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Experiment for Characterizing Viscoelasticity in a 2D Dusty Plasma with Shear Flows[1] JORGE BERUMEN CANTU, JOHN GOREE, VITALIY ZHURAVLYOV, Dept. of Physics and Astronomy, Univ. of Iowa — Viscoelasticity is a property of strongly coupled plasmas characterizing their combination of dissipative (viscous) and energy storing (elastic) properties. Dusty plasmas are well suited for experimental studies of this effect. With their large size, the particles have a large charge and therefore leads to strong coupling. Their size also allows for individual tracking of the particles. We describe an experiment that is underway in a modified Gaseous Electronics Conference (GEC) chamber with a capacitively coupled RF power to sustain the plasma. Polymer microspheres are suspended by the time-average electric field in the sheath above the lower electrode. Laser heating is used to maintain a steady temperature in the dust cloud. A laser-generated shear flow in the particle layer is modulated at a frequency ω. We characterize viscoelasticity as a frequency-dependent viscosity $\eta(\omega)$, where $\eta(\omega)$ is defined as the ratio of shear stress $P_{xy}(\omega)$ over the shear rate $\gamma(\omega)$. A high-speed, high-resolution camera is used to record a video of the particles, and image analysis yields their individual positions and velocities which are the required inputs for calculating $P_{xy}(\omega)$ and $\gamma(\omega)$.

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