AbstractID: 12801 Title: Impact of Post-irradiation Time on the Accuracy of Dose Measurements for EBT-2 Model GAFCHROMIC(TM) Film

Purpose: A new EBT-2 GAFCHROMIC^{TM} model radiochromic film has been released recently with addition of a yellow marker dye within sensitive layer that enables correction of non-uniformity of the active layer of the film. Performance of the EBT-2 was compared with former EBT model in terms of absorption spectra. Since one of the major drawbacks of the current radiochromic film dosimetry protocols is the post-irradiation waiting time, we studied the impact of post-irradiation scanning time on the dose measurements accuracy if shorter times are to be adopted.

Method and Materials: Post-irradiation scanning times employed range from 3 minutes to 5 days and dose range extends from 0 to 6 Gy. Absorption spectra of film samples were measured using a Perkin Elmer Lambda 650 spectrophotometer over the spectral range from 400 nm to 800 nm. Changes in absorption spectra of the samples irradiated to various doses were determined as the net difference between measurement and control film pieces which accounts for changes due to environmental conditions.

Results: Both film models experience similar dose change in net absorbance. However, the sensitivity of the latest EBT-2 model GAFCHROMIC^{TM} film is slightly lower than its predecessor. We show that for two post-irradiation scanning times of 30 minutes and 24 hours the 1% dose error can be achieved if the scanning time window is less than ±5 minutes and ±2 hours, respectively.

Conclusion: By comparing the resultant change in net absorbance between the latest EBT-2 and previous EBT GAFCHROMIC^{TM} film models we conclude that the addition of the yellow marker dye to the sensitive layer does not affect dosimetric properties of the latest film model. We also describe a procedure by which one can establish an acceptable time window around chosen post-irradiation scanning time protocol that would provide an acceptable dose error for practical purposes.