

AbstractID: 11420 Title: Investigation of Discrepancy in Reports on GafChromic EBT Energy Dependence

Purpose: Radiochromic films, such as GafChromic EBT, provide a convenient and versatile dosimeter, and are particularly useful for small field dosimetry. Due to previous reports showing energy independence, GafChromic EBT films were implemented as dosimeters across a wide range of energies. However, in recent years, reports showing energy dependence have been presented, contradicting previously published data. This discrepancy was investigated by comparing two batches of film manufactured 4 years ago to two recently manufactured batches.

Method and Materials: Small pieces of film were irradiated to 100 cGy using a 6 MV and a 105 kVp beams. A 30 cm × 30 cm × 4.5 cm phantom equipped with optical fibers was used, with appropriate amount of Solid Water as backscatter. Net optical density was measured by two completely independent methods: a 10 nm range at main absorbance peak was used for real-time measurements, and a red channel of an Epson 1680 flatbed scanner was used for the measurements performed 24 hours after irradiation.

Results: The ratios of optical density (105 kVp to 6 MV) were markedly different between the old and new batches of film, both for real-time and scanner measurements. While the ratio of the older films demonstrated energy independent within 10%, as previously reported, the newer films show approximately a 25% drop in response when orthovoltage energies were used.

Conclusion: A statistically significant difference in energy dependence exists between older and newer GafChromic EBT films, confirming both the publications demonstrating energy independence and those showing a decrease in sensitivity at low energies. Chemical analysis is underway to investigate the potential causes of the observed results.