Abstract ID: 16744 Title: Variation in lesion detectability of a Positron Emission Mammography (PEM) system as a function of breast thickness.

Purpose:
In a previous study the lesion detectability of a PEM system was evaluated using 2 and 4 cm thick phantoms (Shkumat N et al. J Nucl Med 51(Suppl 2):130P, 2010). In this work we extend that analysis to thicker (6 and 8 cm) phantoms that more accurately represent patient breast sizes.

Methods:
Gelatin breast phantoms with and without (blank) disk shaped (2mm thick) contrast objects (lesions) with varying diameters (3-14.5 mm) and activity concentrations ratios (ACR) to background (2.7-58) were constructed with two thicknesses (6 and 8 cm). All phantoms were imaged with the standard clinical protocol of 10 minutes. Each lesion was then segmented from the resulting images and inserted randomly into the corresponding blank phantom image. The resulting image sets (120 in total) were read by 7 physicians and scored (1 – correctly identified, 0 incorrect). From these results, the sensitivity, specificity, and accuracy of lesion detectability were calculated and correlated with lesion size, ACR and phantom thickness and compared to the same metrics in the thinner (2 and 4 cm) phantoms.

Results:
The overall sensitivity across all ACR and lesion diameters decreased from 0.77(95% CI: [0.74, 0.80]) in the 2 and 4 cm phantoms to 0.55(95% CI: [0.49, 0.62]) in the 6 and 8 cm phantoms. More specifically sensitivity decreased from 0.52 to 0.10 and 0.93 to 0.67 for the 3 and 14.5mm diameter respectively, and 0.27 to 0.05 and 1 to 0.86 for ACR of 3 and 58 respectively.

Conclusions:
There was significant degradation of detactability performance with thicker phantom suggesting that women with larger breasts would benefit the least from PEM exams. We anticipate a sensitivity improvement when using spheroidal lesions rather than the disks used in this investigation.