AbstractID: 8142 Title: Monte Carlo simulation on the percentage depth dose ratio for the surface dosimetry using tangential photon beams

Purpose: To investigate the characteristics of the relative dose profile in the phantom skin layer for oblique tangential–like photon beams with different energies and field sizes using Monte Carlo simulations. **Methods and Materials:** EGSnrc-based codes (BEAMnrc and DOSXYZnrc) were used to predict the relative depth doses for the half (HPG) and full phantom geometry (FPG) for the 6 and 15 MV photon beams with field sizes of 4×4 and 10×10 cm^2 produced by a Varian 21EX Linac. Monte Carlo phase-space beams were verified by measurements using films. The HPG is the experimental setup for the beam central axis (CAX) parallel to the phantom-air interface (gantry angle = 270 deg), while FPG is the setup with the air region of the interface filled with the phantom material (Solid Water). The PDD ratios, defined as the relative depth dose from the HPG to the relative depth dose from the FPG at a given depth along the phantom skin, were calculated. **Results:** The PDD ratio was found very sensitive when the tangential beam was turned slightly from zero to 1 deg clockwise, and the ratio increased with depth. For the same photon beam energy, when a 10×10 cm^2 field size was used, the increase of the PDD ratio was less than that for a 4×4 cm^2 field. While for the same field size, 6 MV photon beam had a greater increase in the PDD ratio with depth compared to 15 MV. **Conclusions:** The PDD ratio study based on Monte Carlo simulation shows that the surface dose varies with the energy and field size of the tangential-like photon beams. The data in this study provides useful information to predict the surface dose variation for a clinical tangential photon beam with changes of beam obliquities, energies and field sizes.