Abstract Submitted
for the PSF13 Meeting of
The American Physical Society

A novel approach to modeling photon propagation in biological tissue using the scattering signatures of spheroidal particles VERN HART, William Woods University, TIMOTHY DOYLE, Utah Valley University — Clinical applications of diffuse tomography require a Monte Carlo algorithm to model optical diffusion in turbid media. Of the existing algorithms, random-walk and phase function techniques are the most common. However, these approaches do not include histological information in determining subsequent photon paths. A significant amount of the optical scattering which occurs in cells has been attributed to intracellular structures, such as mitochondria, which are typically spheroidal in shape. The sphere-like cell nucleus can also become elongated during the early stages of certain cancers. The presented research introduces a novel Monte Carlo algorithm in which the scattering solution for light incident on a spheroidal particle is used to determine photon scattering directions. This technique is suggested to be a more physical description due to the inclusion of cellular properties. Diffusion profiles were generated using additional techniques for comparative purposes and significant differences were observed, indicating that the included scattering mechanism has a significant effect on the resulting diffusion. The ability to distinguish structural types in a scattered signal could potentially be used as an early diagnostic tool.

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Date submitted: 11 Oct 2013 Electronic form version 1.4