

AbstractID: 6439 Title: Artifact free EBT film scanner for Radiotherapy Dosimetry

Purpose: To build a high resolution, accurate, 2D optical densitometer that eliminates scanner-film artifacts commonly observed in radiochromic film dosimetry.

Method and Materials: An optical densitometer was built using a stationary light source and detector with a moving film holder attached to a high precision computerized X-Y stage. The light source was a red LED (633nm), to conform to EBT film absorption peak. Two silicon photo-detectors were used to measure incident and transmitted light. The LED output was focused to a sub-millimeter spotsize at the film. Data acquisition was performed with a 16-bit A/D card in conjunction with commercial software. The densitometer was used with radiographic EDR2 and radiochromic EBT films. Sensitometric curves and three IMRT field scans were acquired with a resolution of 1mm. The results were compared with the MapCHECK diode array measurement under identical geometry. The EBT film was rotated by 90 degrees and rescanned to record orientation effects.

Results: A spotsize of 0.8mm was measured at the film using the half razor technique. The EBT film rotated by 90 degrees showed no orientation effect. From the absolute comparison mode of the MapCHECK analysis software, the average passing rates with 3%/3mm criteria were 97.5% for EBT films and 96.6% for EDR2 films. The main difference between EBT and EDR2 measurements were in low dose areas, with EDR2 readings higher. This is most likely due to over response of the radiographic film to scatter radiation. No artifacts were observed in the scanned films. A scan of 15x15cm took 20 minutes to acquire.

Conclusion: The LED densitometer provides accurate film dosimetry with 1mm or better resolution. It eliminates the orientation dependence of EBT film dosimetry. The IMRT results compared well with Mapcheck measurements.

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