AbstractID: 7570 Title: Determination of optical properties using linear sources in a homogeneous phantom

**Purpose:** For interstitial photodynamic therapy (PDT), linear sources are often used to deliver light. It would be advantageous to use the same linear sources to characterize tissue optical properties (absorption and reduced scattering coefficients, $\mu_a$ and $\mu_s$'). The purpose of this study is to determine the feasibility and accuracy of this method in a homogeneous turbid media.

**Method and Materials:** Measurements were performed in homogeneous tissue-simulating phantoms with linear light sources of lengths 2 to 4 cm. In-air measurements were performed to characterize the intensity profile of each linear fiber. The phantom optical properties were characterized using two independent methods. One method uses depth dependence for a collimated broad beam and the other method uses a series of point sources. Optical properties were determined by fitting the measured light fluence rate profiles at several fixed distances (3, 4.5 and 7mm) from the linear source axis using a model in which the linear source is treated as a series of point sources, each modeled using diffusion theory. The resulting optical properties were compared with independent results.

**Results:** We developed a method to quickly determine the optical properties for $\mu_a$ between 0.1-1.0$cm^{-1}$ and $\mu_s$' between 3 and 13 $cm^{-1}$. We are able to determine the optical properties $\mu_a$ and $\mu_s$' with a standard and maximum deviation of 36% (11%) and 50% (18%), respectively when using linear light source. These errors are due mainly to uncertainty in the distance between the detector catheter and light source catheter. The 7mm separation gives the most accurate determination of optical properties.