AbstractID: 1567 Title: An automated electron beam commissioning tool for Monte Carlo treatment planning

The purpose of this study is to investigate the feasibility of applying an automated electron beam commissioning procedure for Monte Carlo treatment planning dose calculations. First of all, a four-source beam model (a primary electron source, two scatter electron sources and a contaminant photon source) located at the entrance level of the last scraper of an electron applicator has been employed to represent the clinical electron beams coming from the treatment head of Varian linear accelerators. The beam model parameters were then determined by the beam commissioning procedure from a standard set of data which are routinely measured and available. Finally, 3D dose distributions were calculated using EGS4/BEAM in a water phantom with the four-source beam model obtained from the commissioning procedure, and have been compared with the measurement data for five beam energies (6, 9, 12, 16, and 20 MeV) and five applicator sizes (6 × 6, 10 × 10, 15 × 15, 20 × 20, and 25 × 25 cm^2) at 100 cm source-to-surface distance (SSD) of Varian 21EX. Good agreement (within 2%/2 mm) has generally been observed in central axis percent depth doses, dose profiles at various depths, and electron cutout factors. Our results have demonstrated that the proposed electron beam commissioning procedure is sufficient for electron beam dose calculations of Varian linear accelerators. With appropriate adaptation, it is highly possible that our proposed beam commissioning procedure could be equally efficient for the Monte Carlo treatment planning electron dose calculations in other radiotherapy accelerators.