

AbstractID: 3292 Title: Dosimetric Responses at Different Gantry and Collimator Angles in Dynamic MLC Beam Delivery

Purpose: IMRT uses Dynamic Multi-Leaf Collimator (DMLC). This study is to investigate the DMLC performance at different gantry and collimator angles based on dosimetric measurements. Conformity index and symmetry index were introduced to quantify the performance.

Method and Materials: We developed a technique to measure the dosimetric impact of DMLC delivery at different gantry and collimator angles. Various DMLC patterns were designed to observe the discrepancies of the DMLC delivery at different gantry collimator angles. The discrepancies were quantified by acquiring dosimetric information under the corresponding radiation delivery conditions. The designed dynamic fields were delivered using 6 MV photon beams to a Solid WaterTM phantom with an ion chamber at the isocenter. Phantom was carefully set up so that both the phantom and the chamber remained the same, geometrically, with respect to the beam's coordinates when the gantry angle was changed. The measurements were carried out for two Varian's 23Ex Liancs. Conformity index was defined to measure the output ratios at different gantry angles for a same DMLC pattern. Symmetry index was defined to assess the dosimetric discrepancies of the same pattern with opposite collimator setting at a same gantry angle.

Results: The same measurements were performed for each machine for five consecutive days. It was observed that conformity index varied within between 98% and 100%. And the results varied on daily basis, which may imply the slight instability of DMLC performance. A consistent value less than 100% for the conformity index may indicate a gravity effect on the DMLC performance. In the meantime at a fixed gantry angle and at different collimator angle with a same DMCL pattern, the symmetry index varied randomly from 97.5% to 102.2%.

Conclusion: The gravity may affect the DMLC dosimetric performance. This impact on IMRT dynamic delivery warrants further investigation.