

AbstractID: 3095 Title: Correlation of electron beam parameters with measured dose ratios in clinical photon beams

Purpose: The purpose of this work is to find a direct correlation between measured depth dose ratios and off axis ratios and two beam parameters for Monte Carlo simulations (i.e., the incident beam energy and radius) in clinical megavoltage photon beams in order to facilitate Monte Carlo applications in radiotherapy treatment planning.

Method and Materials: The BEAM code was used to simulate the 6 MV photon beams from a Varian 2100C. A series of Monte Carlo simulations of Varian 2100C treatment head were performed for the incident beam energies from 5.1 MeV to 6.9 MeV and the beam radii from 0.03 cm to 0.12 cm. The calculated phase space files were then used for dose calculations in water. The depth dose ratio (DDR) defined as ratio of central axis depth dose at 20 cm to that at 10 cm and the off axis ratio (OAR) defined as ratio of dose at 10 cm in depth and 15 cm off axis to that at 10 cm on central axis as a function of incident electron beam energy and beam radius were studied.

Results: For a fixed beam radius, the DDRs and OARs were linearly proportional to the incident beam energy for all the beam radii, with $DDR = 0.5746 + 0.0072E_{in}$ and $OAR = 1.4864 - 0.0824E_{in}$, respectively. However, for a fixed incident beam energy, both DDRs and OARs were found to be virtually independent of incident beam radius, which is inconsistent with previously reported 18 MV photon beam in-air results (Med. Phys. 29, 379, 2002).

Conclusions: The OARs are more sensitive than the DDRs to the incident beam energy. However, both ratios are essentially independent of incident beam radius.

Conflict of Interest (only if applicable): None.