

AbstractID: 7054 Title: Primary electron beam spot parameter determination for X-ray beams

Purpose: Determine the characteristics, especially spot size and position, of a linac's primary electron beam, required as input to high-precision Monte Carlo calculations of the X-ray beam.

Method and Materials: A parallel slit beam spot camera is placed on the block tray and a diode (oriented with normal to flat surface perpendicular to the beam) is scanned through the beam in air. This method permits easily making many scans to investigate parameter dependences. An upper bound to the diode resolution is determined by partially blocking the beam. Camera slit width is determined by varying target-diode distance. Measurements are made with/without flattening filters, using different targets, and versus beam parameters (soft-pots) including static, dynamic steering. The camera is simulated using Monte Carlo.

Results: Resolution of the diode is  $< 0.5$  mm FWHM. For 5 Siemens Primus/Oncor linacs, FWHM spot sizes are: 6 MV: crossplane,  $0.96 \pm 0.13$  mm; inplane,  $1.29 \pm 0.13$  mm; 18 MV: crossplane  $0.087 \pm 0.011$  mm; inplane  $1.012 \pm 0.005$  mm (errors, standard deviation). Inplane is larger than crossplane by  $0--0.6$  mm, 6 MV is larger than 18 MV by  $0--0.4$  mm. Broadening from flattening filters is less than 10%. Steering moves the inplane spot position by: 18 MV:  $-1.8 \pm 0.1$  mm/A (static steering);  $1.35 \pm 0.05$  mm/A (dynamic); 6 MV:  $-7.5 \pm 1.5$  mm/A (static);  $2.3 \pm 0.1$  mm/A (dynamic).

Conclusions: Spot sizes of 5 Siemens Primus/Oncor linacs at 6, 18 MV are in the range  $0.7--1.5$  mm. The method is ideally suited for investigating parameter dependences.

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