AbstractID: 1703 Title: Patient Specific Electron Cutout Factors by Monte Carlo Computation

Radiotherapy treatment using electrons usually requires a non-standard setup. That is, patient specific field shapes (cutouts), extended distance, and often obliquely incident beams are routinely called for. The paradigm for monitor unit calculations of patient specific electron fields is to determine the output factor by measurement in an idealized, usually flat solid homogeneous phantom. In this work, we explore an alternate approach. Namely, we performed patient specific electron cutout calculations by simulating dose delivery to phantoms prepared from actual patient CT data in the treatment geometry specified by physician at time of setup (i.e., cutout shape, extended distance, oblique incidence, and location on the patient). NXEGS software (NXEGS version 1.0.10.0, Numerix, LLC) is used to calculate the output factors via the Monte Carlo method. We have established that, in uniform water phantoms, NXEGS calculates electron cutout factors for symmetric electron cutouts to an accuracy of typically ±2% and for irregularly shaped cutouts to an accuracy of typically better than ±3%. We find that absolute percentage differences between cutout factors calculated in uniform water phantoms and patient phantoms (in the patient specific treatment geometry) can be in excess of 5% for the same cutout. This result suggests that patient specific Monte Carlo calculated electron factors, in the actual patient CT phantom, may improve estimates of electron cutout factors at a clinically significant level.