AbstractID: 7765 Title: Commissioning of a MCSim prototype treatment planning system for photon-MLC shaped electron beams

Purpose: Commission the MCSim treatment planning system to support photon-MLC shaped electron beams for modulated electron beam radiotherapy (MERT).

Method and Materials: This code has the ability to generate phase-space files from source models or input files generated by an EGS4 based file, such as BEAM(NRC). The system also supports calculations for geometric phantoms or by import (RTOG format) of CT scans. We validated MC based dose calculations in phantom for phase space files create using BEAM for the five electron energies available on a commercial linear accelerator (Varian Trilogy), for a series of aperture sizes and SSDs. EDR film, micro- and parallel-plate ionization chamber measurements were conducted in homogeneous flat phantoms. As part of the BEAM phase space file generation, we first generated the phase space files using the accelerator input files choosing the most probable electron energy, rather than a spectrum. The collimating jaws were configured sufficiently wide to encompass a multiple-aperture delivery. Downstream, the MLC input file was configured using DYNVMLC input files. The measured films were scanned using the RIT system for export. Dose per particle data was based on measured normalized outputs.

Results: We found that the mono-energetic electron energy required tuning to ensure measured and calculated PDDs correlated with 1mm agreement. Deep-depth (Bremsstrahlung) correlation required manipulation of some phase space file specifications. Chamber measurements in the buildup and peripheral regions correlated well (typically within 3%) with the calculations. Finally, measured and calculated dose profiles matched well, within 3% at most locations.

Conclusion: After further fine tuning, we will implement the MCSim planning for clinically-relevant scenarios, including phantoms containing heterogeneities and surface irregularities. Finally, we will extend the calculations to patient cases.

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