AbstractID: 5637 Title: IMRT Dosimetry with an Active Matrix Flat Panel Dosimeter

Purpose:
Dosimetric performance of a fully-customized Active Matrix Flat Panel Dosimeter (AMFPD) is reported for IMRT measurements in a solid-water phantom.

Method and Materials:
The AMFPD consists of a-Si:H photodiodes and thin film transistors deposited on a glass substrate. No scintillator screen or copper plate is present above the photodiodes. The device is operated in a continuous acquisition mode asynchronously with the radiation beam delivery at 0.8 fps. Prior to field delivery, a dark frame was acquired to take into account dark signal contributions to the radiation signal including any lag effects from previous irradiations. Dose was determined by summing the corresponding radiation frames (after subtracting from each frame a dark frame obtained prior to radiation delivery), correcting for defective pixels, applying a pixel-to-pixel gain correction, and then applying the measured dose response calibration curve. The response of the AMFPD was evaluated as a function of the applied bias voltage across the photodiodes, as this parameter affects dark signal, lag contributions, and sensitivity. In addition, the AMPFD response was evaluated as a function of dose, dose rate, and energy for static fields at 10 cm depth. For comparison, SMLC and DMLC IMRT fields were measured with the AMFPD and film, using standard methods for reliable film dosimetry. All comparisons were made in absolute dose values of cGy.

Results:
In continuous acquisition mode, the AMFPD maintained a linear dose response (correlation coefficient r^2>0.9999) up to 1040 cGy over the period of study (six months). In order to obtain reliable integrated dose results for IMRT fields, effects of lag on the radiation signal were minimized. Compared to film, the AMFPD results were excellent, generally within 2% /±2 mm.

Conclusion:
We found that the AMFPD can be used as a dosimeter at multiple depths in phantom for static, SMLC and DMLC IMRT fields.