

AbstractID: 10262 Title: Validation and benchmark of a source model for a Varian 6 MV photon beam using Monte Carlo calculations

**Purpose:** Validation and benchmarking of a newly-developed measurement-driven source model based on Monte Carlo calculations.

**Method and Materials:** A measurement-driven model using the Dose Planning Method DPM dose calculation algorithm is being developed for use with Varian, Elekta, and Siemens 6 MV and 10 MV photon beams. The present work details the validation and benchmarking for the Varian 6 MV beam. The multi-source model consists of a primary photon point source, an extra-focal exponential disk source, and an electron contamination uniform disk source. The model accounts for fluence and off-axis energy effects due to the flattening filter. Dose calculations for field sizes from 4 cm by 4 cm to 40 cm by 40 cm were performed and tested against the basic beam data measurements. In addition, an IMRT homogeneous plan, a stereotactic lung plan, and an IMRT lung plan were delivered to anthropomorphic phantoms housing TLD and radiographic film dosimeters for benchmark evaluations.

**Results:** Comparisons between calculation and measurement of the PDD and dose profiles for all square field size configurations showed agreement within 2%/2 mm for 90% of the data tested. General agreement at the level of 3%/2mm for 85% of the data tested was found in both of the lung treatment plans. However, calculation of the highly modulated IMRT homogeneous plan showed an underestimation of dose of up to 8% locally in the center of the PTV.

**Conclusion:** This work demonstrates a source model that is robust for the Varian 6 MV photon beam; however, only a simple MLC model that did not include the effects of the rounded leaf ends and interleaf leakage was used. We are currently evaluating a detailed MLC model to improve the agreement with measurement.

**Conflict of Interest:** Work supported by PHS CA010953, CA081647, and R01 CA85181 awarded by NCI, DHHS