Antiferromagnetism and superfluidity of a dipolar Fermi gas in a 2D optical lattice

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In a dipolar Fermi gas, the dipole-dipole interaction between fermions can be turned into a dipolar Ising interaction between pseduospins in the presence of an AC electric field. When trapped in a 2D optical lattice, such a dipolar Fermi gas has a very rich phase diagram at zero temperature, due to the competition between antiferromagnetism and superfluidity. At half filling, the antiferromagnetic state is the favored ground state. The superfluid state appears as the ground state at a smaller filling factor. In between there is a phase-separated region. The order parameter of the superfluid state can display different symmetries depending on the filling factor and interaction strength. The implication for the current experiment is discussed.