

Dose rate maps for the ^{60}Co γ -ray irradiation facility of KURRI

Measurement Date

2008 / 2 / 19 – 2008 / 2 / 21

^{60}Co half life

5.2714y = 63.257m = 1925.3d

Decay function

$$f = (1/2)^{t/\tau}$$

f : decay factor, t : elapsed time, τ : half life

Approx. decay rate

-0.036 %	(1 day)
-0.25 %	(1 week)
-1.1 %	(1 month)
-3.2 %	(3 months)
-12 %	(1 year)

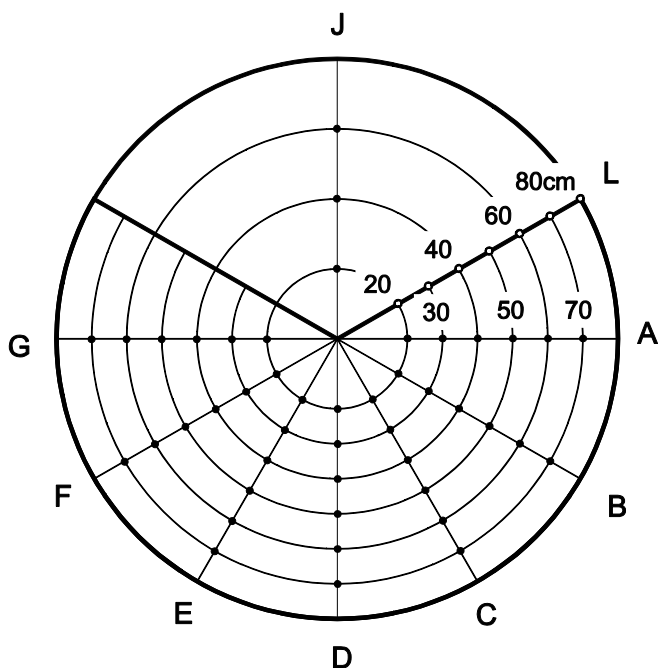


Table I. Absorption Dose Rate for Water 20cm above the Stage.

Distance	G 180°	F 150°	E 120°	D 90°	C 60°	B 30°	A 0°	J 270°
20 cm	3.01 kGy/h	4.10	4.17	4.60	3.60	2.55	1.91	1.67
30	1.36	1.72	1.72	1.83	1.55	1.20	0.934	
40	0.770	0.945	0.981	0.970	0.897	0.683	0.555	0.53
50	0.492	0.585	0.601	0.595	0.560	0.439	0.362	
60	0.340	0.404	0.421	0.411	0.384	0.312	0.257	0.25
70	0.255	0.294	0.305	0.299	0.283	0.231	0.195	

Table II. Absorption Dose Rate for Water 0.75cm above the Stage.

Distance	G 180°	F 150°	E 120°	D 90°	C 60°	B 30°	A 0°	J 270°	L 330°
20 cm	1.43 kGy/h	1.88	1.88	2.02	1.73	1.18	0.899	0.041	0.912
30	0.939	1.19	1.18	1.23	1.11	0.831	0.634	–	0.616
40	0.635	0.772	0.756	0.791	0.719	0.559	0.443	0.952	0.421
50	0.445	0.537	0.533	0.538	0.494	0.395	0.319	–	0.301
60	0.325	0.389	0.391	0.388	0.361	0.290	0.242	0.112	0.224
70	0.245	0.292	0.292	0.293	0.278	0.224	0.185	–	0.173
80	–	–	–	–	–	–	–	–	0.132

cf. Mass Energy Absorption Coefficient Ratios $(\mu_{en}/\rho)_{\text{material}} / (\mu_{en}/\rho)_{\text{water}}$ for ^{60}Co γ -rays with Reference to Water.

Material	air	LIF	Polystyrene	PMMA	bone	muscle
Ratio	0.90	0.83	0.97	0.97	0.95	0.99

Measurement date: 2008/2/19 - 2/21

Method: Ionization Chamber

Probe: C-110 (0.6mL type, ϕ 15mm, Applied Engineering Inc.)

Calibration Source: ^{60}Co source at National Institute of Radiological Sciences

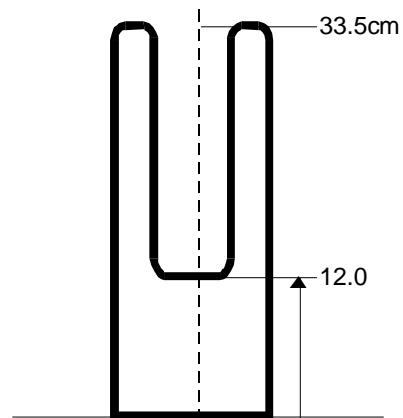
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Technical Advice: Akira Maruhashi and Hiroki Tanaka

● **Vertical dose rate map at the source center.**

Table III. Dose Rate at the Source Center.

Height from the stage	Dose rate
33.5 cm	5.9 kGy/h
30.0	11.1
25.0	25.4
21.5	33.6
20.0	34.9
18.5	36.0
17.0	34.1
15.5	33.0
12.5	23.5
Method: Alanine dosimeter	



● **Other lower dose rate points**

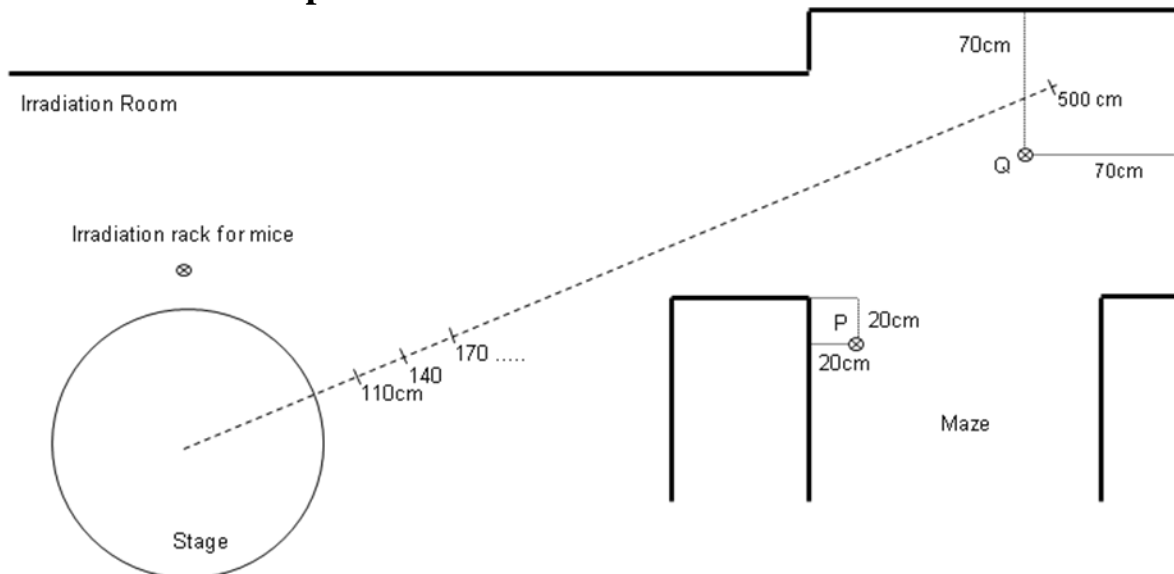


Table IV. Dose Rate on the Extention Line.

Distance from the source center	Dose rate	Distance from the source center	Dose rate
110 cm	71.7 Gy/h	320 cm	10.0 Gy/h
140	44.6	350	8.35
170	31.6	380	7.14
200	24.5	410	6.04 *
230	18.6	440	5.31 *
260	15.0	470	4.54 *
290	12.2	500	3.84 *
Method: Ionization chamber			
Height: 72.5 cm (= 20 cm above the surface of the stage.)			
* Re-evaluated by Hiroki Tanaka on June 25, 2008.			

Table V. Dose Rate for Other Points.

Specified points		Irradiation rack for mice.	
Point P	1.06 Gy/h	Top slot	72.9 Gy/hr
Point Q	5.19	Bottom slot	58.7
Method: Ionization chamber		Method: Ionization chamber	
Height: Floor level			