AbstractID: 13052 Title: A water equivalent and angular independent two-dimensional plastic scintillation detector array for quality assurance of IMRT treatments

Purpose: The goals of this study are: 1) to present a novel two Dimensional Plastic Scintillation Detector array (2D-PSD) for dose measurements of IMRT treatments, 2) to demonstrate that the dose distribution in the irradiated volume is not perturbed by the presence of the 781 detectors and 3) to demonstrate that the 2D-PSD can be used for high accuracy dose measurements for variable beam incidences. **Methods and Materials:** The 2D-PSD consists of 781 PSDs inserted vertically in a plastic water slab covering a 26x26 cm^2 region. The prototype is built entirely from nearly water equivalent plastic materials. To characterize the angular dependence of the 2D-PSD, the detector array was irradiated with a square field size 10x10 cm^2 using variable beam incidences from 0° to 120°. Furthermore, a clinical head and neck IMRT plan composed of six beam incidences was delivered on the 2D-PSD in two configurations: 1) the gantry angle of the linear accelerator is keep fixed at 0°, 2) using planned gantry angle values. The dose distributions measured with the 2D-PSD were compared to those calculated with a treatment planning system (Pinnacle^3, Philips Medical Systems) on a CT scan of the detector array. **Results:** The results of the angular dependence study indicate an excellent agreement between the measured and calculated dose distributions. For the IMRT plan delivered at a fixed gantry angle, the gamma evaluation was successful for 98.5% of the detectors for a dose tolerance of 3% and a distance to agreement of 3 mm. For the IMRT plan delivered with planned gantry angles, the gamma evaluation was successful for 99% of the detectors (tolerances of 4% and 4 mm). **Conclusion:** The results presented in this work suggest that the developed 2D-PSD could be used as a quality assurance tool for IMRT and arc therapy patient plan verification.