

AbstractID: 11554 Title: A Novel Approach for Measurement of Dosimetric Leaf Gap for a Rounded Leaf End Multi-Leaf Collimator

Purpose: For Varian multi-leaf collimators (MLCs), the rounded leaf ends of the MLC cause a mismatch between the edges of the light field and the radiation field in the plane of isocenter. The radiation field edge is defined as the point at the edge of the radiation field at which the intensity drops to 50% of the intensity within the field. The dosimetric leaf gap is defined in the Eclipse treatment planning system (TPS) as twice the displacement between the leaf tip projection and the radiation field edge. **Method and Materials:** A step and shoot sequence of MLC fields generated nominally 2-cm wide strips narrower at their tops and wider at their bottoms. Pairs of strips were abutted with a 2-mm gap at the narrow ends. The gaps between the strips decreased by 0.1 mm for every subsequent leaf pair until the wide ends of the strips overlapped by 2 mm, creating a narrow under-dose triangle at one end of the strips and a narrow over-dose triangle at the other end. The dosimetric leaf gap was derived from the settings of the leaf pairs along the strips at which the tips of these triangles met. **Results:** To measure the location at which the triangles met, a region of interest (ROI) was drawn in imaging software and moved along the intensity strip pattern, measuring the standard deviation (SD) of intensity values within the ROI at each location. These SDs were fit to a second-order polynomial whose minimum identified the leaf tip positions used to determine the dosimetric leaf gap. These measurements determined a 0.6-mm dosimetric leaf gap. **Conclusion:** The dosimetric leaf gap value used for commissioning a TPS can be determined for a rounded-leaf MLC by analyzing a step-and-shoot MLC sequence that employs abutting strips creating an over- and under-dose pattern.