AbstractID: 8195 Title: An Investigation on the Cross-Calibration Value of the Plane-Parallel Chamber against the Cylindrical Chamber for Different High-Energy Electron Beams with TG-51 Protocol

Purpose: To investigate the cross-calibration value of the plane-parallel chamber for different high-energy electron beams. **Method and Materials:** An Exradin parallel-plate ion chamber (P11) and a calibrated cylindrical ion chamber (PTW N30006) were used for measurements. R_{50} of electron beams was calculated from Eq.(16) of the AAPM TG-51 protocol with depth-ionization curves measured by the cylindrical chamber. Since 2 cm $\leq R_{50} \leq$ 20 cm for electron beams 9, 12, 15 and 18 MeV, $(K'_{R50})^{pp}$, the electron beam quality conversion factor, was calculated from Eq.(20) of the protocol. Dose per MU at d_{ref} using the cylindrical chamber was determined with worksheet B according to the protocol. The parallel-plate chamber was used with the TG-51 worksheet C to determine the cross-calibration value, K_c, of the plane-parallel chamber against the cylindrical chamber for the above electron beams. Measurements were repeated several times. **Results:** K_c should be constant for the same parallel-plate chamber for different energy electron beams since it only depends on chamber's construction, however, our measurements show K_c increases with beam energy. The average cross-calibration value for 18 MeV is approximately 0.8 % larger than that for 9 MeV. K_c is a function of $(K'_{R50})^{pp}$ which depends on beam energy via Eq.(20). If Eq.(20) doesn't describe such dependence accurately, K_c will vary with beam energies. When we fit our measurement data with a different set of parameters in Eq.(20), K_c no longer varies with beam energies. **Conclusions:** Eq.(20) in TG-51 protocol may not accurately describe the dependence of $(K'_{R50})^{pp}$ as a function of electron beam energies. Variations of the cross-calibration value for different beam qualities for the same parallel-plate chamber are observed. It may be necessary to use different parameters in Eq.(20) to more accurately describe the above dependence.