AbstractID: 1601 Title: A novel device for determination of the absorption and scattering properties of tissue simulating phantom

We have developed a device to quickly determine tissue optical properties (absorption coefficient μ_a and reduced scattering coefficient μ_s') by measuring the ratio of light fluence rate per unit source strength along a linear channel at a fixed distance (5 mm) from an isotropic point source. Diffuse light is collected by an isotropic detector whose position is determined by a computer controlled step motor, with a positioning accuracy of better than 0.1 mm. The system automatically records and plots the light fluence rate per light power as a function of position, with the position of peak fluence rate converted to the minimum distance between the two channels. The result is fitted to a diffusion equation to extrapolate μ_a and μ_s'. One improvement over a previous system is to use an integrating sphere to determine the calibration factor for the light fluence per light power, thus reducing uncertainty of individual calibrations. To test the ability of this algorithm to accurately recover the optical properties of the tissue, we made measurements in tissue simulating phantoms consisting of intralipid at concentrations of 0.23 and 0.53% in the presence of Higgins India black ink at concentrations of 0.002 - 0.023% (μ_a = 0.1 - 1 cm^{-1}). For comparison, the optical properties of each phantom are determined independently using broad-beam illumination. We find that μ_a and μ_s' can be determined by this method with a standard error of 0.09cm^{-1} and 0.91cm^{-1}, respectively.