Purpose:
To investigate the visibility of microcalcifications (MCs) in cone beam breast CT using various flat panel detectors.

Methods:
We investigated the visibility of MCs in cone beam CT (CBCT) breast imaging using various flat panel detectors, including PaxScan 4030CB (aSi/CsI) by Varian Medical Systems, FPD14 (aSi/aSe) by Anrad, C4742 (CCD/GdO2S:Tb) and C7921 (CMOS/CsI) detectors by Hamamatsu. A paraffin cylinder with a diameter of 135 mm and a thickness of 40 mm was used to simulate a 100% adipose breast. Calcium carbonate grains, from 125 - 140 μm to 224 - 250 μm in various size groups, were used to simulate the MCs. Groups of 25 same size MCs were arranged into 5 × 5 clusters. Each cluster was embedded at the center of a 15 mm diameter cylindrical paraffin phantom, which as inserted into a hole at the center of the breast phantom. The breast phantom with the simulated MCs was scanned on a bench top CBCT system at various exposure levels for each detector. The reconstructed images were reviewed by 6 readers independently. The MC visibility was quantified as the fraction of visible MCs and averaged over all readers for analysis. The visibility was plotted as a function of the estimated dose level and image signal-to-noise ratio (SNR) for various scans and detectors. The relative detector DQEs were compared among the four detectors.

Results:
It was found the relationship between the visibility and size can be fitted with a Boltzmann function for all the detectors. The Varian detector has the best MC visibility among all the detectors at the same dose level.

Conclusions:
The visibility of MCs increased with the isocenter dose and image SNR for all detectors. Detector with better DQE could achieve the same MC visibility with lower radiation dose.