Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Density instabilities in a two-dimensional dipolar Fermi gas MEERA PARISH, University College London, FRANCESCA MARCHETTI, Universidad Autonoma de Madrid — We investigate the inhomogeneous phases of fermionic polar molecules confined in a single two-dimensional (2D) layer, where the molecule dipole moments are all aligned by an external electric field. We show that the Random Phase Approximation (RPA) for the density-density response function is never accurate for the 2D dipolar Fermi gas. To incorporate correlations beyond RPA, we use an improved version of the Singwi-Tosi-Land-Sjolander scheme, which has been successful for electron systems. In addition to density-wave instabilities, our formalism captures the collapse instability that is expected from Hartree-Fock calculations but is absent from RPA. Crucially, we find that when the dipoles are oriented perpendicular to the layer, the system spontaneously breaks rotational symmetry and forms a stripe phase, in defiance of conventional wisdom.

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Date submitted: 09 Nov 2011 Electronic form version 1.4