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Subharmonic Square Waves for a Vibrated Powder[1] JEAN-PHILIPPE MATAS, Universite J.-J. Fourier, Grenoble, JUN UEHARA, Duke University, BOB BEHRINGER, Duke University — We describe experiments on vibrated powders in a gas environment. Because the powders are fine, typically about 60 μm in diameter, the system is inherently two-phase in nature. In the experiments, we control the amplitude and frequency of shaking and the ambient pressure, P. At high enough accelerations, subharmonic waves appear. We focus on a novel wave form that consists of unusual and striking square waves. These waves appear in a narrow frequency window that depends on P. We analyze a simple model for Darcian flow in a porous medium to obtain a qualitative understanding of some of the wave properties. We find that the wave amplitude depends on the shaking amplitude and P. However, the wavelength appears to depend on the penetration depth for gas in the porous medium consisting of the grains. In particular, this leads to a qualitatively different form for the dispersion relation for the waves that has been seen in experiments, such as those by Melo et al. for granular subharmonic waves in vacuum.

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