Purpose: To investigate the feasibility of quantifying an iodinated contrast agent with dual energy and spectral breast computed tomography (CT).

Methods: A cylindrical Polymethyl methacrylate (PMMA) phantom with a diameter of 4.5 cm was constructed using various iodine concentrations that ranged from 0.4 to 4 mg/ml. Calibrations and measurements were carried out with (1) a flat panel detector using dual kVp technique and (2) a Cadmium-Zinc-Telluride (CZT) photon counting detector using a single kVp approach in a spectral CT system. Based on the simulation results, energies of 50 and 120 kVp were chosen for the dual kVp imaging. Energy splitting at 34 keV, which is just above the k-edge of iodine, was used to bin photons into two images within a single energy acquisition at 50 kVp. .

Results: Iodinated solutions with different concentrations can be clearly identified in the dedicated iodine image obtained from both dual kVp flat panel imaging and CZT-based spectral CT. The linear fitting of the experimental data as a function of the known values yielded slopes of 0.998 and 1.021 for the dual kVp and spectral CT techniques, respectively. This suggested that the measured iodine concentrations agreed very well with the known values.

Conclusion: The experimental results suggest that both dual kVp and spectral CT can be used for quantitative decomposition of contrast-enhanced breast imaging. Meanwhile, the CZT-based spectral CT system may offer a better image quality than the comparable flat panel based dual energy CT system.