Condensed Matter Seminar

STATICS AND DYNAMICS OF VORTEX MATTER WITH COMPETING INTERACTIONS IN MULTI-BAND SUPERCONDUCTORS

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Recently there has been growing interest in understanding exotic vortex states that could arise in multi-band superconductors or multi-component BEC's where the vortices do not have a strictly long range repulsive interaction but have instead a long range attraction competing with a short range repulsion. Using large scale simulations we examine the configurations and dynamics of this type of vortex system in the absence of pinning as well as with random or periodic pinning. We identify a phenomenon we term a "vortex wetting-dewetting transition" where at low pinning strengths and densities the attractive term dominates and the vortex configurations consist of large scale clumps with a heterogeneous density. For strong or dense pinning, the vortex distribution becomes spatially uniform and is indistinguishable from vortex matter with only repulsive interactions. Under an applied drive the strongly pinned uniform state can form a moving clump/stripe state, resulting in strong hysteresis in the transport. In the presence of periodic pinning arrays, various types of stripe configurations can be stabilized.

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