AbstractID: 3509 Title: Verification of IMRT Dose Distributions Using a Tissue Equivalent Plastic Scintillator Based Dosimetry System

Purpose: Intensity modulated radiation therapy (IMRT) offers the potential for improved target coverage and increased normal tissue sparing compared with conformal radiotherapy. The complex fluence maps used in IMRT, however, lead to more challenging quality assurance with dose verification being labor-intensive and time consuming. An IMRT dose verification system has been developed using tissue equivalent plastic scintillator that provides easy to acquire, rapid electronic and directly digital dose measurements of a 2D plane perpendicular to the beam.

Method and Materials: The prototype system consists of a water-filled Lucite phantom with a scintillator screen built into the top surface. The phantom contains a plastic mirror to reflect scintillation light towards a viewing window where it is captured using a CCD camera and a personal computer. Optical photon spread is removed using a micro-louvre optical collimator and by deconvolving a glare kernel from the raw images. System calibration is performed using radiation fields of known dose distributions. The system was evaluated by verifying a 5-field IMRT plan and comparing the results to a 2-D film dosimetry verification of the same plan. Resultant distributions were compared using 1-D dose profiles, 2-D dose difference maps and gamma factor analysis. A comparison of the time requirements for verification with each system was also performed.

Results: Preliminary results acquired with the new verification system indicate agreement within 5% of 2-D film dosimetry. Gamma factor analysis shows excellent agreement over most of the distributions. The timing comparison of the verification systems highlights the efficiency of the new scintillator system for IMRT verification with a 50% reduction in time.

Conclusion: Results from a 5-field IMRT plan verification using the new scintillator based system are very promising. With further development this system promises to provide a fast, directly digital, and tissue equivalent alternative to current IMRT verification systems.