A Simple Electron Beam Simulation Program

The small (~150 line) C program described in this presentation was written as a teaching tool in order to simulate electron pencil beam scattering in multilayered media and to determine relationships between depth dose, electron loss, and angular distribution. The medium is divided into 150 thin slabs, and a number of electron path histories (typically 20000 to 100000) are followed through these slabs. Each electron is assigned a total path length, and when that sum is reached, the history is terminated. The direction of electron travel at the face of each layer is determined by adding a random x and y component of deflection calculated from a normal distribution based on an angular variance which represents the scattering power at that level. The angular variances are pre-calculated as a function of total path length in a separate module. Angular standard deviation functions are generated which can represent either realistic energy dependent scattering power or constant scattering power. The stopping powers are assumed to be constant, so the total dose in an individual slab is the sum of all of the electron path lengths. The dose and electron count at each level are tabulated and printed out in a text file for analysis. A theta-x projection, x displacement, and individual path length for every electron is stored at each depth and written to a binary file which is approximately 100 Mb size. Analysis of this file is done using software outside of the simulation program.