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Moat regimes within a 2 + 1 flavor Polyakov-quark-meson model

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To better understand recent predictions on the moat regime of quantum chromodynamics (QCD) matter, this paper extends the previous work within the two-flavor quark-meson (QM) model to the more realistic 2+1 flavor Polyakov-quark-meson (PQM) model. Mainly, two effects are further taken into account: strange quark and confinement coded through Polyakov loop. Model parameters are chosen to consistently reproduce the pseudocritical temperature from lattice QCD, TC ~ 156 MeV, and the baryon chemical potential at the critical end point (CEP) from FRG-QCD, μB(CEP) ~635 MeV. It is found that the basic features of moat regimes for σ and π mesons remain similar to those from QM model: Moat regimes cover the region where temperature or baryon chemical potential is large; reentrances occur around the critical baryon chemical potential of chiral transition at zero temperature. Thus, the FRG-QCD results can still not be well understood, especially why the extrapolated CEP should be consistent with the boundaries of moat regimes for σ and π mesons. Nevertheless, some basic features can be understood qualitatively, and it is consistent that the pole energies are increasing functions of momenta in the whole T – μB plane. The moat regime and pole energy of K mesons are also studied with the features similar.

Primary author: 曹, 高清 (Sen Yat-sen University)

Presenter: 曹, 高清 (Sen Yat-sen University)

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