Evaluation of Detector Response in Rectangular Small Field Dosimetry
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Presentations
SU-F-T-557 (Sunday, July 31, 2016) 3:00 PM - 6:00 PM Room: Exhibit Hall

Purpose:
As stereotactic treatment modalities grow towards becoming the standard of care, the need for accurate dose computation in small fields is becoming increasingly essential. The purpose of this study is to evaluate the response of different detectors, intended for small field dosimetry, in jaw defined small rectangular fields by analyzing output factors from a stereotactic clinical accelerator.

Methods:
Two Dosimeters, the Exradin A26 Microionization Chamber (Standard Imaging) and Edge Diode Detector (Sun Nuclear) were used to measure output factors taken on the Varian Edge Stereotactic Linear accelerator. Measurements were taken at 6MV and 6FFF at 10cm depth, 100cm SSD in a 48x48x40cm\textsuperscript{3} Welhoffer BluePhantom\textsuperscript{2} (IBA) with X and Y jaws set from 0.6 to 2.0cm. Output factors were normalized to a 5x5cm\textsuperscript{2} machine-specific reference field. Measurements were made in the vertical orientation for the A26 and horizontal orientation for both the A26 and Edge.

Output factors were measured as:
$$\text{OF}_{FS} = \frac{M_{FS}}{M_{ref}}$$
where $M_{FS}$ and $M_{ref}$ are the measured signals for the clinical field and the reference field, respectively. Measured output factors were then analyzed to establish relative responses of the detectors in small fields.

Results:
At 6MV the Edge detector exhibited a variation in output factors dependent on jaw positioning (X-by-Y vs Y-by-X) of 5.7% of the 5x5cm reference output and a variation of 3.33% at 6FFF. The A26 exhibited variation of output factor dependent on jaw positioning of upto 7.7% of the 5x5cm reference field at 6MV and upto 5.33% at 6FFF.

Conclusion:
Both the Edge detector and A26 responded as expected at small fields however a dependence on the jaw positioning was noted. At 6MV and 6FFF the detector response showed an increased dependence on the positioning of the X jaws as compared to the positioning of the Y jaws.