AbstractID: 11457 Title: A Monte-Carlo investigation of the beam quality conversion factor

Purpose: Clinical reference dosimetry based on absorbed dose standards requires the use of a beam quality conversion factor, k_Q. This parameter is ionization chamber-specific and varies with beam quality. Current dosimetry protocols provide values of k_Q for commonly used chambers (AAPM TG-51 (1999), IAEA TRS-398 (2000)). However, additional chambers are being used clinically for which values are not available. The aim is to obtain values of k_Q for various ionization chambers over a range of photon beam quality using Monte Carle (MC) simulations. There is particular interest in obtaining values for those chambers which cannot be calculated using the TG-51 approach because of missing data, specifically for chambers with a relatively small collecting volume. **Method and Materials:** Direct MC calculations were made of the absorbed dose to water and the absorbed dose to gas in an ionization chamber at the reference depth in a water phantom. The simulations were performed using the EGSnrc user-codes cavity and egs_chamber to model the ionization chambers using the extended geometry package. The source input used a collimated point source from tabulated spectra for Cobalt-60 beams and various clinical linear accelerators. The chamber geometries were modeled using specifications from the various manufacturers' manuals. Values for seven of the eleven chambers that were simulated in this study are available in TG-51. **Results:** The calculations of values which are available in TG-51 had a maximum difference of 0.4% from the TG-51 values. The maximum relative uncertainty in these calculations was 0.2%. In cases where experimental results were available the calculations were compared with measurements. Values were obtained for the chambers not provided in TG-51. **Conclusion:** Direct calculations of k_Q show agreement with those provided in TG-51. The simulations are being extended to cylindrical chambers in electron beams and to plane-parallel chambers in photon beams.