AbstractID: 9541 Title: Modulated Electron Radiation Therapy Using a Conventional Multi-leaf Collimator: A Feasibility Study

This work investigates the feasibility of modulated electron radiation therapy (MERT) beam delivery using a conventional multileaf collimator (MLC). In radiation therapy, electron beams are usually delivered using an electron cutout on an applicator. An electron-specific MLC replacing the bottom scraper of an applicator has been investigated for MERT. In this study, we investigated modulated electron beam delivery using a double-focused MLC on a Siemens PRIMUS linear accelerator. The EGS4 user codes MCBEAM and MCSIM were used to model the linear accelerator geometry and perform dose calculations, respectively. Without the accessory mount and the electron applicator, different field shapes collimated by the photon MLC were delivered in a service mode. In the Siemens PRIMUS accelerator, the focused multi-leafs are made of tungsten, the distance from the source to the bottom of the MLC is 35.9cm. Dose distributions and fluence profiles were calculated and measured at source-to-surface distances (SSD) 50-100cm for different MLC patterns. 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. Our results showed that a photon MLC could delivery electron fields reasonably accurately at shorter SSD (55-65cm with effective leaf widths 5.5-6.5 mm) and the effect of electron scattering in air and by the MLC leaves could be accounted for accurately using Monte Carlo simulations. There was negligible leaf transmission through the photon MLC. These results indicate that it may be possible to deliver MERT using a photon MLC with double-focused leaves.