AbstractID: 11706 Title: Effects of Varying Slice Overlap on Image Noise and SNR in 3D PET Imaging

Objective: To investigate the effects of different number of slice overlaps (SO) on image noise and SNR in 3D PET data acquisition. **Materials and Methods**: Three phantoms were scanned to simulate different patient sizes: (1) an ACR phantom with three cold inserts, (2) a NEMA/IEC phantom, and (3) a NEMA/IEC phantom coupled to a second NEMA/IEC phantom to act as a scatter source. The background activity concentration in the phantoms ranged between 3.5-5 kBq/cc. All phantoms were scanned in 3D on a GE-DRX PET/CT scanner using two bed positions (3min/bed) with three different number of SOs (3, 7&11) between the two bed positions. This paradigm resulted in 91, 87 & 83 PET image slices for SO 3, 7 & 11 respectively. 3D-IR (2 iterations, 21 subsets) was used for all image reconstructions. For each phantom and each SO, a 7x7 square ROI was drawn on all slices of the phantom background, and the average & STD of the ROI were calculated to represent the phantom background AC and noise content. SNR was then determined as the ratio between AC and noise. Noise and SNR were plotted versus different image slices for all the phantoms and SOs. **Results**: Increasing the slice overlap decreased the noise and improved the SNR in the overlap region. The improvement in SNR between SO3 and SO11 was 46% on average over all phantoms; while the improvement between SO7 and SO11 was 19%. For the ACR and NEMA/IEC, the SO7 and SO11 images showed relatively similar noise and SNR, while for the NEMA/IEC+Scatter, the SO3 and SO7 had similar results. **Conclusion**: Increasing SO improves SNR in the overlap region. An SO of 7 is optimal for intermediate size objects and should be increased to 11 for larger cross section particularly with scatter from outside the FOV.