AbstractID: 5520 Title: A single dose calibration method for IMRT QA film dosimetry using Gafchromic® EBT film

Purpose:
In order to decrease the workload for IMRT QA film dosimetry we propose a simple method for Gafchromic® EBT film calibration using a pre-measured batch calibration curve (BCC) which is mathematically scaled with a single dose exposure (SDE) for each subsequent IMRT QA session. We evaluate how the SDE method corrects for post exposure density growth and temperature dependence in addition to inter film response homogeneity.

Method and Materials:
Each of five EBT films, from a single production lot, were exposed to doses of 22.5, 43.1, 84.4, 147.4, 209.1, and 291.2 cGy. Measurement of the resulting response curves were performed at times ranging from 0.7 to 52 hours post exposure on a Macbeth TD932 point densitometer customized with a 636nm band pass filter and 16 bit digitizer for increased sensitivity, yielding 35 curves in all. The BCC was generated from a film measured at 0.7 hours and fit to the equation Dose= $A*netOD^3 + B*netOD^2 + C*netOD$. To test the method, net optical density (NOD) data for the remaining 34 curves was scaled to fit the BCC using 209.1 cGy as the SDE. The scaling factor is the ratio of the actual measured NOD of the SDE, and the NOD predicted by the BCC for this dose. The new scaled calibration is used to predict all 204 test doses, which were then compared to the actual delivered doses.

Results:
Using the single uncorrected BCC resulted in an average error for the 204 dose points of 11.9 cGy. However, scaling according the method described reduced the average measured dose error to 1.1 cGy.

Conclusion:
The single dose exposure method described here is an accurate and time efficient calibration procedure for IMRT QA film dosimetry.

Conflict of Interest:
Partially supported by International Specialty Products.