

## AbstractID: 5362 Title: Evaluation of the Performance of an Optical CT Scanner

**Purpose:** Optical CT technology has received much attention recently in the areas of 3D gel dosimetry and biological imaging, owing to its uniqueness in offering high contrast 3D images for optically transparent objects. In this work we evaluate the performance of a commercial optical CT scanner OCTOPUS™ to ensure its imaging qualities.

**Method and Materials:** The output stability of the He-Ne laser in the scanner was measured for 10 hours. The ratio of the output over a reference measurement of the laser beam was monitored as well. The linearity response of the detector (photodiode) was evaluated by measuring the transmission light through the films that have known transmittances of 85.1%, 42.7%, 30.2%, 20.9%, and 3.9%. A thin wire of diameter 0.2mm was used for imaging to estimate imaging resolution. Multiple of such wires embedded in a gel at different locations were scanned to evaluate the geometric accuracy of imaging. A uniform gel slice was used to analyze imaging uniformity. The imaging linearity of the scanner was evaluated by scanning a gel slice containing a few optical contrast inserts.

**Results:** The output of the laser shows a 4% variation in the 10 hours measurements but the effect of such variation was greatly reduced to 1% by normalizing the output measurement to the reference measurement of the laser signal. The photodiode shows a linear response within 1%. The imaging resolution of 1mm, uniformity of 1%, geometric accuracy within 1mm, and linearity of 1% can be achieved by the optical CT scanner.

**Conclusion:** The evaluation demonstrates that the optical CT scanner has the capability of imaging 3D optical objects with high resolution and accuracy. The application of high quality optical CT in gel dosimetry and tumor tissue imaging would provide better understanding of 3D dose distributions and 3D biological structures and functions.