

TG-51 Worksheet B: Electron Beams - Cylindrical Chambers

For electrons with $R_{50} \geq 2.6$ cm (energies > 6 MV) only and preferably ≥ 4.3 cm (10 MeV).

1. Site data

Institution: _____
 Physicist: _____
 Date: _____
 Accel Mfr: _____
 Model & serial number: _____
 Nominal electron energy/beam identifier: _____ MeV

2. Instrumentation

a. Chamber model: _____
 Serial number: _____
 Cavity inner radius (r_{cav} , Table III): _____ cm

Waterproof: yes no

If no, is waterproofing ≤ 1 mm PMMA or thin latex?: yes no

b. Electrometer model:

Serial number: _____
i. P_{elec} , electrom. corr factor (Sec.VII.B): _____ C/C or C/rdg.

c. Calibration Factor $N_{D,w}^{60Co}$ (Sec.V): _____ Gy/C (or Gy/rdg)

Date of report (not to exceed 2 years): _____

3. Measurement Conditions (center axis of chamber at d_{ref} Sec. X.A)

a. Distance SSD: _____ cm
b. Field Size on surface: _____ cm²
c. Number of monitor units: _____ MU

4. Beam Quality (Sec.VIII.C)

Measure I_{50} by measuring depth-ionization curve and, for cylindrical chambers only, shifting curve upstream by $0.5 r_{cav}$

I_{50} : _____ cm

a.i. If $2 \leq I_{50} \leq 10$ cm:

$R_{50} = 1.029I_{50} - 0.06$ _____ cm

ii. If $I_{50} > 10$ cm:

$R_{50} = 1.059I_{50} - 0.37$ _____ cm

b. Reference depth $d_{ref} = 0.6R_{50} - 0.1$ _____ cm (water equivalent)

5. Determination of k_{ecal} and $k'_{R_{50}}$

Chamber mode used to get k_{ecal} : _____

a. k_{ecal} _____ [Table III]

b. i. $k'_{R_{50}}$ from figures _____ [Fig 5 or 7]

or **ii. $k'_{R_{50}}$ from analytic expression for Farmer-like cylindrical chambers**

$k'_{R_{50}} = 0.9905 + 0.071 e^{(-R_{50}/3.67)}$ _____ [Eq.(19) $2 \leq R_{50} \leq 9$ cm]

TG-51 Worksheet B: Electron Beams - Cylindrical Chambers (cont).

6. Temperature /Pressure Correction (Sec.VII.C)

- a. Temperature: _____ °C
- b. Pressure: _____ kPa $\left[= \text{mmHg} \cdot \frac{101.33}{760} \right]$
- c. P_{TP} : _____ $\left[\text{Eq.(10)} = \left(\frac{273.2 + 6a}{295.2} \right) \left(\frac{101.33}{6b} \right) \right]$

7. Polarity Correction (Sec.VII.A)

- M_{raw}^+ : _____ C or rdg
- M_{raw}^- : _____ C or rdg
- a. M_{raw} (for polarity of calibration): _____ C or rdg
- b. P_{pol} : _____ $\left[\text{Eq.(9)} = \left| \frac{(M_{raw}^+ - M_{raw}^-)}{2M_{raw}} \right| \right]$

8. P_{ion} measurements (Sec.VII.D.2)

- Operating voltage= V_H : _____ V
- Lower voltage V_L : _____ V
- M_{raw}^H : _____ C or rdg
- M_{raw}^L : _____ C or rdg
- P_{ion} (V_H) (pulsed/swept beam, Eq.(12)): _____ $\left[\left(1 - \frac{V_H}{V_L} \right) / \left(\frac{M_{raw}^H}{M_{raw}^L} - \frac{V_H}{V_L} \right) \right]$

If $P_{ion} > 1.05$, another ion chamber should be used.

9. Corrected ion. ch. rdg M (Sec.VII) at d_{ref}

$$M = P_{ion} P_{TP} P_{elec} P_{pol} M_{raw} = [8 \cdot 6c \cdot 2bi \cdot 7b \cdot 7a]$$

Fully corrected M (Eq (8)): _____ C or rdg

10. Dose to water at reference depth, d_{ref} : $D_w^Q = MP_{gr}^Q k_{R50}' k_{ecal} N_{D,w}^{60Co} = [9 \cdot 10a \cdot 5b \cdot 5a \cdot 2c]$

- a. P_{gr}^Q (cyl) = $\frac{M_{raw}(d_{ref} + 0.5r_{cav})}{M_{raw}(d_{ref})}$ _____
- b. Dose to water at d_{ref} = _____ Gy
- c. Dose / MU at d_{ref} =

Gy/MU

 [10b/3c]

11. Dose to water / MU at d_{max} (if relevant locally)

- a. %dd(d_{ref}) as used clinically: _____
- b. Dose / MU at d_{max} = _____ Gy/MU [10c/(11a/100)]