

AbstractID: 12657 Title: The correction factors of a cylindrical ion chamber in heterogeneous phantoms for megavoltage photon beams

**Purpose:** To investigate perturbation correction factors and inhomogeneity correction factors (ICFs) for a cylindrical chamber in heterogeneous phantoms which include solid water (SW), lung (LN), and bone (BN) materials. **Methods and materials:** The perturbation factors,  $P_{gr}$ ,  $P_{wall}$ ,  $P_{stem}$ ,  $P_{cel}$ , and  $P_Q$  for a cylindrical chamber in heterogeneous phantoms were calculated with the EGSnrc/cavity code for 6 and 15 MV photons. The PTW31010 (0.125 cm<sup>3</sup>) chamber was used for measurements and Monte Carlo (MC) calculations of depth-ionization curves with field sizes of 3×3, 5×5, and 10×10 cm<sup>2</sup> at SSD of 100 cm. ICFs were calculated from the ratio of the product of the stopping power ratios and  $P_Q$  of LN or BN to SW. Finally, measured depth-ionization curves were converted to depth-dose curves by using ICFs and compared with those calculated by the MC method. **Results:**  $P_Q$  for SW and LN at a 5×5 cm<sup>2</sup> field for 6 and 15 MV photon beams was almost the same and ranged from 0.98 to 0.99.  $P_Q$  for BN reached 1.037 for 6 MV and 1.030 for 15 MV.  $P_{wall}$  and  $P_{stem}$  for BN were 1.029 and 1.015 for 6 MV and 1.022 and 1.013 for 15 MV, respectively. ICFs for LN ranged from 1.005 to 0.995 for 6 MV and from 1.010 to 0.995 for 15 MV. In contrast, ICFs for BN reached 0.950 for 6 MV and 0.940 for 15 MV. The measured depth-dose curves for heterogeneous phantoms agreed within 1% with those of MC calculations. **Conclusions:** The perturbation effects of the chamber stem and the wall in LN are insignificant but the effects in BN are more significant. It was found that ICFs for ionization measurements in heterogeneous phantoms are up to 2% for LN and 6% for BN, and depend on the photon energy and the field size.