AbstractID: 2042 Title: Correlation of system performance parameters to ROC analysis of PET/CT images

Combined PET/CT imaging systems are finding increased popularity for cancer diagnosis and radiation therapy treatment planning. PET/CT systems providing 2D and 3D acquisition modes are available. This work reports a comparison of the diagnostic quality of a Discovery ST scanner operated in both 2D and 3D modes and a CTI-Siemens Reveal HD system in 3D mode. Fused PET/CT images of a torso phantom containing simulated lesions are acquired and read by a set of radiologists. ROC curves are generated from the radiologists' readings of the 2D and 3D-mode images from the two scanners. We then correlate the ROC curves' area Az, true-positive fraction (TPF) at a fixed false-positive fraction (FPF), and FPF at a fixed TPF, to both manufacturer specified and experimentally measured performance parameters (e.g., PET and CT spatial resolution). The resulting correlations link the individual quantitative performance parameters to the qualitative diagnostic image quality. The results provide a basis for comparing the relative diagnostic performance of the two PET/CT systems for imaging tumors in the chest, as well as the utility of 2D vs. 3D mode acquisition.