AbstractID: 7372 Title: Use of Adaptive Filtering and Intensity Limits in Deliverable IMRT Optimization to Improve Delivery Efficiency

Purpose: To investigate the effect of adaptive filtering, relative intensity limits, and fluence matrix resolution in deliverable IMRT optimization on MU efficiency and plan quality for dynamic MLC delivery.

Method and Materials: An adaptive filtering method that filters the optimized intensities as needed in combination with different relative intensity limits were used to reduce MUs needed to deliver the beams. The adaptive filtering parameters were adjusted so that it achieved the optimal results. A deliverable-based optimization that incorporates beam-delivery constraints directly into the IMRT optimization process was used. H&N and prostate cases were used to evaluate the quality and complexity of each plan. Each case was optimized with and without adaptive filtering and in combination with a series of relative intensity limits for fluence matrix resolution of 1.5 mm to 6 mm. The IMRT plans were evaluated in terms of dose-volume statistics , MUs, and the complexity of fluence matrix resolution.

Results: Up to 47.5% reductions in MUs were achieved using adaptive filtering in combination with relative intensity limits. When the adaptive filtering is on, the use of a relative intensity limit of 1.5 further reduced the total MUs by 6.3% and 15.9% for a fluence matrix resolution of 3- and 6mm respectively. Adaptive filtering in combination with relative intensity limits was able to reduce the total MUs without significantly changing the prostate and nodal PTV coverages. The changes in critical structure doses were negligible. The similar results have been obtained for the H&N case included in the study.

Conclusion: The adaptive filtering was able to significantly reduce total MUs without compromising the plan quality for deliverable IMRT optimization process. The use of relative intensity limits in combination with adaptive filtering did not have a significant effect on MU efficiency as compared to the use of adaptive filtering alone.