AbstractID: 7660 Title: Dosimetry limitations and a dose profile correction methodology for sliding window IMRT

Purpose: The aim of this work was to investigate dose uncertainties between planned and dynamically delivered IMRT beams using extreme dose rate and leaf speed. In-house developed software, SWIMRT, was used to convert intensity-modulated dose to dynamic MLC control points using the sliding window (SW) technique. In this study, the ability of SWIMRT to synchronize a Varian 21EX MLC to deliver dynamic beams was evaluated.

Methods and Materials: Non-clinical and clinical dose profiles were used to deliver from 2 to 100 cGy/beam of field sizes up to 14 cm × 14 cm with dose rates from 100 – 600 MU/min and leaf speeds from 1 – 5 cm/s. As the measurements in this investigation were based on the in-house software, the relative output ratios for dynamic beams were measured using a Farmer-type ionization chamber. The dose profile differences were measured using Kodak radiographic films. The differences between planned and delivered doses were determined point-by-point for every leaf. The correction methodology was examined on non-clinical beams, which can be used to extrapolate the behavior of clinical beams.

Results: Using point-by-point differences as correction factors, a close agreement between the planned and delivered dose profiles was achieved. Profile differences < 0.5 - 0.8% were measured for geometrically complicated and clinical beams irradiated with a dose rate = 600 MU/min and leaf speed = 5 cm/s.

Conclusions: Our results suggest that it is possible to use DMLC with extreme DR and LS to achieve clinical SW beams of high quality for shorter delivery time and insignificant increase of leaf leakage outside the field. SWIMRT is found to be an extremely useful QA tool for SW IMRT. The correction methodology could be integrated in a commercial treatment planning system.