

AbstractID: 9145 Title: Improving SNR by using Super-Resolution (SR) Incorporated Image Reconstruction in PET Imaging

**Objective:** Two SR Implementations (original and new) have been recently proposed to improve PET image resolution and SNR (*IEEE Med. Img.*, 2006, 25, p137-147 & *J Nucl Med.* 2007; 48:411P). These implementations however, are performed retrospectively following image reconstruction. The objective of this abstract is to propose a prospective SR-Incorporated reconstruction (SRIR) method and compare it to native PET reconstruction (NR).

**Materials and Methods:** A 2D digital phantom consisting of  $10^7$  counts and containing various spheres (3.6-32mm diameter) was simulated in a PET scanner. The digital phantom was forward-projected and poisson noise was added to generate the corresponding sinogram. Four such simulations/sinograms were generated each time by shifting the phantom along X or Y axis by 1.8 mm. These sinograms were then processed using a SRIR algorithm (supporting document) to produce a new (New-SRIR) and original (Original-SRIR) SR image. The images were reconstructed in a 46 cm FOV using OSEM (21 subsets, 2 iterations). In addition, a 256\*256 NR was also generated from the *first* sinogram using the same FOV. The three images (Original-SRIR, New-SRIR, NR) were compared using SNR and line profiles drawn across the two smallest spheres. To assess noise content, a 2-D FFT was also applied to a square ROI drawn in the background of the three images.

**Results:** Line profiles of all images showed similar resolution and contrast. However, the original and new-SRIR showed on average 17.5 and 10.3% higher SNR compared to NR respectively. The Original-SRIR had a 6.5% higher SNR versus new-SRIR. FFT analysis indicated that NR contains more high-frequency noise compared to the two SRIRs. Noise content in the original-SRIR was less compared to the new-SRIR.

**Conclusion:** SRIR processing has similar resolution and contrast but higher SNR compared to NR of PET images.