

## **Evaluation of the telegrapher's equation and multiple-flux theories for calculating the transmittance and reflectance of a diffuse absorbing slab**

We study the propagation of light through a medium containing isotropic scattering and absorption centers. With a Monte Carlo simulation serving as the benchmark solution to the radiative transfer problem of light propagating through a turbid slab, we compare the transmission and reflection density computed from the telegrapher's equation, the diffusion equation, and multiple-flux theories such as the Kubelka-Munk and four-flux theories. Results are presented for both normally incident light and diffusely incident light. We find that we can always obtain very good results from the telegrapher's equation provided that two parameters that appear in the solution are set appropriately. We also find an interesting connection between certain solutions of the telegrapher's equation and solutions of the Kubelka-Munk and four-flux theories with a small modification to how the phenomenological parameters in those theories are traditionally related to the optical scattering and absorption coefficients of the slab. Finally, we briefly explore how well the theories can be extended to the case of anisotropic scattering by multiplying the scattering coefficient by a simple correction factor.

© 2007 Optical Society of America.