

AbstractID: 8941 Title: Dosimetric Characteristics of High Definition Multi-leaf Collimator

Introduction: A new type of high-definition multi-leaf collimator (HD 120 MLC, Varian Medical Systems) is being introduced into clinical practice to improve the conformality of stereotactic radiation therapy and radiosurgery. Its leaf width at isocenter is 2.5 mm. The interface and casing are the same as Millennium 120 MLC so it can be easily fit inside the gantry for better clearance and efficiency. This study investigated the dosimetric characteristics of this new micro MLC.

Methods: The HD 120 MLC was installed in a Novalis TX dedicated image-guided SRS/SBRT machine. Beam penumbra (defined between 20-80%) was measured with a scanning radiosurgery diode for various field sizes, depth, and beam energies. Dynamic dosimetric gap and leaf transmission were measured with both low (6 MV and 6 MV SRS) and high energy (15 MV) photon beams. The conformity and step effect were studied with a series of circular beams with various radius.

Results: The penumbra of HD 120 MLC was measured to be 0.25 cm for 6 MV at 1.5 cm depth with 2 cm x 2 cm field size. It increases to 0.49 cm for 30 cm x 30 cm field size. For 15 MV at 3 cm depth, the penumbra increases from 0.36 cm at 2 cm x 2 cm to 0.60 at 30 cm x 30 cm. For other field sizes and depth, the penumbra values are listed in Table I. The dynamic dosimetric gap was 0.86 cm for 6 MV and 0.98 mm for 15 MV. The leaf transmission factors were 1.17% for 6 MV and 1.33% for 15 MV.

Conclusion: HD 120 MLC provides finer beam penumbra, smaller dynamic dose gap, and lower leaf transmission compared to conventional Millennium MLC, and can thus potentially improve the conformality of SRS/SBRT treatments.