# AbstractID: 3053 Title: Rotating Aperture Optimization – Planning and Delivery Characteristics

**Purpose: To describe and evaluate the dosimetric characteristics of a new method for directly optimizing dose distributions with MLC shaped apertures that fully exploit collimator rotation.**

**Method and Materials: In direct aperture optimization only the leaf positions and segment weights are used to optimize the three dimensional dose distribution. It has been previously shown that equivalent dose distributions may be generated that have significantly fewer MU and number of segments when compared to fluence based optimization methods. Here we introduce an expansion of direct aperture optimization that includes collimator rotation. Collimator rotation allows for the generation of high spatial resolution dose distributions that are more efficient and have less interleaf errors. IMRT plans for a prostate as well as a nasopharynx target were generated to evaluate the benefits of combining both techniques.**

**Results: Dose volume analyses showed that conformal dose distributions may be generated with only 6 segments per beam and with an average 29% reduction in MU when compared to our fluence based leaf sequencing with collimator rotation. Collimator angle was found to be accurate and reproducible to within 0.5 degrees and was independent of gantry angle on our Varian cl21ex linac. The accuracy of the MLC fluence model was also validated using film based verification methods.**

**Conclusion: Our results show that rotating aperture optimization is capable of producing high quality dose distributions with a small number of segments and significantly few monitor units than a fluence based IMRT technique. Also, quality assurance tests of collimator rotation IMRT delivery show that current MLC/collimator rotation control systems are capable of delivering the dose distributions accurately and reproducibly.**

**Conflict of Interest: This work was supported in part by Varian Medical Systems.**