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Quasi-equilibrium in tapered chains ROBERT DONEY, Department of Physics, State University of New York at Buffalo and U.S. Army Research Laboratory, SURAJIT SEN, Department of Physics, State University of New York at Buffalo — The approach to equilibrium in 1d lattices is interesting for granular media since temperature is not well-defined and various authors have reported a violation of equipartition. We extend our previous work on shock mitigation in tapered chains to look at energy sharing among spheres and how the system appraoches a so-called quasi-equilibrium. An overlap potential of adjacent particles is used to model the elastic response of spheres under loading and has the form, $V \sim \delta^n$. For spheres, $n = 5/2$ and is known as the Hertz potential. We can also compare results when $n = 2$ which resembles spring-like behavior. It should be noted however, that in both cases the potential has no restoration term and vanishes when adjacent spheres lose contact. We present the velocity statistics for a variety of Hertzian chain configurations as well as fluctuations for the system's total kinetic energy for both $n = 2$ and $n = 2.5$. We find that most particles in these systems exhibit Gaussian velocity distributions and that the kinetic energy fluctuations of the system depend strongly on system size and weakly on tapering of the spheres. Fluctuations do not damp out over long time however, indicating that the steady-state is a type of quasi-equilibrium. Mathematical fits of the mean fluctuations are further provided as functions of system size, tapering, and n.

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