

RPC WEBPAGE NEWSLETTER

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Should I use an ADCL calibration of my parallel plate chamber?

Effective January 1 2000, the calibration protocol known as "TG-51" became the recognized AAPM calibration protocol for megavoltage photon and electron beams. A majority of US medical physicists have switched to TG-51, but a number of people continue to use the TG-21 protocol. A significant difference between the two protocols is that the TG-51 is based on ion-chamber calibrations in terms of dose-to-water provided by an Accredited Dosimetry Calibration Laboratory ([ADCL](#)). TG-21 is based instead on an exposure calibration.

The [ADCLs](#) provide dose-to-water calibrations of cylindrical ionization chambers and parallel-plate (PP) ion chambers. If you use a PP chamber for electron beam calibrations, the use of its [ADCL](#) calibration factor can introduce an error of up to 2%, or even more, depending on the PP's make and model. The TG-51 protocol and the RPC strongly recommend a procedure to assign calibration factors to the PP chamber based on a comparison with a cylindrical chamber in a high-energy electron beam (~16 MeV).

For TG-21, a procedure to assign the N_{gas} value for the PP chamber by the cylindrical chamber comparison technique is outlined in the report from AAPM task group 39 (*Med. Phys.* 21, 1251-1260, 1994). For TG-51, the comparison technique should be employed to determine the product ($N_{\text{D,w}}^{60\text{Co}} \bullet k_{\text{ecal}}$) for the PP chamber. The required values of k_{ecal} for most commonly used cylindrical chambers are provided in TG-51. With the comparison technique, good agreement (0.5%) between output calibrations with PP and cylindrical chambers has been shown to extend down to 6 MeV^{1,2}. The [ADCL](#) calibration of PP chambers, however, continues to prove useful as a redundant check and to satisfy regulatory requirements.

We refer you to the following articles for more details:

- 1) [Beddar AS, Taylor RC "Calibration of low-energy electron beams from a mobile linear accelerator with plane-parallel chambers using both TG-51 and TG-21 protocols", *Phys. Med. Bio.* 49: N105-N110, 2004](#)
- 2) [Taylor R, Hanson W, Wells N "Are photons and Electron beam calibration More consistent with TG-51 than with TG-21?", Poster SU-GG-PDS-34, *Med. Phys.* 30: 1350, 2003.](#)
- 3) [Taylor RC, Hanson WF, Ibbott GS. TG-51 Experience from 150 institutions, common errors, and helpful hints. *Journal of Applied Clinical Medical Physics* 4:102-111, 2003.](#)
- 4) [Taylor R, Hanson W. Calculated absorbed-dose ratios, TG-51/TG-21, for most widely used cylindrical and parallel-plate ion chambers over a range of photon and electron energies, *Medical Physics* 29:1464-1472, 2002.](#)
- 5) [J. R. Lowenstein, P. Balter, D.S. Followill, and W.F. Hanson. Implementation of TG-51: Practical Considerations. Poster TH-CXH-38, *Med. Phys.* 27: 1429, 2000.](#)

Should you have questions, please do not hesitate to contact the RPC at (713) 745-8989 or email at rpc@mdanderson.org.

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