TG-51 Worksheet A: Photon Beams

1. Site data

Institution: ____________________________

Physicist: ____________________________

Date: ____________________________

Accel or ^{60}Co Mfr.: ____________________________

Model & serial number: ____________________________

Nominal photon energy/beam identifier: ____________________________ MV

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. Electometer 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 (10 x 10 cm^2, point of measurement at 10 cm depth (water equivalent)

a. Distance (SSD or SAD): ______________________ cm SAD ☐ or SSD ☐

b. Field size: ______________________ cm^2

on surface (SSD setup) ☐

at detector (SAD setup): ☐

c. Number of monitor units: ________________________ MU (min for ^{60}Co)

4. Beam Quality (Sec. VIII.B – not needed for ^{60}Co

If energy <10 MV, use no lead foil.

Measure %*dd* (10) [% depth-dose at 10 cm depth for curve shifted upstream by $0.6r_{cav}$]

Field size 10 x 10 cm^2 on surface, SSD = 100 cm: yes ☐ no ☐

a.$\%dd(10)_x = \%\, dd(10)$ ____________________________________

If energy ≥ 10 MV

Distance of 1 mm lead foil phantom surface 50 ± 5 cm ☐ 30 ± 1 cm ☐

Measure $\%\, dd(10)_{Pb}$ [% depth-dose at 10 cm depth for curve shifted upstream by $0.6\, r_{cav}$]

Field size 10 x 10 cm^2 on surface, SSD = 100 cm: yes ☐ no ☐

$\%dd(10)_{Pb}$(includes e$^-$ contamination): ____________________________________

50 cm: $\%dd(10)_x = [0.8905 + 0.00150\%dd(10)_{Pb}]\%dd(10)_{Pb}$ [$\%dd(10)_{Pb} \geq 73\%$] Eq.(13)

30 cm: $\%dd(10)_x = [0.8116 + 0.00264\%dd(10)_{Pb}]\%dd(10)_{Pb}$ [$\%dd(10)_{Pb} \geq 71\%$] Eq. (14)

If $\%dd(10)_{Pb} < 71\%$ (30 cm) or 73% (50 cm): $\%dd(10)_x = \%dd(10)_{Pb}$

b. $\%dd(10)_x$ (for open beam): ____________________________________

Has lead foil been removed? yes ☐ no ☐

Interim alternative for energy > 10MV & with ≥ 45 cm clearance: using no lead foil

Measure %*dd*(10) [% depth-dose at 10 cm depth for curve shifted upstream by $0.6\, r_{cav}$]

%*dd*(10): No lead ____________________________________

$\%dd(10)_x = 1.267 (\%dd(10) - 20.0$ [for $75\% < \%dd(10) \geq 89\%$

c. $\%dd(10)_x =$ ____________________________________

TG-51 Worksheet A: Photon Beams (cont'd)

5 Determination of k_Q (Sec. IX. B)
Chamber model used to get k_Q: ____________________
a. %dd(10)$_x$ (from 4, above): ____________________
b. k_Q [Table I or Fig. 4]: ____________________

6. Temperature/pressure Correction (Sec.VII.C)
a. Temperature: ____________________ ºC
b. Pressure: ____________________ kPa $\left[= \text{mmHg}\frac{101.33}{760.}\right]$

c. P_{TP}: ____________________ $\left[Eq.(10) = \left(\frac{273.2+6a}{295.2}\right)\left(\frac{101.33}{6b}\right)\right]$

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}: ____________________ $\left[Eq.(9) = \left|\frac{M^{+}_{raw} - M^{-}_{raw}}{2M_{raw}}\right|\right]$

8. P_{ion} measurements (Sec.VII. D. 2)
Operating voltage = V_H: ____________________ V
Lower voltage V_L: ____________________ V
M^{H}_{raw}: ____________________ C or rdg
M^{L}_{raw}: ____________________ C or rdg
^{60}Co treated as general recombination
a. $P_{ion}(V_H)$ (Eq.(11)); ____________________ $\left[\left(1.-\left(\frac{V_H}{V_L}\right)^2\right)\Big/\left(\frac{M^{H}_{raw}}{M^{L}_{raw}}-\left(\frac{V_H}{V_L}\right)^2\right)\right]$

Pulsed/swept beams
b. $P_{ion}(V_H)$ (Eq.(12)) ____________________ $\left[\left(1.-\frac{V_H}{V_L}\right)\Big/\left(\frac{M^{H}_{raw}}{M^{L}_{raw}}-\frac{V_H}{V_L}\right)\right]$

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

9. Corrected ion. ch. rdg. M (Sec.VII) at 10 cm depth, water equivalent

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

Fully corrected M (Eq.(8)): ____________________

10. Dose to water at 10 cm depth: $D_w^Q = Mk_Q N_{D,w}^{60Co} = [9\cdot 5b\cdot 2c]$ Eq. (3)
a. Dose to water at 10 cm depth = ____________________

b. Dose/ MU(or min ^{60} Co) at 10 cm depth [Gy/MU] [10*a*/3*c*]

11. Dose to water/MU(or min,^{60}Co) at d_{max} (if relevant locally)
a. Clinical %*dd*(10) for SSD setup / 100.: ____________________
or clinical TMR(10, 10 x 10) for SAD setup: ____________________
b. Dose / MU(or min, ^{60}Co) at d_{max}: Gy/MU [10*b*/(11*a*)]
____________________ cGy (water)/MU