AbstractID: 5851 Title: Computed Radiography for Helical Tomotherapy Quality Assurance

Purpose: To determine if a CR system that had been used for radiation therapy digital imaging since 2001 could also be used for IMRT quality assurance, and if the system could be used in helical tomotherapy quality assurance.

Methods and Materials: The CR system used consisted of a desktop CR reader that utilizes storage phosphor plates, a 650 nm laser diode scanning beam source, and a high luminance light box for plate erasure. The CR plates are made of phosphor, coated with a photostimulable storage phosphor ($BaFBR:Eu^{2+}$). Three types of dose-to-response calibrations were performed 1.) Static square fields; 2.) An IMRT step-wedge; and 3.) A rotational helical tomotherapy delivery with concentric rings of known dose. All readings were taken with 6 MV beams. Like TLDs, some of the trapped charge carriers in the storage phosphor gradually decay with time. Because of the decay effect, it was important to determine the best time to wait between exposure and scanning. Five helical tomotherapy patients were selected as test cases for the CR dosimetry. Measurements were made in a cylindrical phantom with the CR plate and again with radiographic film. Calibration techniques #1, #2, and #3 were applied to the CR images to determine which was the most appropriate. Dose differences and gamma comparisons were made between the calculated and measured doses.

Results: A time and field size dependence was observed. After comparing readings from different time intervals, ranging from one to twenty minutes, it was decided that four minutes was an optimal time to wait between exposure and scanning. Also, gamma for the CR images was significantly worse than the film images taken for the same patient.

Conclusions: The field-size dependences, inconsistencies between calibration techniques, and plate decay make the CR system used in this study non-usable for IMRT dosimetry.