

Ionizing Dose Estimates in the Collimator Cave

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Dose Estimates in the Collimator Cave

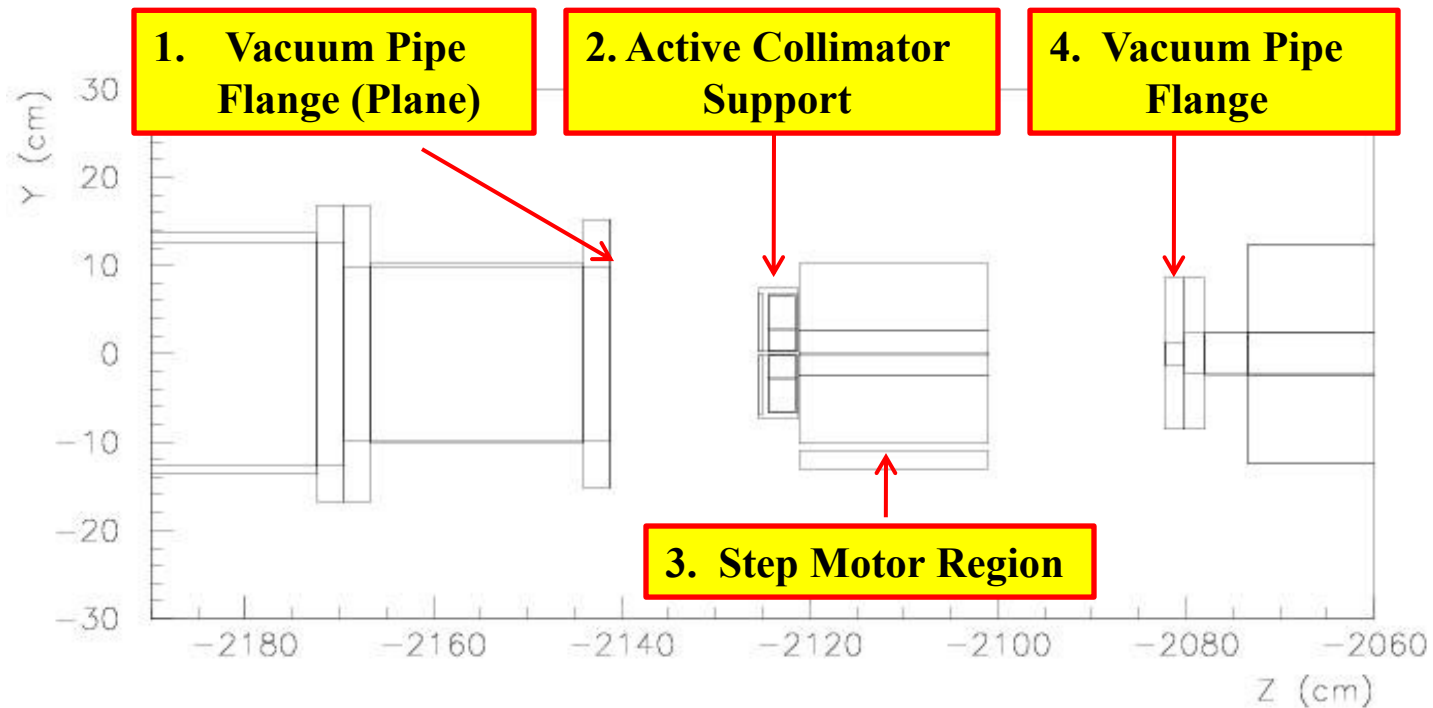
- Calculate radiation doses at different places in the collimator cave

Energy deposited in Geant is related to the dose as

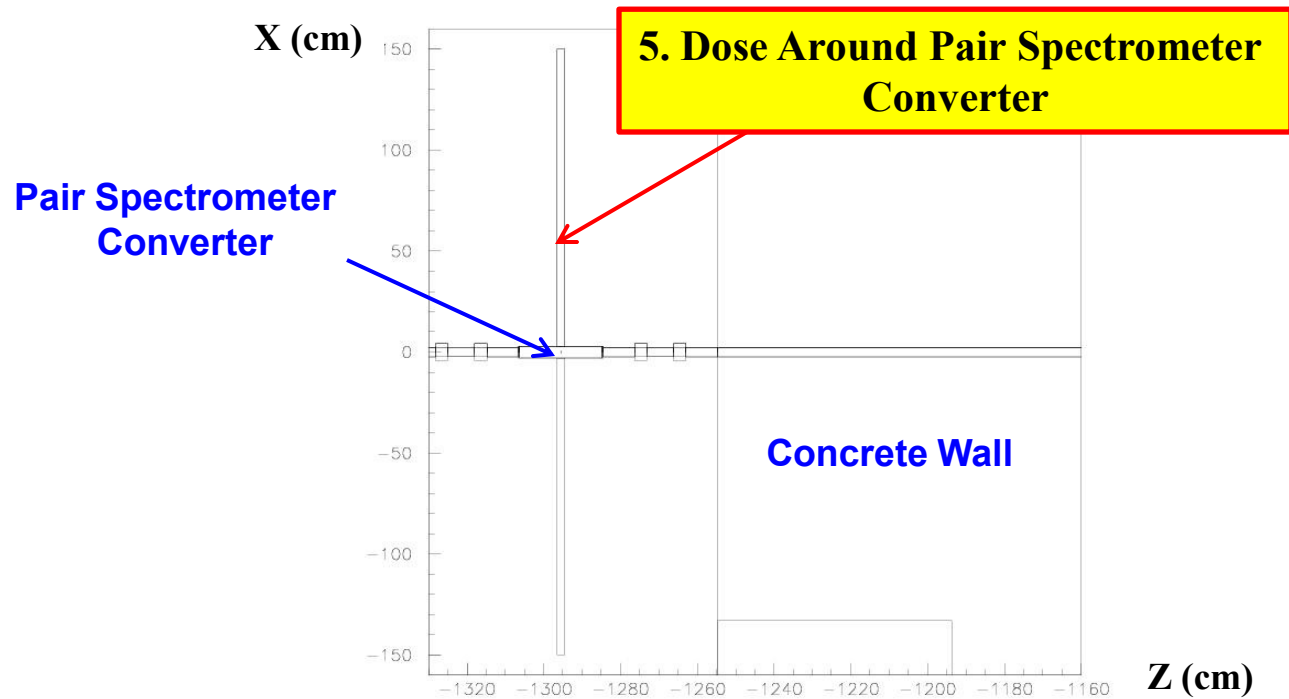
$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ joules}$$

$$1 \text{ rad} = 0.01 \text{ Gy}$$

$$1 \text{ Gy} = 1 \text{ joule} / 1 \text{ kg}$$

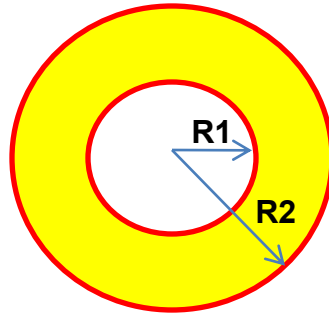


Dose Estimates in the Collimator Cave



1. Exit of the Vacuum Pipe

O-ring gasket



Material: Polyethelene ($\rho = 0.95 \text{ g/cm}^3$)

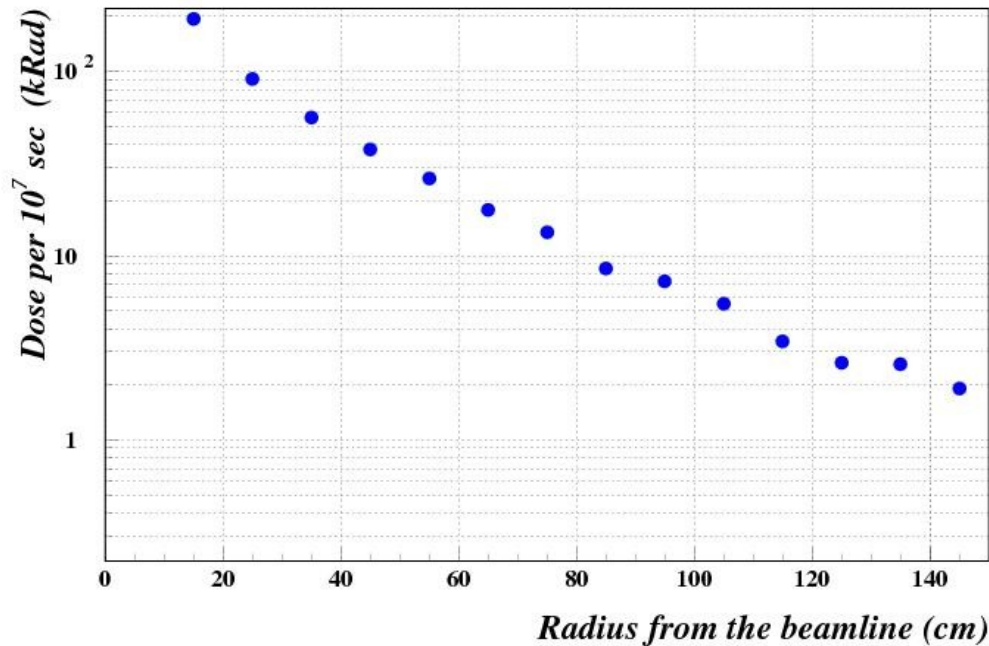
$R1 = 9.91 \text{ cm}$

$R2 = 11.91 \text{ cm}$

$h = 0.5 \text{ cm}$

Dose = $2.9 \times 10^{-2} \text{ Rad/sec}$

Dose per year (10^7 sec) = 290 kRad



2. Active collimator support structure

Ring around the active collimator:

$$R_{\text{in}} = 7.4 \text{ cm}$$

$$R_{\text{out}} = 11.9 \text{ cm}$$

$$L = 4.2 \text{ cm}$$

$$\text{Dose} = 0.2 \text{ Rad/sec}$$

$$\text{Dose per year (} 10^7 \text{ sec)} = 2 \text{ MRad}$$

3. Plate below the 1st passive collimator for the step motor

Rectangular box: $20 \times 20 \times 2 \text{ cm}^3$

$$\text{Dose} = 9 \times 10^{-3} \text{ Rad/sec}$$

$$\text{Dose per year (} 10^7 \text{ sec)} = 90 \text{ kRad}$$

4. Entrance window of the vacuum pipe

Ring (gasket)

$$R_{\text{in}} = 3 \text{ cm}$$

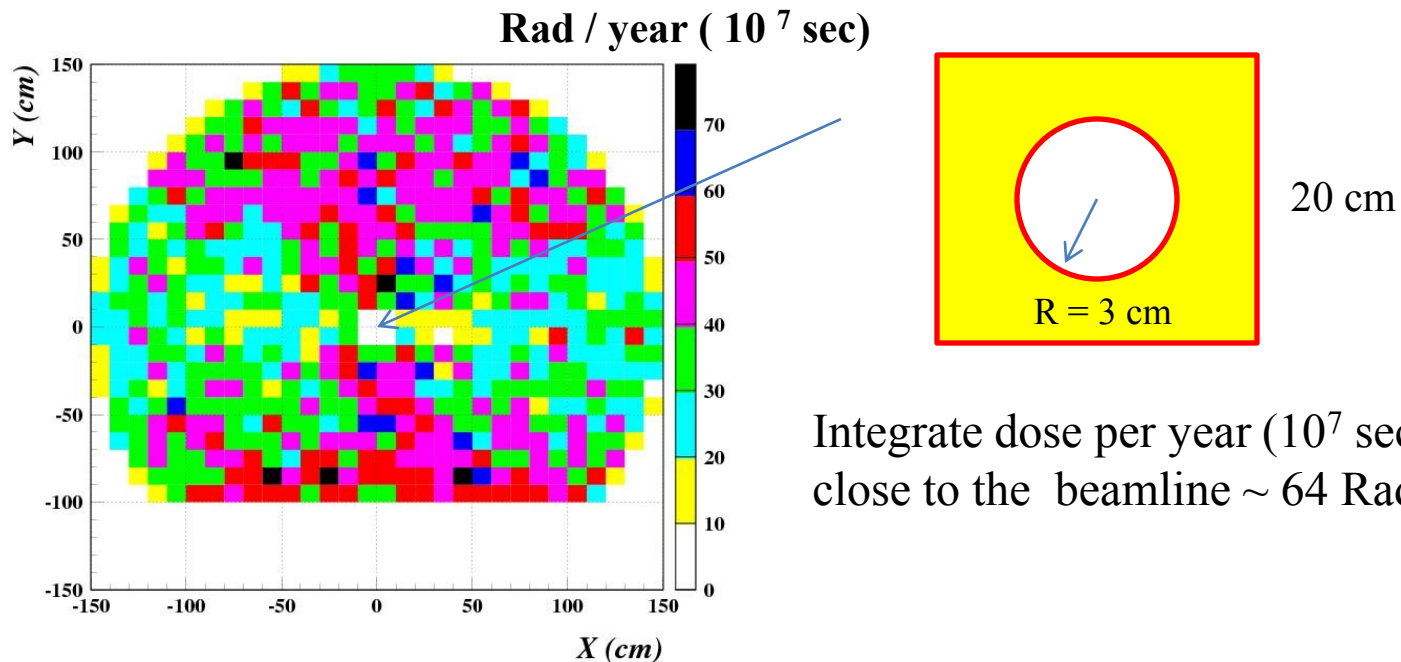
$$R_{\text{out}} = 6 \text{ cm}$$

$$L = 2 \text{ cm}$$

$$\text{Dose} = 5.5 \times 10^{-3} \text{ Rad/sec}$$

$$\text{Dose per year (} 10^7 \text{ sec)} = 55 \text{ kRad}$$

5. Plane perpendicular to the beamline at the pair spectrometer converter



Integrate dose per year (10^7 sec) in the region close to the beamline ~ 64 Rad.