AbstractID: 5891 Title: A novel optical imager towards breast cancer diagnosis

Purpose: To design and develop a portable optical imager for early-stage breast cancer diagnostics, providing great depth information, enhanced data acquisition rates, and minimal patient discomfort.

Method and Materials: A unique measurement geometry of simultaneous multiple point source illumination was implemented in the design and development of the hand-held based optical probe. Simultaneous multiple point detection was carried out using an intensified charge-coupled camera (ICCD) that can be operated in the continuous wave and frequency domain measurement approaches. The hand-held based imaging probe has been coupled to the ICCD detection system and the performance characteristics (in terms of measurement accuracy and precision) of the imager is characterized through initial phantom studies under homogeneous conditions.
Results: Preliminary simulated studies using simultaneous multiple point illumination measurement geometry over the universally used single point illumination geometry demonstrated an increase in the detected signal strength as well as total interrogated tissue volumes. An optimal number of source and detector fibers used to develop the probe head, minimized the dead volume and improved the data acquisition times.

Conclusion: A novel fluorescence-enhanced imaging system was developed using a hand-held probe and an ICCD camera, enabling the flexible and rapid imaging of any given tissue volume. Further work involves phantom based experimental studies towards 3D optical imaging and tomographic analysis. The final goal is to translate the current laboratory-based techniques into routine clinical use.