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Waves in a strongly coupled 2D superparamagnetic dusty plasma[1]

M. ROSENBERG, University of California, San Diego, G.J. KALMAN, Boston College, Z. DONKO, P. HARTMANN, Wigner Research Centre for Physics, Hungarian Academy of Sciences, S. KYRKOS, Le Moyne College — In a two-dimensional (2D) dusty plasma composed of superparamagnetic dust grains and immersed in an external magnetic field, the dust interacts via both Yukawa and magnetic dipole-dipole interactions. The induced magnetic dipole moments of the grains all lie along the magnetic field **B**. When the direction of **B** is tilted with respect to the dust layer, the interaction between the grains becomes anisotropic. We have theoretically considered the behavior of waves in the strongly coupled liquid phase of this system [1], using the Quasi-Localized Charge approximation combined with molecular dynamics simulations. The analyis is confined to magnetic tilt angles where the interaction remains repulsive in the dust layer, which allows for a stable equilibrium. Two new directions are explored. One relates to possible coupling between in-plane and out-of-plane polarized modes in a quasi-2D liquid phase, taking into account the effect of an external potential that confines the layer. The other relates to the crystalline state and how different lattice structures can arise and how they affect wave behavior.

[1] P. Hartmann, Z. Donko, M. Rosenberg and G. J. Kalman, *Phys. Rev. E* **89**, 043102 (2014).

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Stamatios Kyrkos
Le Moyne College

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