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Pairing Instability in Two-Dimensional Rotating Fermion Liquids Near Unitarity[1] PREDRAG NIKOLIC, Rice University — Fermionic superfluids can undergo phase transitions into different kinds of normal regimes, characterized by whether Cooper pairs remain locally stable. If the normal phase retains strong pairing fluctuations, it behaves like a liquid of vortices as seen in cuprate superconductors. We argue that analogous strongly correlated normal states exist in two-dimensional neutral fermion liquids near unitarity, where superfluid is destroyed by fast rotation. The formal analysis is based on a model with SP(2N) symmetry which describes the quantum critical region in the vicinity of a broad Feshbach resonance. Assuming that pairing is the only instability in perturbation theory, we map the universal phase diagram in two-dimensions. Such a pairing instability is driven by macroscopically degenerate collective modes, which makes the Abrikosov flux lattice of the superfluid particularly susceptible to quantum melting. Combining this observation with a renormnalization group analysis, we conclude that the unconventional normal states can be expected in the vicinity of the universal pairing instability, especially at low temperatures in the BCS limit.

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