Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Tabletop Traffic Jams: Modeling Traffic Jams using Self Propelled Particles VIKRANT YADAV, ARSHAD KUDROLLI, Clark University — We model behavior of traffic using Self Propelled Particles (SPPs). Granular rods with asymmetric mass distribution confined to move in a circular channel on a vibrated substrate and interact with each other through inelastic collision serve as our model vehicle. Motion of a single vehicle is observed to be composed of 2 parts, a linear velocity in the direction of lighter end of particle and a non-Gaussian random velocity. We find that the collective mean speed of the SPPs is constant over a wide range of line densities before decreasing rapidly as the maximum packing is approached indicating the spontaneous formation of Phantom jams. This decrease in speed is observed to be far greater than any small differences in the mean drift speed of individual SPPs , and occurs as the collision frequency between SPPs increase exponentially with line density. However the random velocity component of SPPs remain super-diffusive over entire range of line densities. While the collective motion at low densities is characterized by caravan following behind the slowest particle leading to clustering, at higher densities we see formation of jamming waves travelling in direction opposite to that of motion of particles.

Vikrant Yadav
Clark University

Date submitted: 14 Nov 2014 Electronic form version 1.4