Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Effect of randomness on wave propagation in granular systems
MOHITH MANJUNATH, AMNAYA P. AWASTHI, PHILIPPE H. GEUBELLE, Department of Aerospace Engineering, University of Illinois at Urbana-Champaign
— Granular systems have been shown to possess energy absorbing and potential wave mitigation characteristics due to the flexibility in tuning the properties of the particles. The present study focuses on the impact of randomness on wave propagation in 1D and 2D lattices of spherical particles where the randomness is associated with either the mass, Young's modulus or radius of the spheres. The 1D study (motivated by M. Manciu et. al. (2001)) reveals the presence of two distinct regimes of decay in peak compressive force with distance for any level of randomness. The transition between the regimes of exponential and power-law decay is shown to occur when the amplitude of the leading pulse reduces below that of the scatter. Investigation into the ensemble kinetic and potential energies of the system as a function of time shows the gradual transfer of energy from potential to kinetic with increase in the level of randomness. In 2D square packed systems simulated with a modified version of the molecular dynamics package LAMMPS, we note that the decay in peak compressive force is present due to dimensionality as well as randomness. Normalization is then used to quantify the decay due to randomness alone and we investigate the anisotropy of the randomness induced decay.

Mohith Manjunath
Department of Aerospace Engineering,
University of Illinois at Urbana-Champaign

Date submitted: 02 Nov 2011 Electronic form version 1.4