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(G*) (POS-14) Triangular Pair-Density Wave in Confined Superfluid 3-He

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Recent advances in experiment and theory suggest that superfluid ^{3}He under planar confinement may form a pair-density wave (PDW) whereby superfluid and crystalline orders coexist. While a natural candidate for this phase is a unidirectional stripe phase predicted by Vorontsov and Sauls in 2007, recent nuclear magnetic resonance measurements of the superfluid order parameter rather suggest a two-dimensional PDW with non-collinear wavevectors, of possibly square or hexagonal symmetry. In this work, we present a general mechanism by which a PDW with the symmetry of a triangular lattice can be stabilized, based on a superfluid generalization of Landau's theory of the liquid-solid transition. A soft-mode instability at finite wavevector within the translationally invariant planar-distorted B phase triggers a transition from uniform superfluid to PDW that is first order due to a cubic term generally present in the PDW free-energy functional. This cubic term also lifts the degeneracy of possible PDW states in favor of those for which wavevectors add to zero in triangles, which in two dimensions uniquely selects the triangular lattice.

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