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Measuring Ultrasonic Backscatter in the Presence of Nonlinear Propagation TIMOTHY STILES, QUINTON GUERRERO, Monmouth College — A goal of medical ultrasound is the formation of quantitative ultrasound images in which contrast is determined by acoustic or physical properties of tissue rather than relative echo amplitude. Such images could greatly enhance early detection of many diseases, including breast cancer and liver cirrhosis. Accurate determination of the ultrasonic backscatter coefficient from patients remains a difficult task. One reason for this difficulty is the inherent nonlinear propagation of ultrasound at high intensities used for medical imaging. The backscatter coefficient from several tissue-mimicking samples were measured using the planar reflector method. In this method, the power spectrum from a sample is compared to the power spectrum of an optically flat sample of quartz. The results should be independent of incident pressure amplitude. Results demonstrate that backscatter coefficients can vary by more than an order of magnitude when ultrasound pressure varies from 0.1 MPa to 1.5 MPa at 5.0 MHz. A new method that incorporates nonlinear propagation is proposed to explain these discrepancies.

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