

Purpose:

Commercially available surface diodes are found to have as great as $\pm 12\%$ change in sensitivity with the angle of incidence of radiation. This work is a study of the cause of angular dependence of diode sensitivity and how it can be decreased.

Materials and Methods:

A number of different surface diodes were used in these measurements: a commercially available, CA, and two prototype diodes, D1 and D2. CA and D1 were mounted on a circuit board that had a plane of copper on its backside; D2 was not mounted on a circuit board but did have a metal contact-pad on its back surface. Optically stimulated luminescent dosimeters, OSLDs, were used that were packaged in a plastic case. All detectors were mounted in a water equivalent cylindrical phantom that provided symmetric buildup. Irradiations were made with a 6 MV, $10 \times 10 \text{ cm}^2$ field of a linear accelerator.

Results:

CA, D1, and OSLD had angular dependence of sensitivity of $\pm 12\%$, $\pm 9\%$, and $\pm 1\%$, respectively. It was hypothesized that the copper plane on the circuit board was the cause of the anisotropy in sensitivity of the diodes. When a copper disc was placed on the backside of the OSLD its angular sensitivity became similar to that of CA and D1. D2 was found to have an angular dependence of $\pm 5\%$.

Conclusions:

1. The anisotropy in angular dependence of diode sensitivity is in part due to the mounting of the diode on a circuit board that has a plane of copper.
2. Low energy electrons are back scattered at the high atomic number interface and this results in higher detector sensitivity to photons that enter from the directions of the front and back surfaces of the detector.
3. Diodes that are modified and not mounted near a plane of copper have reduced angular dependence.