Purpose: To use the new EBT3 Gafchromic films for large modulated field dosimetry, a lateral scan correction needs to be performed. We propose a lateral correction built in in the calibration curve. The feasibility of this calibration methodology is evaluated.

Methods: The relative scan value (Transmittance, T) is associated with the dose using a rational function with three parameters: $T_0$ the unirradiated transmittance, $T_{max}$ the maximal transmittance, and $b_3$ a parameter scaling the impact of the dose. Because, the lateral scan effect is inherent to the scanner transmission system, a parabolic correction is implemented in the calibration function itself, instead of a post calibration correction. To assess a sufficient sampling of both the dose and the lateral dependency in the calibration procedure, eight dose levels are irradiated to two lateral locations on two uncut calibration films (one location per film).

The resulting calibration function is validated by delivering known uniform doses on eight strips a single film. The central pixel line of each validation strip is converted to dose for the three (RGB) color channels. To show lateral independence of the measured dose, the central pixel line is divided in five 2 inch ROIs, subsequently, the root mean square error (RMSE) of these ROIs is calculated.

Results: The dose errors (1SD) are 2%, 2.2%, and 2% for the red, green, and blue color channel respectively. The red channel dose, without lateral correction, has a maximal RMSE $>2.5\%$, for the outer ROI. The proposed methodology results in a maximal RMSE $< 0.5\%$ for all ROIs and all three color channels in a $[0.57, 4.16]$ Gy dose range.

Conclusions: The scanner-transmission system with the new EBT3 gafchromic films is calibrated with a calibration protocol incorporating the lateral scan effect. This method reduces the RMSE from 2.5\% to 0.5\%.

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