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Spatiotemporally Resolved Acoustics in a Photoelastic Granular Material ELI OWENS, KAREN DANIELS, Dept. of Physics, NC State University — In granular materials, stress transmission is manifested as force chains that propagate through the material in a branching structure. We send acoustic pulses into a two dimensional photoelastic granular material in which force chains are visible and investigate how the force chains influence the amplitude, speed, and dispersion of the sound waves. We observe particle scale dynamics using two methods, movies which provide spatiotemporally resolved measurements and accelerometers within individual grains. The movies allow us to visualize the sound's path through the material, revealing that the sound travels primarily along the force chains. Using the brightness of the photoelastic particles as a measure of the force chain strength, we observe that the sound travels both faster and at higher amplitude along the strong force chains. An exception to this trend is seen in transient force chains that only exist while the sound is closing particle contacts. We also measure the frequency dependence of the amplitude, speed, and dispersion of the sound wave.

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