AbstractID: 10791 Title: Evaluation of background trend correction technique in breast tomosynthesis quantitation

Purpose: The main shortcoming of breast tomosynthesis (tomo) imaging when compared to CT is poor resolution in the depth direction and the associated difficulty in quantifying tissue density. This study will assess the quantitative potential of breast tomo using a clinical prototype and relatively simple reconstruction and the proposed background trend correction scheme. Tomo quantitation would allow improved characterization of lesions as well as proper image processing of tomo images (analogous to that of mammography). **Method and Materials:** Studies were based on a Siemens prototype breast tomo system with a 45^{o} total angular span. First, Monte Carlo simulations were conducted using geometry to mimic the aforementioned prototype and voxelized breast tissue-equivalent phantoms embedded with eleven small cuboid lesions of varying density. The material surrounding the lesions was either fat or glandular equivalent plastic. From the simulations, the effects of scatter, lesion depth, and background material density were studied. Empirical studies were then conducted with the prototype system and tissue-equivalent phantoms similar to those of the simulations to allow investigation of the effects of lesion depth and background material density. All image reconstruction was performed using filtered backprojection incorporating a filter designed to emulate some grayscale characteristics of iterative reconstruction. **Results:** Resulting images displayed a visible difference in lesion brightness for both empirical and simulated experiments. After applying our background trend correction technique, the lesion voxel values varied linearly with glandular fraction (all $R^2 \geq 0.90$) under all simulated and empirical conditions. Significant differences were encountered only for different background materials (in all scatter-included paradigms). **Conclusions:** These high R^2 values suggest that breast tomo image voxel values corrected by our outlined methods are *highly* positively correlated with true tissue density, implying that breast tomo imaging has definite quantitative potential.