Wednesday, July 29, 2009

Practical Medical Physics		You must log into the abstracts system to use the meeting planner
Practical Application of Beam Calibration Protocols		
Wednesday	4:00:00 PM - 5:30:00 PM	Room: 213A

Moderator 1: Bruce H. Curran, Rhode Island Hospital/Brown Medical Center

4:00 PM WE-E-213A-1	**Practical Aspects (and Pitfalls) of External Beam Photon Calibrations Using TG-51** - B. Curran*
4:20 PM WE-E-213A-2	**Practical Aspects of Cyberknife Small Field Dosimetry** - S. Dieterich*, L. Wang
4:40 PM WE-E-213A-3	**Practical Aspects of Commissioning and Calibration of Clinical Orthovoltage Units** - W. Abdel-Rahman*, L. Liang, I. AlDahlawi, J. Seuntjens
5:00 PM WE-E-213A-4	**Practical Aspects of Electron Beam Dosimetry** - B. Gerbi*

Practical Aspects (and Pitfalls) of External Beam Photon Calibrations Using TG-51

Bruce Curran, MS, ME
Rhode Island Hospital
Brown University School of Medicine
Providence, RI

THE RHODE ISLAND HOSPITAL PROVIDENCE

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TG-51 Formalism

$$D_w^Q = M k_Q N_{D,w}^{^{60}Co}$$

$$M = P_{ion} P_{TP} P_{elec} P_{pol} M_{raw}$$

Press/temp $$P_{TP} = \frac{T + 273.2}{273.2 + 22} \times \frac{101.33}{P}$$

Courtesy of: David W O Rogers slides for TG-51 Refresher Course at 1999 AAPM
(Reference later in the presentation)

P_{ion}

$$P_{ion}(V_H) = \frac{1 - \frac{V_H}{V_L}}{\frac{M_{raw}^H}{M_{raw}^L} - \frac{V_H}{V_L}}$$

P_{ion}

1. P_{ion} can be < 1.000?
   a. True
   b. False

?

"Although the exact equations for pulsed or pulsed-swept beams are nonlinear,[38] Eq. (12) gives the same result as solving the nonlinear equations to within 0.2% and 0.4%, respectively, for a voltage ratio of 2 and 0.3% and 0.6% for a voltage ratio of 3 and is most inaccurate at the limiting value of P_{ion}=1.05. For larger values of the voltage ratio or values of P_{ion} near 1.05 one may use the published programs or fits for the nonlinear equations. [5,38]" *[Medical Physics 26(9), p. 1854, 1999]*

P_{pol}

Polarity correction $$P_{pol} = \left| \frac{\left(M^{+}_{raw} - M^{-}_{raw}\right)}{2M_{raw}} \right|$$

Pop Quiz (1)

1. What bias voltage do you use for routine dosimetry?
   a. Positive
   b. Negative
2. What bias voltage was your chamber calibrated with?
   a. Positive
   b. Negative
   c. Don’t know
3. What polarity are the readings with your electrometer?
   a. Positive
   b. Negative
   c. Can’t remember (it’s not important anyway)

Ion Chambers 101

1. The bias voltage for an ion chamber is connected between:
   a. Outer shield and inner shield
   b. Inner shield and collector
   c. Outer shield and collector
   d. None of the above

Connected to both guard and collector and referenced to outer shield (ground)

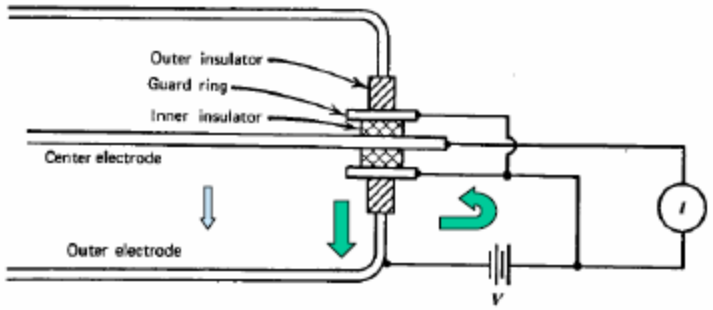


Fig. 5.5 Knoll, 3rd Ed.

Ion Chambers 101

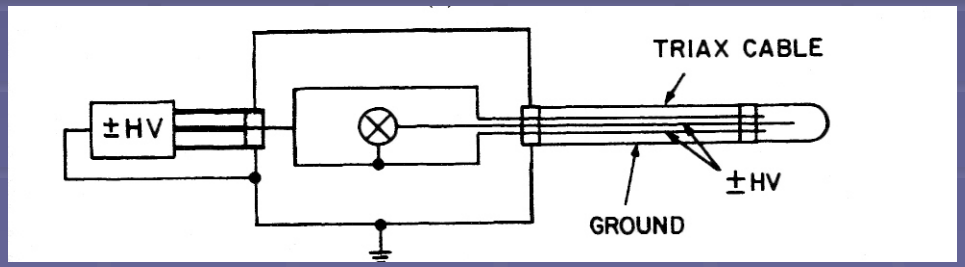
2. For a specific ion chamber, P_{pol} is independent of electrometer.
   a. True
   b. False

P_{ion} and P_{pol} are specific to a combination of ion-chamber, linac, beam modality, and beam energy. As long as the combination stays the same, P_{ion} and P_{pol} , in principle, should remain the same.

[TG-51: Experience from 150 institutions, common errors, and helpful hints]

Electrometers 101

- Collecting Electrode and Guard are maintained at same voltage to reduce leakage.
- Good design generally has the shell at or near ground voltage to reduce risk of shock



[Attix, Introduction to Radiological Physics and Radiation Dosimetry, Wiley, 1986]

Electrometers 101

- Electrometers measure the DC current collected by the ion chamber
- An electrometer that measures a negative charge for a negative bias is connected in reverse to an electrometer that measures positive charge for a negative bias (assuming good electrometer design)
- THUS, the P_{pol} correction for two electrometers with reversed readings will be the inverse of each other for the same chamber.

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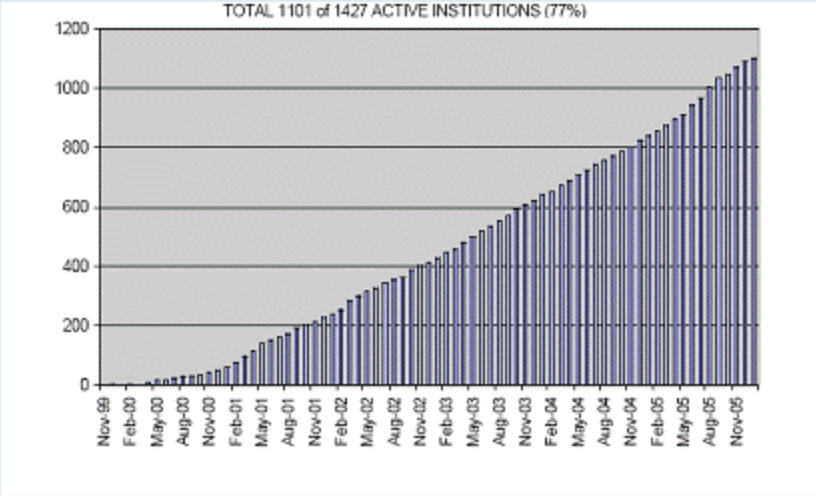
AAPM TG-51 Calibration Protocol

TG-51 QA Program | Videos | Worksheets | Publications | FAQ

Since the publication of the AAPM TG-51 calibration protocol the RPC has taken an active role in providing the medical physics community with the necessary information to clarify areas in the protocol where physicists may have problems. At the beginning of the year 2000, the RPC launched special efforts to make the switch to the new protocol as smooth and accurate as possible.



Prior to implementing the switch to TG-51, the participating institutions were requested to measure, furnish the changes in beam outputs caused by the switch to the RPC. The cases showing unusual beam-output changes were resolved via phone and fax after comprehensive review of the institution's detailed calculations.

Through numerous phone calls, seminars, publications and this TG-51 protocol website page, the RPC physicists have been the engine behind a conversion of 77% of the RPC monitored institutions to the new protocol. See the graph on the right.

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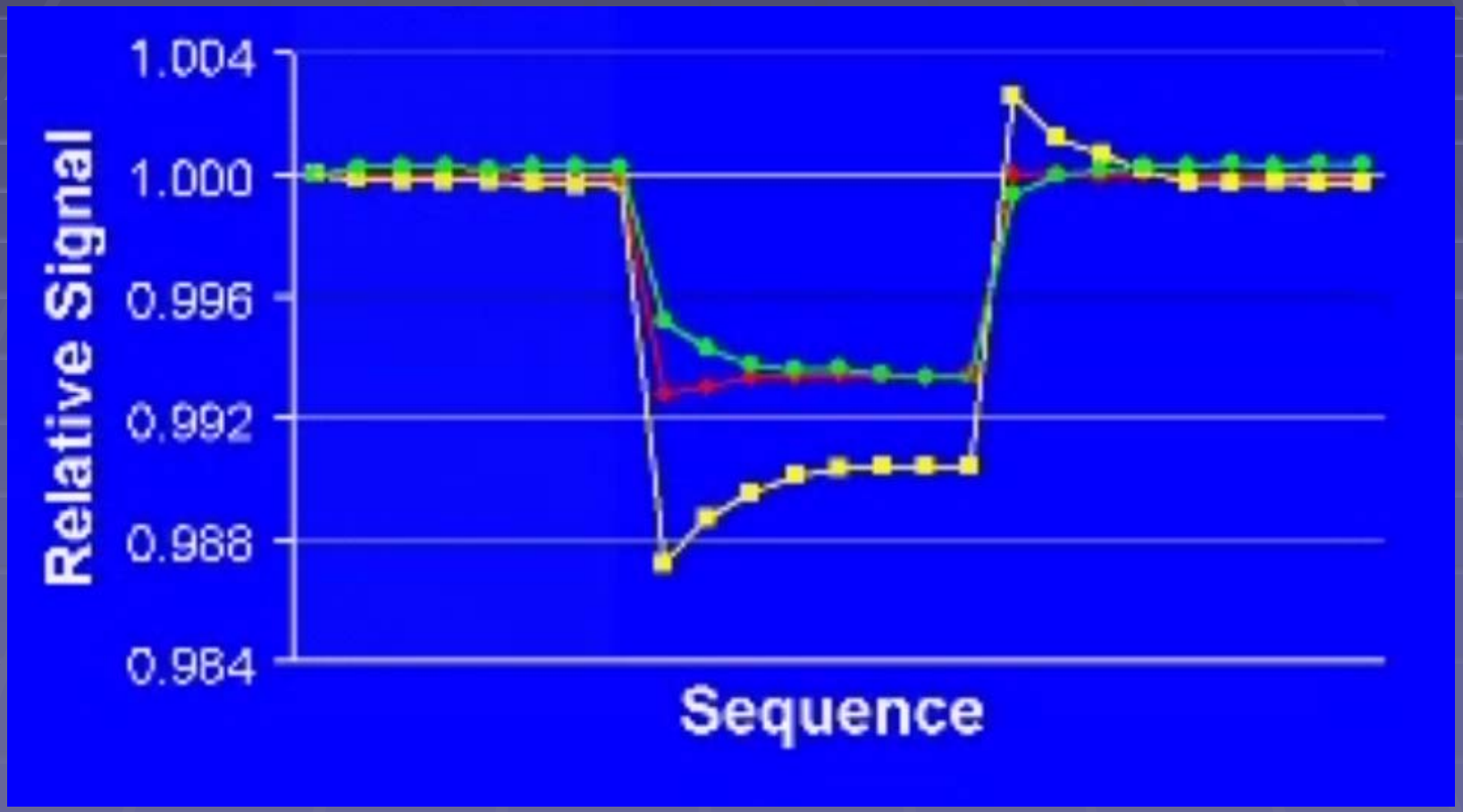
AAPM TG-51 Calibration Protocol

TG-51 QA Program | Videos | Worksheets | Publications | FAQ

Note This symbol real *indicates videos that can only be viewed using Real Player. You can get a free download for Macintosh or Windows platforms by clicking on this link Real Player Download. The other*

- Determination of Electron Beam Quality
- real Calibration of Electron Beams
- real Calibration of Photon Beams
- real Determination of Photon Beam Quality
- Set up of parallel plate chamber
- TG-51 RPC Presentation (SEAAPM) (Sample)

Signal Stability
(changing bias voltage)



TG-51: Experience from 150 institutions, common errors, and helpful hints

R. C. Tailor,* W. F. Hanson,† and G. S. Ibbott‡
Department of Radiation Physics, University of Texas M.D. Anderson Cancer Center,
1515 Holcombe Blvd., Box 547, Houston, Texas 77030

JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 4, NUMBER 2, SPRING 2003

P_{ion} & P_{pol}

- P_{ion} depends on the dose per pulse. Therefore, it is a function of depth so it should be measured at the relevant depth. In addition, there are several linacs with high dose rate electron capabilities ~e.g., the Varian Clinac CD and EX and the Siemens ME!. The P_{ion} correction for electrons on these units is significantly larger than on other linacs.
- P_{ion} and P_{pol} are specific to a combination of ion-chamber, linac, beam modality, and beam energy. As long as the combination stays the same, P_{ion} and P_{pol} , in principle, should remain the same.
  - (must account for electrometer as well)

k_Q

- The beam-quality specifier, %dd(10)x , being a depth dose parameter, requires a shift to the effective point of measurement. The center of the chamber is placed at $10.0 + 0.6 * r_{cav}$.

k_Q

1. r_{cav} refers to the radius of the
   1. Air cavity
   2. Air cavity + chamber wall

r_{cav} : radius of the air cavity in a cylindrical ion chamber. Unit, cm. See Secs. VIIIA and XB.
[*Medical Physics 26(9), p. 1850, 1999*]

Implementation of TG-51: Practical Considerations

J. R. Lowenstein, P. Balter, D. S. Followill, and W. F. Hanson
Department of Radiation Physics
The University of Texas M. D. Anderson Cancer Center
Houston, Texas 77030

The use of a lead foil to determine beam quality:

- For common linear accelerators, k_Q, thus beam calibration, varied by no more than 0.2% if the interim algebraic expression was used to determine %dd(10)x, rather than the sheet of lead.
- If the lead sheet is encased within a thin layer of plastic, no measurable difference will be seen in the determination of k_Q.
- If a sheet of lead is placed on the underside of a Lucite tray, one may see up to a 0.3% difference in the determination of k_Q.

RPC POLICY

- Based on data presented here, the RPC has adopted the following policies.
- **The use of the lead foil to determine beam quality:**
  - The RPC will use the sheet of lead until data are published in a peer review journal that demonstrate that it is not necessary.

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TG-51 Resource Page

This page is a compilation of items received and scavenged from various sources on the new AAPM megavoltage beam calibration protocol "TG-51" which replaces "TG-21". Please email suggestions, contributions, corrections and updates for this page to Carter Schroy at **EventsEd@aol.com**.

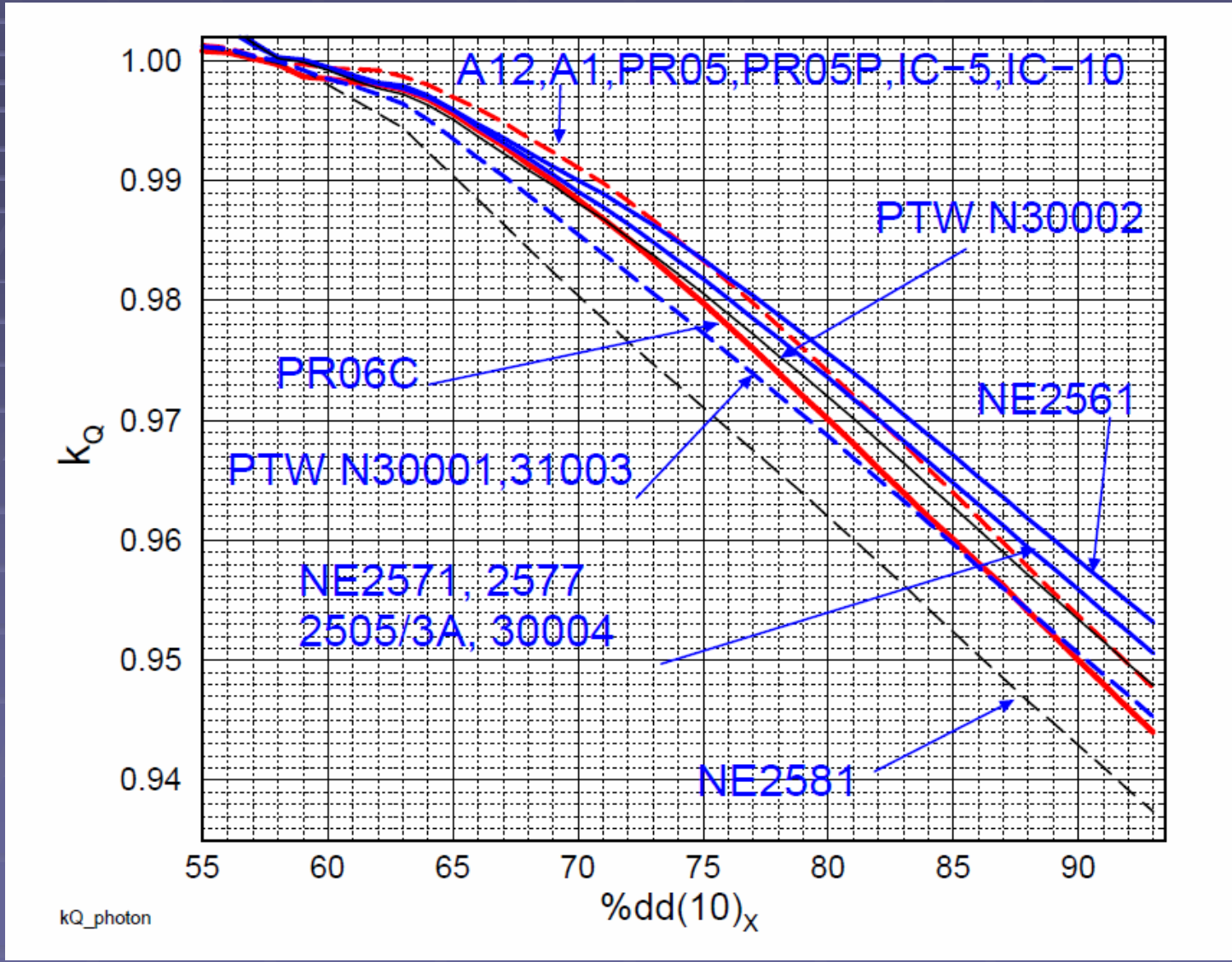
"AAPM's TG-51 protocol for clinical reference dosimetry of high-energy photon and electron beams"
by PR Almond et al., Medical Physics *26*, 1847-1870 (1999)

JPEG files: Figure [4] [5] [6] [7] [8]
contributed by Hansen Chen
TG-51 Slides
TG-51 Figures
from Dave Rogers, NRCC, Ottawa

TG-51 Conversion Forms and Information
Radiological Physics Center, Houston

http://www.aapm.org/links/medphys/resources/TG51/default.asp

TG-51 Figures



http://www.irs.inms.nrc.ca/tg51_figures/tg51_figures.html

www.standardimaging.com

STANDARD IMAGING	TECHNICAL NOTE	DATE 12-28-07	MARKETS TG-51
		PAGE page 1 of 4	
		NUMBER 4603-04	

SUBJECT: **Determining the k_Q factor for Exradin cylindrical ionization chambers not characterized in AAPM TG-51 protocol**

The following information is provided as a service to our users and customers:

Determining the k_Q factor for Exradin cylindrical ionization chambers not characterized in AAPM TG-51 protocol

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METHOD 1:

Section XI of AAPM's TG-51 protocol describes how the user is to determine the k_Q factor for those cylindrical ionization chambers that are not characterized in the protocol by prioritizing the physical features in which to compare to a listed cylindrical chamber:

Below is a chart with an inter-comparison of these four critical features for the entire Exradin cylindrical ionization chamber product line. This is intended to help the physicist see the similarities and differences between the chamber models.

	CHAMBER MODEL									
	Mod 1	Mod A1SL	Mod 2	Mod A12	Mod A12S	Mod 14	Mod A14SL	Mod A16	Mod A18	Mod A19
Collector, Guard & Wall Material[1]	A, T	A	A, T, P	A	A	A, T	A	A	A	A
Radius of air cavity [mm]	2.0	2.0	4.8	3.0	3.0	2.0	2.0	1.2	2.4	3.0
Aluminum collector present?	no	no	no	no	no	no[2]	no[2]	no[2]	no	no
Wall Thickness [mm]	1.0	1.1	1.0	0.5	0.5	1.0	1.1	0.5	1.0	0.5
Collecting Volume [cc]	0.056	0.056	0.500	0.650	0.250	0.009	0.009	0.007	0.125	0.622

Published k_Q factors for Exradin Model A1 and Model A12

TG-51 protocol, Med. Phys. **26** (9), September 1999, pg 1857

	k_Q %dd $(10)_x$					
	58.0	63.0	66.0	71.0	81.0	93.0
Mod A1	0.999	0.998	0.996	0.990	0.972	0.948
Mod A12	1.000	0.999	0.996	0.990	0.972	0.948

(Subject to change based on future evaluation results)

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METHOD 2

The concept of the inter-comparison method is straightforward: the Absorbed Dose to Water at a fixed point in a water phantom is the same, regardless of which chamber is being used to measure it.

$$k_Q^u = k_Q^c * \left(\frac{P_{ion}^c * P_{TP}^c * P_{elec}^c * P_{pol}^c * M_{raw}^c * N_{D,w}^{^{60}Co,c}}{P_{ion}^u * P_{TP}^u * P_{elec}^u * P_{pol}^u * M_{raw}^u * N_{D,w}^{^{60}Co,u}} \right)$$

k_Q work continues

NRC Activities and Publications, 2007-2009
Report to the CCRI(I) Meeting, BIPM
May 2009

6 New k_Q factors for MV photon beams

(Malcolm McEwen and David Rogers (Carleton University))

Review and Extension of beam quality conversion factors for TG-51 Protocol

email: <2009.zWGTG51@aapm.org> | www: WGTG51 Website
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      - **Review and Extension of beam quality conversion factors for TG-51 Protocol** [Status]

Charge	The primary goal of the working group is to review experimental and calculated data sets of beam quality conversion factors. At a later stage a consensus dataset can be generated that (1) when justified, supersedes the TG-51 dataset and (2) provides realistic uncertainty estimates on the consensus values. The WG will thus present a review of measured and calculated kQ data as well as a clarification document for TG-51 that contains tables of kQ for chambers currently not listed in the protocol. We also intend to review different calibration issues. The function of the WG is thus primarily to produce a review on the basis of which recommendations can be formulated, if needed, by a new TG aiming to provide a consistent update of TG-51.

Calibration Spreadsheets

Example 1

Monthly Spot Check Report

VARIAN 2300 CD, SN: 526

Date:	05/28/09	Performed by:	Jose Garcia-Cobian, MS	Physicist:	Sunyoung Jang, PhD

TG-51 Factor

6 X	23 X	6 MeV	9 MeV	12 MeV	16 MeV	20 MeV
5.3078	5.2007	5.3155	4.9634	4.9143	4.8650	4.8057

Dosimetry Equipment Date: 02/05/09 AAPM TG-51 Dosimetry protocol

Ion Chamber:	PTW MODEL N30013 0.6CC ACRYLIC	SN:1058	$N_{D,W}$:	5.3960E+07	Gy/C	
Electrometer:	Standard Imaging MAX-4000, SN: E993		P_{elec}:	1.0010	nC/Rdg.	
Phantom:	Water	SSD (Photon):	100 cm	SSD (Electron):	100 cm	

Machine Setup & Measurement Conditions (Center of the Chamber @ Depth)

Gantry Angle:	180	Collimator Angle:	180	Field Size (cm^2):	10x10		
Monitor Units:	100	T (°C):	22.8	P (mmHg):	762.35	P_{TP}:	0.9996
Electrometer:	Battery (V):	100%	Bias (V):	-300	Leakage (pA):	0.031	

Photon Beams (cGy/MU @ d_{max} with 100 cm SSD)

E (MV)	Depth (cm)	Reading (nC)			Average (nC)	Dose (cGy)	%DD (Table)	cGy/MU (@d_{max})	QA (< 2%)	Comment	300 MU
6	1.6	18.79	18.79	18.79	18.79	99.70	100.0	0.997	Pass		56.30
	10.0	12.75	12.75	12.76	12.75	67.67	67.7	1.000	Pass		
23	3.3	19.25	19.23	19.24	19.24	100.02	100.0	1.000	Pass		57.61
	10.0	15.38	15.37	15.37	15.37	79.92	79.3	1.008	Pass		

Calibration Spreadsheets

Example 2

21iX Photon Calibration

Date: 3/3/2009 Done by: BHC Checked by:

Phantom	Phantom ID	Electrometer	P_{elec}	Scale (nC/Rdg)	MU	Chamber ID	Type	$N_{D,w}$
Small Tank	W	*F35040*	1.0000	1.0000	200	1058	N30013	5.3960

Phantom Temp (° C)	Pressure (mmHg)	P_{TP}
20.3	765.60	0.9870

P_{tp}=(760/P)*(273.2+T)/295.2

6, 10 MV Photons Set-Up Conditions:

Field Size at Surface: 10 x 10 cm^2 SSD (cm): 100.0

E (MV)	depth* (cm)	%DD	k_Q	P_{ion}	P_{pol}	F_{corr}	d_{max}
10	10.00	73.50	0.9806	1.0001	1.0007	0.9900	2.40
6	10.00	66.70	0.9918	1.0001	1.0014	0.9900	1.60

*** Depth is measured to center of chamber**

Calculations:

Desired Electrometer Reading Photons = $[(R_{cal})(\%DD)(MU)] / [(100)(Scale)(P_{ion})(P_{pol})(P_{tp})(P_{elec})(k_Q)(N_{D,w})(F_{corr})]$

Dose/MU Photons = $[(Rdg)(100)(Scale)(P_{ion})(P_{pol})(P_{tp})(P_{elec})(k_Q)(N_{D,w})(F_{corr})] / [(\%DD)(MU)]$

$P_{ion}=(1-V_h/V_l)/(Rdg_h/Rdg_l-V_h/V_l)$ V_h= -300 V_l= -150 Rdg_h=Rdg@-300V Rdg_l=Rdg@-150V

$P_{pol}=|((Rdg^-)-(Rdg^+))/2*(Rdg^-)|$ (Rdg^-)=Rdg@-300V (Rdg^+)=Rdg@+300V

R_{cal} =dose rate@calibration depth

R_{cal} Photons= 1.000 cGy/MU @ depth= d_{max} to Muscle

Calibration Spreadsheets

Example 2

21iX Photon Calibration **Dose rate :** 400 MU/min

10 MV	Bias (V)	Readings			Avg.	Std		DER
Depth	-150							28.410
10.00	-300	28.450	28.450	28.460	28.453	0.006		
	300						Update?	No
							P_{ion}	1.0001
		Dose Rate @ depth=2.4 cm			1.0015	cGy/MU	P_{pol}	1.0007
		%Error with 1 cGy/MU:			0.15	%		
Adjusted?	No						MU2 Rdg:	200
Tracker?	Yes						Adjusted?	No

6 MV	Bias (V)	Readings			Avg.	Std		DER
Depth	-150							25.219
10.00	-300	25.590	25.590	25.590	25.590	0.000		
	300						Update?	No
							P_{ion}	1.0001
		Dose Rate @ depth=1.6 cm			1.0147	cGy/MU	P_{pol}	1.0014
		%Error with 1 cGy/MU:			1.47	%		
Adjusted?	No						MU2 Rdg:	201
Tracker?	No						Adjusted?	No

Actual calibrations are done to the center of the chamber, not the effective point of measurement!

Spreadsheet Caveats

- NO spreadsheet should be used without **extensive** manual checking of results and **review**!
- Learn to use formatting, particularly conditional formatting to improve visualization of errors

10 MV	Bias (V)	Readings				Avg.	Std		DER
Depth	-150								27.927
10.00	-300	28.480	28.490	28.480		28.483	0.006		
	300							Update?	No
Adjusted	-300	27.950	27.950	27.960		27.953	0.01	P_{ion}	1.0001
		Dose Rate @ depth=2.4 cm			1.0009	cGy/MU		P_{pol}	1.0007
		%Error vs 1 cGy/MU:			0.09	%			
Adjusted?	Yes	Dose Before Adjustment:			1.0199	cGy/MU		MU2 Rdg:	200
Tracker?	Yes	%Error Before Adjustment:			1.99	%		Adjusted?	Yes

Spreadsheet Caveats

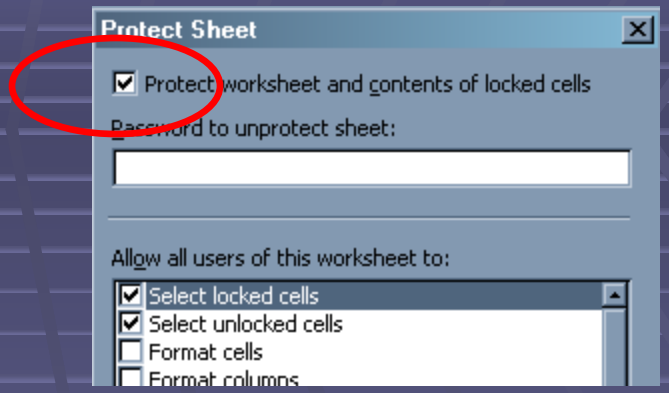
- A spreadsheet “database” can simplify changes due to new calibrations, etc.

Ion Chamber Photon Class Table

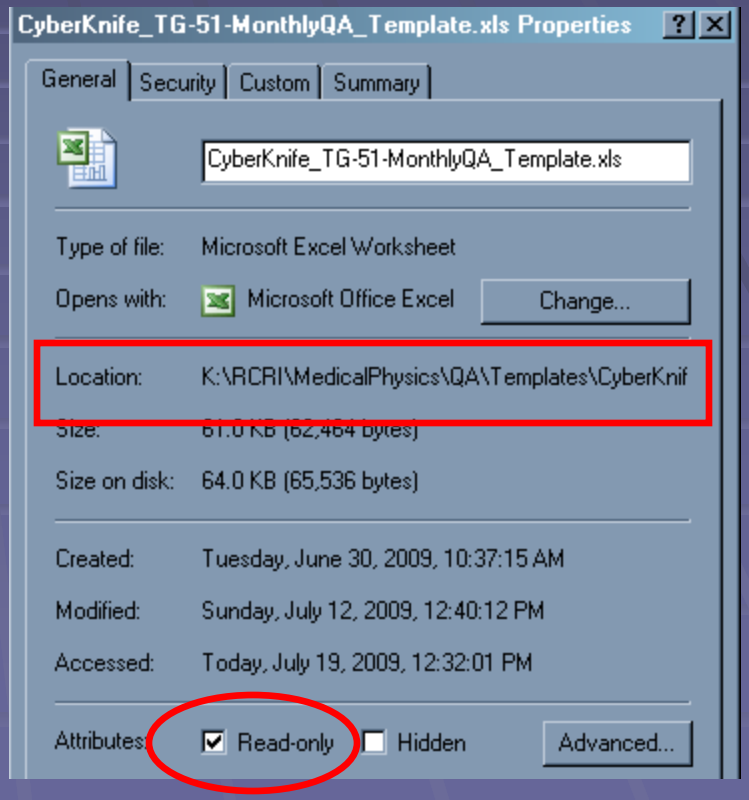
Chamber Class	Energy	Phantom ID	Search Key	SSD	Depth	%DD	k_Q	P_{Ion}	P_{pol}	F_{corr}
N30013	6	W	N30013-6-W	100.00	10.00	66.70	0.9918	1.0001	1.0014	0.9900
N30013	6	SW	N30013-6-SW	100.00	10.00	66.70	0.9918	1.0001	1.0014	0.9900
N30013	6SRS	W	N30013-6SRS-W	100.00	10.00	66.40	0.9918	1.0001	1.0014	0.9900
N30013	6SRS	SW	N30013-6SRS-SV	100.00	10.00	66.40	0.9918	1.0001	1.0014	0.9900
N30013	10	W	N30013-10-W	100.00	10.00	73.50	0.9806	1.0001	1.0007	0.9900
N30013	10	SW	N30013-10-SW	100.00	10.00	73.50	0.9806	1.0001	1.0007	0.9900
N30013	18	W	N30013-18-W	100.00	10.00	79.30	1.0000	1.0000	1.0000	0.9900
N30013	18	SW	N30013-18-SW	100.00	10.00	79.30	1.0000	1.0000	1.0000	0.9900
N23333	6	W	N23333-6-W	100.00	10.00	66.70	0.9918	1.0001	1.0014	0.9900
N23333	6	SW	N23333-6-SW	100.00	10.00	66.70	0.9918	1.0001	1.0014	0.9900
N23333	6SRS	W	N23333-6SRS-W	100.00	10.00	66.40	0.9918	1.0001	1.0014	0.9900
N23333	6SRS	SW	N23333-6SRS-SV	100.00	10.00	66.40	0.9918	1.0001	1.0014	0.9900
N23333	10	W	N23333-10-W	100.00	10.00	73.50	0.9806	1.0001	1.0007	0.9900
N23333	10	SW	N23333-10-SW	100.00	10.00	73.50	0.9806	1.0001	1.0007	0.9900
N23333	18	W	N23333-18-W	100.00	10.00	79.30	1.0000	1.0000	1.0000	0.9900
N23333	18	SW	N23333-18-SW	100.00	10.00	79.30	1.0000	1.0000	1.0000	0.9900

Spreadsheet Caveats

- Use Protection and Passwords to prevent accidental data alteration



- Create Templates (read-only) and use them; it is to easy to propagate changes when copying a previous spreadsheet.



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- Upcoming Meetings

AAPM TG-51 Calibration Protocol

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- Photon Beams Worksheet (Word Doc)
- Electron Beams - Cylindrical Chambers Worksheet (Word Doc)
- Kecal $N_{D,w}^{60Co}$ for Plane-Parallel Chambers Worksheet (Word Doc)
- Electron Beams using Plane-Parallel Chambers Worksheet (Word Doc)
- TG-51 Workshop Worksheet Example (Word Doc)
- TG-51/Tg-21 Conversion Form (Word Doc)

TG-51 Worksheet
(use it!!!)

TG-51 Worksheet A: Photon Beams

1. **Site data**

Institution:	Rhode Island Hospital
Physicist:	Bruce Curran
Date:	31/Jan/2009
Accel or ^{60}Co Mfr.:	Varian
Model & serial number:	Clinac-iX #4207
Nominal photon energy/beam identifier:	6 MV

2. **Instrumentation**

a. Chamber model:	PTW 310003
Serial number:	0595
Cavity inner radius (r_{cav}, Table III):	0.305 cm
Waterproof:	yes [X] no [ ]
If no, is waterproofing ≤ 1 mm PMMA or thin latex?:	yes [ ] no [ ]
b. Electrometer model:	Fluke 35040
Serial number:	99818
i. P_{elec}, electrom. Corr factor (Sec. VII.B):	1.000 C/C or C/rdg.
c. Calibration factor $N_{D,w}^{60_{Co}}$ (Sec.V):	5.318 Gy/C (or Gy/rdg)
Date of report (not to exceed 2 years):	30/Jul/2008

3. **Measurement Conditions** (10 x 10 cm^2, point of measurement at 10 cm depth (water equivalent)

a. Distance (SSD or SAD):	100 cm SSD
b. Field size:	10 x 10 cm^2
on surface (SSD setup)	[ ]

TG-51 worksheets

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

After adjustment, $M_{raw} = 25.393$

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

Fully corrected M (Eq.(8)): 25.114=(1.0001)(0.9883)(1.000)(1.0014)(25.393)__

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

a. Dose to water at 10 cm depth = 132.564=(25.114)(0.9918)(5.318)_____

b. Dose/ MU(or min ^{60}Co) at 10 cm depth | 132.564/200=0.6628 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.: 66.15_____

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*)]

1.0020_____cGy (water)/MU

Recommendations

- Use a waterproof chamber!
  - Sleeves are a viable option, but have some risk and require additional time and care. A waterproof chamber is worth the investment.
- Take care of your equipment
  - Kinked cables and open connectors are an invitation to erratic results. Keep connectors sealed when not in use and coil cables so as to reduce tension and knotting.

Recommendations

- Do cross comparisons of your chambers and electrometers on a regular basis

	Ion Chamber	MU	Bias V	Scale	Readings					Average	S.D.	Absolute Reading (nC/MU)
A	PTW N23333 #871	200	-300	10^{-8}	2.8620	2.8610	2.8620	2.8640	2.8630	2.8624	0.04%	0.1431
B	PTW N30013 #1058	200	-300	10^{-8}	2.8370	2.8380	2.8380	2.8380	2.8370	2.8376	0.02%	0.1419
C	PTW N30013 #0595	200	-300	10^{-8}	2.8820	2.8810	2.8820	2.8830	2.8840	2.8824	0.04%	0.1441

	Calibration Correlation		Valid Cal.			Cross-Calibrat
	Electrometer	Cal. Factor		A	B	C
A	PTW N23333 #871	5.3650	Yes	1.0000	1.0029	1.0018
B	PTW N30013 #1058	5.3960	Yes	0.9971	1.0000	0.9989
C	PTW N30013 #0595	5.3180	Yes	0.9982	1.0011	1.0000

Thanks

Clinical Dosimetry Measurements in Radiotherapy (AAPM 2009 Summer School) NEW! Hardcover book includes CD version!

Authors: D. W. O. Rogers and Joanna Cygler, Editors

ISBN: 9781888340846

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Price: US $140.00

Contents

Reviews

Description

While radiation dosimetry is no longer the "hot topic" of research that it once was, new treatment modalities still have challenges to be solved and detector systems are constantly being developed. But as a relatively mature subject, there is no widely used current book devoted to clinical dosimetry. A primary purpose of producing this Summer School was to create such a text to help in the education of clinical physicists who had not had access to the forefront research into understanding radiation dosimetry. Making sure the dose delivered to the patient is what it should be is one of the most important jobs medical physicists have. There are many aspects to doing this, but at the core, the radiation must be accurately measured. One of the original major tasks of the AAPM was to establish methods which its members could use to reliably carry out this task, and it has been highly successful. There have been clinical dosimetry protocols and formalisms for brachytherapy dosimetry developed, calibration laboratories accredited, and a myriad of task group reports produced on different dosimetry techniques and delivery modalities. Hardcover book includes CD version. **| 170**

Wednesday, July 29, 2009

Practical Medical Physics		You must log into the abstracts system to use the meeting planner
Practical Application of Beam Calibration Protocols		
Wednesday	4:00:00 PM - 5:30:00 PM	Room: 213A

Moderator 1: Bruce H. Curran, Rhode Island Hospital/Brown Medical Center

4:00 PM WE-E-213A-1	**Practical Aspects (and Pitfalls) of External Beam Photon Calibrations Using TG-51** - B. Curran*
4:20 PM WE-E-213A-2	**Practical Aspects of Cyberknife Small Field Dosimetry** - S. Dieterich*, L. Wang
4:40 PM WE-E-213A-3	**Practical Aspects of Commissioning and Calibration of Clinical Orthovoltage Units** - W. Abdel-Rahman*, L. Liang, I. AlDahlawi, J. Seuntjens
5:00 PM WE-E-213A-4	**Practical Aspects of Electron Beam Dosimetry** - B. Gerbi*