AbstractID: 5879 Title: Calibration of the Perkin Elmer AG9 Flat Panel Portal Imager for Exit Dosimetry

Purpose:

The new and highly sensitive amorphous-silicon AG9 flat panel portal imager by Perkin Elmer allows imaging with extremely low doses. The purpose of this work is to establish the dosimetric response of the panel. Dosimetric calibration of the detector is also a necessary step for a dose reconstruction program under investigation.

Methods and Materials:

A convolution model was developed to map the flat panel images to equivalent dose in water at a depth of 1.5cm. The three model parameters are the flat-panel and water energy-deposition kernels, the flat-panel-to-water-dose conversion function, and the pixel sensitivity matrix. They account for differing flat-panel and water energy responses, field size effects, and the panel's pixel nonuniformity. To determine these parameters, identical setups with the flat panel and with a water phantom were used to carry out numerous measurements. To validate the model, 10cm and 5cm square fields were delivered through 16cm of solid-water slabs and a cylindrical solid-water QA phantom. The flat-panel converted dose profiles were compared with that measured in the Wellhofer water tank.

Results:

Both the flat-panel and water kernels decrease sharply with distance. The magnitude of the flat-panel kernel was greater, possibly due to the additional scatter in the high-density panel material. The conversion function varies with the off-axis distance and is nearly linear as the attenuation thickness varies. The sensitivity matrix values were approximately within 1% of unity, demonstrating good pixel uniformity of the panel. Validation tests showed that the model-extracted dose agrees with measurements to within 1%.

Conclusion:

A good understanding of the dosimetric response of the AG9 flat panel was achieved. The developed convolution model was shown to be accurate and suitable for generating energy-fluence maps for 3D dose reconstruction.

Conflict of Interest:

Research supported by Siemens.