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High-Frequency Ultrasound for Assessing Breast Cancer Surgical Margins: Evaluating the Effect of Breast Density using Histology Mimicking Phantoms ZACHARY COFFMAN, NICOLE COWAN, ROBYN OMER, TIMOTHY DOYLE, Utah Valley University — Breast density is typically determined using mammography, and describes the proportion of connective tissue versus fat tissue in the breast. Women with higher breast density are four to five times more likely to develop breast cancer than women with lower breast densities. Clinical studies performed in collaboration between Utah Valley University and the Huntsman Cancer Institute show that high-frequency (HF) ultrasound (20-80 MHz), and the parameters peak density and attenuation, are sensitive to breast tissue pathology. These studies also showed that breast density had no effect on peak density while attenuation increases two times from entirely fat to extremely dense. The objective of this study was to determine the effect of breast density on HF ultrasound wave propagation using phantoms that mimic breast tissue histology. Phantoms were created from distilled water, agarose powder, 10X TBE stock solution, and polyethylene microspheres. Pitch-catch measurements were acquired using 50-MHz transducers, a HF pulser-receiver, and a 1-GHz digital oscilloscope. Peak density showed no significant change with increasing breast density, whereas attenuation showed sensitivity to the total weight percent of scatterers. The phantom results confirm the results seen in clinical studies.

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