Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Nonlinear Resonance Phenomena Leading to Strong Pulse Attenuation in Granular Diatomic Chains with no Pre-Compression
JAYAPRAKASH KR, YULI STAROSVETSKY, ALEXANDER F. VAKAKIS, University of Illinois — We consider diatomic (dimer) chains with 'heavy' and 'light' beads interacting with elastic Hertzian law and with no pre compression. A new family of solitary waves analogous to the one in homogeneous chain studied by Nesterenko was discovered in these systems. We observe that these waves lead to no separation between beads; rather satisfy special symmetries or, equivalently anti-resonances. Further, we discuss a contrasting phenomena of resonance that leads to efficient pulse attenuation. We attribute anti-resonance to symmetric waveforms whereas resonance to the break of symmetry and thus leading to attenuation of traveling pulses, maximum amplitude amplification of radiated waves emanating from the propagating pulse and distortion of waveforms due to radiation of energy in the form of travelling waves to the far field. We show that the capacity of the dimer to attenuate propagating pulses is reduced when system is precompressed. These results have interesting implications on applications where granular media is employed as shock transmitters/attenuators.

Jayaprakash KR
Graduate Research Assistant

Date submitted: 23 Feb 2011 Electronic form version 1.4