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Non-Abelian vortices in dense QCD: quark-hadron continuity and non-Abelian statistics

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Quark-hadron continuity was proposed as crossover between hadronic matter and quark matter without a phase transition, based on the matching of the symmetry and excitations in both phases. In the limit of a light strange-quark mass, it connects hyperon matter and the color-flavor-locked phase exhibiting color superconductivity. Here, we argue that three hadronic superfluid vortices must combine with three non-Abelian vortices with different colors with the total color magnetic fluxes canceled out through a junction called a colorful boojum. We prove this based on the Aharonov-Bohm phases of quarks around vortices. We then discuss non-Abelian statistics of non-Abelian vortices based on the Bogoliubov-de Gennes equation and possible application to the above continuity.

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