AbstractID: 7647 Title: Reducing PET Scan Duration By Improving SNR Using Super-Resolution Techniques

Objectives: Super resolution (SR) techniques reconstruct a high resolution image from a series of low resolution images taken from different points of view of the same object. The aim of this abstract is to compare the SNR of images reconstructed with and without SR processing versus total scan duration in an attempt to produce images of similar quality but with shorter scan duration.

Methods: A NEMA/IEC phantom containing 6 spheres of varying diameters (1-3.7cm) was filled with F-18 water and scanned on a DSTE PET/CT scanner. The phantom was scanned in LIST mode for 4 min in 2D and 3D using three different sphere-to-background ratios (SBR) (3, 5, and 8). The LIST data was then rebinned into 24 different scan durations in 10 sec increments and reconstructed into 128*128 matrix using OSEM (2 iterations, 21 subsets). In addition, for each scan duration, a 128*128 SR image was generated from 4 64*64 images by offsetting the pixel grid by a 4mm along the X and Y axes. SNR was then determined by drawing ROIs on all spheres and background on all images with and without SR processing for all SBRs and scan durations in both 2D and 3D.

Results: For the same scan duration, the noise in images with SR processing is reduced by 19-35% while SNR is improved by 36-40% for all SBRs and scan modes. For the same SNR, scan duration with SR processing can be reduced by 31-41% for different SBRs and scan modes.

Conclusion: SR processing produces images with superior SNR and noise content thereby allowing a reduction in PET scan duration while maintaining similar image quality to standard reconstruction. One specific application of SR processing is to improve the quality of gated PET images.