AbstractID: 13714 Title: Measurement of small field output factors using plastic scintillation detectors

Purpose: To investigate the performance of a small volume, water-equivalent plastic scintillation detector (PSD) for measuring output factors for small IMRT fields, as compared to 0.01cm^3 ionization chamber. **Method and Materials:** A PSD of 0.5 mm diameter and 2 mm length was irradiated with 6 and 18 MV beams from a Varian Clinac 21EX. The PSD was positioned vertically at a source-to-axis distance of 100 cm, at 10 cm depth in a water phantom, and irradiated with fields ranging in size from 0.5 × 0.5 cm^2 to 10 × 10 cm^2. The field sizes were defined either by the collimator jaws alone, or by a multi-leaf collimator (MLC) alone. The MLC fields were constructed in two ways: with the closed leaves (i.e., those leaves that were not opened to define the square field) meeting at either the field center-line, or at a 4 cm offset from center-line. Scintillation light was recorded using a CCD camera. Measurements were made using a CC01 ionization chamber under conditions identical to those used for the PSD. **Results:** Output factors measured using the PSD were found to be in good agreement with those measured using the CC01 down to a field size of 2.0 × 2.0 cm^2. The PSD measured higher output factors than the CC01 at smaller fields, e.g. by 7.8 % at 0.5 × 0.5 cm^2 under 6 MV photons using MLC fields with 4 cm leaf offset. Also, output factors were found to depend on the field defining geometry. **Conclusion:** This study suggests that PSDs provide a useful alternative to existing dosimetry systems for small fields, as they are less susceptible to volume averaging and perturbation effects than larger, air-filled ionization chambers. Therefore, PSDs may provide more accurate output factor determination due to their inherent properties. Supported by the NCI 1R01CA120198-01A2.