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**Vibrational density of states for granular solids** CARL SCHRECK, Yale University, THIBAULT BERTAND, Close École Normale Supérieure de Cachan, MARK SHATTUCK, City College of New York, COREY O'HERN, Yale University — It was recently shown that granular packings composed of frictionless particles with purely repulsive contact interactions are strongly anharmonic. When perturbed along an eigenmode of the static packing (in the harmonic approximation), energy leaks from the original mode of vibration to a continuum of frequencies even when the system is under significant compression due to the breaking of the weakest contact. In light of this, we perform numerical simulations to measure the displacement matrix averaged over fluctuations and the associated eigenspectrum of weakly vibrated frictionless packings, which possess well-defined equilibrium positions that are different than those of the nearest static packing. We find that there is an increase in the number of low-frequency eigenmodes of the displacement matrix in the harmonic approximation (over the number of low-frequency modes in the static case) and these modes provide a more accurate description of the system dynamics. We also investigate the extent to which these results hold for systems with continuous potentials with repulsive and attractive interactions.

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