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Motion of a Short Granular Polymer in Vibrations P.C. HUANG, NTU, JACK WU, C.Y. TAO, Inst. of Physics. Academia Sinica, Y.Y. CHEN, NTU, J.C. TSAI, Inst. of Physics. Academia Sinica — Using both numerical simulations and laboratory experiments, we investigate the movements of a short granular polymer driven by vibrations. Surprisingly, our minimal models of constrained point masses with a simple assumption on the momentum transfer not only reproduce the rapid ratcheting motion in prior experiments [Phys. Rev. Lett. 112, 058001 (2014)], but also reveal the crucial role of random noises in triggering the spontaneous switching of bouncing modes in our previous report [http://meetings.aps.org/link/BAPS.2014.DFD.H24.1]. Subsequent experiments with a bead chain vibrated in an annular channel allow uninterrupted observations on the granular polymer. From the long-time statistics, we correlate the horizontal displacements to the different modes of response and identify the characteristic timescales for the transitions. Cross examinations of the numerical models and the statistical experiments suggest certain generic ratcheting and mode transitions that are insensitive to the mechanical details of such polymer.

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