Abstract Submitted
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Self-diffusion and random motion in a strongly-coupled dusty-plasma: experiment[1] BIN LIU, J. GOREE, Dept. of Physics & Astronomy, The Univ. of Iowa — Self-diffusion and random motion in a two-dimensional (2D) dusty plasma were experimentally measured. A single-layer suspension of microsphere particles was levitated in an rf plasma, forming a strongly-coupled dusty plasma with a Yukawa interparticle potential. A pair of cw laser beams moves around the suspension and exerts radiation pressure forces on particles, providing an external control on particle temperature. A dusty-plasma solid is heated to form a dusty-plasma liquid. Particles are imaged, yielding an accurate measurement of particle position and velocity. Random motion is characterized by mean-square displacement (MSD), yielding an estimate of a diffusion coefficient, D. Dependence of D on temperature T is dominated by a power law at high T and an Arrhenius form at low T. Particle random motion obeys Gaussian statistics at high T, but not at low T as indicated by a probability distribution function (PDF) that resembles a kappa distribution. The PDF is self-similar for times longer than the ballistic time scale.

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