AbstractID: 5074 Title: Modeling and Correcting for Respiratory Motion in PET

Purpose: To model and correct for respiratory motion in PET

Method and Materials: Regular arrays of lesions of different sizes and contrast were incorporated into the NCAT Torso phantom. SimSET was used to simulate data acquisition and data was reconstructed using the filtered back projection algorithm at 16 phases of the respiratory cycle. Affine registrations were performed on the images to create a single summed motion corrected PET frame. The transformations were derived from (i) the PET images themselves and (ii) simulated CT images at the same respiratory phases.

Results: Respiratory motion both blurs lesions and decreases the accuracy of quantification of PET images. These effects varied with lesion size and SUV. Lesion size is seen to increase and uptake values decrease in lesions undergoing motion. Smaller and lower contrast lesions show more differences between static, time average and motion corrected frames. Preliminary comparisons between corrected and static frames show that the CT corrected frame is closer to the static frame than the PET corrected one.

Conclusion: We have developed a complete simulation of the PET data acquisition and reconstruction process based on the NCAT and SIMSET software packages, to assess the effect of respiratory motion and our proposed motion correction technique on PET data. For the small number of lesions of sizes described here, the differences in volume and SUV confirm that respiratory motion both blurs lesions and decreases the accuracy of the quantification of PET images. The simulation and assessment methods above were used to evaluate motion correction methods used to correct simulated PET data. Results show that smaller and lower contrast lesions show more differences in volume and SUV between the corrected, static and time average frames. Future work will involve looking into ways to improve the correction scheme, and application of the technique to clinical data.