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Spatiotemporally resolved granular acoustics ELI OWENS, KAREN DANIELS, North Carolina State University — Acoustic techniques provide a non-invasive method of characterizing granular material properties; however, there are many challenges in formulating accurate models of sound propagation due to the inherently heterogeneous nature of granular materials. In order to quantify acoustic responses in space and time, we perform experiments in a photoelastic granular material in which the internal stress pattern (in the form of force chains) is visible. We utilize two complementary methods, high-speed imaging and piezoelectric transduction, to provide particle-scale measurements of the amplitude of the acoustic wave. We observe that the average wave amplitude is largest within particles experiencing the largest forces. The force-dependence of this amplitude is in qualitative agreement with a simple Hertzian-like model for contact area. In addition, we investigate the power spectrum of the propagating signal using the piezoelectric sensors. For a Gaussian wave packet input, we observe a broad spectrum of transmitted frequencies below the driving frequency, and we quantify the characteristic frequencies and corresponding length scales of our material as the system pressure is varied.

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