The Domestic Nuclear Detection Office under the Department of Homeland Security is continuing to sponsor research for replacement portal monitor detectors, and replacement technologies need to be able to discriminate between neutrons and gammas. One of the replacement technologies being considered is thin polymeric scintillating films, and in order to predict its performance it is necessary to understand the difference between energy deposition from photon interactions and neutron reaction products. GEANT4, a Monte Carlo toolkit, is being employed to calculate the energy deposition in these films, including the tracking of secondary charged particles. Validation of the calculation was performed, in part, by simulating the energy deposition of photons in water as reported by Tuner et al (1982). A source of monotonic photons were impingent into water, with the energy deposition being governed by a micro dose physics model, G4DNAPhysics. The energy loss of the first collision was then calculated. This allows for the probability that a given collision will result in an energy loss to be plotted versus energy. Comparison to the work of Turner yields a similar structure, with the G4DNAPhysics model providing finer energy resolution allowing for the discrete binding energies of the electrons in the material to be visible.