AbstractID: 5835 Title: Gross Tumor Volume Measurement of Simulated Lung Nodules Using PET Imaging

Objective: The aim of this study is to determine the PET image threshold that will generate the most accurate measurement of gross tumor volume (GTV) of lung nodules. **Methods:** A NEMA IEC phantom containing six spheres of different sizes (10, 13, 17, 22, 28, and 37 mm diameter) was scanned on a DISCOVERY ST PET/CT scanner. The phantom was scanned three times. In each case, the sphere to back ground ratio was varied (3.4:1, 7.4:1, 13.5:1) while keeping the activity concentration in all spheres constant. To simulate tumor motion, the phantom was positioned on a unidirectional translating platform. A sinusoidal waveform (5 sec cycle, 2cm peak to peak) was used to drive the platform during the PET data acquisition. The platform motion was tracked using an RPM device which sent a trigger signal to the PET scanner at a specific phase of every repeating cycle of the waveform. PET data was acquired in 2D for 30 minutes using LIST mode (10 bins per cycle). PET images were then reconstructed using OSEM. An in-house software program was then used to find the percent threshold that best estimated the true known sphere volume. The program was written to perform the analysis at an increment of 1% in threshold. **Results:** Spheres that have minimum partial volume effects (>17 mm) had an average threshold of 32% ±2.8 at different contrast ratios. The smaller spheres had a larger threshold value and a larger standard deviation. The results also showed that the threshold for the small spheres increased with decreasing contrast ratio. For the 13 mm sphere the threshold changed from 27% to 55% when using a contrast of 13.5:1 to 3.4:1. **Conclusion:** A threshold of 32% gave the most accurate GTV. The effects of scan duration on this threshold will also be presented.