AbstractID: 3767 Title: Benchmarking of an event-by-event Monte Carlo code, NOREC: Generation of scaled point kernels in water for mono-energetic electrons between 10 keV and 1 MeV

Purpose: To compare scaled point kernels (SPK) in water for mono-energetic electrons generated by an event-by-event Monte Carlo code, NOREC, with published kernels based on a condensed history Monte Carlo code.

Method and Materials: An event-by-event Monte Carlo code called NOREC, which replaces the Oak Ridge electron transport code (OREC), was released in 2003, after a number of modifications to the OREC including the replacement of the original OREC elastic cross sections by a newer data set from the National Institute of Standards and Technology (NIST). Initial benchmark tests showed that, for a number of dosimetric quantities (e.g., electron depth dose distribution), NOREC was capable of producing better agreement with published results than OREC, which indicates the effectiveness of the modifications introduced to the code. For a more comprehensive benchmarking, NOREC was used in this study to generate scaled point kernels for a number of electron energies between 0.01 and 1.0 MeV. Calculated kernels were compared with published kernels (i.e., the so-called Berger kernels) based on a condensed history Monte Carlo code, ETRAN.

Results: Although qualitatively similar, scaled point kernels generated by NOREC generally showed more energy deposition in the first half of continuous slowing down approximation (CSDA) electron ranges than the Berger kernels. Calculated ranges of electrons were similar between the two kernels.

Conclusion: NOREC can produce SPK comparable to those generated by ETRAN. The current results suggest that NOREC can be used for both micro- and macro-dosimetry problems which require more detailed transport of electrons below 1 MeV.

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