

AbstractID: 13596 Title: Central electrode correction factor,  $P_{cel}$ , for steel and wire electrodes

**Purpose:** Beam quality conversion factors,  $k_Q$ , are required for use with the TG-51 clinical dosimetry protocol. TG-51 values of  $k_Q$  are calculated using the ratio of several correction factors including the central electrode correction factor,  $P_{cel}$ , which is known for ion chambers with aluminum or graphite electrodes. This study calculates  $P_{cel}$  values in photon beams for more recent chambers that use electrodes composed of high-Z materials. **Method and Materials:** Monte Carlo simulations using the EGSnrc user-code `egs_chamber` are used to calculate the absorbed dose to the gas in an ion chamber with and without the central electrode. The ratio of the two doses gives  $P_{cel}$ . Manufacturers' blueprints and user's manuals are used to model the ion chambers. The source is modeled as a collimated point source from tabulated spectra for Cobalt-60 and linear accelerator photon beams. Spectra used include some linear accelerators without flattening filters to investigate the value of  $P_{cel}$  in 'soft' beams. **Results:** For small volume ion chambers with electrodes composed of high-Z materials the central electrode effect is unlike that of aluminum electrodes in standard Farmer-like chambers. This results in  $k_Q$  factors which are up to 1.5% larger for clinical beams than those used in current dosimetry protocols. For standard Farmer-like chambers,  $P_{cel}$  does not depend on the degree of filtration in the beam but for chambers with high-Z electrodes  $P_{cel}$  is different by up to 1.5% in lightly-filtered beams compared to values in typical clinical beams. **Conclusion:** Calculations of the central electrode correction factor in photon beams have shown that ion chambers with electrodes made of high-Z materials have significantly larger electrode effects (1 to 2.5%) than those with aluminum electrodes (<0.8%). It would be best to avoid such high-Z electrode materials.