AbstractID: 13644 Title: Graphical user interface for Monte Carlo phase space field trimming

Purpose: A graphical user interface (GUI) was developed to trim a radiation field of a phase space file to the dimensions of an arbitrary field as needed. This GUI is expected to be used in the monitor unit calculations on electron and orthovoltage x-ray therapy under certain assumptions.

Methods and Materials: The GUI and the phase space trimming algorithm were developed using MATLAB with compiled C code for fast read and write operations. The input phase space files were generated using EGSnrc-based BEAMnrc through Monte Carlo simulations of the Varian 21 EX LINAC at SSD = 100 cm for electron beam energies of 4, 6, 9, 12, and 16 MeV and a 10×10 cm^2 applicator. Various fields were tested including circles, triangles, and 2 irregular shapes. The user interacts with the GUI to provide the specifications for the trimming operation, which include scaling and orienting the arbitrary field within the scoring plane of the phase space file.

Results: Verification of the trimming process was performed by comparing the plots of the trimmed particle distributions with the arbitrary field. The GUI took under a minute to trim a 0.5 gigabyte file with 15 million particle histories using a 4×8 cm^2 irregular 'E'-shaped field. Reading and writing particle histories was the most time consuming process, whereas the trimming operation was the least.

Conclusions: The phase space trimming GUI is a platform independent tool that can trim any arbitrary field as needed from a bigger phase space file.