Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

**Low-frequency oscillations in vibrated granular media** NICOLAS RIVAS, ANTHONY THORNTON, STEFAN LUDING, University of Twente, KIT WINDOWS-YULE, DAVID PARKER, University of Birmingham — We present simulations and a theoretical treatment of vertically vibrated granular media. The systems considered are confined in narrow quasi-two-dimensional and quasi-one-dimensional (column) geometries, where the vertical extension of the container is much larger than both horizontal lengths. The additional geometric constraint present in the column setup frustrates the convection state that is normally observed in wider geometries. This makes it possible to study collective oscillations of the grains with a characteristic frequency that is much lower than the frequency of energy injection. We observe that, in the quasi-two-dimensional setup, low-frequency oscillations are present even in the convective regime. This suggests that they may play a significant role in the transition from a density inverted state to convection. Our hydrodynamic model shows that a sufficient condition for the existence of the low-frequency mode is an inverted density profile with distinct low and high density regions, a condition that may apply to other systems. Lastly, we also present experimental results that confirm the presence of the oscillations in a vast region of phase-space. Theory, experiments and simulations are seen to be in high agreement, specially for high energy inputs.

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Date submitted: 01 Aug 2014 Electronic form version 1.4