AbstractID: 7465 Title: A phantom study of contrast-enhanced dual energy mammography (CEDEM)

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Purpose: To optimize and study the effectiveness of CEDEM using simple breast-equivalent phantoms in the experimental setting.

Method and Materials: The experimental evaluation of CEDEM was performed using a dedicated cone-bream breast CT scanner in our laboratory, with the system operating in stationary imaging mode. A series of physical phantoms approximating the anatomical complexity of the breast were fabricated. Polyethylene and water were used for the adipose and glandular aspects of the breast phantom, respectively, due to their similar x-ray attenuation characteristics. Holes of various sizes were randomly drilled on the polyethylene slabs to create an "anatomical" noise pattern. Rectangular cells (cuvettes) filled with various iodine concentrations were placed in a polyethylene slab to maintain a homogeneous projected iodine thickness (mg/cm^2). When imaged experimentally, the polyethylene slab with five cuvettes of various iodine concentrations was overlaid with a number of the slabs with pseudo-anatomical noise distributions while immersed in a plastic container filled with water. Data were acquired at 55 kVp and100 kVp (suggested by computer optimization) with additional elemental filters (0.1 – 0.3 mm copper filtration), and dual-energy subtracted images were produced.

Results: Preliminary results were acquired at 55 kVp and 100 kVp (0.3 mm additional copper filtration). The sensitivity to iodine contrast agent in the dual-energy subtracted image (signal-difference-to-noise ratio (SDNR) per mg/cm^2) was evaluated and found to be linear with concentration. The influence of the breast phantom thickness, composition, and dose on contrast enhancement at different kVp combinations will be presented.

Conclusion: The effectiveness of CEDEM with an anatomical-complex phantom was evaluated. The results indicate that the dual-energy subtracted image can enhance the iodine contrast agent with background anatomical structures. This approach may be useful for the evaluation of the kinetic curve in contrast enhanced breast imaging procedures.