AbstractID: 8225 Title: An Electron Specific Multileaf Collimator for Modulated Electron Radiation Therapy

Recently, energy- and intensity-modulated electron radiation therapy (MERT) has garnered increased interest because of its potential for treating superficial targets such as breast and head and neck cancer. In MERT, small electron beams (beamlets) of different energies are used to achieve dose uniformity in the treatment volume while reducing dose to distal normal tissues. Because of the large number of electron beamlets used, it is impractical to deliver a MERT treatment using electron cutouts. In this work, we investigate an electron beam specific multileaf collimator (eMLC) for MERT beam delivery. We have developed a manual set eMLC for this purpose. The eMLC replaces the bottom scraper of a 25cm x 25cm electron cone on a Siemens PRIMUS accelerator. The 84 straight copper leaves are 0.5 cm wide and 1.9 cm thick, mounted on an aluminum frame. The maximum field size available is 20 cm x 20 cm defined at 90 cm source-surface distance (SSD). Extensive file and ion chamber measurements have been performed to determine the bremsstrahlung leakage through the eMLC leaves, electron scattering off the leaf edges, and the beam characteristics collimated by the eMLC. The measured leakage is 0.8%, 1.6%, and 4.6% respectively for 6, 12, and 18 MeV electrons. Electron scattering has a more significant effect on lower energy electrons. We also performed Monte Carlo simulations to study the effect of effective leaf position and developed a method to correct for bremsstrahlung leakage.

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S McNeeley, Li, Price, Chen, Ding, Fourkal, Ma