AbstractID: 9061 Title: Modeling of C(E) for Pencil-beam Redefinition Algorithm to Predict Percent Depth Dose

This work investigates the accuracy of the pencil-beam redefinition algorithm (PBRA) in calculating central-axis percent depth dose in water for rectangular fields ≥ 2x2 cm^2. The PBRA energy correction factor, C(E), is determined so that the PBRA calculated percent depth dose best matches that measured in water. Three possible methods for determining C(E) are to fit PBRA calculated to measured percent depth dose for either (1) a single large field having side-scatter equilibrium, (2) individual rectangular fields, or (3) a small number of square fields. Preliminary investigations showed method (1) to be insufficiently accurate. Method (2) is the most accurate, but doubles the time of calculation. Method (3) has been investigated by making the energy correction factor a polynomial in both energy and side of square, W, i.e. C=C(E,W). To best fit the electron dose component, the photon dose model was modified to include dose buildup. PBRA calculations were compared with square and rectangular field measured depth doses for the Siemens Primus accelerator from 6 to 15 MeV at 100-cm SSD. Rectangular fields utilized a square-root method for determining C(E,W). Results showed appropriate fits required a 2^{nd} or 3^{rd} order polynomial in energy and side of square. Comparisons showed that for most cases, the PBRA was able to predict percent depth dose within 2% in low-dose gradient or 1 mm in high-dose gradient regions.

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