AbstractID: 6758 Title: Evaluation of radiation dosimeters for kilovoltage x-ray beam dosimetry

Purpose: To evaluate radiation detectors for the dosimetry of kilovoltage x-ray beams.

Method and Materials: The study evaluated cylindrical and parallel plate ionization chambers provided with the PTW MP3 water tank system. Kilovoltage x-ray beams were generated by a Pantak DXT300 x-ray unit with energies ranging from 50 to 280 kVp. The following data was measured: percentage depth dose curves in water, relative detector response both in air and in solid water with the 6 cm diameter applicator. The reference detector was an NE 2571 ionization chamber that had been calibrated in a primary standards laboratory. The EGSnrc Monte Carlo code V4.2.2 was used to calculate depth dose curves in water for comparison with measured data. The x-ray spectrum of primary beam was determined using an analytical program, XRAYBEAM, and subsequently verified by calculation of the half value layer.

Results: For the measured depth doses, the PTW 0.3 cc thimble chamber, NACP, Markus and Roos chamber were in good agreement with the Monte Carlo calculated depth dose data. The agreement was better than 3% in most cases, and a maximum deviation of 4% for the 50 kVp x-ray beam. The M31002 pinpoint chamber gave a greater deviation, up to 9% for the 50 kVp beam. The relative detector response, as compared to the NE 2571, indicated that thimble chambers had a small variation of up to 5% over the energy range. However the relative detector response for the parallel plate chambers was large, with the deviation increasing as the x-ray beam energy decreased, up to 70% for the Markus chamber. Similar large response changes also occurred for the pinpoint chamber.

Conclusion: The parallel plate chambers (Markus, Roos, NACP) were found to be suitable for depth dose measurements in water for kilovoltage x-ray beams.