AbstractID: 4777 Title: Characterization and use of EBT radiochromic film for IMRT dose verification

Purpose: To quantify and evaluate the use of the new EBT GafChromic film for its implementation in routine IMRT QA.

Method and Materials: The new film was examined using a characterized flat-bed scanner for several properties including polarization effects with scan angle and delivered dose, dose sensitivity, dose uniformity, OD time evolution post exposure, and dose response in comparison to water. The film high elasticity and relative insensitivity to water immersion allowed for its non conventional use in verifying dose distributions on curved surfaces. The film was wrapped into a cylindrical geometry inside an in-house built cylindrical phantom and then immersed in water. Calculated dose distributions from the TomoTherapy treatment planning system (TPS) were then compared to the film's measured IMRT deliveries for 10 IMRT cases (5 Head and Neck, 5 prostate).

Results: The film's intrinsic polarization was shown to be a function of delivered dose and could significantly affect the scanner's OD output readout. Film uniformity was shown to improve with delivered dose from ±5% for 50 cGy to nearly ±1.5% at 200 cGy. In addition, the film's OD was shown to saturate within 2 hours post exposure to a 2Gy dose, making it the fastest and least noisy RCF film so far. An excellent agreement was found between scanned water and film PDDs indicating the EBT energy response with depth is similar to water. Excellent agreement between predicted and measured isodose distributions and dose profiles were seen using the EBT film based on 10 IMRT deliveries.

Conclusions: This work indicates that this new RCF film possesses unique and improved characteristics which allows for its use in routine patient-specific IMRT QA. These encouraging results have motivated us to design an in-house cylindrical phantom to verify dose beyond 2D planar surfaces and in water phantoms.