AbstractID: 11354 Title: Positioning recommendations for parallel-plate ionization chambers in clinical electron beams according to different dosimetry protocols - a Monte Carlo study for three different chamber types

Purpose: Current dosimetry protocols recommend the use of plane-parallel ionization chambers for the dosimetry of clinical electron beams. Regarding the allowance for the non-water equivalence of the entrance window and therefore the exact positioning of the parallel-plate chambers, the recommendations given in these protocols are not unique, resulting in positioning deviations in the range of tenth of millimeter. **Method and Materials:** The dose and the spectral fluences inside the active volume of three parallel-plate chamber types (Roos-, Advanced-Markus- and NACP-chamber) were calculated in a water phantom in the reference depth z_{Ref} and the half-value depth R_{50} for three electron energies (6, 11 and 21 MeV) using the EGSnrc Monte Carlo code. From these results the perturbation correction p_{wall} was calculated as $p_{wall} = D_{cav}/D_{det}$ where D_{det} is the dose inside the active volume of the chamber and D_{cav} the dose inside the air cavity with walls entirely made of water. To inspect the consequences of the different positioning recommendations given in the dosimetry protocols (AAPM TG-51, IAEA TRS-398, DIN 6800-2), the chamber's reference point was shifted by an amount Δz to fulfill the recommendations given in the different protocols. **Results:** Although the recommended shifts Δz are in the range of tenth of millimeters only, the spectral fluence inside the active volume of the chambers changed strongly with Δz. At the depth z_{ref} these spectral fluence changes had no impact on p_{wall}. For all chambers its numerical value is larger than 1, the recommended value given in all protocols. Contrary, at the depth R_{50} the different positioning recommendations resulted in deviations of p_{wall} up to 15%. **Conclusion:** The different positioning recommendations have no impact on the results of dose measurements at the clinical relevant depth z_{ref}. The resulting deviations in p_{wall} at the depth R_{50} may be of academic interest.