

# Worksheet for the determination of the absorbed dose to water in a high-energy photon-beam

User: **CLINICA AUNA CHICLAYO** Date: **31/03/2025**

## 1. Radiation treatment unit and reference conditions for $D_{w,Q}$ determination

Accelerator: **Infinity Chiclayo**

Nominal dose rate: **600.0** MU min<sup>-1</sup>

Reference phantom: **water**

Reference field size: **10** cm x cm

Reference depth  $z_{ref}$ : **10.0** g cm<sup>-2</sup>

Nominal Acc Potential: **6 (FFF)** MV

Beam quality,  $Q$  ( $TPR_{20,10}$ ): **0.6791**

Set up: **10** cm

Reference distance: **10** cm

## 2. Ionization chamber and electrometer

Ion. chamber model: **PMMA**

Chamber wall material: **PMMA**

Waterproof sleeve material: **PMMA**

Phantom window material: **PMMA**

Serial No.: **270315003**

thickness: **0.078** g cm<sup>-2</sup>

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Abs. dose-to-water calibration factor <sup>a</sup>: **0.286**

Calibration quality  $Q_0$ : **0.001** Calibration depth: **5** g cm<sup>-2</sup>

If  $Q_0$  is photons, give  $TPR_{20,10}$ :

Reference conditions for calibration

$P_0$ : **101.3** kPa  $T_0$ : **20.0** °C Rel. humidity: **50** %

Polarizing potential  $V_1$ : **1000** V

Calibration polarity: **+**

User polarity: **+**

Calibration laboratory: **LSCD IPEN** Date: **26-Jun-24**

Electrometer model: **PC ELECTROMETER** Serial no.: **270267006**

Calib. separately from chamber: **No** Range setting: **1000**

If yes Calibration laboratory: **IPEN** Date: **26-Jun-24**

## 3. Dosimetry reading <sup>b</sup> and correction for influence quantities

Uncorrected dosimeter reading at  $V_1$  and user polarity: **2.339**

Corresponding accelerator monitor units: **100** MU

Ratio of dosimeter reading and monitor units:  $M_1 =$  **0.0234**

(i)  $P$ : **100.7** kPa  $T$ : **23.5** °C Rel. humidity: **50** %

**1.018**

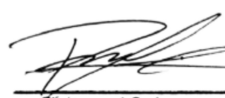
(ii) Electrometer calibration factor  $k_{elec}$ :

(iii) Polarity correction <sup>d</sup> rdg at  $+V_1$ :  $M_+ =$  **2.206** rdg at  $-V_1$ :  $M_- =$  **2.220**

**1.003**

  
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(iv) Recombination correction (two-voltage method)

Polarizing voltages:  $V_1$  (normal) = **-300** V  $V_2$  (reduced) = **-150** V  
Readings at each  $^e$  V:  $M_1$  = **2.206**  $M_2$  = **2.193**  
Beam type:   
Voltage ratio  $V_1 / V_2$  = **2.0000** Ratio of read.  $M_1 / M_2$  = **1.006**  
 $a_0$  = 2.3370  $a_1$  = -3.6360  $a_2$  = 2.2990  
**1.006**<sup>f,g</sup>

Corrected dosimeter reading at the voltage  $V_1$ :

**2.4028E-02**

4. Absorbed dose rate to water at the reference depth,  $z_{ref}$

Beam quality corr. factor for user quality Q: **0.9901**  
taken from

**6.8041E-03** Gy / MU

5. Absorbed dose rate to water at the depth of dose maximum,  $z_{max}$

Depth of dose maximum:  $z_{max}$  = **17.00** g cm<sup>-2</sup>

(i) SSD set-up

Percentage depth-dose at  $z_{ref}$  for a 10 cm x cm field size

$PDD(z_{ref} = 10.0 \text{ g cm}^{-2})$  = **67.72** %

Absorbed-dose rate at  $z_{max}$  :

**1.0047E-02** Gy / MU

(ii) SAD set-up

TMR at  $z_{ref}$  for a 10 cm x 10 cm field size:

$TMR(z_{ref} = 10.0 \text{ g cm}^{-2})$  =

Absorbed-dose rate at  $z_{max}$  :

Gy / MU

Notes:

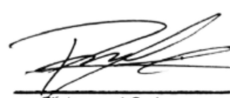
300	-150	-300
-2.22	2.193	2.208
-2.22	2.193	2.205
-2.219	2.193	2.205

VOLTAJES (nC)

-2.220 2.193 2.206

  
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- <sup>a</sup> Note that if  $Q_0$  is  $^{60}\text{Co}$ ,  $N_{D,w,Q_0}$  is denoted  $N_{D,w}$
- <sup>b</sup> All readings should be checked for leakage and corrected if necessary
- <sup>d</sup>  $M$  in the denominator of  $k_{pol}$  denotes reading at the user polarity. Preferably, each reading in the equation should be the average of the ratios of  $M$  (or  $M_+$  or  $M_-$ ) to the reading of an external monitor,  $M_{em}$ .
- <sup>e</sup> Strictly, readings should be corrected for polarity effect (average with both polarities). Preferably, each reading in the equation should be the average of the ratios of  $M_1$  or  $M_2$  to the reading of an external monitor,  $M_{em}$ .
- <sup>f</sup> It is assumed that the calibration laboratory has performed a recombination correction. Otherwise the factor should be used instead of  $k_s$ . When  $Q_0$  is  $^{60}\text{Co}$ ,  $k_{s,Q_0}$  (at the calibration laboratory) will normally be close to unity and the effect of not using this equation will be negligible in most cases.
- <sup>g</sup> Check that

0.006

0.006

  
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