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(I) Plasma and dusty plasma pattern formation at high magnetic fields

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The vast majority of dusty/complex plasma experiments have involved the suspension of charged, micron-sized particles in plasmas. The particles are suspended due to a delicate balance between gravitational and electrostatic forces. The addition of a magnetic field to these systems has a profound influence on both the surrounding plasma and the dusty plasma as the dynamics of first the electrons, then the ions, and finally the charged dust grains become influenced by the magnetic field. Since the mid-2000s, a number of experimental devices have been built around the world to explore the physics of dusty plasmas in strongly magnetized plasmas. One of these devices, the Magnetized Dusty Plasma Experiment (MDPX) device at Auburn University is a flexible, high magnetic field research instrument with a mission to serve as an open access, multi-user facility for the dusty plasma and basic plasma research communities. In particular, under conditions when the magnetic field is sufficiently large, $B \geq 1$ T, a variety of emergent phenomena are observed including the formation of self-ordered plasma structure, specifically plasma filamentation along the magnetic field direction, as well as a new type of imposed spatial ordering of the dust particles. Recent three-dimensional fluid simulations suggest that both of these phenomena are strongly connected to differences in ion and electron transport parallel and perpendicular to the magnetic field. This presentation will provide an overview of recent experiments and the associated simulations.

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