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Theoretical Study of Fulde-Ferrell-Larkin-Ovchinnikov State in Unconventional Superconductors

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In this talk I will report results of our theoretical studies on the Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) State in unconventional superconductors. In particular, I will discuss (i) the possibilities of using phase-sensitive Josephson effect and exotic vortex lattice structure to detect the FFLO state, and measure the momentum of the order parameter; (ii) an exact solution that indicates the second order nature of the BCS-FFLO transition in the 1D limit; (iii) An analysis of fluctuation effects based on renormalization group, which suggests that the transition between the normal and FFLO states is a fluctuation-driven first order transition, even when mean-field theory suggests a second-order transition. Comparisons will be made with experiments whenever appropriate.