Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Synchronization of self-excited dust acoustic waves[1] W.D. SURANGA RUHUNUSIRI, JOHN GOREE, The University of Iowa — Synchronization is a nonlinear phenomenon where a self-excited oscillation, like a wave in a plasma, interacts with an external driving, resulting in an adjustment of the oscillation frequency. Dust acoustic wave synchronization has been experimentally studied previously in laboratory and in microgravity conditions, e.g. [Pilch PoP 2009] and [Menzel PRL 2010]. We perform a laboratory experiment to study synchronization of self-excited dust acoustic waves. An rf glow discharge argon plasma is formed by applying a low power radio frequency voltage to a lower electrode. A 3D dust cloud is formed by levitating 4.83 micron microspheres inside a glass box placed on the lower electrode. Dust acoustic waves are self-excited with a natural frequency of 22 Hz due to an ion streaming instability. A cross section of the dust cloud is illuminated by a vertical laser sheet and imaged from the side with a digital camera. To synchronize the waves, we sinusoidally modulate the overall ion density. Differently from previous experiments, we use a driving electrode that is separate from the electrode that sustains the plasma, and we characterize synchronization by varying both driving amplitude and frequency.

[1]This work was supported by NSF and NASA.

W.D. Suranga Ruhunusiri
The University of Iowa

Date submitted: 12 Jul 2012 Electronic form version 1.4