

## CALCULATION FORM

(to document changes in absorbed dose as a result of implementing the  
AAPM TG-51\* dosimetry protocol)

INSTITUTION \_\_\_\_\_ DATE \_\_\_\_\_

Person doing Calibrations and/or Calculations \_\_\_\_\_ Phone \_\_\_\_\_

I. Please complete this form for the dosimetry system used for therapy machine calibration at your institution. Also complete, as far as possible, the worksheets for every megavoltage beam at your institution; Worksheet A for calibrating photon beams, Worksheet B for calibrating electron beams using Cylindrical Chambers, Worksheet C to calculate  $k_{ecal} N_{D,W}^{60Co}$  for plane-parallel chambers, and Worksheet D for calibrating electron beams using Plane-Parallel Chambers. It is suggested that this calculation form and the worksheets in the protocol be completed as far as possible before measurements are made. If you utilize different measurement systems for different machines please indicate.

II. Dosimetry System **prior** to implementing the TG-51 Protocol.

a. For photons

Make and model of chamber \_\_\_\_\_

Cobalt-60 chamber exposure Calibration factor,  $N_X$  \_\_\_\_\_

Make and Model of electrometer \_\_\_\_\_

Electrometer calibration factor,  $N_E$  \_\_\_\_\_

Polarizing Potential \_\_\_\_\_ volts.

Phantom: Material \_\_\_\_\_ Density \_\_\_\_\_ g/cm<sup>3</sup>

How is chamber protected for measurements in phantom:

Material \_\_\_\_\_ Thickness \_\_\_\_\_

Equation used to determine dose rate if different from TG-21: \_\_\_\_\_

b. For electrons (complete if different from photons)

Make and model of chamber \_\_\_\_\_

Cobalt-60 chamber exposure Calibration factor,  $N_X$  \_\_\_\_\_

$N_{gas}$  for parallel plate chamber assigned with farmer chamber \_\_\_\_\_

Make and Model of electrometer \_\_\_\_\_

Electrometer calibration factor,  $N_E$  \_\_\_\_\_

Polarizing Potential \_\_\_\_\_ volts.

Phantom: Material \_\_\_\_\_ Density \_\_\_\_\_ g/cm<sup>3</sup>

How is chamber protected for measurements in phantom:

Material \_\_\_\_\_ Thickness \_\_\_\_\_

Equation used to determine dose rate if different from TG-21: \_\_\_\_\_

\* Medical Physics 26 (9), Sept. 1999

III. Dosimetry System for TG-51 Protocol

a. For photons

Make and model of chamber \_\_\_\_\_

Absorbed dose Calibration factor for Cobalt-60,  $N_{D,W}^{60Co}$  \_\_\_\_\_ (cGy/coul)

Make and Model of electrometer \_\_\_\_\_

Electrometer calibration factor  $P_{elec}$  (coul/rdg) \_\_\_\_\_

Polarizing Potential \_\_\_\_\_ volts.

How is chamber protected for measurements in water:

Material \_\_\_\_\_ Thickness \_\_\_\_\_ g/cm<sup>2</sup>

Comments: \_\_\_\_\_

**If chamber or equivalent chamber is not listed in TG-51, provide the following information:**

Wall: Material \_\_\_\_\_ Thickness \_\_\_\_\_

Inner diameter of chamber \_\_\_\_\_

How was  $K_Q$  determined? \_\_\_\_\_

b. For electrons (complete if different from photons)

Make and model of chamber \_\_\_\_\_

Absorbed dose Calibration factor for Cobalt-60,  $N_{D,W}^{60Co}$  \_\_\_\_\_ (cGy/coul)

Make and Model of electrometer \_\_\_\_\_

Electrometer calibration factor  $P_{elec}$  (coul/rdg) \_\_\_\_\_

Polarizing Potential \_\_\_\_\_ volts.

How is chamber protected for measurements in water:

Material \_\_\_\_\_ Thickness \_\_\_\_\_ g/cm<sup>2</sup>

Comments: \_\_\_\_\_

**If chamber or equivalent chamber is not listed in TG-51, provide the following information:**

Wall: Material \_\_\_\_\_ Thickness \_\_\_\_\_

Inner diameter of chamber \_\_\_\_\_

How was  $K_{ecal}$  and  $K_{R50}$  determined? \_\_\_\_\_

IV. Monthly/Weekly Systems

TG-51 states, for the purpose of frequent dose verification, plastic phantoms are acceptable to use. It recommends that correction factors for monthly/weekly systems be determined at the time of the annual water calibration.

Make and model of chamber \_\_\_\_\_

Make and Model of electrometer \_\_\_\_\_

Phantom: Material \_\_\_\_\_ Density \_\_\_\_\_ g/cm<sup>3</sup>

Machine	Treatment Beam (e.g. 6x, 9e)	Field Size (cm x cm)	Depth (cm)	Distance SCD <sup>†</sup> (cm)	θ Correction factor OR θ Expected Reading (K <sub>TP</sub> corrected)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

<sup>†</sup> Source Chamber Distance

- V. Determine change in calculated dose rate (cGy/min or cGy/mu). Please follow the steps listed below to determine the change in the calculated absorbed dose (rate).
- a. Determine absorbed dose rate for each photon and electron beam according to your previous calibration protocol and fill in the following information. (Please do not adjust the monitor yet).

**Prior to TG-51 prior to adjusting monitor**

For TG-21 Dose is specified to muscle  $\theta$  or water  $\theta$

Machine	Treatment Beam (e.g. 6x, 9e)	Field Size (cm x cm)	Calibration Depth(cm)/ SSD	Dose Specification Point Depth(cm)/ SSD	Prior to TG-51 Dose rate (cGy/min-cGy/mu)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

- b. Determine absorbed dose rate, without adjusting monitor for each photon and electron beam according to the TG-51 protocol. Please fill in the following information and complete Worksheets A, B and D begun earlier. (Please do not adjust the monitor yet).

**TG-51 prior to adjusting monitor**

For TG-51 Dose is specified to muscle  $\theta$  or water  $\theta$

Machine	Treatment Beam (e.g. 6x, 9e)	Field Size (cm x cm)	Calibration Depth(cm)/ SSD	Dose Specification Point Depth(cm)/ SSD	TG-51 Dose rate (cGy/min-cGy/mu)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

- c. Since we are recommending that cooperative clinical trial groups not change the numerical value of dose prescription on clinical protocols, it is important to know the change in the absorbed dose to the patient for the same dose prescription under the new protocol. Calculate the percent change in the dose received by the patients before and after the implementation of the new protocol via the following equation:

$$\% \text{ change}^* = \left( \frac{\text{dose rate in V a}}{\text{dose rate in V b}} - 1.00 \right) \times 100$$

\*A positive value means the patient will receive more dose under the new calibration protocol while a negative value means the patient will receive less dose than before. The RPC anticipates that the percent change will be  $-2\% < \Delta D < 0\%$ .

Please indicate the date you will change to the new dosimetry protocol.     /    /      
mo dy yr

Machine	Treatment Beam (e.g. 6x, 9e)	Change in Dose	
		sign (+/-)	%change
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**IF ANY CHANGES ARE 2.5% OR GREATER:**

- Contact the RPC at (713) 745-8989.
- Include TG-21 and TG-51 calculation sheets for these beams.

If you have any questions or comments please call the RPC.

VI. After recalibration using the TG-51 protocol, the calibration used clinically will be:

Machine	Did you change monitor? yes/no	Treatment Beam (e.g. 6x, 9e)	Field size (cm x cm)	Depth (cm)	Distance SCD <sup>†</sup> (cm)	Clinical dose rate (cGy/min-cGy/mu)	Specify dose to muscle or H <sub>2</sub> O
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

**IT IS IMPORTANT THAT WE RECEIVE THIS INFORMATION SO THAT THE RPC'S DATABASE USED TO CHECK PATIENT TREATMENT RECORDS REFLECTS YOUR CHANGES IN DOSIMETRY.**

RETURN THIS FORM AND COPIES OF ALL WORKSHEETS TO:

U.T. M.D. Anderson Cancer Center  
 Radiological Physics Center  
 1515 Holcombe Blvd. – Box 547  
 Houston, TX 77030  
 e-mail: [rpc@.mdanderson.org](mailto:rpc@mdanderson.org)

(713) 745-8989 phone  
 (713) 794-1364 fax

<sup>†</sup> Source chamber distance