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Modeling Laser-Tissue Interactions: Implementing Thermal Models and the Wave Equation to Simulate Photon Transport in Tissues[1]

FREDERICK BARRERA, DHIRAJ SARDAR — The tracking of photons through turbid media (e.g. tissues) has been studied extensively from an experimental vantage point. In addition, myriad computational techniques have also been developed to simulate the interaction of light with tissues. These tissues are difficult to characterize- since their components are exceedingly variegated- and thus present many challenges to clinicians who require models which precisely predict the location and time evolution of energy deposition. Furthermore, the interaction of the turbid media sample with the source of radiation typically involves many dynamic mechanisms (e.g. mechanical, photochemical etc.) Indeed, under certain dynamic conditions, optical properties (e.g. index of refraction, absorption coefficient etc.) are not constant. Using models of thermal distribution, and accounting for an incident source of electromagnetic radiation an analysis may be performed. The differential equations describing these processes may be solved numerically using a finite element technique.

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