AbstractID: 6737 Title: Benchmarking of the DPM Monte Carlo Code for Electron Beam Dose Calculations in Heterogeneous Media

A rigorous set of measurements and calculations has been conducted to investigate the accuracy of the DPM Monte Carlo code for electron beam dose calculations in heterogeneous media. Measurements were made using 10 and 50 MeV elemental scanned electron beams from a Racetrack Microtron. Source spatial distributions were found to have FWHM of 4.5 cm and 1.5 cm, at 100 cm from the source, for the 10 and 50 MeV beams respectively,. Profile and depth dose measurements were made using an ion chamber in a water phantom with slabs of lung or bone-equivalent materials submerged at various depths and off-axis positions. Source distributions for the Monte Carlo calculations were reconstructed from in-air ion chamber measurements and then benchmarked against measurements in homogeneous water. DPM calculations are within 2% agreement with measurement for both homogeneous and heterogeneous type geometries. The severe loss of lateral electron equilibrium observed for the 50 MeV pencil beam in heterogeneous media provides an extremely stringent test of the code's electron transport physics; the excellent agreement between calculation and measurement illustrates that the code is capable of accurate dose calculation even under such conditions. Independent calculations using the code MCNP4B were also performed for comparison purposes. MCNP4B calculations were conducted using identical source model, physics, and scoring parameters as those with DPM. Agreement between DPM and MCNP is within 2%. The accuracy of the DPM code illustrated in this work suggests that DPM may be used as a valuable tool for clinical electron beam dose calculations.