AbstractID: 8309 Title: EGSnrc benchmarking against high-precision angular electron scattering data through thin foils

Purpose:

The EGSnrc Monte Carlo code was benchmarked against newly measured angular scattering distributions of electron beams through thin materials.

Method and Materials:

The BEAMnrc user code was used for the simulation of the experimental setup. The geometry, beam and material properties were implemented in BEAMnrc, while the DOSXYZnrc user code was used to score the absorbed dose up to angles of 10º. The electron beam was generated using the National Research Council of Canada (NRC) Vickers linear accelerator, which allows for the production of narrow pencil beams of electrons with well known energies. Six materials: Be, C, Al, Ti, Cu, Ta and Au, were used as scattering foils and measurements were made at two energies - 13 MeV and 20 MeV. Great care was taken to obtain high accuracy experimental data for comparison with the results of the simulations.

Results:

The obtained angular distributions were fitted with a Gaussian and the characteristic angle (the angle at which the absorbed dose decreases by 1/e) was used to compare the measured and simulated distributions. The discrepancy between the measured and the EGSnrc characteristic angles is on average about 1.5%. A careful error estimation was performed on the measured data, that resulted in a value of about 1%. The EGSnrc code shows an agreement with the measured data at the 2σ level. In general, the EGSnrc predicts narrower distributions. The full distributions were also compared and the shapes were found to be very similar even at large angles.

Conclusion:

The present study shows that the EGSnrc code predicts electron angular scattering distributions in agreement with the measured data at the 2% level. It is intended to make the experimental data available to the user community to be used for benchmarking of other Monte Carlo codes.

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