

**Purpose:** To investigate the optimal techniques for dual energy and spectral breast computed tomography with an iodinated contrast agent.

**Methods:** Simulations were performed for three CT systems. The first system was based on a CsI flat panel detector and used a dual kVp technique. The second and third systems were based on a CZT photon counting detector with energy resolution and single kVp technique. The first CZT system used a single threshold to separate photons from one acquisition into either low or high energy images. The second CZT system used multiple thresholds to separate photons from one acquisition into one of five energy images. Iodine images for the dual kVp system and the two energy CZT system were generated under the assumption that a linear three material decomposition contains glandular tissue, adipose tissue and iodine. For the second CZT system, iodine images were generated using an iterative likelihood maximization algorithm. Beam energies ranging from 40 to 140 kVp were simulated for all systems. A figure-of-merit (FOM), defined as the dual energy signal-to-noise ratio of contrast in the iodine image divided by the square root of mean glandular dose, was used to quantify imaging performance.

**Results:** The highest FOM, normalized to 1.0, was seen with the two energy CZT system at a beam energy of 40 kVp. Performance from the five energy CZT system was highest at 46 kVp with an FOM value of 0.75. The FOM of the dual kVp was maximized at beam energies of 48 kVp and 140 kVp with a value of 0.28.

**Conclusion:** The results of this study indicate that a CZT based CT system of either configuration could potentially produce images of significantly higher quality than that of a comparable flat panel based dual energy CT system.