AbstractID: 10149 Title: Calculation of the cavity correction factor, P_{cav}, for cylindrical ionization chambers in clinical electron beams by Monte Carlo simulation

Purpose: To calculate the cavity correction factor, P_{cav}, for the cylindrical ionization chambers in clinical electron beams by Monte Carlo simulation. **Methods and materials:** The P_{cav} values for cylindrical chambers were calculated with the EGSnrc C++ user code cavity for 6, 9. 12, 15, and 18 MeV electron beams. The air cavity for cylindrical chambers was replaced with "low density water (LDW)" material. LDW is an artificial material that has all the dosimetric properties of nominal water except its density is equal to that of air. The dose to water was calculated with a 0.1 mm thick slab at a reference depth, d_{ref}. The point of measurement for the LDW cavity was taken to be 0.5r (r is the radius of the chamber's cavity) deeper than d_{ref}. P_{cav} was calculated for the cavities with diameters of 7 mm, 6 mm, 5 mm, 4 mm, 3 mm, and 2 mm and lengths of 20 mm, 10 mm, and 5 mm. The calculated P_{cav} values were compared with those from IAEA TRS-398. **Results:** P_{cav} values calculated for cylindrical chambers at d_{ref} in clinical electron beams were typically higher than those of TRS-398, which are based on experimental data of Johansson *et al.* For a Farmer chamber with the cavity of diameter 6 mm and length 20 mm, calculated P_{cav} values were higher from 2% to 0.8% than the TRS-398's data, in a range of 6 MeV to 18 MeV. The dependence on the cavity lengths for P_{cav} was found at grater or equal to a diameter of 5 mm, but it was not sufficient at diameters of 4 mm and 3 mm. **Conclusions:** It was found that the calculated P_{cav} values of cylindrical chambers in electron beams are sufficiently different from the TRS-398 data.