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Possibility of phase transition on superfluid vortex under Higgs-confinement crossover

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At finite densities of three-flavor QCD, a hadron (confinement) superfluid phase is expected to be realized at low densities, and a color superconducting (Higgs) phase at high densities. It is not well understood whether these two phases are connected with or without a phase transition. In this talk, we consider the Higgs-confinement transition with superfluidity in a U(1)U(1) lattice model as a simple model. We found that a phase transition occurs on a superfluid vortex, although the bulk system does not exhibit a phase transition. We confirm this phase transition through analytical calculations using weak/strong coupling expansion and Monte Carlo simulations. We also discuss possible scenarios for QCD.

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