

AbstractID: 4799 Title: Commissioning electron beams with Monte Carlo simulation based on large field measurements

Purpose: To commission electron beams using measurements made with the jaws wide open (with no applicator) along with state-of-the-art Monte Carlo simulation.

Method and Materials: Central axis depth dose curves and dose profiles of 6-21 MeV Primus electron beams were measured for the 40x40 cm field and a comprehensive set of field sizes for all square applicators. Monte Carlo treatment head and water phantom simulations were done with the EGSnrc system using the BEAM and MCRTTP user codes, respectively. The measured data for the 40x40 cm field was used to estimate the source and geometry parameters used in the smaller-field simulations. Calculated output and dose distributions were compared to measurement.

Results: Dose distributions calculated with this large-field commissioning approach generally compared to 2%/2 mm or better with diode measurement. Relative output factors compared to 2% for the largest field available for each applicator. Output with cut-outs, relative to the field with no cutout, also agreed within 2%.

Conclusion: EGSnrc is sufficiently accurate for commissioning electron beams, given a good match to a few carefully done measurements for the 40x40 cm field with no applicator. This demonstrates the use of Monte Carlo simulation to commission electron beams, with only a few measurements. Measurements needed include the 40x40 cm central axis depth dose curve and cross-plane and in-plane profiles at d_{max} , and the ROF for the largest field of each applicator for all beam energies. Output and dose distributions for small and large fields for each applicator should be measured to verify the accuracy of the simulation.