AbstractID: 7955 Title: A Path Length Formulation for Electron Beam Depth Dose

In this work we describe a method to calculate electron depth dose in heterogeneous media from water depth dose data. Traditionally, an effective depth derived by integrating stopping power is used to look up depth dose. However, differences in scattering power may cause the dose to be higher or lower because of path length corrections to the electron fluence. Furthermore, those corrections will alter the final effective range of the beam. In a previous study we developed a method for computing electron beam angular distributions using scattering power. This model is accurate even for situations where the Fermi-Eyges model breaks down. In this study we use that model to calculate angular distribution as a function of depth in water. The path length correction, which is the reciprocal of the mean cosine, is determined at each depth, and the integral of this function is stored as the mean cumulative path. Depth dose data for water is divided by the path length correction to generate a planar fluence curve, which is stored as a function of cumulative mean path. To calculate depth dose in heterogeneous medium, the angular distributions are calculated at each depth from the scattering power history, and the path length correction is determined at each depth. The path correction times the relative stopping power is integrated to yield the cumulative path length, and this is used to look up the planar fluence. The depth dose is then calculated by multiplying the planar fluence by the path length correction.