TG-51 Worksheet C: Kecal $N_{D,w}^{^{60}Co}$ for plane-parallel chambers

There are two methods for determining Kecal $N_{D,w}^{^{60}Co}$ for plane-parallel chamber. Method A uses cross-calibration against a calibrated cylindrical chamber and is preferred method. Method B uses a ^{60}Co absorbed-dose calibration factor.

Method A: Cross-Calibration

1. Site data

Institution: _____

Physicist: _____

Date: _____

Accel Mfr.: _____

Model & serial number: _____

Nominal e^- energy/beam identifier: _____ MeV

2. Dose using cylindrical chamber

Do reference dosimetry for this beam using Worksheet B.

Transfer the following information from that worksheet:

a. Date: _____ [B:1]

b. Beam quality R_{50}: _____ [B:4*a*]

c. Reference depth, d_{ref} _____ [B:4*b*]

d. Dose/MU at d_{ref}: _____ [B:10*c*]

e. Number of MU (same used here): _____ [B:3*c*]

Now place the point of measurement of the plane-parallel chamber at d_{ref}

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

a. Temperature: _____ °C

b. Pressure: _____ $kPa\left[= mmHg.\frac{101.33}{760.}\right]$

c. P_{Tp}: _____ $\left[Eq.(10) = \left(\frac{273.2+3a}{295.2}\right)\left(\frac{101.33}{3b}\right)\right]$

4. Polarity Correction (Sec. VII. A.)

M_{raw}^{+}: _____ C or rdg

M_{raw}^{-}: _____ C or rdg

a. M_{raw} (for polarity used clinically): _____ C or rdg

b.P_{pol}: _____ $\left[Eq.(9) = \left|\frac{\left(M_{raw}^{+} - M_{raw}^{-}\right)}{2M_{raw}}\right|\right]$

5. 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)): _____ $\left[\left(1.-\frac{V_H}{V_L}\right)\Big/\left(\frac{M_{raw}^{H}}{M_{raw}^{L}}-\frac{V_H}{V_L}\right)\right]$

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

TG-51 Worksheet C: Kecal $N_{D,w}^{60\ Co}$ for plane-parallel chambers (cont)

6. Corrected ion. Ch. Rdg. M (Sec. VII)

$$M = P_{ion}P_{TP}P_{elec}(=1.0)P_{pol}M_{raw} = [5 \cdot 3c \cdot 1.0 \cdot 4b \cdot 4a]$$

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

7. Determination of $k'_{R_{50}}$ for plane-parallel chamber, beam quality R_{50}(2b)

i. $k'_{R_{50}}$ from figures _____ [Fig 6 or 8]

or ii. $k'_{R_{50}}$ from analytic expression for well-guarded plane-parallel chambers

$k'_{R_{50}} = 1.2239 - 0.145(R_{50})^{0.214}$ _____[Eq.(20) $2 \le R_{50} \le 20$ cm]

8. Cross calibration value

$$\left(k_{ecal} N_{D,w}^{60_{Co}}\right)^{pp} = \frac{\left(D_w/MU\right)^{cyl} MU}{\left(Mk'_{R_{50}}\right)^{pp}} = \left[\frac{2d \cdot 2e}{6 \cdot 7(\text{i or ii})}\right]$$

_____ Gy/C(or Gy/rdg)

Method B: ^{60}Co Calibration

1. Instrumentation

a. Chamber model: _____

Serial number: _____

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 $N_{D,w}^{60_{Co}}$ (Sec. V): _____Gy/C (or Gy/rdg

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

2. Determination of k_{ecal}

Chamber model used to get k_{ecal}: _____

a. k_{ecal}: _____ [Table II]

3. $k_{ecal} N_{D,w}^{60_{Co}}$ **:**

_____ Gy/C(orGy/rdg)