Abstract ID: 19162  Title: Thin-Film Organic Photocell (OPV) Properties in MV and KV Beams for Dosimetry Applications

Purpose:

To characterize dosimetric properties of low-cost thin film organic-based photovoltaic (OPV) cells to kV and MV x-ray beams for their usage as large area dosimeter for QA and patient safety monitoring device.

Methods:

A series of thin film OPV cells of various areas and thicknesses were irradiated with MV beams to evaluate the stability and reproducibility of their response, linearity and sensitivity to absorbed dose. The OPV response to x-rays of various linac energies were also characterized. Furthermore the practical (clinical) sensitivity of the cells was determined using IMRT sweeping gap test generated with various gap sizes. To evaluate their potential usage in the development of low cost kV imaging device, the OPV cells were irradiated with kV beam (60â€“120 kVp) from a fluoroscopy unit. Photocell response to the absorbed dose was characterized as a function of the organic thin film thickness and size, beam energy and exposure for kV beams as well. In addition, photocell response was determined with and without thin plastic scintillator.

Results:

Response of the OPV cells to the absorbed dose from kV and MV beams are stable and reproducible. The photocell response was linearly proportional to the size and about slightly decreasing with the thickness of the organic thin film, which agrees with the general performance of the photocells in visible light. The photocell response increases as a linear function of absorbed dose and x-ray energy. The sweeping gap tests performed showed that OPV cells have sufficient practical sensitivity to measured MV x-ray delivery with gap size as small as 1 mm.

Conclusions:

With proper calibration, the OPV cells could be used for online radiation dose measurement for quality assurance and patient safety purposes. Their response to kV beam show promising potential in development of low cost kV radiation detection devices.