AbstractID: 6739 Title: Commissioning electron beams for the pencil-beam redefinition algorithm using a dual-source model

The electron pencil-beam redefinition algorithm (PBRA) originally modeled the electron beam using a single electron source. The present work adds a second electron source to allow more accurate modeling of beams having significant collimator-scattered electrons. The PBRA requires a unique beam model for each beam energy and applicator combination, using either a single or dual source. To determine the source parameters for each source used, an optimization scheme has been developed that fits PBRA-calculated values to central-axis depth-dose and a single off-axis dose profile data measured in water at the nominal and extended SSD. The two off-axis dose profiles are measured at the same depth, typically 2 cm. A 2D version of the PBRA algorithm calculates planar dose distributions in water in a few seconds, allowing for rapid determination of source parameters. In this study we have modeled 9 and 20 MeV beams from a Varian Clinac 1800 and Clinac 2100. Results show the single-electron source model to be sufficient for “clean” electron beams, i.e. able to achieve dose accuracy within 3% of the “given dose”. When modeling beams with significant collimator-scattered electrons, such as those of the Varian Clinac 1800, the dual-source model is required to achieve 3% dose accuracy. Hence, the dual source model provides a more comprehensive beam model when using the PBRA.

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