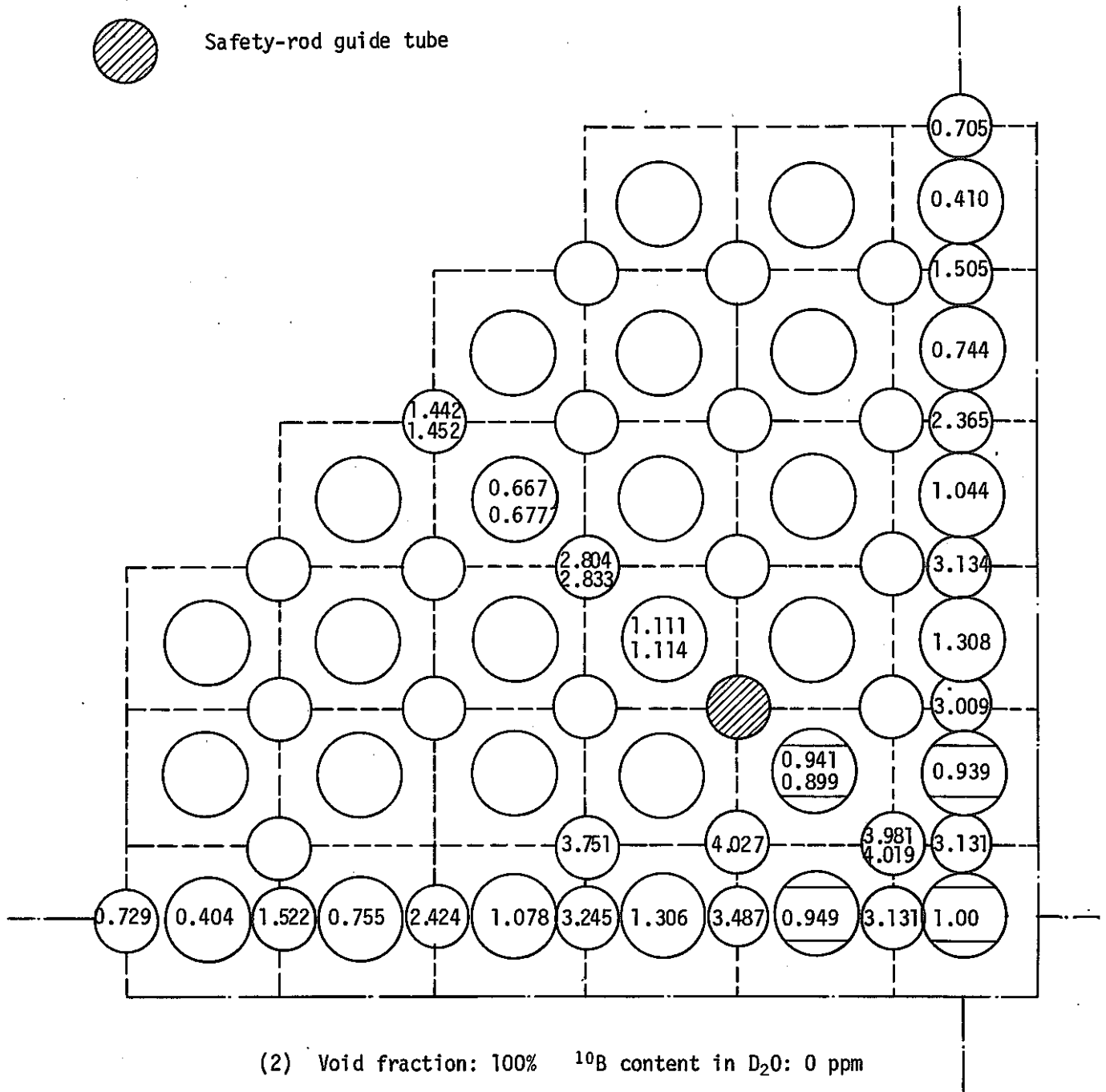


Fig. 4-2 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

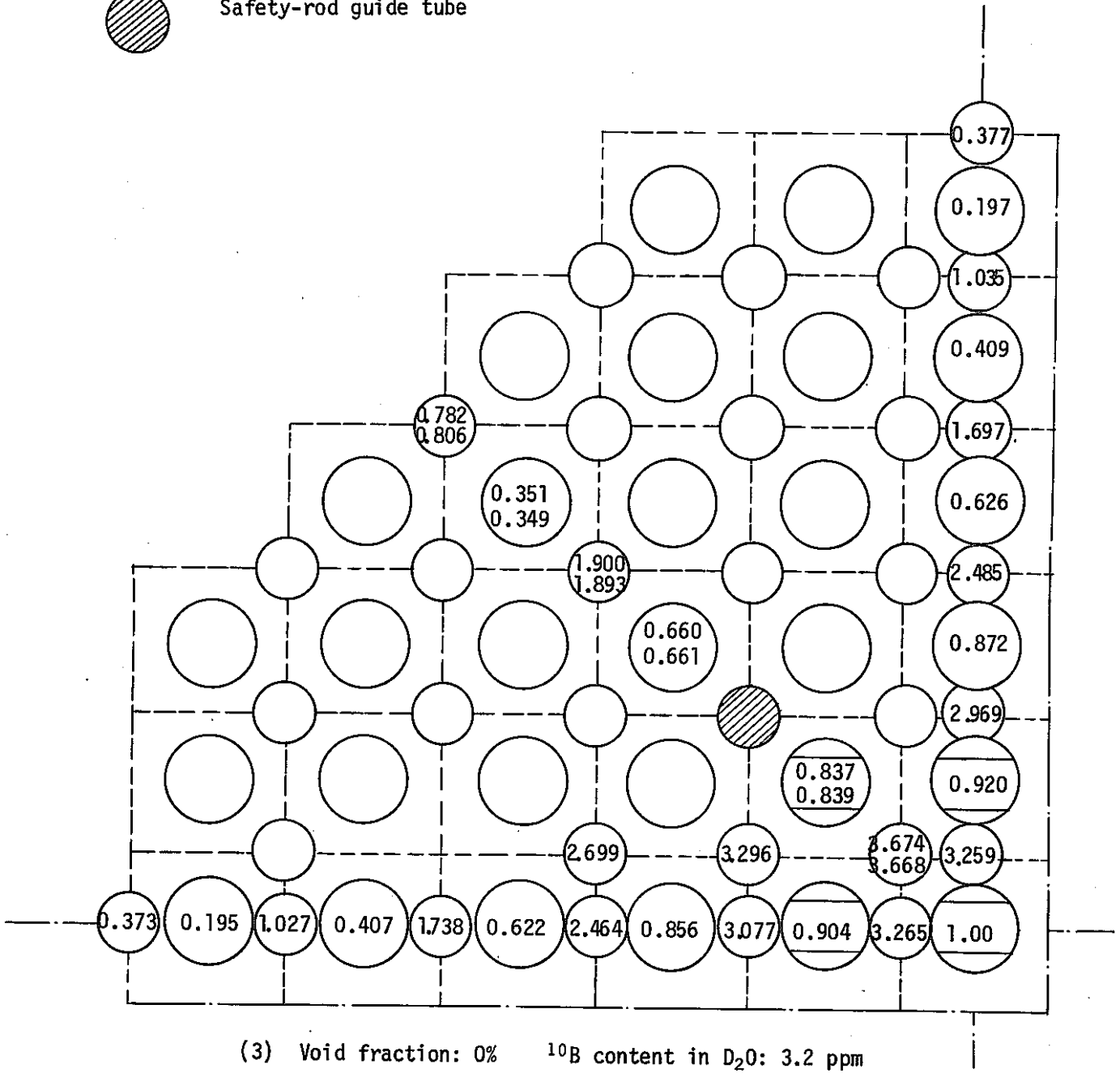
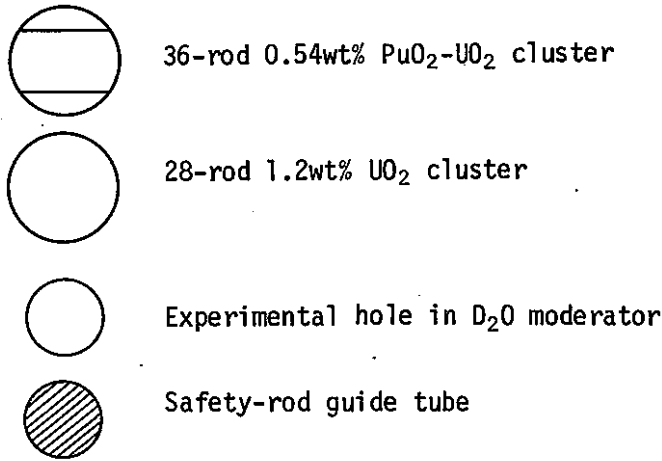
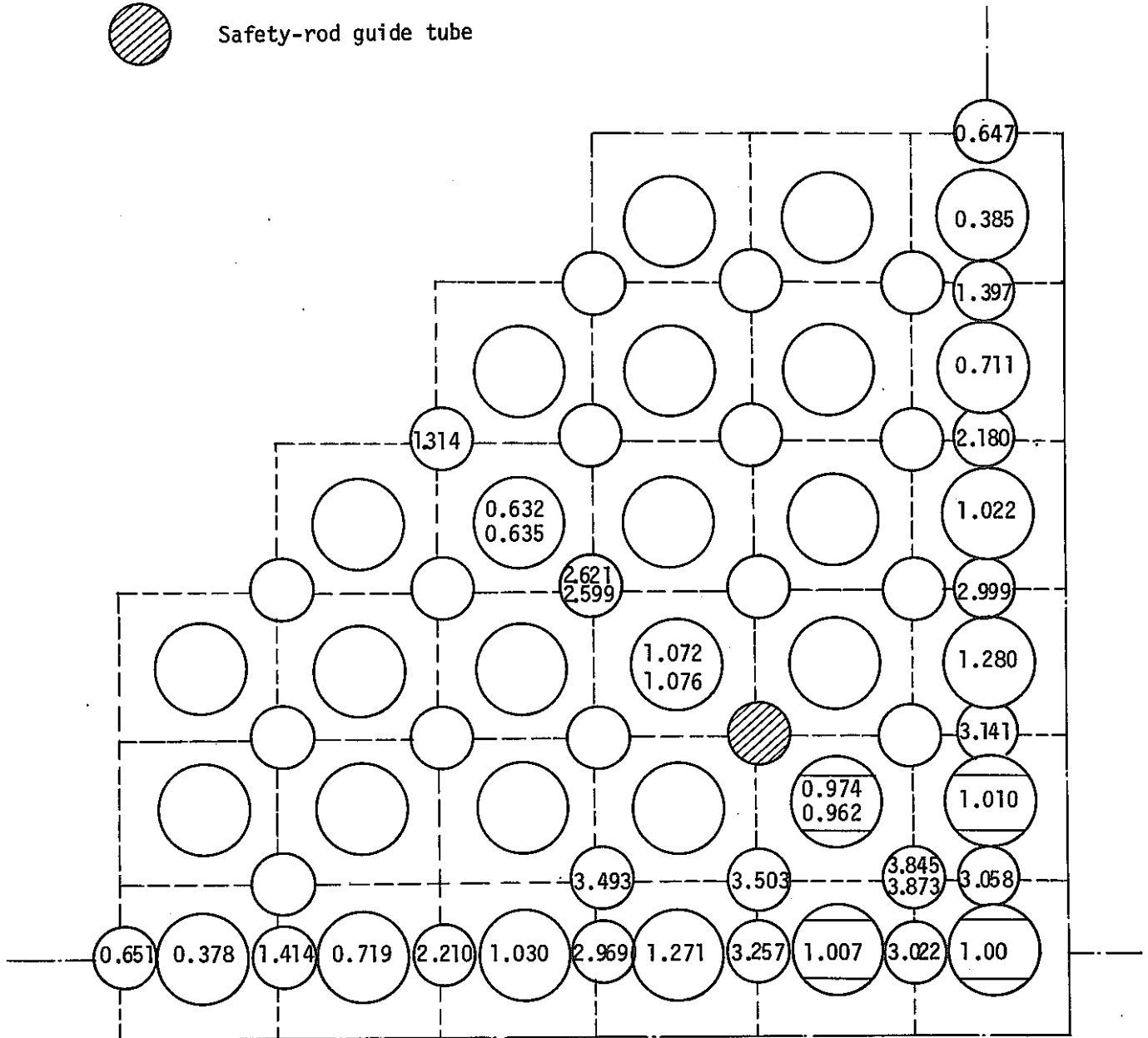
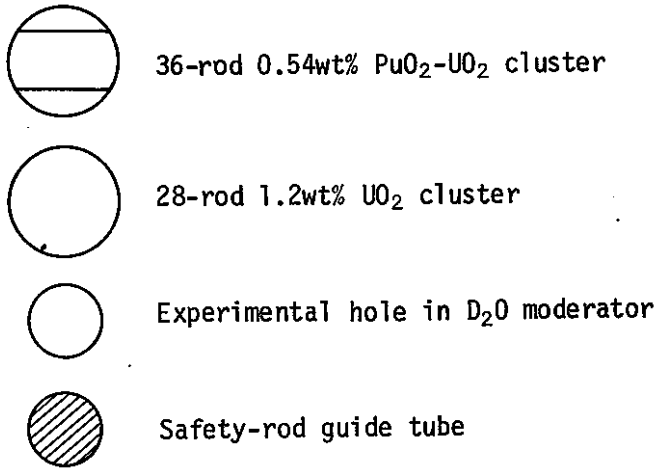
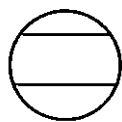
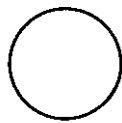




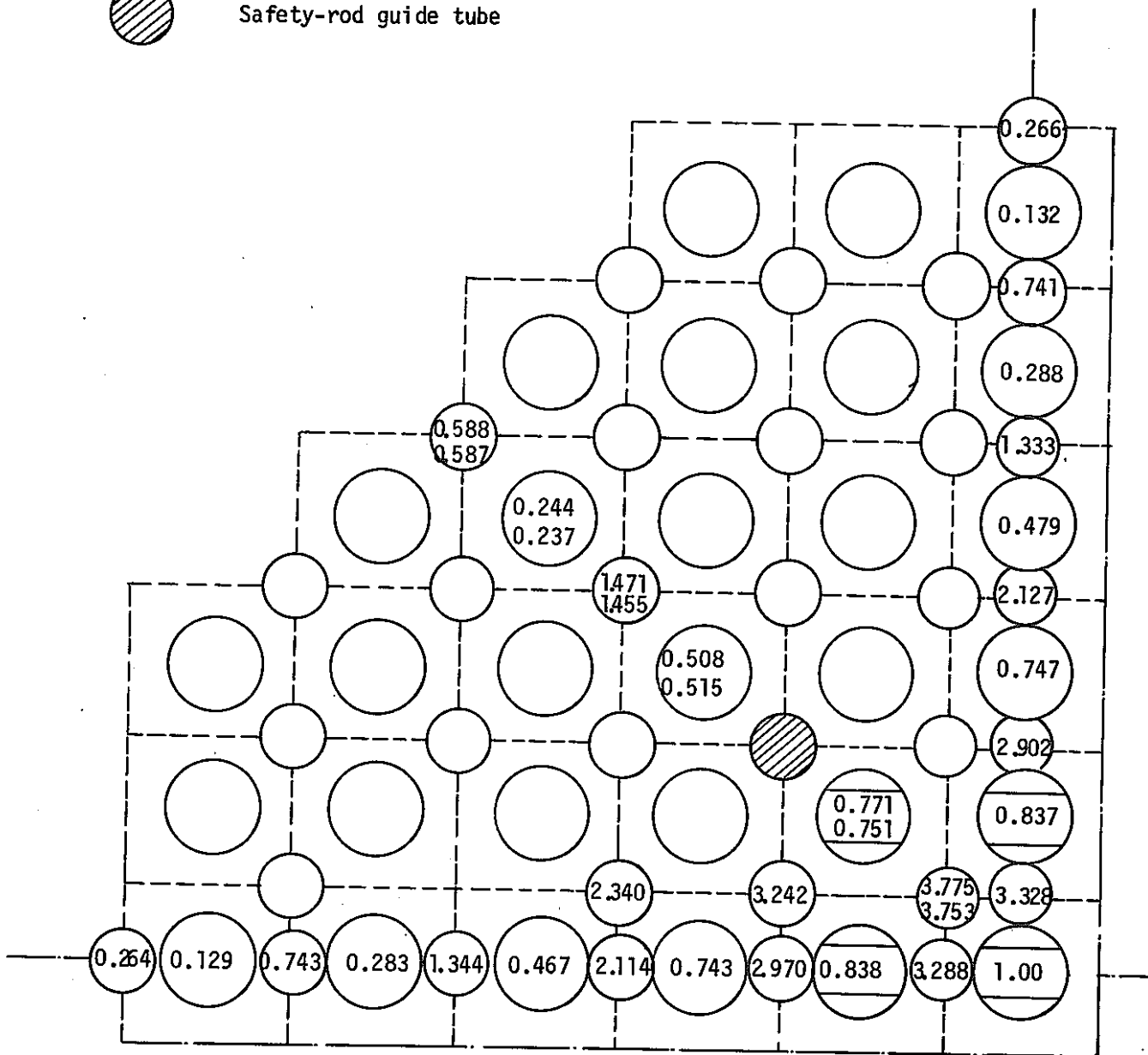
Fig. 4-2 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(4) Void fraction: 100% ¹⁰B content in D₂O: 3.2 ppm

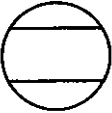
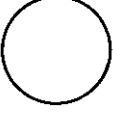


Fig. 4-2 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

-  36-rod 0.87wt% PuO₂-UO₂ cluster
-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator (0 ppm ¹⁰B)
-  Safety-rod guide tube



(1) Void fraction: 0%

Fig. 4-3 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters

-  36-rod 0.87wt% PuO₂-UO₂ cluster
-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator (0 ppm ¹⁰B)
-  Safety-rod guide tube

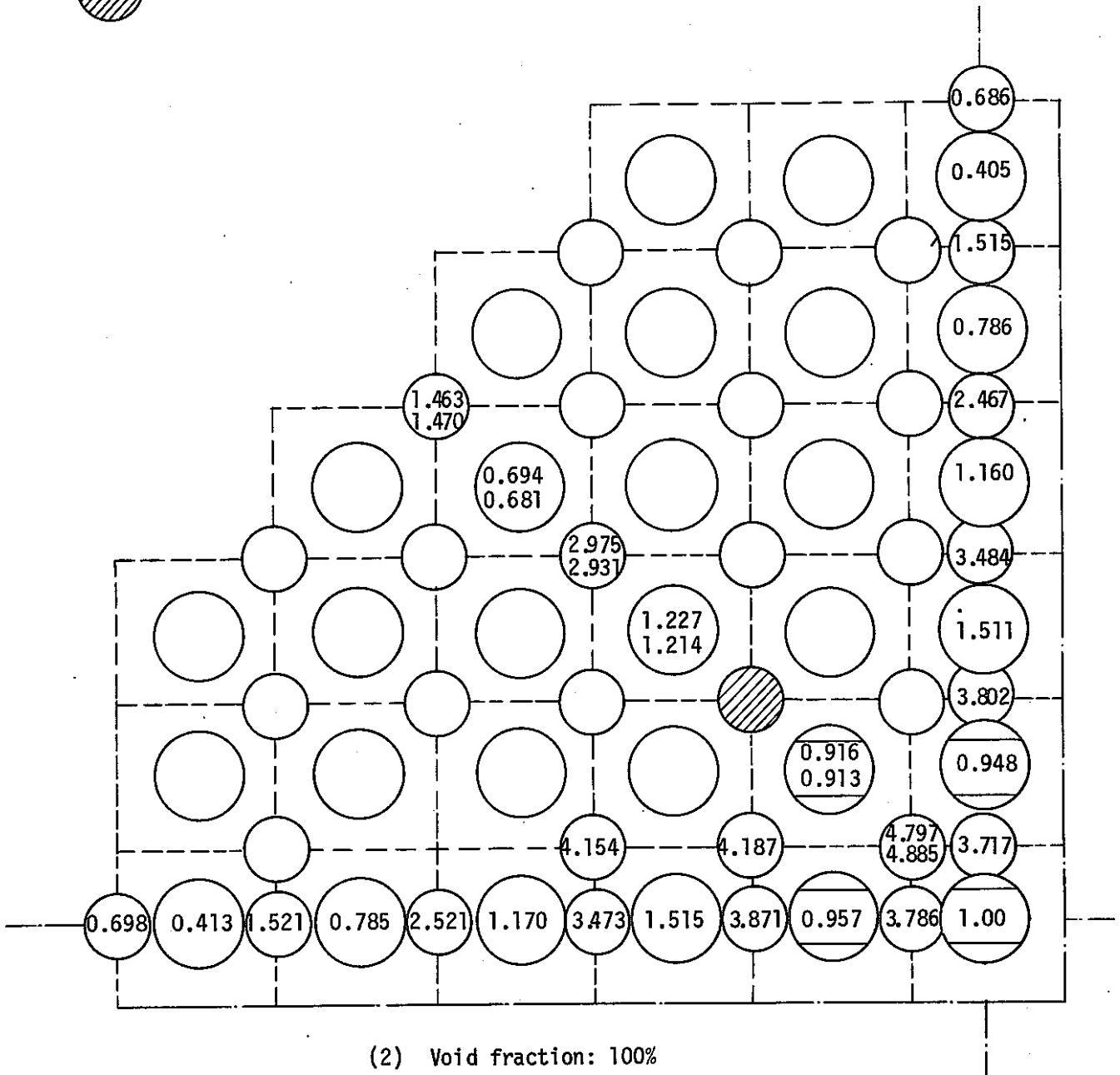
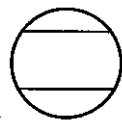
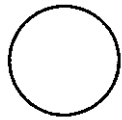
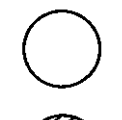



Fig. 4-3 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.

-  36-rod 0.87wt% PuO₂-UO₂ cluster
-  28-rod 1.2wt% UO₂ cluster
-  Experimental hole in D₂O moderator (0 ppm ¹⁰B)
-  Safety-rod guide tube

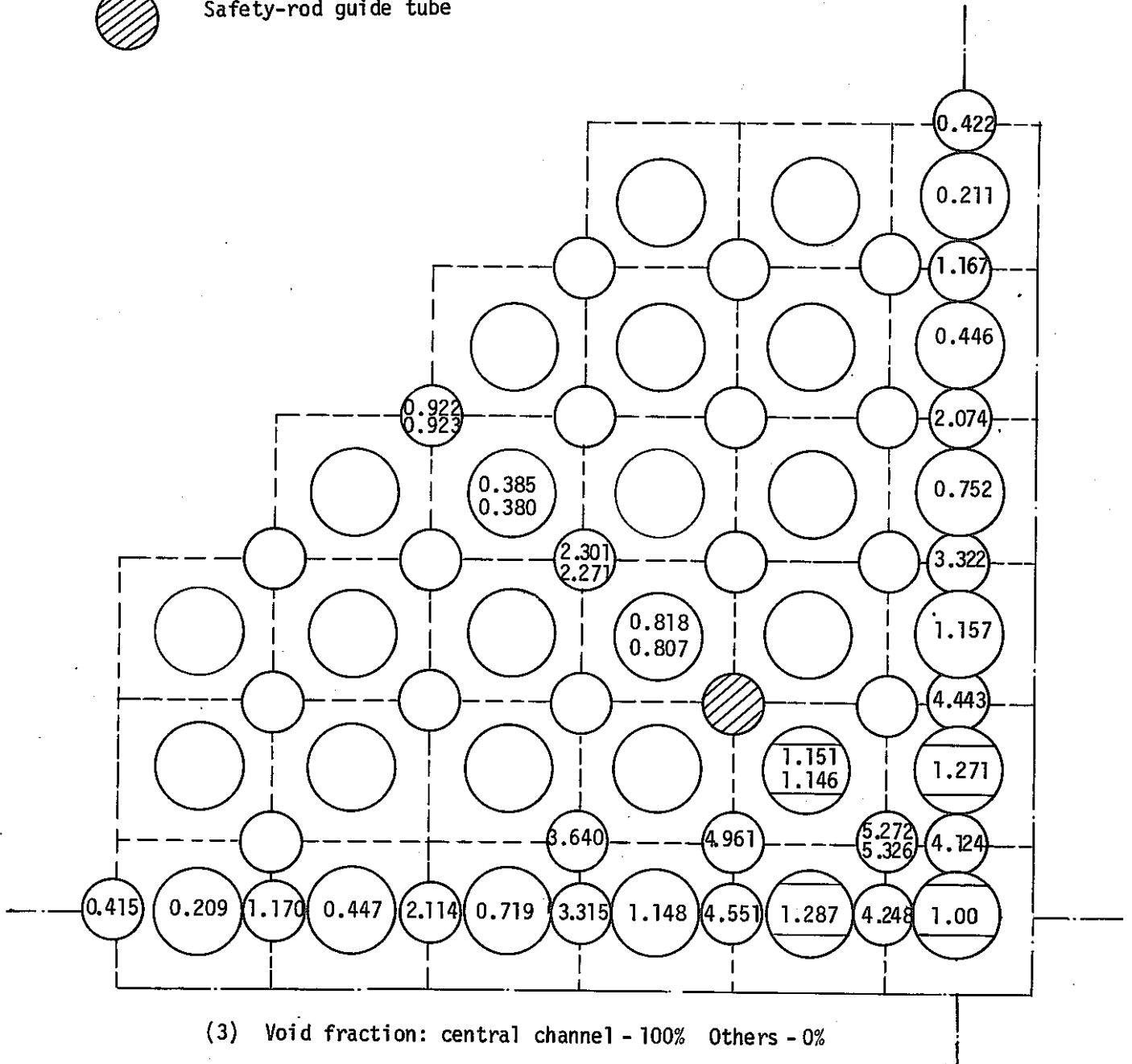
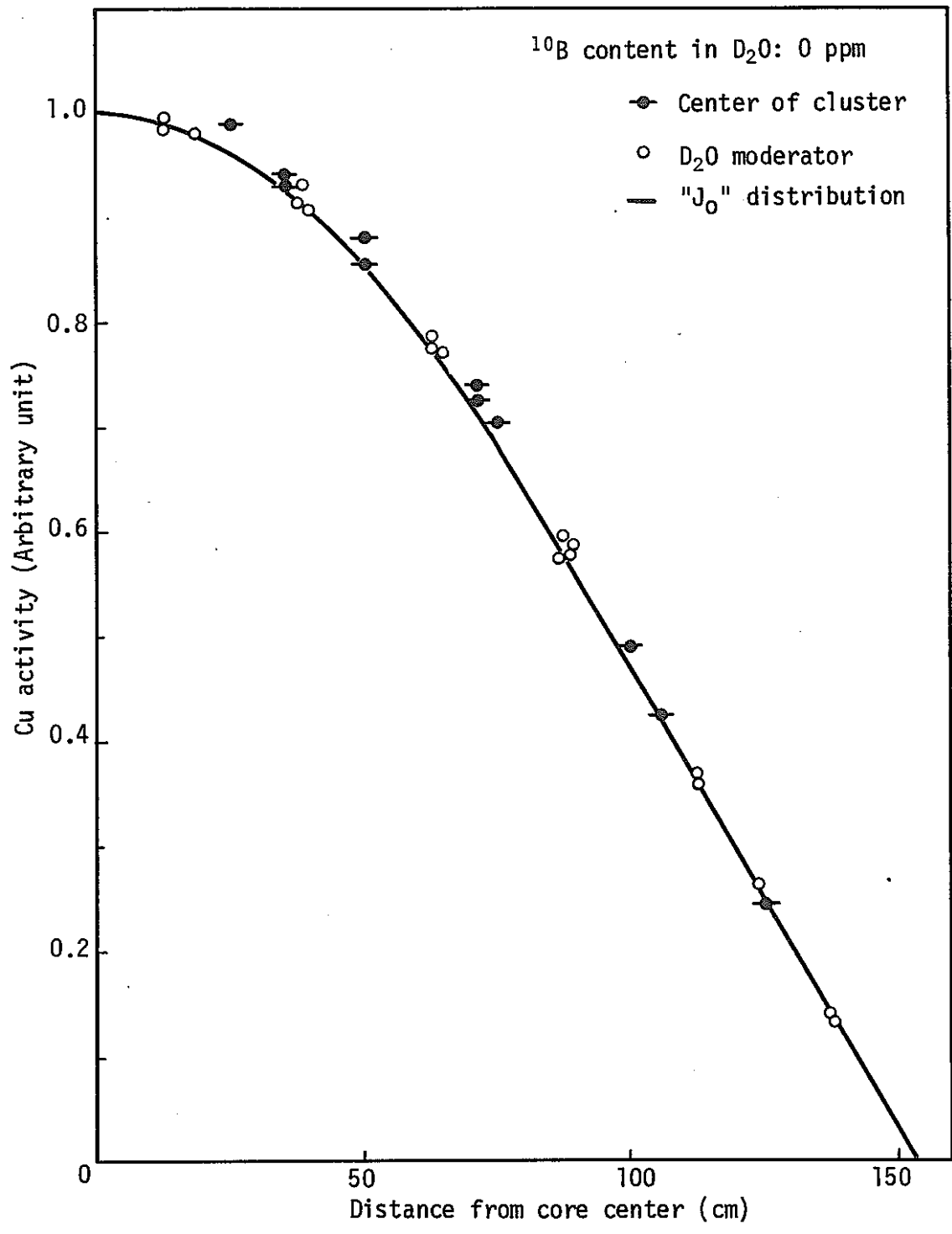
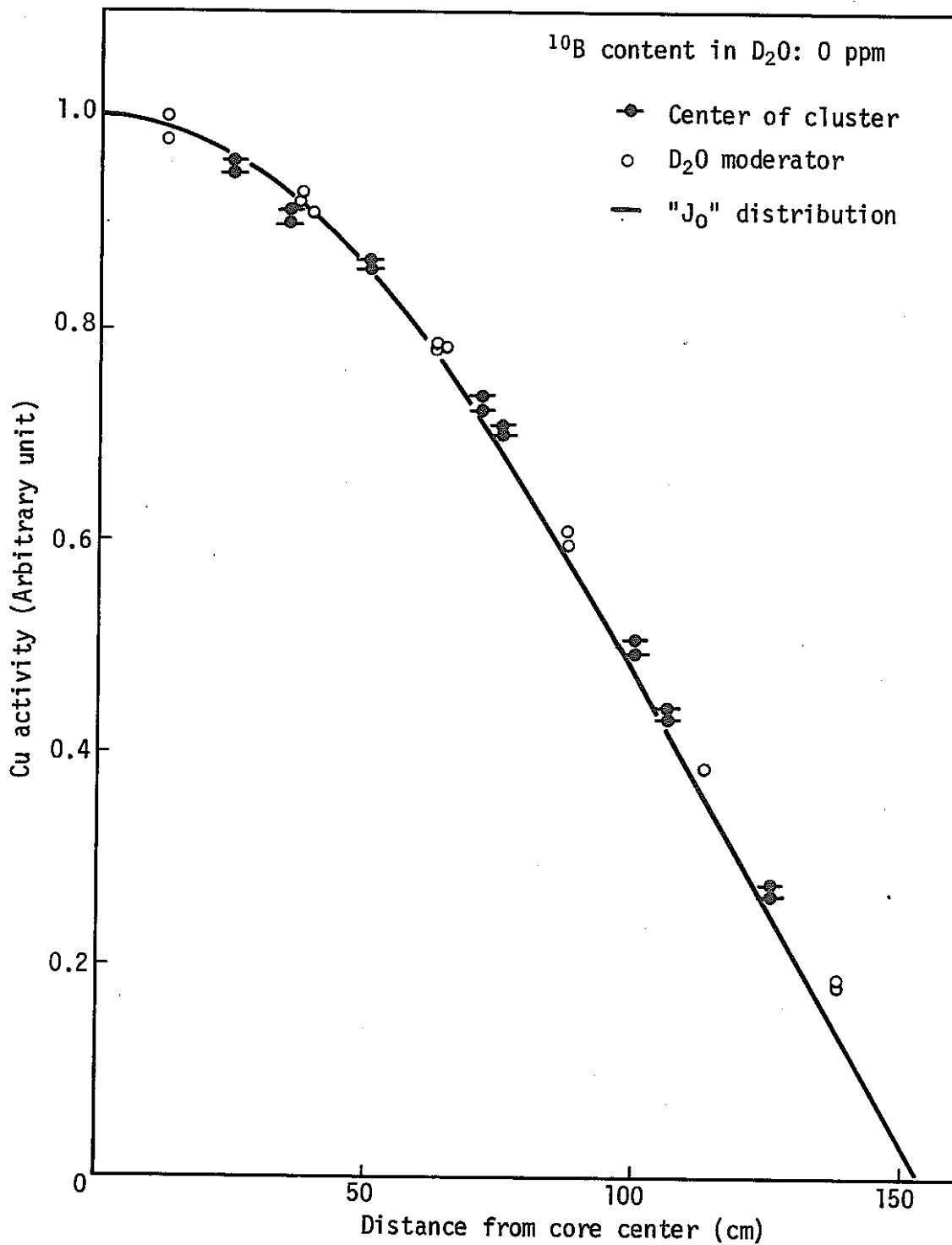


Fig. 4-3 Radial Cu reaction rate distribution at the center of cluster and D₂O moderator in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.



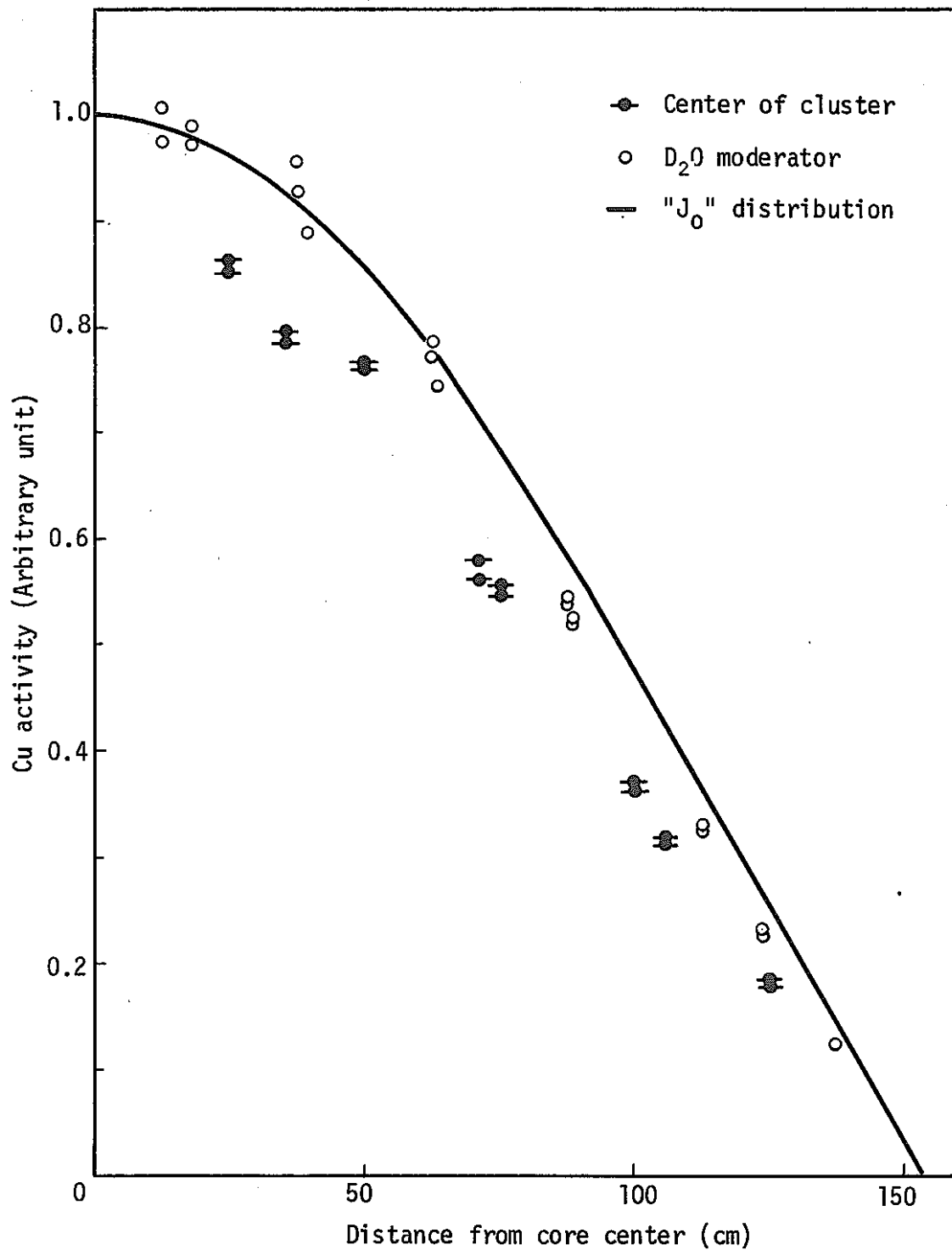
(1) Void fraction: 0 %

Fig. 4-4 Radial flux distribution normalized to the core center in the core uniformly loaded with 28-rod 1.2wt%UO₂ clusters



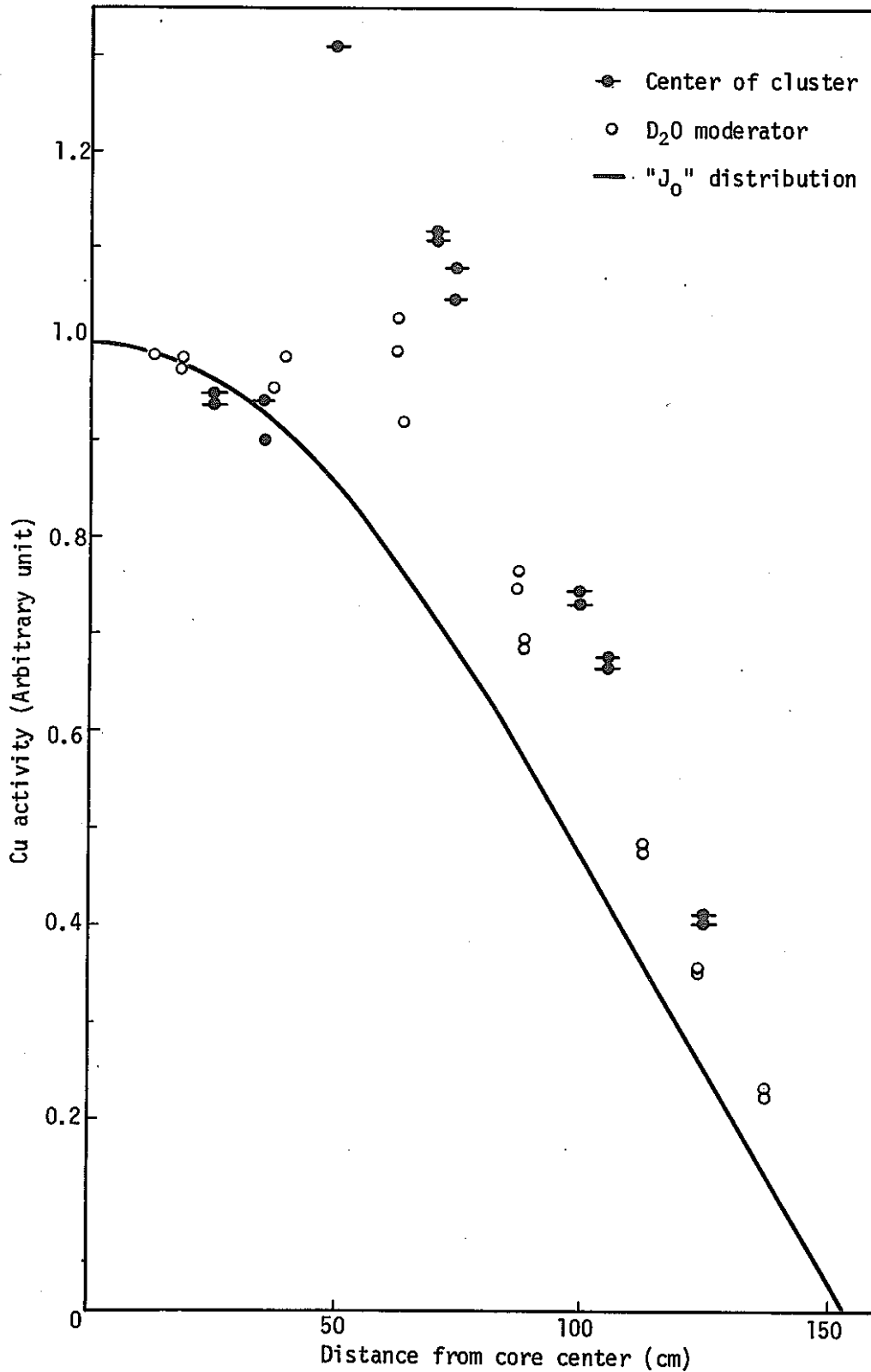
(2) Void fraction: 100 %

Fig. 4-4 Radial flux distribution normalized to the core center in the core uniformly loaded with 28-rod 1.2wt% UO_2 clusters.



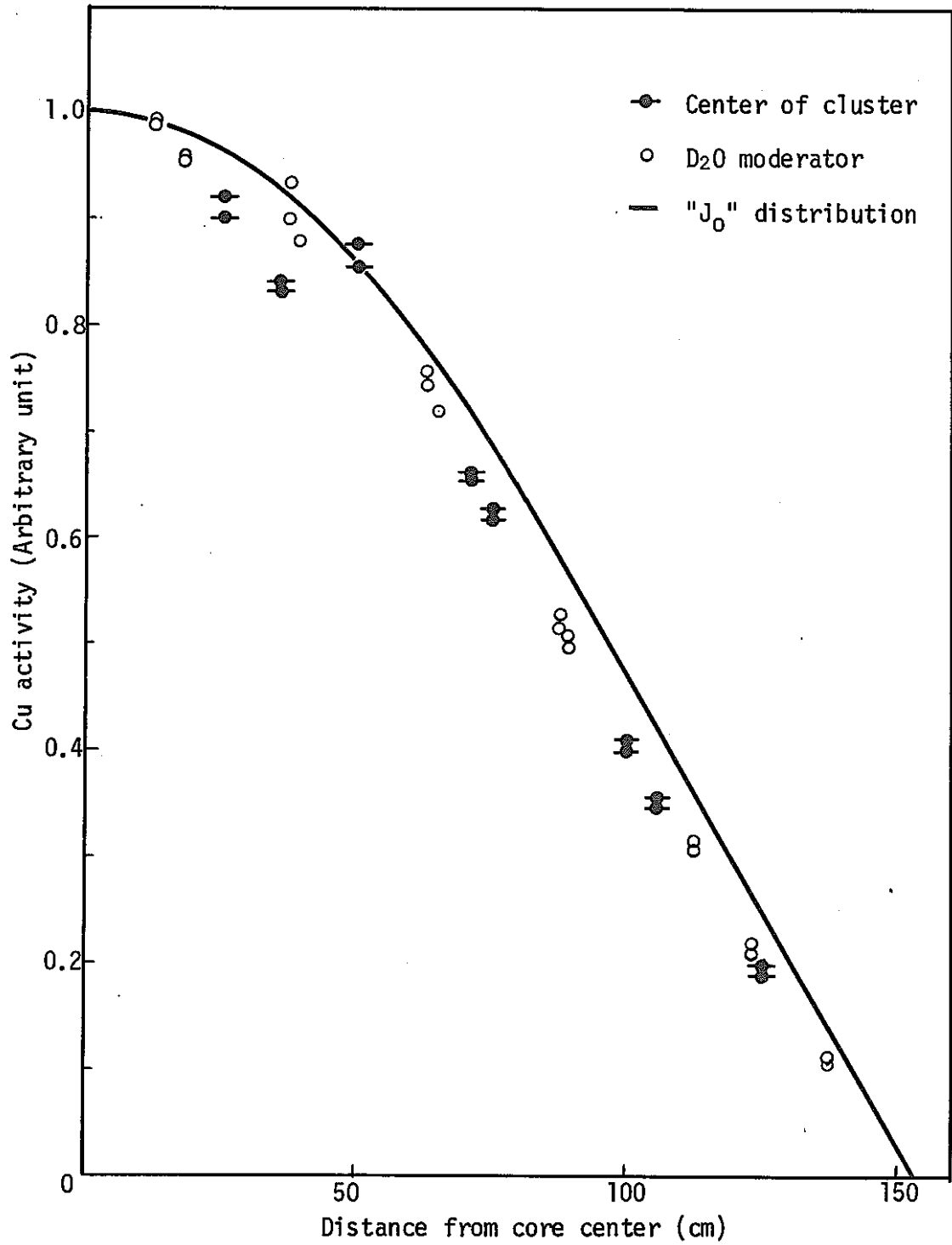
(1) Void fraction: 0 % ¹⁰B content in D₂O: 0 ppm

Fig. 4-5 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.54wt%PuO₂-UO₂ clusters



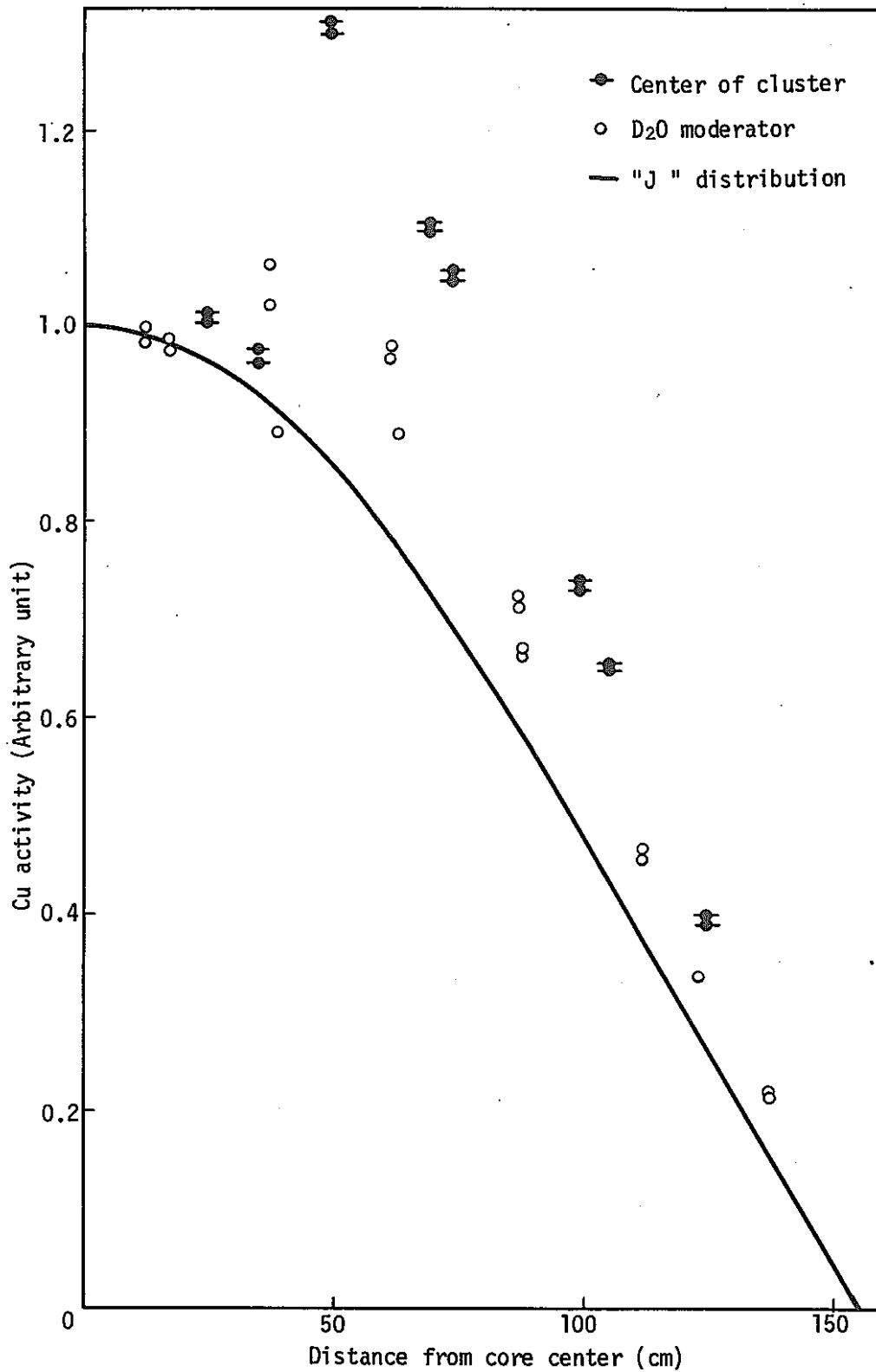
(2) Void fraction: 100% ¹⁰B content in D₂O: 0 ppm

Fig. 4-5 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(3) Void fraction: 0 % ¹⁰B content in D₂O: 3.2 ppm

Fig. 4-5 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.



(4) Void fraction: 100 % ¹⁰B content in D₂O: 3.2 ppm

Fig. 4-5 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.54wt% PuO₂-UO₂ clusters.

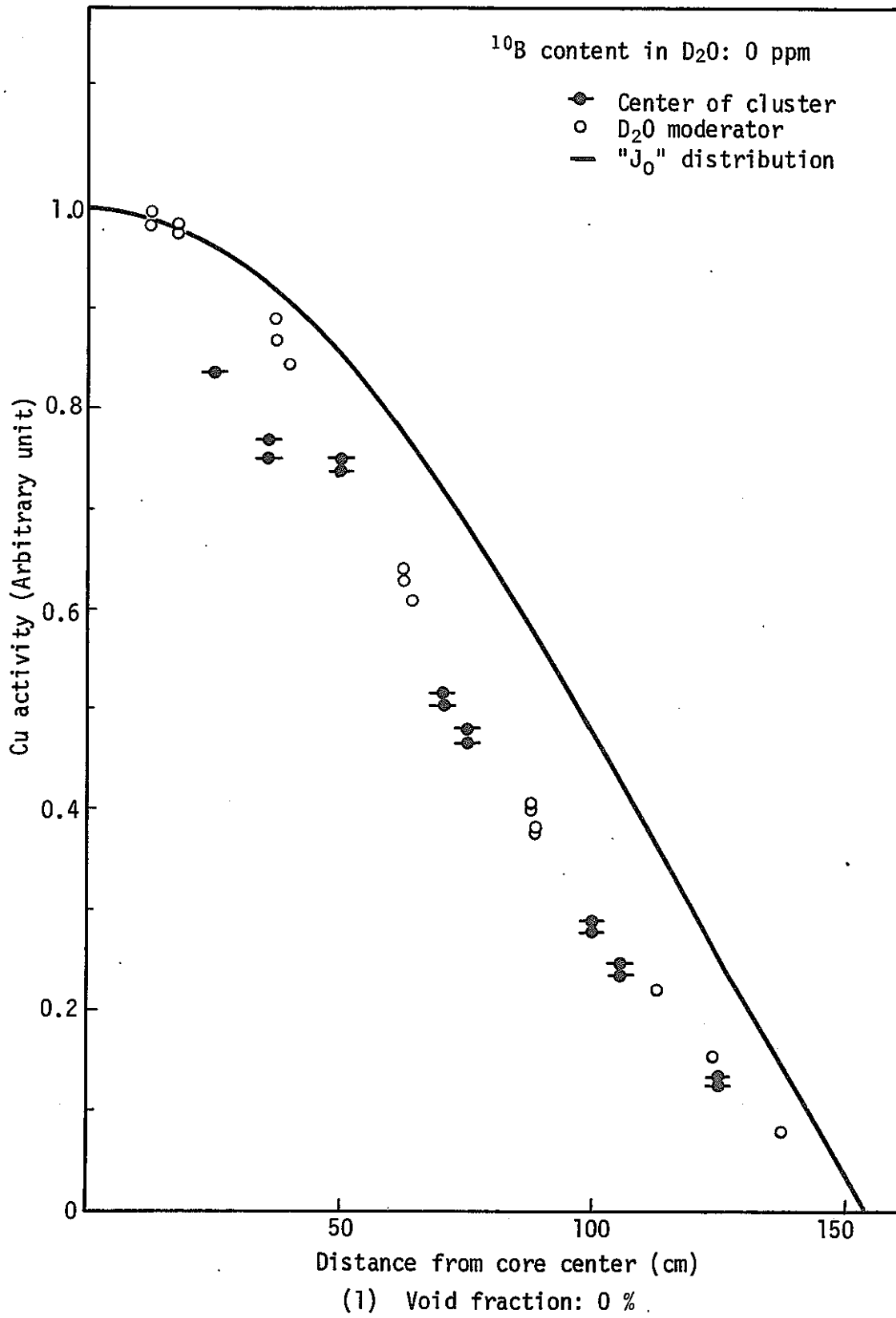


Fig. 4-6 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.87wt%PuO₂-UO₂ clusters

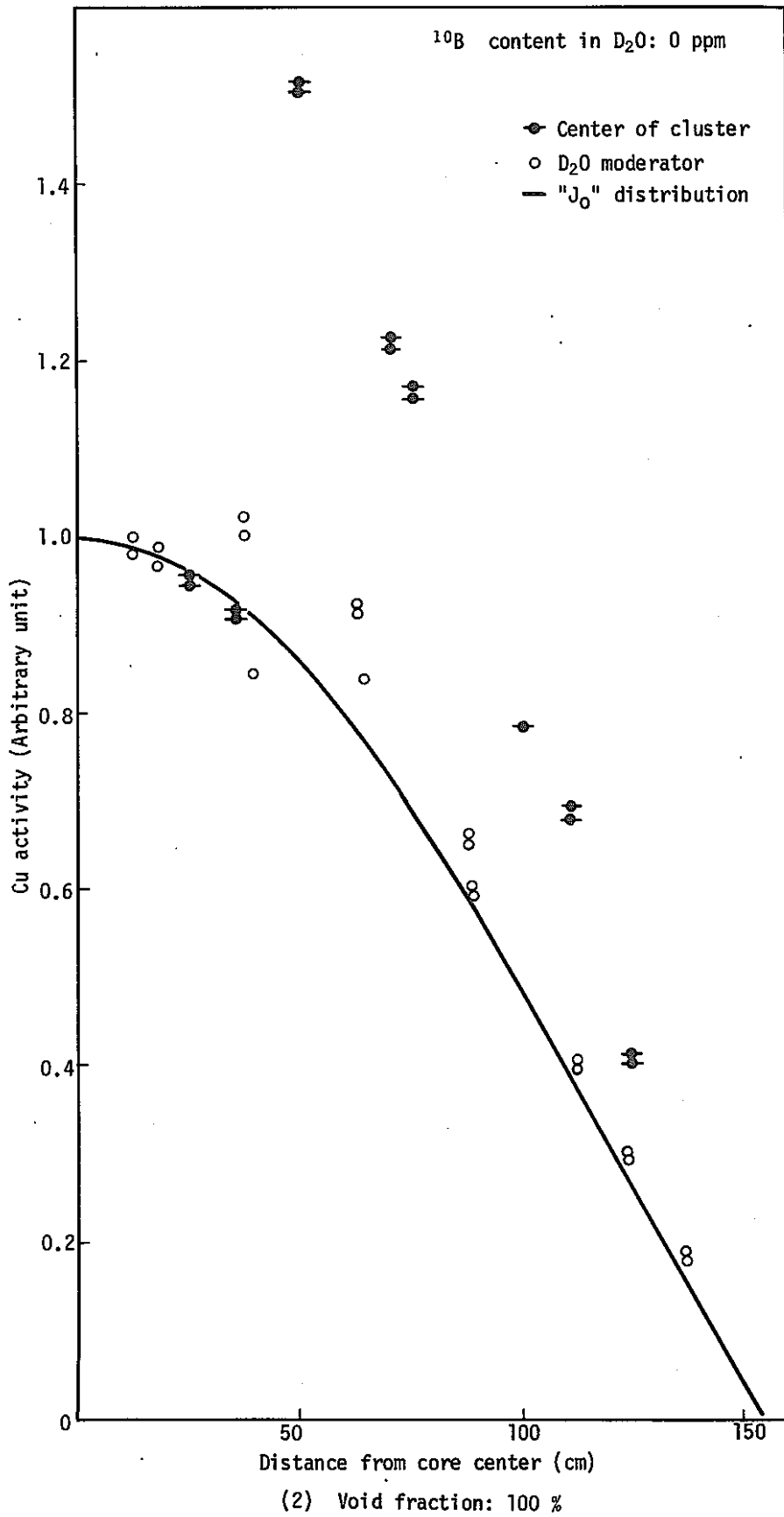
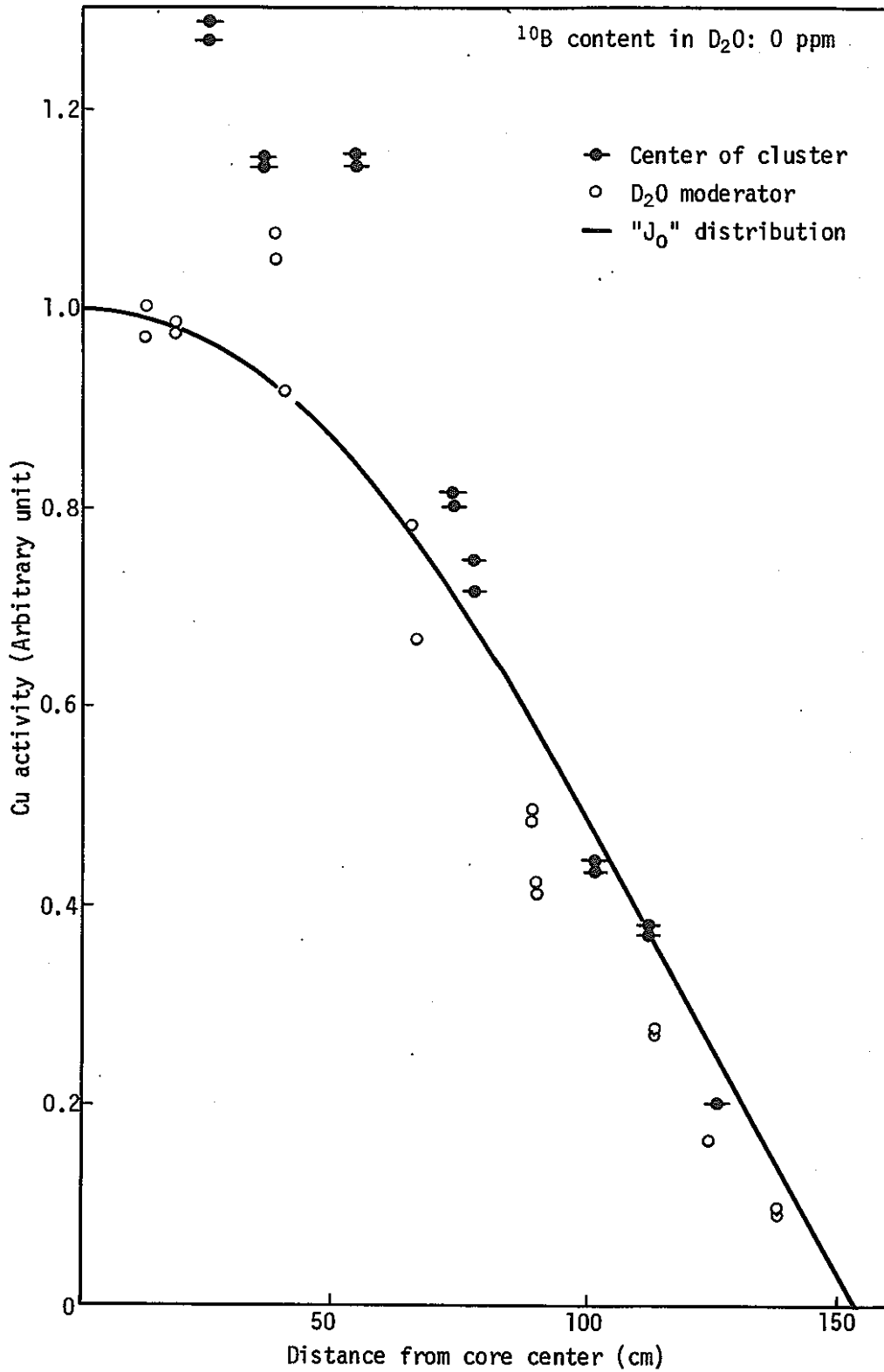


Fig. 4-6 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.



(3) Void fraction: Central channel - 100% Others - 0%

Fig. 4-6 Radial flux distribution normalized to the core center in the core partially loaded with 36-rod 0.87wt% PuO₂-UO₂ clusters.