AbstractID: 12988 Title: Monte Carlo characterization of skin doses in MRI-guided-Radiotherapy

Purpose: The main focus of this work is to continue investigations into the Monte Carlo predicted skin doses seen in MRI-guided radiotherapy (MRIgRT). In particular we aim to characterise the 70 micron skin doses. The effect of surface orientation on both the entry and exit sides is also investigated, as well as the use of exit bolus.

Materials and Methods: High resolution Geant4 Monte Carlo simulations of a water phantom exposed to a 6 MV X-ray beam (Varian 2100C) have been performed. Transverse magnetic fields of strengths between 0 and 3 T have been applied to a 30x30x20 cm3 phantom. This phantom is also altered to have variable entry and exit surfaces with respect to the beam central axis and they range from -75 to +75 deg. The exit bolus simulated is a 1 cm thick (water equivalent) slab located on the beam exit side.

Results: On the entry side significant skin doses at the beam central axis are reported for large positive surface angles and strong magnetic fields. Over the entry surface angle range of -30 to -45 deg the entry skin dose is comparable with zero magnetic field skin dose, regardless of magnetic field strength and field size. On the exit side moderate skin dose increases are expected except for large positve angles at the higher magnetic fields. For exit bolus of 1 cm thick the central axis exit skin dose becomes an almost consistant value at around 35-38% of Dmax. This is due to the almost complete absorption of the ERE electrons by the bolus.

Conclusion: There are many combinations in MRIgRT where skin dose may become excessive. Results from this study can be used to determine arrangements where skin dose is comparable to B = 0 T.