

Table 2.7.2. (Continued)

Position (cm)				$^{115}\text{In}, n$	$^{58}\text{Ni}, p$	$^{27}\text{Al}, \alpha$	$^{197}\text{Au}, \gamma$ Cadmium Covered	$^{197}\text{Au}, \gamma$ Bare	^7LiF (mR/h/W)
Name	X	Y	Z						
C- 1	1	-15	0	3.53-22	2.42-22	3.16-24	5.55-20	1.87-19	9.34+02
3	40			5.63-23	4.93-23	7.27-25	9.51-21	3.65-20	1.76+02
5	80			1.67-23	1.53-23	2.62-25	2.19-21	8.05-21	5.74+01
7	120			6.93-24	6.57-24	1.21-25	7.04-22	2.67-21	2.25+01
9	160			3.41-24	3.20-24	6.37-26	3.04-22	1.10-21	1.11+01
10	180			2.04-24	2.29-24	4.90-26	2.30-22	8.19-22	7.70+00
11			20	3.58-25	2.27-25	4.45-27	8.25-23	3.23-22	7.95-01
12			40	5.34-26	2.56-26	-	2.55-23	1.12-22	1.97-01
13			60	2.00-26	-	-	9.63-24	4.20-23	1.25-01
14			80	-	-	-	4.37-24	1.80-23	8.07-02
15			100	-	-	-	2.16-24	8.98-24	4.23-02
16			120	-	-	-	1.28-24	5.04-24	2.82-02
D- 1	1	0	-15	4.64-22	3.25-22	3.74-24	6.83-20	2.36-19	1.10+03
3	40			6.07-23	5.18-23	7.31-25	1.02-20	3.83-20	2.01+02
5	80			1.75-23	1.56-23	2.46-25	2.26-21	8.41-21	5.41+01
7	120			7.08-24	6.68-24	1.14-25	7.35-22	2.71-21	2.04+01
9	160			3.66-24	3.50-24	6.31-26	3.09-22	1.16-21	1.16+01
10	180			2.68-24	2.37-24	4.66-26	2.40-22	8.96-22	8.55+00
11	195			2.26-24	1.90-24	3.78-26	2.30-22	9.05-22	7.31+00
12			0	2.19-25	1.17-25	1.01-27	1.09-22	4.69-22	6.22-01
13			20	2.05-25	1.46-25	3.06-27	5.92-23	2.67-22	1.17+00
14			40	3.86-26	1.84-26	-	2.28-23	1.00-22	1.89-01
15			60	1.48-26	-	-	9.12-24	3.96-23	1.07-01
16			80	7.63-27	-	-	4.21-24	1.75-23	6.64-02
17			100	4.42-27	-	-	2.33-24	8.75-24	4.62-02
18			120	2.86-27	-	-	1.38-24	4.88-24	3.02-02
E- 1	1	15	0	2.88-22	2.10-22	2.60-24	4.20-20	1.35-19	8.19+02
7	120			6.03-24	5.71-24	9.75-26	6.67-22	2.38-21	1.98+01
14	180		80	-	-	-	4.17-24	1.78-23	9.46-02

Table 2.7.3. Statistical Errors in the Measurement
of $^{58}\text{Ni}(n,p)^{58}\text{Co}$ and $^{27}\text{Al}(n,\alpha)^{24}\text{Na}$
Reaction Rates in Configuration of
Experiment 2.7

$^{58}\text{Ni},p$		$^{27}\text{Al},\alpha$	
Reaction rate ($\text{sec}^{-1}\cdot\text{W}^{-1}$)	Statistical Error (%)	Reaction rate ($\text{sec}^{-1}\cdot\text{W}^{-1}$)	Statistical Error (%)
$> 1\times 10^{-26}$	1	$> 1\times 10^{-27}$	1
3×10^{-27}	2	3×10^{-28}	2
$< 1\times 10^{-27}$	3	1×10^{-28}	3
		3×10^{-29}	4
		$< 1\times 10^{-29}$	5

Table 2.7.4. The Thermal and Epithermal Neutron Fluxes ($\text{cm}^{-2}\cdot\text{sec}^{-1}\cdot\text{W}^{-1}$) Measured in Experiment 2.7

Position	Configuration 1		Configuration 2	
	ϕ_0 ($\text{cm}^{-2}\cdot\text{sec}^{-1}\cdot\text{W}^{-1}$)	θ' ($\text{cm}^{-2}\cdot\text{sec}^{-1}\cdot\text{W}^{-1}$)	ϕ_0 ($\text{cm}^{-2}\cdot\text{sec}^{-1}\cdot\text{W}^{-1}$)	θ' ($\text{cm}^{-2}\cdot\text{sec}^{-1}\cdot\text{W}^{-1}$)
A- 1	1.14 +03 ^a	6.64 +01	3.39 +03	1.57 +02
2	6.92 +02	3.32 +01	8.98 +02	1.69 +01
3	3.11 +02	1.93 +01	2.55 +02	3.57 +00
4	1.70 +02	1.04 +01	9.88 +01	1.29 +00
5	8.64 +01	5.88 +00	4.83 +01	6.45 -01
6	4.43 +01	3.32 +00	2.62 +01	3.73 -01
7	2.91 +01	1.92 +00	1.57 +01	2.30 -01
8	1.73 +01	1.24 +00	9.68 +00	1.58 -01
9	1.07 +01	7.98 -01	6.09 +00	1.26 -01
10	7.85 +00	6.01 -01	7.58 +00	1.20 -01
11	7.29 +00	4.56 -01	7.45 +00	1.56 -01
12	5.12 +00	3.50 -01	5.45 +00	1.32 -01
13	2.32 +00	1.57 -01	6.78 -01	1.07 -02
14	1.04 +00	8.10 -02	1.67 -01	1.71 -02
15	5.11 -01	3.96 -02	5.40 -02	
16	2.47 -01	2.09 -02	2.11 -02	
17	1.47 -01	1.25 -02	9.94 -03	
B- 1	9.42 +02	5.28 +01	1.04 +03	5.65 +01
3			2.57 +02	1.12 +01
5			5.84 +01	2.72 +00
7	3.20 +01	2.02 +00	1.91 +01	8.71 -01
9			7.26 +00	3.55 -01
10			5.61 +00	1.89 -01
11			9.76 -01	3.65 -02
12			3.64 -01	1.32 -02
13	6.76 -01	2.24 -02	1.53 -01	5.90 -03
14			7.75 -02	2.86 -03
15			4.39 -02	1.64 -03

^aRead as 1.14×10^3

Table 2.7.4. (Continued)

Position	Configuration 1		Configuration 2	
	ϕ_0 ($\text{cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{W}^{-1}$)	θ' ($\text{cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{W}^{-1}$)	ϕ_0 ($\text{cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{W}^{-1}$)	θ' ($\text{cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{W}^{-1}$)
C- 1	1.27 +03	7.11 +01	1.45 +03	7.74 +01
3			3.00 +02	1.32 +01
5			6.51 +01	3.05 +00
7	2.80 +01	2.12 +00	2.18 +01	9.82 -01
9			8.77 +00	4.24 -01
10			6.53 +00	3.20 -01
11			2.67 +00	1.15 -01
12			9.65 -01	3.55 -02
13			3.61 -01	1.34 -02
14	6.95 -01	2.26 -02	1.51 -01	6.09 -03
15			7.60 -02	3.01 -03
16			4.18 -02	1.78 -03
D- 1	1.66 +03	8.91 +01	1.85 +03	9.52 +01
3			3.12 +02	1.42 +01
5			6.83 +01	3.15 +00
7	3.53 +01	2.09 +00	2.19 +01	1.02 +00
9			9.41 +00	4.31 -01
10			7.24 +00	3.34 -01
11			7.54 +00	3.20 -01
12			4.01 +00	1.52 -01
13			2.32 +00	8.25 -02
14			8.57 -01	3.18 -02
15			3.39 -01	1.27 -02
16	7.06 -01	2.21 -02	1.47 -01	5.87 -03
17			7.13 -02	3.25 -03
18			3.88 -02	1.92 -03
E- 1	9.75 +02	5.56 +01	1.02 +03	5.85 +01
7	3.26 +01	2.05 +00	1.90 +01	9.30 -01
14	6.90 -01	2.24 -02	1.52 -01	5.81 -03

Table 2.7.5. Comparison of Reaction Rates Measured at the Duct Mouth and Those Measured in the Water Shield of JRR-4. In This Table, D Means the Distance between Measured Position and Core Tank Surface.

Reaction	A: Measured at the Duct Mouth (D = 22 cm)	B: Measured in Water Shield (D = 20 cm)	Ratio A/B
$^{115}\text{In}, \text{n}$	6.00 $\times 10^{-22}$ ^a	5.66 $\times 10^{-22}$	1.06
$^{58}\text{Ni}, \text{p}$	4.30 $\times 10^{-22}$	4.09 $\times 10^{-22}$	1.05
$^{27}\text{Al}, \alpha$	4.96 $\times 10^{-24}$	4.83 $\times 10^{-24}$	1.03

^aRead as 6.00×10^{-22}

Table 2.8.1. Measured Reaction Rates ($\text{sec}^{-1}.\text{W}^{-1}$) and Neutron Fluxes ($\text{cm}^{-2}.\text{sec}^{-1}.\text{W}^{-1}$) in Configuration 1L of Experiment 2.8

Position Name	X ^a (cm)	⁵⁸ Ni,p	¹⁹⁷ Au,γ Cadmium Covered	¹⁹⁷ Au,γ Bare	Φ ₀	θ'
Line A: Y=0.0 cm, Z=14.65 cm						
A-1	1	7.89-24 ^b	7.36-21	1.54-20	8.52+01	1.46+01
	20	3.81-24	3.48-21	9.19-21	6.26+01	4.85+00
	40	1.80-24	1.59-21	4.33-21	3.01+01	2.22+00
	80	6.32-25	4.09-22	1.08-21	7.35+00	5.71-01
	120	2.99-25	1.35-22	3.53-22	2.38+00	1.88-01
	160	1.62-25	6.22-23	1.46-22	9.12-01	8.68-02
	200	9.92-26	3.10-23	7.22-23	4.48-01	4.32-02
	240	6.52-26	2.74-23	5.91-23	3.41-01	3.82-02
Line B: Y=14.65 cm, Z=0.0 cm						
B-1	1	8.98-24	8.44-21	1.84-20	1.06+02	1.68+01
	20	4.13-24	3.69-21	9.47-21	6.32+01	5.15+00
	40	1.89-24	1.63-21	4.33-21	2.95+01	2.27+00
	80	6.73-25	4.06-22	1.08-21	7.39+00	5.66-01
	120	3.13-25	1.36-22	3.50-22	2.34+00	1.90-01
	160	1.72-25	6.19-23	1.47-22	9.24-01	8.64-02
	200	1.04-25	3.12-23	7.38-23	4.63-01	4.35-02
	240	6.86-26	2.72-23	6.01-23	3.56-01	3.79-02
Line C: Y=0.0 cm, Z=-14.65 cm						
C-1	1	9.22-24	8.11-21	1.71-20	9.56+01	1.61+01
	20	4.11-24	3.73-21	9.72-21	6.57+01	5.20+00
	40	1.85-24	1.50-21	4.20-21	2.97+01	2.09+00
	80	6.58-25	3.95-22	1.08-21	7.51+00	5.51-01
	120	3.06-25	1.36-22	3.46-22	2.29+00	1.90-01
	160	1.77-25	6.08-23	1.45-22	9.15-01	8.48-02
	200	1.06-25	3.30-23	7.49-23	4.54-01	4.60-02
	240	6.91-26	2.58-23	5.78-23	3.46-01	3.60-02

^aDistance from duct mouth

^bRead as 7.89×10^{-24}

Table 2.8.2. Measured Reaction Rates ($\text{sec}^{-1}.\text{W}^{-1}$) and Neutron Fluxes ($\text{cm}^{-2}.\text{sec}^{-1}.\text{W}^{-1}$) in Configuration 1M of Experiment 2.8

Position Name	$^{58}\text{Ni}, \text{p}$	$^{197}\text{Au}, \gamma$ Cadmium Covered	$^{197}\text{Au}, \gamma$ Bare	ψ_0	ϕ'
Line A: Y=0.0 cm, Z=17.35 cm					
A-1	7.53-24 ^a	7.01-21	1.38-20	7.13+01	1.39+01
2	2.11-24	1.79-21	4.52-21	2.98+01	2.50+00
3	7.48-25	5.15-22	1.23-21	7.79+00	7.18-01
4	1.96-25	8.39-23	1.80-22	1.03+00	1.17-01
5	8.18-26	2.49-23	4.93-23	2.61-01	3.47-02
6	4.17-26	1.13-23	2.04-23	9.55-02	1.58-02
7	2.38-26	5.39-24	1.00-23	4.90-02	7.52-03
8	1.50-26	4.58-24	8.15-24	3.76-02	6.39-03
Line B: Y=17.35 cm, Z=0.0 cm					
B-1	9.04-24	8.23-21	1.76-20	9.94+01	1.63+01
2	2.58-24	1.93-21	5.01-21	3.38+01	2.69+00
3	8.88-25	5.42-22	1.31-21	8.38+00	7.56-01
4	2.39-25	8.78-23	1.91-22	1.12+00	1.22-01
5	9.84-26	2.62-23	5.37-23	2.95-01	3.66-02
6	5.11-26	1.18-23	2.22-23	1.10-01	1.65-02
7	2.95-26	6.14-24	1.15-23	5.67-02	8.57-03
8	1.84-26	4.75-24	9.08-24	4.60-02	6.63-03
Line C: Y=0.0 cm, Z=-17.35 cm					
C-1	8.92-24	8.20-21	1.63-20	8.53+01	1.63+01
2	2.64-24	1.93-21	5.30-21	3.70+01	2.69+00
3	9.17-25	5.05-22	1.27-21	8.35+00	7.05-01
4	2.39-25	8.27-23	1.89-22	1.16+00	1.15-01
5	1.02-25	2.56-23	5.12-23	2.74-01	3.57-02
6	5.41-26	1.12-23	2.18-23	1.13-01	1.56-02
7	3.25-26	6.07-24	1.13-23	5.54-02	8.47-03
8	1.94-26	4.67-24	8.75-24	4.32-02	6.52-03

^aRead as 7.53×10^{-24}

Table 2.8.3. Measured Reaction Rates ($\text{sec}^{-1} \cdot \text{W}^{-1}$) and Neutron Fluxes ($\text{cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{W}^{-1}$) in Configuration 1S of Experiment 2.8

Position Name	$^{58}\text{Ni}, p$	$^{197}\text{Au}, \gamma$ Cadmium Covered	$^{197}\text{Au}, \gamma$ Bare	ϕ_0	θ'
Line A: Y=0.0 cm, Z=18.6 cm					
A-1	6.94-24 ^a	5.44-21	1.19-20	6.78+01	1.08+01
2	1.12-24	5.75-22	1.62-21	1.15+01	8.02-01
3	2.64-25	9.65-23	2.37-22	1.53+00	1.35-01
4	4.75-26	1.09-23	2.50-23	1.53-01	1.52-02
5	1.70-26	3.04-24	6.38-24	3.60-02	4.24-03
6	7.73-27	1.29-24	2.66-24	1.47-02	1.80-03
7	4.23-27	7.92-25	1.44-24	6.83-03	1.10-03
8	2.51-27	7.34-25	1.21-24	4.93-03	1.02-03
Line B: Y=18.6 cm, Z=0.0 cm					
B-1	8.84-24	5.94-21	1.53-20	1.02+02	1.18+01
2	1.48-24	6.55-22	1.88-21	1.35+01	9.14-01
3	3.71-25	1.14-22	2.75-22	1.75+00	1.59-01
4	7.31-26	1.34-23	3.06-23	1.86-01	1.87-02
5	2.65-26	4.00-24	8.34-24	4.68-02	5.58-03
6	1.26-26	1.59-24	3.38-24	1.92-02	2.22-03
7	6.96-27	9.82-25	1.77-24	8.29-03	1.37-03
8	4.17-27	8.28-25	1.38-24	5.75-03	1.16-03
Line C: Y=0.0 cm, Z=-18.6 cm					
C-1	8.16-24	6.44-21	1.34-20	7.38+01	1.28+01
2	1.31-24	6.60-22	1.87-21	1.33+01	9.21-01
3	3.18-25	1.13-22	2.61-22	1.61+00	1.58-01
4	5.62-26	1.15-23	2.52-23	1.48-01	1.60-02
5	1.94-26	3.74-24	6.68-24	3.08-02	5.22-03
6	8.52-27	1.52-24	2.59-24	1.11-02	2.12-03
7	4.55-27	8.17-25	1.36-24	5.60-03	1.14-03
8	2.87-27	6.93-25	1.09-24	4.04-03	9.67-04

^aRead as 6.94×10^{-24}

Table 2.8.4. Measured Reaction Rates ($\text{sec}^{-1} \cdot \text{W}^{-1}$) and Neutron Fluxes ($\text{cm}^{-2} \cdot \text{sec}^{-1} \cdot \text{W}^{-1}$) in Configuration 2L of Experiment 2.8

Position Name	$^{58}\text{Ni}, \text{p}$	$^{197}\text{Au}, \gamma$ Cadmium Covered	$^{197}\text{Au}, \gamma$ Bare	ϕ_0	σ
Line A: Y=0.0 cm, Z=94.65 cm					
A-1	2.73-25 ^a	7.11-22	1.54-21	8.87+00	1.41+00
2	1.21-25	3.61-22	9.20-22	6.11+00	5.04-01
3	5.11-26	1.63-22	4.43-22	3.07+00	2.27-01
4	1.33-26	4.18-23	1.06-22	7.03-01	5.83-02
5	4.54-27	1.36-23	3.31-23	2.12-01	1.90-02
6	2.11-27	6.11-24	1.35-23	7.96-02	8.52-03
7	1.20-27	3.06-24	6.50-24	3.70-02	4.27-03
8	8.35-28	2.53-24	5.16-24	2.82-02	3.53-03
Line B: Y=14.65 cm, Z=80.0 cm					
B-1	6.37-25	9.70-22	2.09-21	1.19+01	1.93+00
2	3.66-25	4.34-22	1.07-21	6.95+00	6.05-01
3	1.35-25	1.80-22	4.80-22	3.29+00	2.51-01
4	2.36-26	4.31-23	1.07-22	6.97-01	6.01-02
5	7.27-27	1.42-23	3.42-23	2.18-01	1.98-02
6	3.79-27	6.45-24	1.42-23	8.37-02	9.00-03
7	1.94-27	3.32-24	6.49-24	3.37-02	4.63-03
8	1.32-27	2.74-24	5.53-24	2.99-02	3.82-03
Line C: Y=0.0 cm, Z=65.35 cm					
C-1	1.32-24	1.32-21	2.82-21	1.59+01	2.62+00
2	3.39-25	4.99-22	1.29-21	8.65+00	6.96-01
3	9.69-26	1.82-22	4.78-22	3.25+00	2.54-01
4	1.73-26	4.48-23	1.12-22	7.34-01	6.25-02
5	7.10-27	1.53-23	3.55-23	2.19-01	2.13-02
6	3.66-27	6.94-24	1.50-23	8.69-02	9.68-03
7	2.03-27	3.90-24	7.59-24	3.94-02	5.44-03
8	1.43-27	2.78-24	5.71-24	3.14-02	3.88-03

^aRead as 2.73×10^{-25}

Table 2.8.5. Measured Reaction Rates ($\text{sec}^{-1}.\text{W}^{-1}$) and Neutron Fluxes ($\text{cm}^{-2}.\text{sec}^{-1}.\text{W}^{-1}$) in Configuration 2M of Experiment 2.8

Position Name	$^{58}\text{Ni}, \text{p}$	$^{197}\text{Au}, \gamma$ Cadmium Covered	$^{197}\text{Au}, \gamma$ Bare	Φ_0	θ'
Line A: Y=0.0 cm, Z=97.35 cm					
A-1	1.70-25 ^a	6.85-22	1.33-21	6.74+00	1.36+00
2	3.77-26	1.61-22	3.94-22	2.54+00	2.25-01
3	1.05-26	4.73-23	1.13-22	7.15-01	6.60-02
4	1.93-27	8.00-24	1.66-23	9.27-02	1.12-02
5	5.53-28	2.37-24	4.45-24	2.21-02	3.31-03
6	1.50-28	1.14-24	1.88-24	7.66-03	1.59-03
7	5.62-29	5.80-25	9.51-25	3.83-03	8.09-04
8	-	4.26-25	7.32-25	3.20-03	5.94-04
Line B: Y=17.35 cm, Z=80.0 cm					
B-1	5.55-25	1.08-21	2.23-21	1.21+01	2.14+00
2	1.70-25	2.39-22	6.03-22	3.97+00	3.33-01
3	4.68-26	6.73-23	1.58-22	9.87-01	9.39-02
4	6.15-27	1.09-23	2.15-23	1.13-01	1.52-02
5	1.86-27	3.26-24	5.87-24	2.75-02	4.55-03
6	7.81-28	1.54-24	2.54-24	1.04-02	2.15-03
7	3.71-28	7.83-25	1.25-24	4.81-03	1.09-03
8	2.13-28	6.10-25	1.02-24	4.25-03	8.51-04
Line C: Y=0.0 cm, Z=62.65 cm					
C-1	1.10-24	1.74-21	3.32-21	1.65+01	3.45+00
2	1.81-25	3.32-22	8.52-22	5.69+00	4.63-01
3	3.82-26	7.80-23	1.81-22	1.19+00	1.09-01
4	5.15-27	1.23-23	2.46-23	1.32-01	1.72-02
5	1.87-27	3.90-24	6.73-24	2.97-02	5.44-03
6	8.57-28	1.80-24	2.97-24	1.21-02	2.51-03
7	4.52-28	9.75-25	1.53-24	5.67-03	1.36-03
8	2.64-28	7.18-25	1.21-24	5.09-03	1.00-03

^aRead as 1.70×10^{-25}

Table 2.8.6. Measured Reaction Rates ($\text{sec}^{-1}.\text{W}^{-1}$) and Neutron Fluxes ($\text{cm}^{-2}.\text{sec}^{-1}.\text{W}^{-1}$) in Configuration 3L of Experiment 2.8

Position Name	$^{197}\text{Au}, \gamma$ Cadmium Covered	$^{197}\text{Au}, \gamma$ Bare	ϕ_0	θ'
Line A: Y=0.0 cm, Z=174.65 cm				
A-1	8.82-23 ^a	2.41-22	1.68+00	1.75-01
2	3.55-23	1.05-22	7.65-01	4.95-02
3	1.53-23	4.47-23	3.24-01	2.13-02
4	3.82-24	1.03-23	7.10-02	5.33-03
5	1.35-24	3.35-24	2.18-02	1.88-03
6	6.27-25	1.43-24	8.71-03	8.75-04
7	3.22-25	7.31-25	4.43-03	4.49-04
8	2.70-25	5.93-25	3.48-03	3.77-04
Line B: Y=14.65 cm, Z=160.0 cm				
B-1	1.06-22	2.02-22	1.00+00	2.10-01
2	4.05-23	9.76-23	6.22-01	5.65-02
3	1.65-23	4.29-23	2.89-01	2.30-02
4	3.93-24	1.03-23	6.98-02	5.48-03
5	1.35-24	3.31-24	2.14-02	1.88-03
6	6.29-25	1.44-24	8.77-03	8.78-04
7	3.37-25	7.35-25	4.30-03	4.70-04
8	2.81-25	6.03-25	3.46-03	3.92-04
Line C: Y=0.0 cm, Z=145.35 cm				
C-1	1.27-22	2.71-22	1.53+00	2.52-01
2	4.31-23	1.13-22	7.65-01	6.01-02
3	1.50-23	4.30-23	3.08-01	2.09-02
4	3.81-24	1.02-23	7.01-02	5.32-03
5	1.33-24	3.33-24	2.18-02	1.86-03
6	6.23-25	1.42-24	8.61-03	8.69-04
7	3.31-25	7.48-25	4.50-03	4.62-04
8	2.70-25	5.82-25	3.36-03	3.77-04

^aRead as 8.82×10^{-23}

Table 3.1.1. The Energy Group Structure for Two-Dimensional Calculation by the DOT-III Code

Group No.	Upper Energy (eV)	Group No.	Upper Energy (eV)
1	1.49×10^7	16	1.11×10^5
2	9.05×10^6	17	6.74×10^4
3	6.70×10^6	18	4.09×10^4
4	5.49×10^6	19	2.48×10^4
5	4.49×10^6	20	1.17×10^4
6	3.68×10^6	21	5.53×10^3
7	3.01×10^6	22	2.61×10^3
8	2.47×10^6	23	1.23×10^3
9	2.02×10^6	24	3.54×10^2
10	1.65×10^6	25	1.01×10^2
11	1.35×10^6	26	2.90×10^1
12	1.11×10^6	27	1.07×10^1
13	6.72×10^5	28	3.06×10^0
14	3.69×10^5	29	1.13×10^0
15	2.02×10^5	30*	4.14×10^{-1}

* Lowest energy is 1.0×10^{-3} eV.

Table 4.2.1. Comparison of the Measured Attenuation Rates and Those Calculated with the PALLAS-2DCY-FC Code in Configuration 1L of Experiment 2.8

X (cm)	$^{197}\text{Au}, \gamma, \text{Bare}$			$^{197}\text{Au}, \gamma, \text{Cd Covered}$			$^{58}\text{Ni}, \text{p}$		
	CAL	EXP	C/E	CAL	EXP	C/E	CAL	EXP	C/E
80	6.40×10^{-2} ^a	6.23×10^{-2}	1.02	5.23×10^{-2}	5.00×10^{-2}	1.04	8.28×10^{-2}	7.51×10^{-2}	1.10
120	2.06×10^{-2}	2.02×10^{-2}	1.02	1.70×10^{-2}	1.68×10^{-2}	1.01	3.24×10^{-2}	3.51×10^{-2}	0.92
160	8.84×10^{-3}	8.44×10^{-3}	1.05	7.61×10^{-3}	7.63×10^{-3}	1.00	1.69×10^{-2}	1.95×10^{-2}	0.87
200	4.92×10^{-3}	4.25×10^{-3}	1.15	4.28×10^{-3}	3.90×10^{-3}	1.10	1.06×10^{-2}	1.18×10^{-2}	0.90

^aRead as 6.40×10^{-2}

Table 4.2.2. Comparison of the Attenuation Rates Calculated with the PALLAS-2DCY-FC Code for the 0.2- to 1.0-cm-Thick Wall

Neutron Energy	X (cm)	Steel Wall Thickness (cm)				
		0.2	0.4	0.6	0.8	1.0
Thermal	40.0	1.44	1.14	1.00	0.92	0.86
	100.0	1.87	1.19	1.00	0.92	0.84
	152.5	1.81	1.09	1.00	0.97	0.91
	217.5	1.46	1.01	1.00	1.01	0.97
3.55 eV	40.0	1.15	1.03	1.00	0.91	0.98
	100.0	1.18	0.99	1.00	1.02	1.03
	152.5	1.11	0.94	1.00	1.07	1.09
	217.5	1.01	0.92	1.00	1.09	1.13
1.05 MeV	40.0	0.93	0.96	1.00	1.04	1.07
	100.0	0.93	0.96	1.00	1.03	1.06
	152.5	0.95	0.96	1.00	1.02	1.05
	217.5	0.95	0.96	1.00	1.02	1.05

Table 4.2.3. Dimensions of the Steel-Walled Annular Ducts Used in the Experiments. The Symbols in This Table Are Explained in Fig.2.8.3. The Dimensions Are in Centimetres.

Experiment Number	R	t ₁	r	t ₂	δ	ℓ	S _ℓ	√S _ℓ
2.4	107.5	2.0	87.5	5.0	20.0	195	3482	59.0
	97.5	1.0	87.5	5.0	10.0	195	1191	34.5
2.5	20.0	0.45	10.0	0.45	10.0	150	498	22.3
2.6	29.8	0.64	20.3	0.64	9.5	298	585	24.2
2.7	20.0	0.60	10.8	0.65	9.2	180/140	443	21.1
2.8	19.7	0.64	9.6	0.53	10.1	250	500	22.4
	19.7	0.64	15.0	0.80	4.7	250	168	13.0
	19.7	0.64	17.5	0.49	2.2	250	55.1	7.42

Table 4.2.4. Dimensions of the Steel-Walled Annular Ducts
 Used in a Reference Experiment (Ref.4). The
 Symbols in This Table Are Explained in Fig.2.8.3.
 The Dimensions Are in Centimetres.

R	t_1	r	t_2	δ	l	S_l	$\sqrt{S_l}$
9.53	0.64	5.08	0.38	4.45	~ 200	103	10.1
		6.35		3.81		63.7	7.98
		7.62		1.91		30.4	5.51
		8.26		1.27		16.8	4.09
		8.89		0.64		5.99	2.45
		9.21		0.32		2.13	1.46

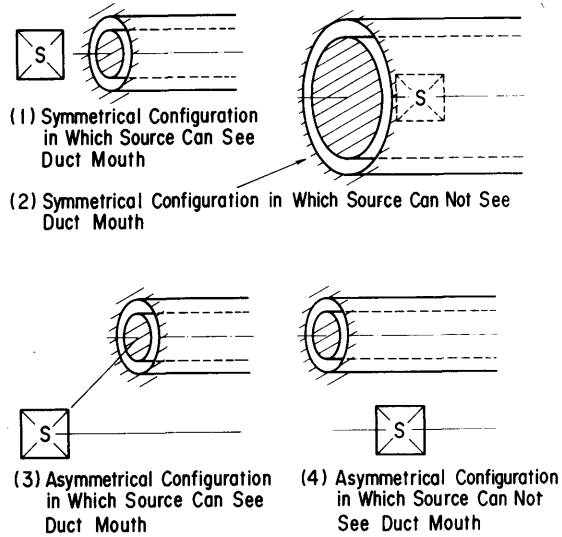


Fig. 2.1.1. Classification of annular duct geometries.

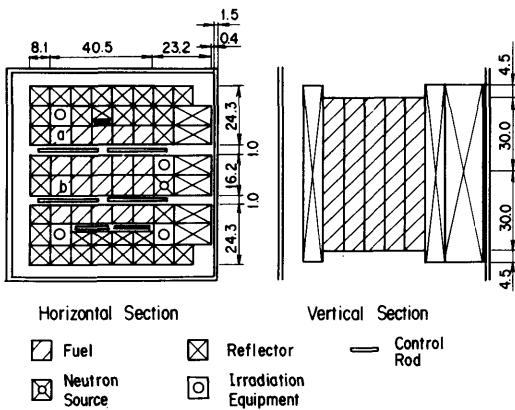


Fig. 2.2.1. Horizontal and vertical cross sections of the JRR-4 reactor core. In experiment 2.7 for a bent duct, the two fuel elements marked a and b are replaced by a graphite reflector element and an element containing an instrumental tube, respectively. Dimensions are in centimetres.

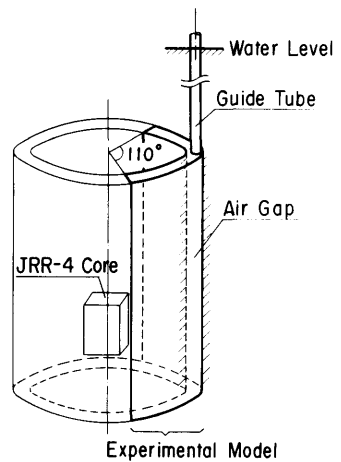


Fig. 2.4.1. Sketch of an experimental model of symmetrical configuration in which source can not see duct mouth. The model simulates the air gap between the reactor vessel and the primary shield.

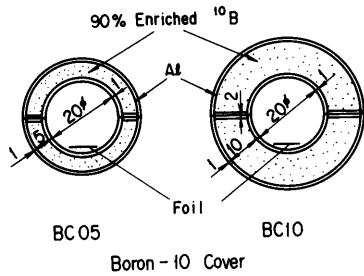


Fig. 2.4.4. Dimensions of boron covers.

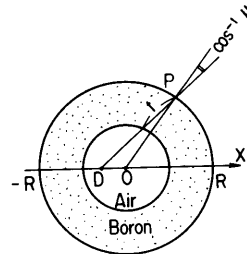


Fig. 2.4.5. Calculational model of boron cover. Neutron source having isotropic angular distribution was input at the outer boundary of spherical layer.

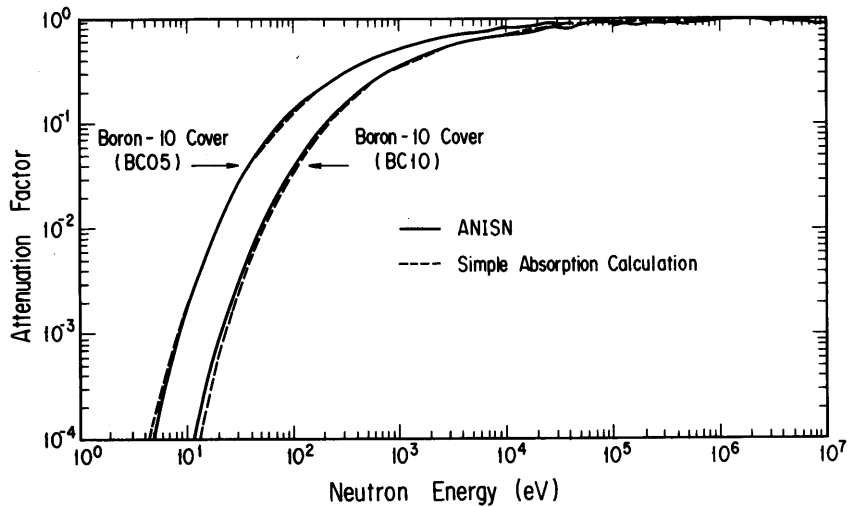


Fig. 2.4.6. Comparison of attenuation factors obtained by the ANISN code and a simple absorption calculation.

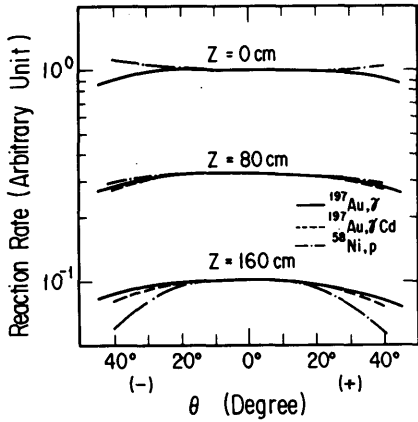


Fig.2.4.7. The fast, epithermal, and thermal neutron flux distributions measured on the lines C, D, and E.

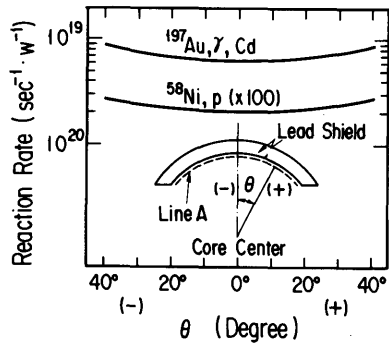


Fig.2.4.8. Neutron flux distributions on the line A measured by nickel and cadmium covered gold foils.

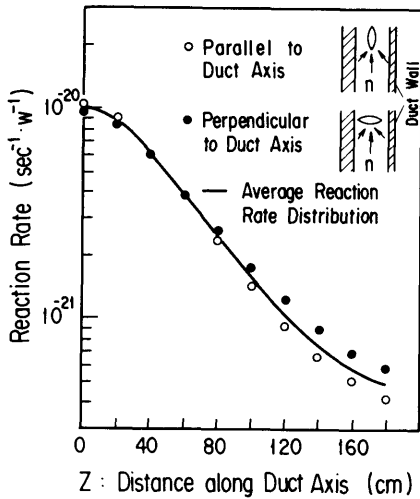


Fig.2.4.9. Comparison of reaction rates measured by cadmium covered gold foils set parallel and perpendicular to duct axis.

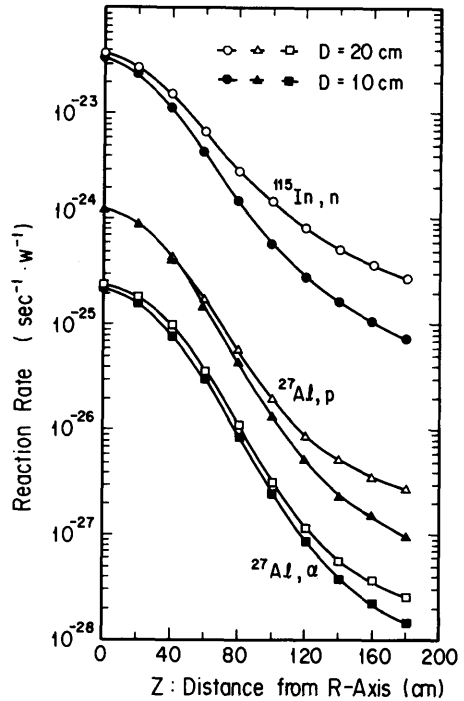


Fig.2.4.10. Comparison of the fast neutron flux distributions measured in 10 and 20 cm air gap widths.

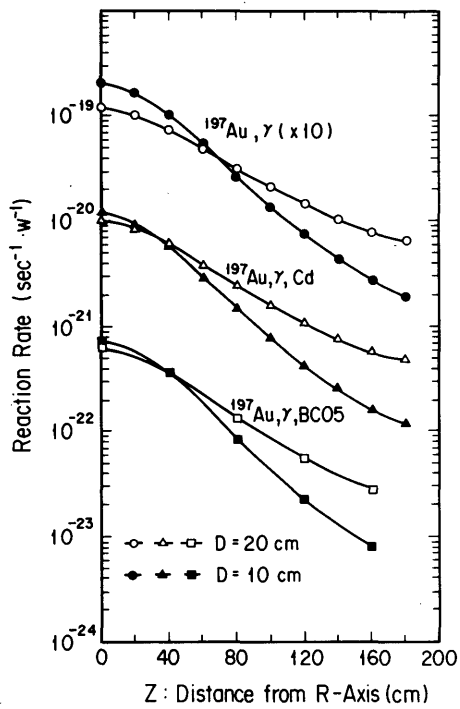


Fig. 2.4.11. Comparison of the slow neutron flux distributions measured in 10 and 20 cm air gap widths.

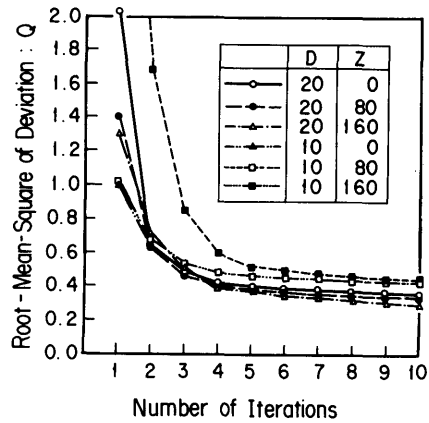


Fig. 2.4.12. Variations of the root-mean-square of deviation, Q , with respect to the iteration number.

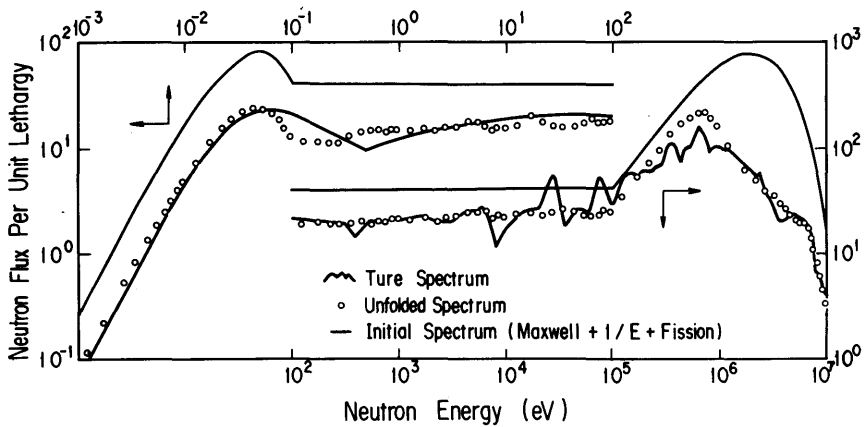


Fig. 2.4.13. Test calculation on reproducibility of true spectrum by SAND-II unfolding.

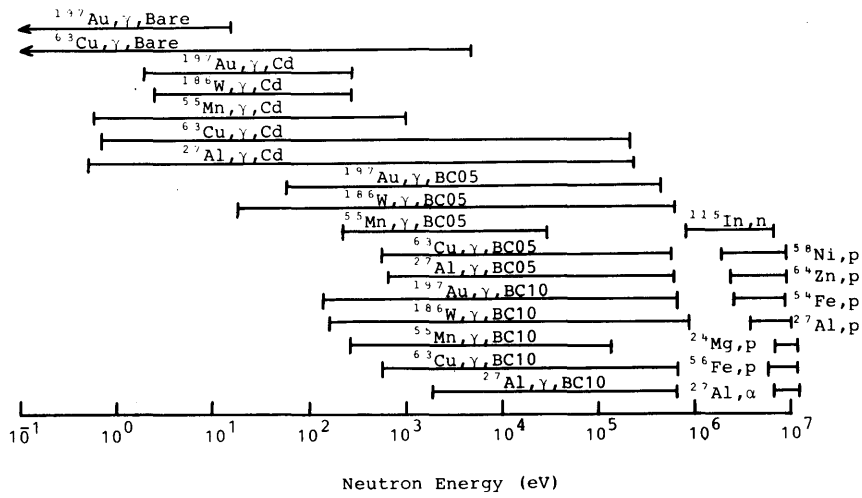


Fig. 2.4.14. 90% response ranges of 25 kinds of activation detectors.

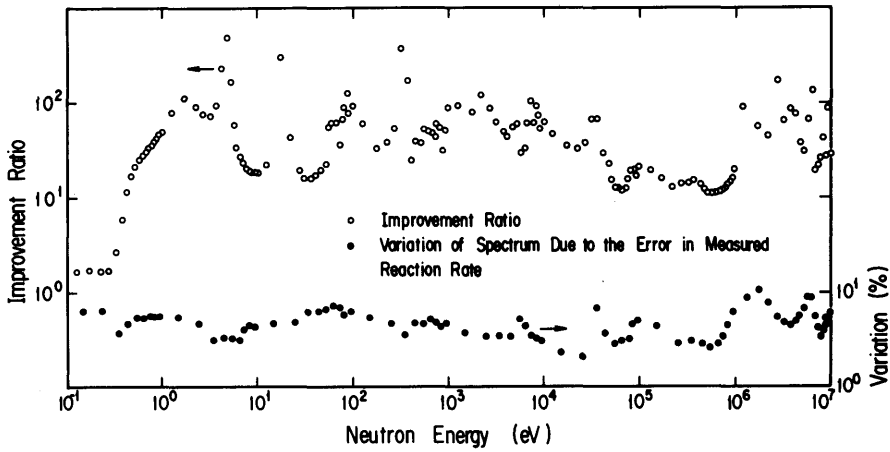


Fig. 2.4.15. Improvement ratio for initial spectral information and spectral variation due to error included in

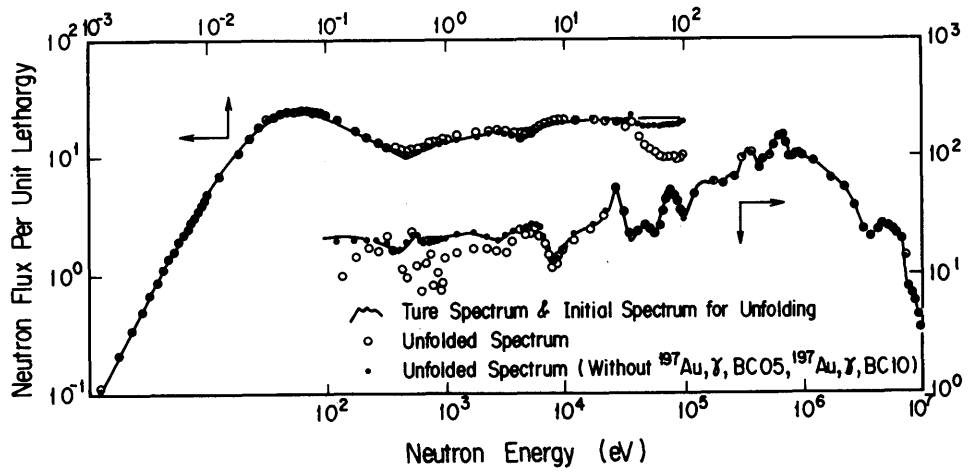


Fig.2.4.16. Test calculation with respect to activation cross section files.

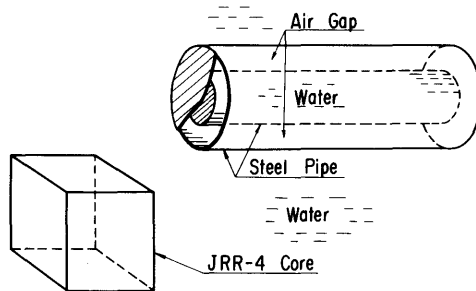


Fig.2.5.1. Sketch of asymmetrical configuration of experiment 2.5 in which source can see duct mouth.

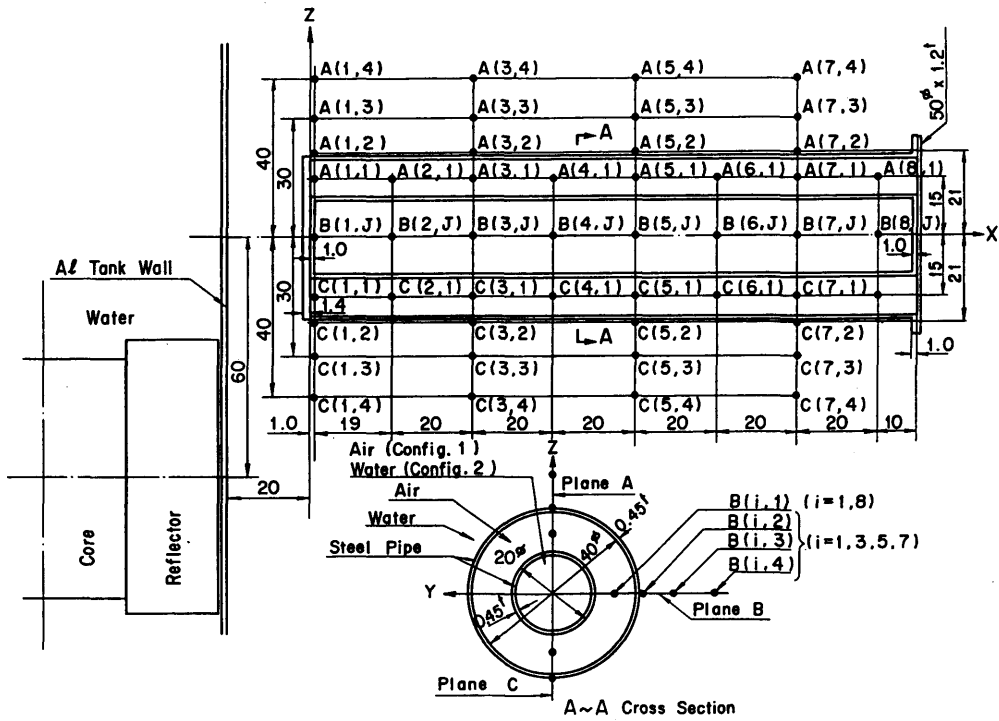


Fig.2.5.2. The experimental configuration simulating the main coolant pipe penetrating the primary shield. The measurement positions are shown as A(1.1), etc. The dimensions are in centimetres.

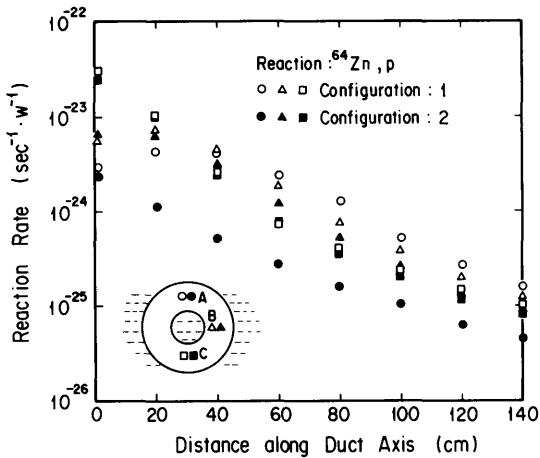


Fig.2.5.3. $^{64}\text{Zn}(n,p)^{64}\text{Cu}$ reaction rates measured along duct axis in configurations 1 and 2.

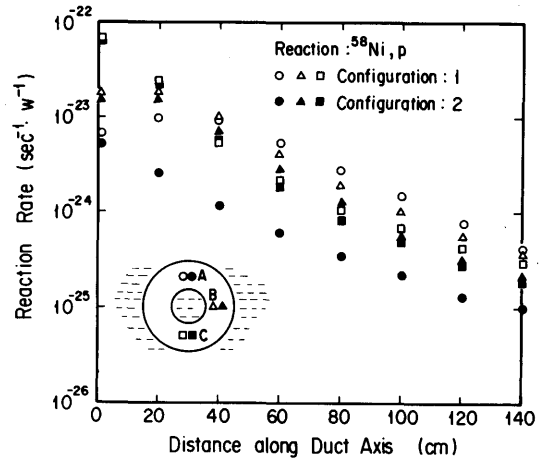


Fig.2.5.4. $^{58}\text{Ni}(n,p)^{58}\text{Co}$ reaction rates measured along duct axis in configurations 1 and 2.

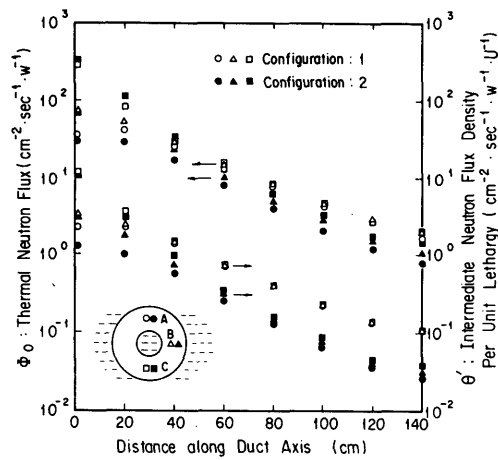


Fig.2.5.5. The thermal and epithermal neutron fluxes measured along duct axis in configurations 1 and 2.

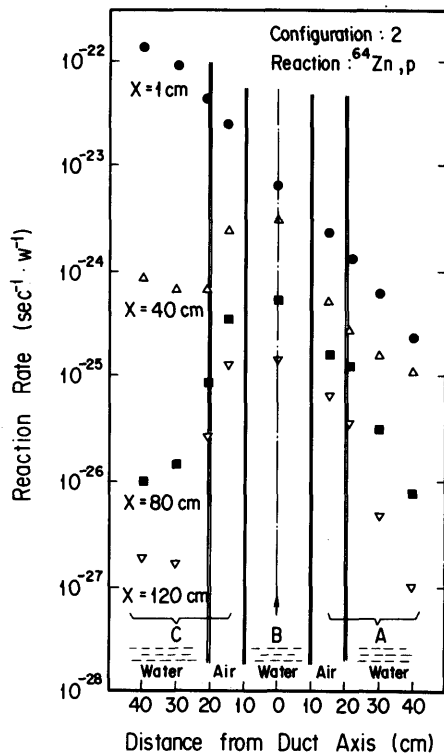


Fig. 2.5.6. Radial distributions of $^{64}\text{Zn}(n,p)^{64}\text{Cu}$ reaction rates measured in configuration 2.

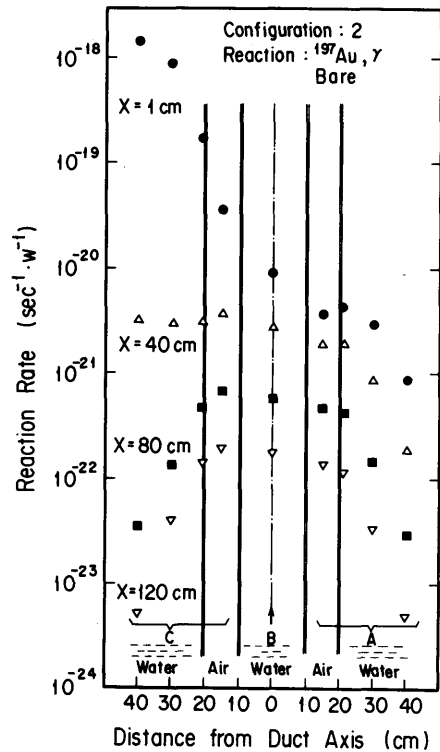


Fig. 2.5.7. Radial distributions of $^{197}\text{Au}(n,\gamma)^{198}\text{Au}$, bare, reaction rates measured in configuration 2.

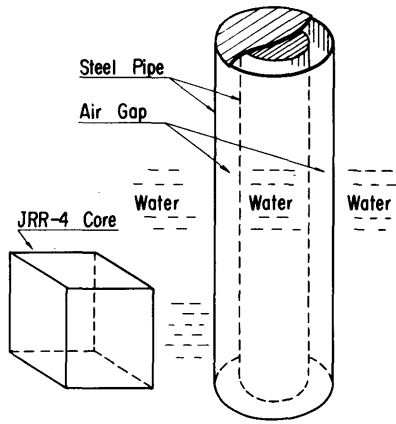


Fig. 2.6.1. Sketch of asymmetrical configuration of experiment 2.6 in which source can not see duct mouth.

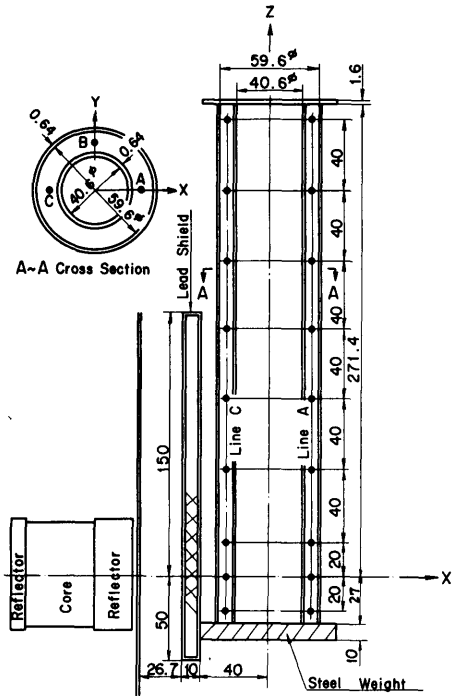


Fig. 2.6.2. The experimental configuration simulating the shield around the primary circulating pump of the integrated type marine reactor. Measurements were taken along lines designated as line A, etc. Dimensions are in centimetres.

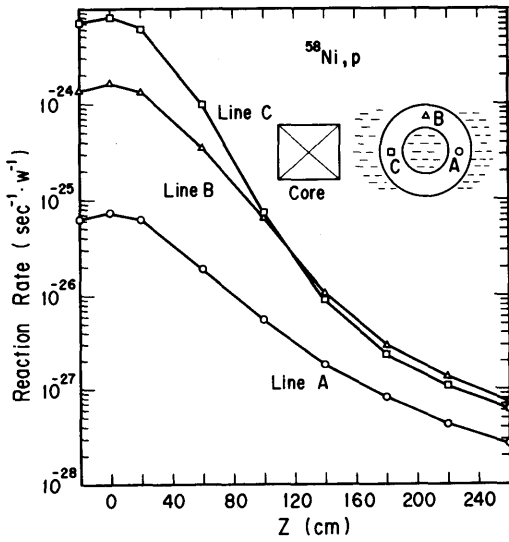


Fig. 2.6.3. $^{58}\text{Ni}(n,p)^{58}\text{Co}$ reaction rates measured along duct axis.

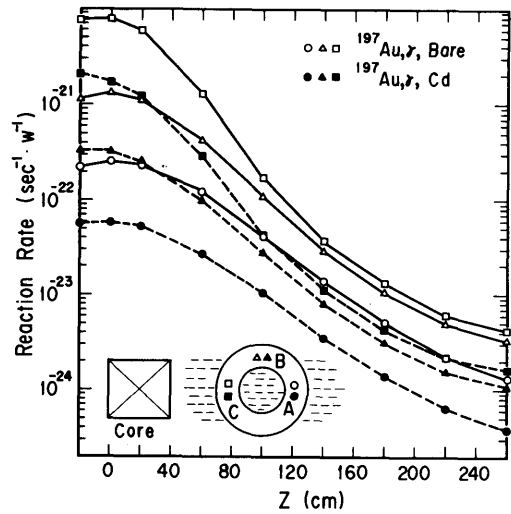


Fig. 2.6.4. Bare and cadmium covered $^{197}\text{Au}(n,\gamma)$ ^{198}Au reaction rates measured along duct axis.

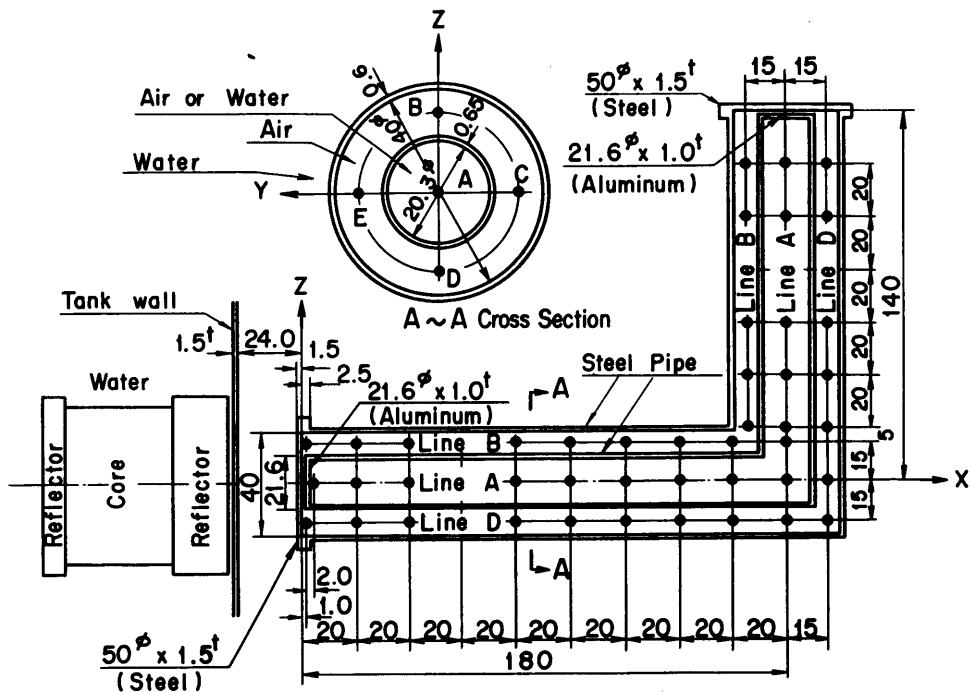


Fig. 2.7.1. The experimental configuration of the one-bend annular duct. Measurements were made along line A, etc. Dimensions are in centimetres.

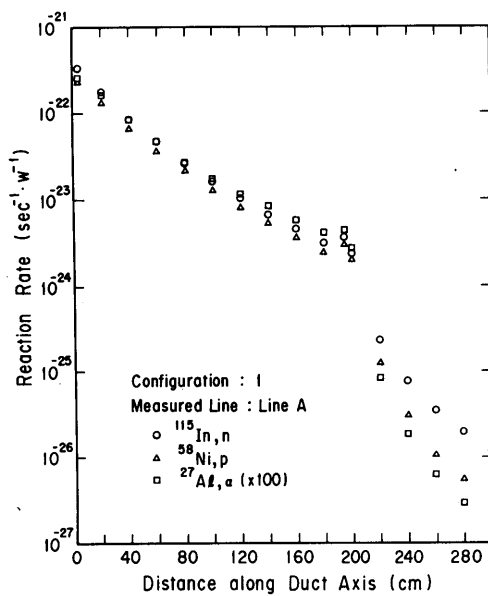


Fig. 2.7.2. Axial distributions of $^{115}\text{In}(n,n')$, $^{115\text{m}}\text{In}$, $^{58}\text{Ni}(n,p)$, ^{58}Co , and $^{27}\text{Al}(n,\alpha)$ ^{24}Na reaction rates measured in configuration 1.

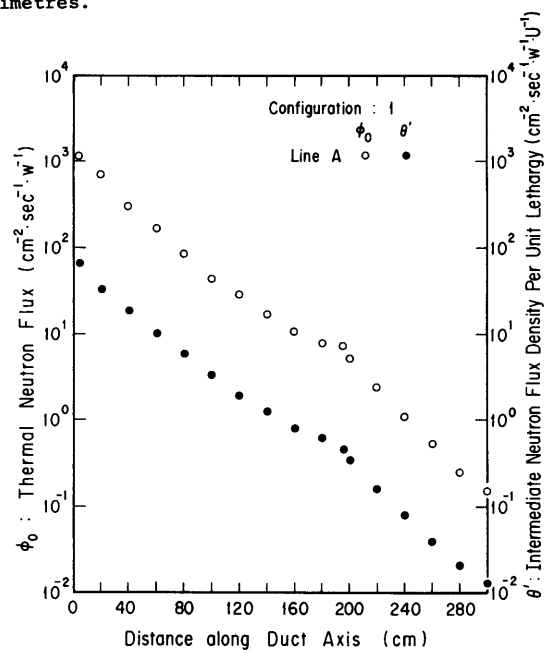


Fig. 2.7.3. Axial distributions of thermal and epithermal neutron fluxes measured in configuration 1.

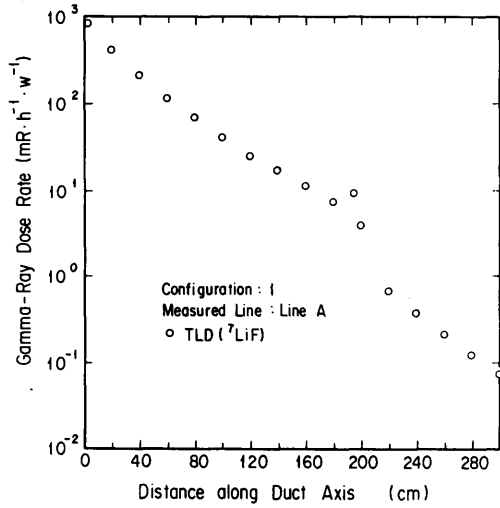


Fig. 2.7.4. Axial distributions of gamma-ray dose rates measured in configuration 1.

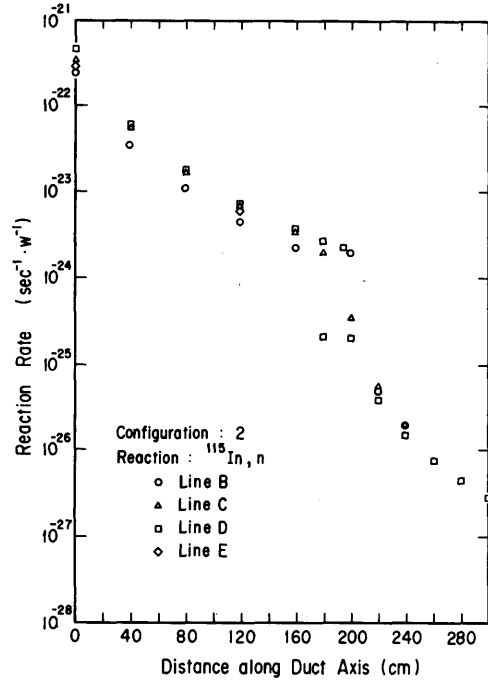


Fig. 2.7.5. Axial distributions of $^{115}\text{In}(n,n')$ $^{115\text{m}}\text{In}$ reaction rates measured in configuration 2.

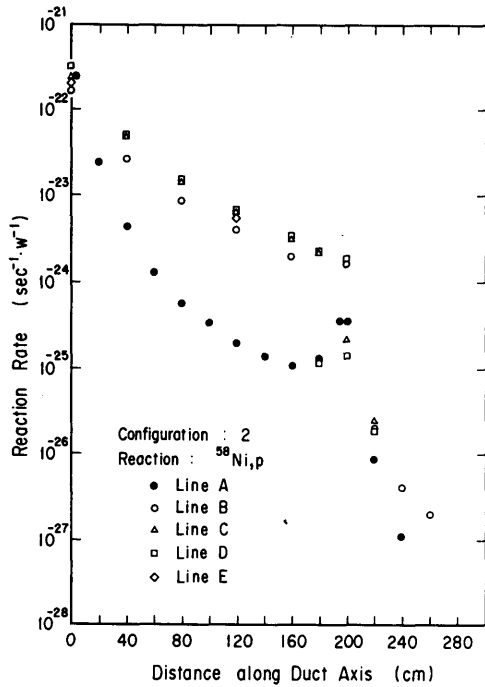


Fig. 2.7.6. Axial distributions of $^{58}\text{Ni}(n,p)$ ^{58}Co reaction rates measured in configuration 2.

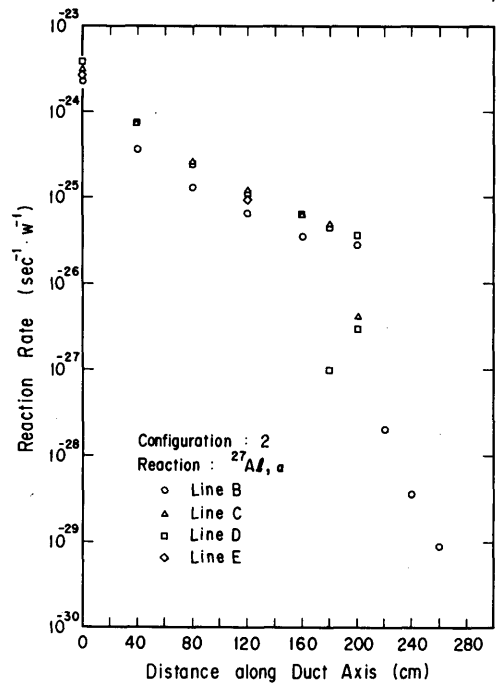


Fig. 2.7.7. Axial distributions of $^{27}\text{Al}(n,\alpha)$ ^{24}Na reaction rates measured in configuration 2.

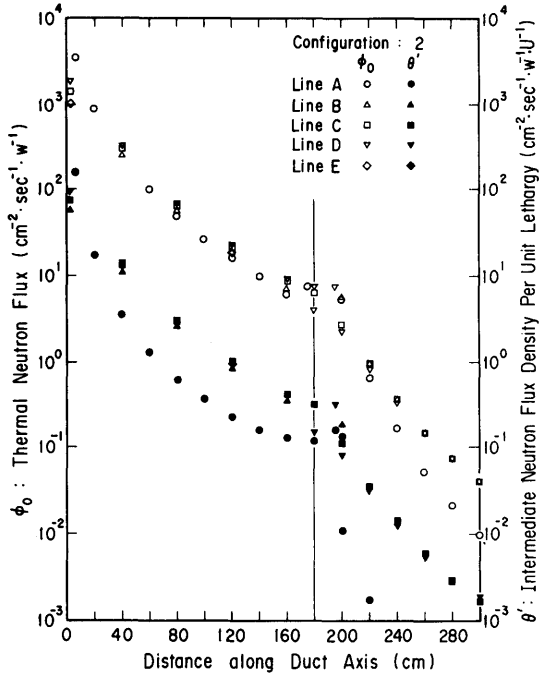


Fig.2.7.8. Axial distributions of the thermal and epithermal neutron fluxes measured in configuration 2.

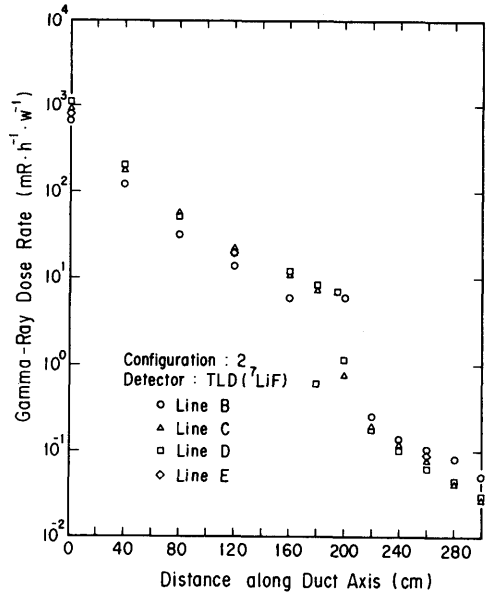


Fig.2.7.9. Axial distributions of gamma-ray dose rates measured in configuration 2.

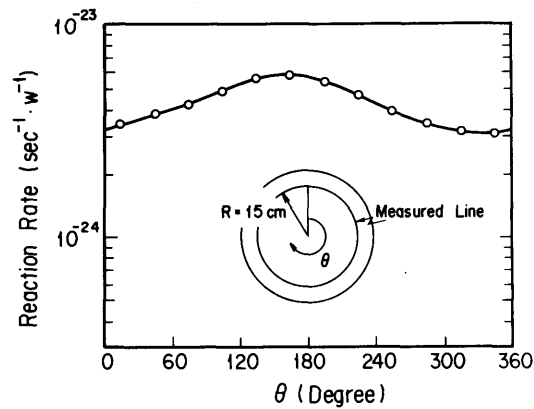


Fig.2.7.10. $^{27}\text{Al}(n, \alpha)^{24}\text{Na}$ reaction rate distribution measured on the circle of 15 cm radius at the duct mouth.

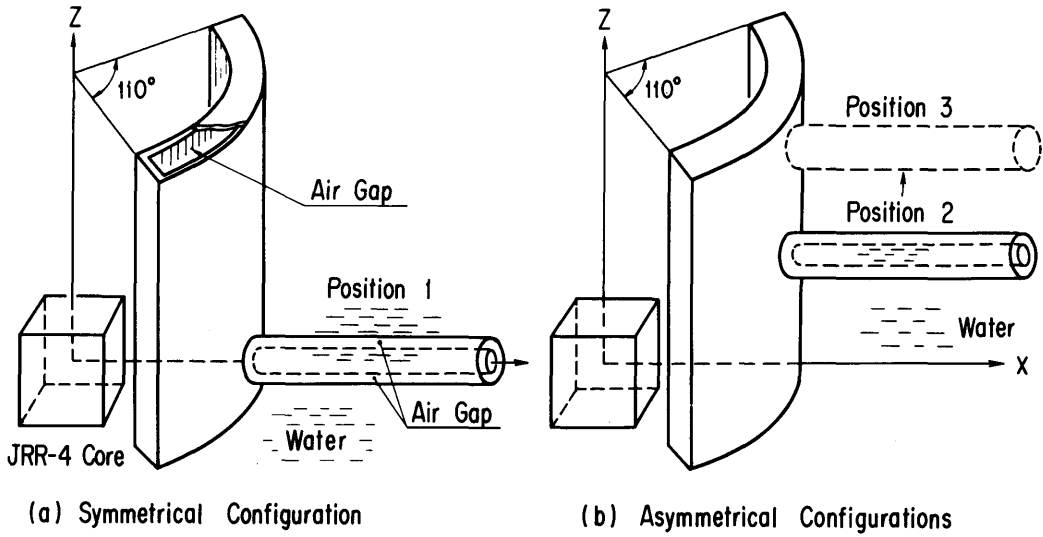


Fig. 2.8.1. (a), (b) Sketch of experimental arrangement. Setting position of horizontal duct is altered in positions 1, 2, and 3. Configurations are symmetrical at position 1 and asymmetrical at positions 2 and 3.

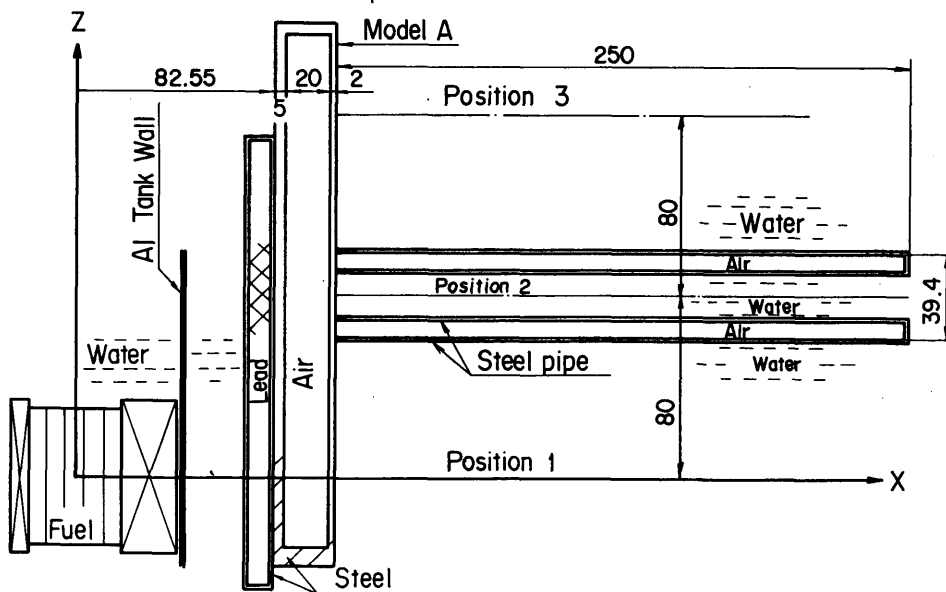


Fig. 2.8.2. A vertical cross section of the configuration of experiment 2.8. The duct location is altered from position 1 to position 3 in water shield. Dimensions are in centimetres.

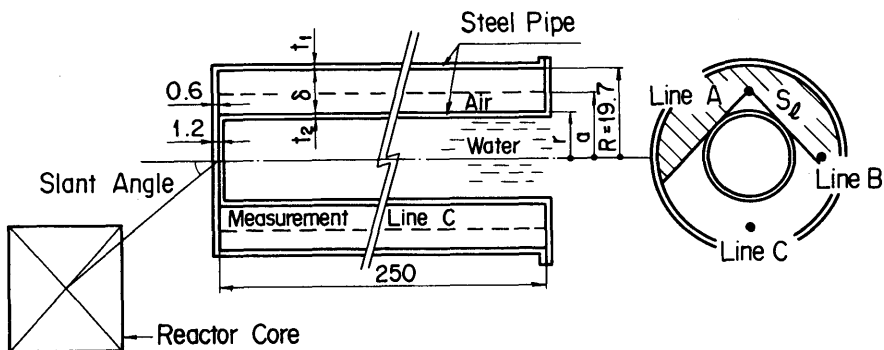


Fig. 2.8.3. Measurement lines A, B, and C and some dimensions for experiment 2.8. Dimensions are in centimetres. Symbols appeared in this figure are used in Table 4.2.3.

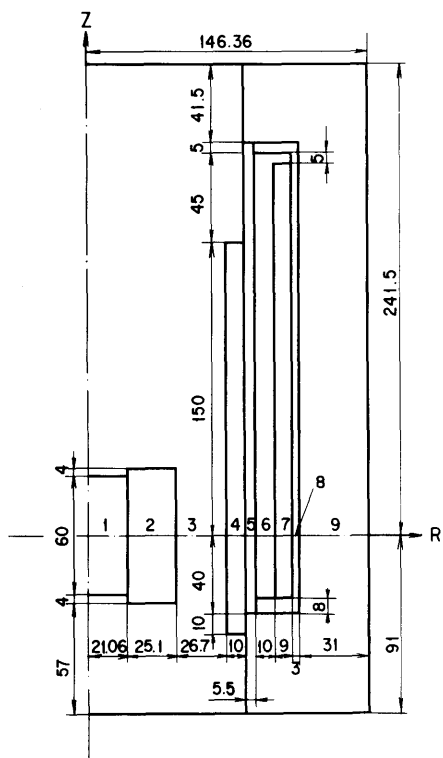


Fig. 3.1.1. Geometrical model for 10 cm air gap configuration. The numbers 1-9 along R axis represent respectively, core, reflector, water, lead shield, iron plate, air, spacer, iron plate, and water.

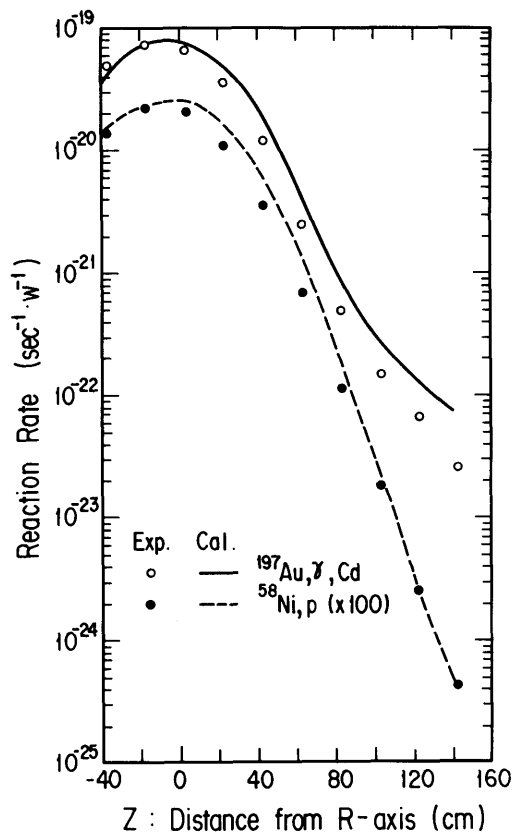
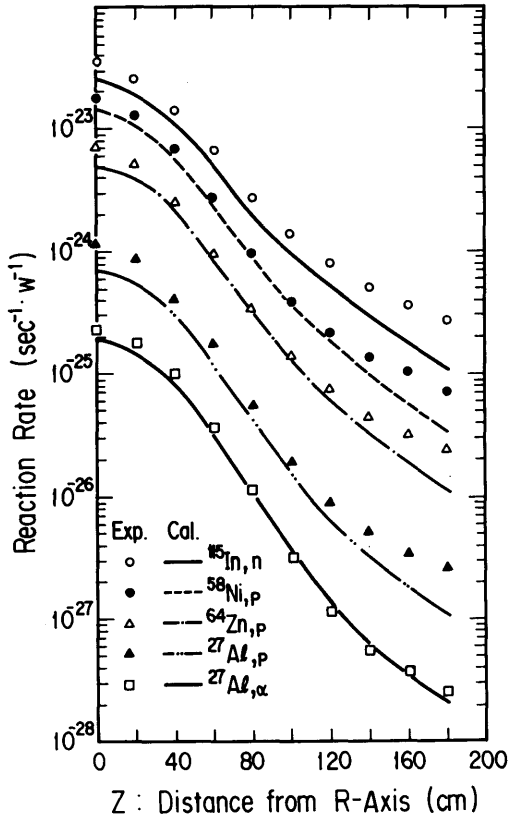
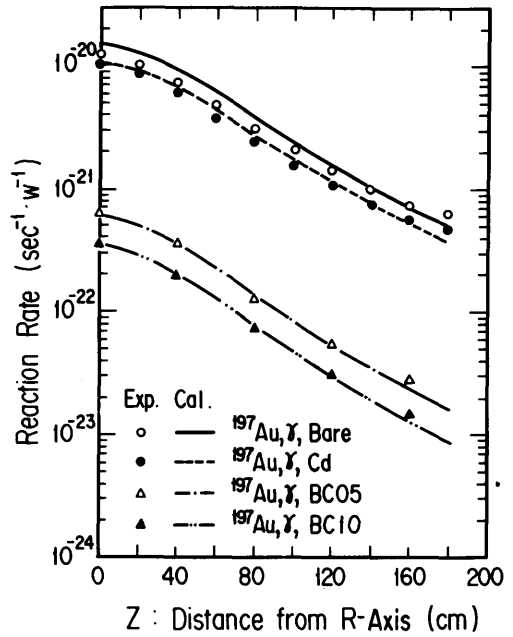


Fig. 3.1.2. Comparison of measured and calculated reaction rates on the line B.



(a) Threshold detector



(b) (n,γ) detector

Fig. 3.1.3. (a), (b) Comparison of measured and calculated reaction rates for threshold detectors and (n,γ) detectors on the line F in 20 cm air gap.