Purpose:This work focuses on analyzing CCD vs CdTe x-ray methods to estimate fat in breast biopsies.

Methods:A digital specimen radiography system consisting of a 2''x 2'' phosphor coupled to a 1'' x 1''CCD was used. We obtained ADU signals as a function of the energy incident signals for different plastic biopsies each 5 mm in diameter and of varying thicknesses. Simulations were performed for 231 combinations of polycarbonate (lexan), lucite and polyethylene (polyet). These plastics mimic respectively fibrous tissue, cancer, and fat. The thickness for heterogeneous biopsies was restricted to 5mm. The average ADU and sigma calculated for 21 subgroups of % polyet reveal significant overlaps between groups. The ADUmean values provide a way to estimate the % polyet experimentally. 26 kV (0.3 mA) beams and exposure times of 3.8 seconds gave X=7.5E-4 C/kg. Region of interests (ROIs) consisting of 15960 pixels were generated and corresponded to a 1.36 mm diameter lesion in the object plane. Using a single pixel CdTe detector, the thickness of polyet can be estimated by assuming the biopsies are composed of two materials, namely polyet and a 50:50 mixture of lexan and lucite. 15 kV (0.15 mA) beams and 1 minute exposures yielded X=1.9E-4 C/kg per measurement. The diameter of the beam at the sample is 1.36 mm. The weighted means of the estimated thicknesses were evaluated using data from 8 keV to 10.6 keV in steps of 0.2 keV.

Results:The root mean square between estimated and actual % polyet for the CCD was 13.8 and 9.2 for the CdTe detector.

Conclusions:The preliminary analysis shows a minor advantage using the CdTe based system. Extending the study to a pixilated CdTe (or CZT) detector could allow larger ROIs to be analyzed. We anticipate better results with breast tissue since contrast is higher.