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Acoustic measurement of the granular density of state ELI OWENS, North Carolina State University, KAREN DANIELS — Measurements of the vibrational density of states (DOS) in glasses reveal that an excess number of low-frequency modes, as compared to the Debye scaling seen in crystalline materials, is associated with a loss of mechanical rigidity. An excess number of modes have also been observed experimentally in colloids and in simulations of idealized granular materials near the jamming point. However, there have not been any experimental measurements in an athermal granular system. We experimentally probe the material by mimicking thermal motion with acoustic waves, thereby allowing us to measure a DOS like quantity by analogy with conventional solid state techniques. Our system is made up of two dimensional photoelastic disks which allow visualization of the internal force structure, and a voice coil driver provides a white noise signal to excite a broad spectrum of vibrations. The sound is then detected with piezoelectric sensors embedded inside a subset of the particles. These measurements give us the particle velocities, from which we are able to compute a DOS by taking the Fourier transform of the velocity autocorrelation function. We measure this DOS as a function of the confining pressure and degree of disorder and find that the peak in the density of states shifts to higher frequency as the system pressure is increased.

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