AbstractID: 5403 Title: Feasibility of high-resolution contrast enhanced digital mammography

Purpose: This study is aimed at investigating the feasibility of high-resolution contrast enhanced digital mammography (CEDM).

Method and Materials: Recent studies report certain promising aspects of contrast mammography [Jong et al., Radiology 228, 842-50, 2003] for identifying subtle lesions that might not be detectable by conventional mammography. In this study we investigate certain physical aspects of high-resolution CEDM. The objective was to study the feasibility of high resolution and low dose CEDM with acceptable contrast characteristics. We used a prototype imager [Vedantham et al., Med Phys 31, 1462-72, 2004] that consists of a 2 x 2, CCD array. The imager was operated in a 78 μm mode by pixel binning. Computational studies with a 49 kVp, W spectrum with 0.6 mm Cu added filtration (1^{st} HVL: 1.9 mm of Al) indicated dose levels in the range of 0.1-0.5 mGy for a 5 cm thick, 50% glandular breast for the entire mammography exam. Theoretical modeling was performed using the parallel cascaded approach described by Cunningham and Yao [Proc. SPIE 3336, 220-30, 1998, Med Phys 28, 2020-38, 2001] for various physical conditions. In addition, experimental evaluation of the physical characteristics of the imager was conducted.

Results: The resolution characteristics at 10% MTF was ~7.8 and ~4.2 cycles/mm and the DQE(0) estimate was ~0..4 and ~0.65 for 150 and 450 μm thick CsI:Tl scintillators respectively. Model results for pixel size range of 39-156 μm and CsI:Tl thickness range of 150-300 μm indicate that a 250-300 μm thick CsI scintillator with an imager pixel size of 78 μm could potentially offer a reasonable trade-off between spatial resolution and DQE(f) characteristics.

Conclusion: The results suggest that high-resolution CEDM appears to be feasible at dose levels substantially lower then digital mammography. This research was supported in part by: NIH-NIBIB Grant RO1-EB002123 and the Georgia Cancer Coalition.