

AbstractID: 12609 Title: Experimental Comparison of Seven Commercial Dosimetry Diodes for Measurement of Stereotactic Radiosurgery Cone Factors

Purpose:

The purpose of this work is to measure SRS cone factors with commercially available diodes to determine the “best” instrumentation for beam data acquisition in small field dosimetry.

Method and Materials:

Measurements were made in 6 MV photon beams with fixed SRS cones for two accelerator-based SRS systems: a Varian Clinac 2300iX (Varian/ZMed cones) at 600 MU/min and a CyberKnife G4 at 800 MU/min. Measurements were made at 1.5 cm depth in water using the IBA Dosimetry “blue phantom” 3D scanning system, controlled by OmniPro-Accept software. The same author performed set-ups on both machines for consistency. Source-to-detector distance was 100 cm for the Clinac, 80 cm for the CyberKnife. Two curves were calculated for the Clinac, one directly from 10x10 diode measurements and the other indirectly by “daisy-chaining” diode measurements to a 10x10 reference ion chamber measurement through an intermediate 4x4 square field. CyberKnife factors were calculated directly from measurements in the 60 mm reference field. Six commercial diodes were evaluated: PTW TN60008, TN60012, TN60016, TN60017; IBA SFD; Sun Nuclear EDGE; Exradin SD1.

Results:

With one exception, all the evaluated devices yielded surprisingly consistent results. Standard deviations of Clinac factors for all diodes *excluding the outlier* ranged from approximately 0.50% at 30 mm to 1.9% at 5 mm cones size when referenced directly to the 10x10 measurement. The daisy-chaining strategy reduced the standard deviation to approximately 0.14% at 30 mm and 1.7% at 5 mm. Standard deviations in the CyberKnife beam ranged from 0.40% at 60 mm to 1.2% at 5 mm.

Conclusion:

The inter-detector variation is small and appears to be systematic with detector packaging, more inherent filtration producing flatter curves for both the relatively hard Clinac beam and the softer CyberKnife beam. The daisy-chain strategy reduces the variance between diodes by about half in the Clinac beam.