Abstract Submitted
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Synchronization of the dust acoustic wave under microgravity[1]
W.D. SURANGA RUHUNUSIRI, J. 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. To prepare for experiments under microgravity conditions using the PK-4 facility on the International Space Station, we perform a laboratory experiment [1] to observe synchronization of the self-excited dust acoustic wave. 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. The dust acoustic wave is 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 wave, 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] Ruhunusiri & Goree, Phys. Rev. E, 85, 046401 (2012)

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