AbstractID: 8429 Title: Electron depth dose measurements using a plastic scintillation detector and a parallel-plate ionization chamber.

Abstract Submission

Purpose: Plastic scintillation detectors (PSDs) have been shown not to require stopping power or perturbation corrections to measure absorbed dose in high energy electron beams. The purpose of this work is to compare the performance of ionization chambers and PSDs in precise measurements of electron beams.

Method and Materials: Electron beam depth dose measurements were performed on a Varian Clinac iX for 6 and 18 MeV. The ionization chamber measurements were performed using a Roos (PTW) parallel plate ionization chamber. The ionization chamber measurements were converted to dose using stopping power ratios for realistic clinical beams. The scintillation dosimetry measurements were performed using a miniature water equivalent plastic scintillation detector (1.6 mm^3). This detector is made out of a (1 mm diameter by 2 mm long) BCF-12 scintillating fiber coupled to a color CCD camera. The Cerenkov radiation produced in the PSD was filtered by a chromatic discrimination technique.

Results: The percentage depth dose of the Roos chamber measured at 6 and 18 MeV agree well with the scintillation detector depth dose from D_{max} to the R_{50} depth. As the depth increases past R_{50}, a gradual discrepancy appears between the curves provided by the 2 detectors at both energies. Past the practical range (R_p) and into the Bremsstrahlung tail, the percentage depth dose curve of the Roos does not agree with the plastic scintillation detector at both energies (20 % and 50 % difference at 6 and 18 MeV).

Conclusion: The discrepancy between the detectors suggests that: 1) The stopping power ratios do not model properly the transition between electrons and photons at the R_p depth or 2) there may be an increase in P_{wall} with depth for the parallel plate chamber or 3) there is loss of water equivalence for the PSD at low electron energies.