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# Color-superconducting quarkyonic matter

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We explore the role of color superconductivity in quarkyonic matter under the conditions of color and electric neutrality at $\beta$- and strong equilibrium, as relevant for neutron stars. By explicitly incorporating the color-superconducting pairing gap into the phenomenological model of a smooth transition from hadron to quark matter, we extend the known quarkyonic framework to include this essential aspect relevant at high densities. The momentum dependence of the pairing gap, motivated by the running of the QCD coupling and introduced similarly to chiral quark models with nonlocal interaction, is a novel element of the model that is crucial for enabling the simultaneous onset of all color–flavor quark states in the presence of color superconductivity.

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