AbstractID: 9375 Title: A fast algorithm to predict dose distribution perturbations in an MRI-linac hybrid syste

Purpose: The hybrid MRI-linac unit under construction at our institute consists of a unique rotating bi-planar (RBP) geometry where a linac is coupled to the open end of a 0.2 T permanent magnet and the entire structure rotates about the patient as a unit. Monte Carlo (MC) simulations that incorporate the influence of the magnetic field in this geometry have demonstrated small perturbations to patient specific dose distributions. This work takes advantage of the constant direction of the net Lorentz force in the RBP geometry to derive an electron density-scaled dose shifting algorithm that will quickly and accurately incorporate magnetic field effects into the treatment planning process. **Method and Materials:** MC simulations of the projection of a 6MV photon beam onto a slab phantom with a central slab of variable electron density were performed using DOSXYZnrc with macros invoked to account for the changes in electron velocity due to the Lorentz force for each transport step. Dose profiles at 0.2 T were shifted in the direction of the Lorentz force until a minimum difference with 0.0 T profiles was observed. From this we derived an electron density scaled-shift function. This function was applied to a four field brain plan calculated by the treatment planning system and the results were compared to full MC simulations. **Results:** The shift correction reasonably reproduced magnetic field effects on dose profiles for relative electron densities down to 0.3. The shift correction accurately accounted for dose perturbations within the patient's body for the brain plan. **Conclusion:** Magnetic field induced dose perturbations for the MRI-linac system at our centre result in a shift of dose in the net Lorentz force direction, which can be quickly accounted for using a shift of the dose distribution based on the relative electron density of the local medium.