

Purpose: The goal of this work is to evaluate the uniformity of International Specialty Products Gafchromic EBT2 film with a high-resolution metric. The effect on uniformity of the marker dye (blue-channel) correction and time post-exposure are investigated.

Methods: Film uniformity was quantified by using EBT2 and Kodak EDR2 film to measure the flatness of a cobalt-60 field. EBT2 films were digitized 24, 48, and 72 hours post-exposure and analyzed using three methods: the manufacturer-recommended blue-channel correction, an in-house blue-channel correction, and a net optical density (OD) measurement in the red color channel. The field flatness was calculated from the horizontal and vertical dose profiles taken through the center of the cobalt-60 field for each analysis method and compared to the EDR2 results.

Results: The blue-channel correction methods improved the flatness measured with EBT2 film by up to 1% over the net OD method. Additionally, the percent standard deviations of the flatness measurements with the blue-channel correction methods were up to 0.7% (1-sigma) lower than the net OD method. The flatness measured with EDR2 film was 1.4% to 1.8% better than the flatness measured with EBT2 film using the net OD method. The flatness did not exhibit any unidirectional change with time and showed a maximum change of 0.4%.

Conclusions: Using field flatness as a metric for response uniformity, EBT2 film analyzed with the net OD method demonstrates substantial non-uniformities relative to EDR2 film. The blue-channel correction considerably improves the uniformity of EBT2 response and reduces the film-to-film response variation relative to the net OD method. The uniformity of EBT2 is independent of post-exposure time. The blue-channel correction can be used to reduce uncertainty in relative dosimetric measurements with EBT2 film.