Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Noise and diffusion in vibrated self-propelled particles LEE WALSH, University of Massachusetts Amherst, SARAH SCHLOSSBERG, University of California San Diego, APARNA BASKARAN, Brandeis University, NARAYANAN MENON, University of Massachusetts Amherst — Active-matter systems are often modeled in the lab by studying the two-dimensional dynamics of granular particles driven by vibration in the third dimension. If the vibrational noise is rectified by the shape of the particle, the resulting motion of the particle shows directed motion superimposed on diffusion. We use particles designed for polar motion along a body axis as well as others that break isotropy in various ways. The long-term motion is typically theoretically modeled by a Langevin equation that encodes a self-propulsion velocity along the body axis as well as uncorrelated rotational and translational noise, all of which are treated as independent parameters. For a dilute system of granular tiles confined to a horizontal plane and vertically vibrated, we measure the long-time single-particle dynamics as well as the short-time distributions of translational and rotational motion. From these we characterize the different correlation functions that determine the noise and test the assumptions of the conventional Langevin dynamics used for self-propelled particles.

Lee Walsh
University of Massachusetts Amherst

Date submitted: 06 Nov 2015 Electronic form version 1.4