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Higgs-confinement continuity in light of particle-vortex statistics

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In gauge theories with fundamental matters, the Higgs and confining regimes are believed to be smoothly connected. This Higgs-confinement continuity forms the foundation of the quark-hadron continuity conjecture, which is a crossover scenario from the nuclear superfluidity phase to the color superconducting phase in dense QCD. Certain superfluid gauge theories, including dense QCD, exhibit nontrivial Aharonov-Bohm (AB) phases around vortices in the Higgs regime. Recently, there has been a growing interest in the question of whether this nontrivial AB phase necessitates a Higgs-confinement transition. In this presentation, I will address this question in favor of Higgs-confinement continuity in relevant gauge-Higgs models. By explicit calculations in lattice models, we demonstrate that the AB phase remains continuous (or even constant when some symmetry constrains the AB phase) across a region bridging Higgs and confining regimes. This finding, in particular, supports the possibility of the quark-hadron continuity. This talk is based on arXiv:2303.02129.

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