AbstractID: 10568 Title: Visibility of simulated microcalcifications with an aSi/aSe flat panel detector based cone beam CT system

Purpose:
To investigate the visibility of microcalcifications (MCs) with an aSi/aSe flat panel detector (FPD14, Anrad Corporation) based cone beam CT (CBCT) system

Method and materials:
A bench top experimental CBCT system was configured for breast imaging and used to image a breast phantom with embedded simulated MCs of various sizes. A paraffin cylinder with a diameter of 135 mm and a height of 40 mm was used to simulate a 100% adipose breast. Calcium carbonate grains, ranging from 125 to 425 µm in size, were used to simulate the microcalcifications. 25 MCs from same size group were arranged into a 5 × 5 cluster and embedded at the center of a 15 mm diameter paraffin rod to make an MC insert, which may be inserted into a hole at the center of the breast phantom for imaging. The breast phantom with MCs was scanned at various exposure levels. 300 projection images were acquired over 360° and reconstructed with Feldkamp's backprojection algorithm using a ramp filter. The images were reviewed by 6 readers. The ratios of visible MCs, averaged over all readers, were plotted as the function of the square root of measured dose level and image signal-to-noise ratio (SNR).

Results:
It was found that 90% visibility was achieved for 224 – 250 µm calcifications at an SNR of 16.8 or an isocenter dose of 5.2 mGys. 70% visibility was achieved for 224 – 250, 212 – 224, 200 – 212, 180 – 200, 160 – 180, 150 – 160 and 124 – 140 µm calcifications at an SNR of 16.8, 16.8, 25.1, 25.1, 44.5, 44.5 and 52.6, respectively.

Conclusions:
Percentage of visible MCs increased with the image SNR and isocenter dose. Higher SNRs and isocenter dose are required for imaging smaller MCs.