

AbstractID: 1649 Title: Calibration of an Amorphous-Silicon Flat Panel Detector for Absolute Dosimetry

Amorphous-silicon flat panel detectors are used to acquire digital portal images with excellent image quality. Their ease of use also makes them attractive for dosimetry applications, but the images must be corrected for non-linear behavior of the electronics, inhomogeneous pixel sensitivities, scattering in the detector, and the panel's complex energy response.

The detector used in this study is a Perkin Elmer RID 1640 attached to a Siemens Primus linear accelerator. By varying the exposure time, we find that the detector's integration is highly linear ($R^2 = 0.99$) after correction for pixel offset. To homogenize the pixel sensitivities, we compare the off-axis pixel responses to film or ion-chamber measurements. By measuring the flat panel's field size dependence, we determine an effective deposition kernel to describe the detector scatter. Absolute calibration of the detector is accomplished by comparison with a calibrated ion chamber in a water phantom placed at the same height as the flat panel. Performing this calibration with various amounts of attenuating material on the treatment table compensates for the flat panel's response to the hardening beam spectrum. For large attenuation and significant beam hardening, the uncorrected flat panel signal is more than 5% lower than the ion chamber measurement. Comparison of the corrected flat panel images with measurements or predictions of the detector dose for complex fields or phantoms is underway. Corrected flat panel images measured during treatment can be used to estimate the delivered absolute dose distribution in the patient.

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