AbstractID: 1332 Title: Monte Carlo Study of Modulated Electron Delivery Using a Conventional Multi-leaf Collimator

Modulated electron radiation therapy (MERT) is gathering interest for treating super facial tumors. However it is still not available in clinic because there is not a practical electron beam delivery system suitable for modulated electron beam delivery. In this study, we investigated the feasibility of electron beam modulation by collimating electrons using double-focused multi-leaf collimators (MLCs) on a Siemens PRIMUS linear accelerator using Monte Carlo simulations and measurements. In the Siemens PRIMUS accelerator, the double focused leaves are made of tungsten, the distance from the source to the bottom of the MLCs is 35.9cm. Dose distributions and fluence profiles were calculated and measured at source-to-surface distances (SSD) of 50-100cm for different MLC patterns. The EGS4 user codes MCBEAM and MCSIM were used to simulate the linear accelerator geometry and perform dose calculations, respectively. The leaf leakage, leaf scattering, air scattering and electron beam penumbral widths were studied for nominal electron energies 6, 9, 12, 15, 18, 21 MeV. A home-grown optimization program was developed for MERT. Our results showed that photon MLCs could deliver electron fields with reasonable accuracy at shorter SSDs (55-65cm with effective leaf widths 5.5-6.5 mm) that may be suitable for beam modulation. The leaf transmission through the photon MLC was negligible. The effect of electron scattering in air and by the MLC leaves was considered in the optimization. The results indicate that it is possible to deliver MERT using photon MLCs with double-focused leaves.