

Two-flavor color superconducting quark stars may not exist

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Large uncertainties in the determinations of the equation of state of dense stellar matter allow the intriguing possibility that the bulk quark matter in beta equilibrium might be the true ground state of the matter at zero pressure. And quarks will form Cooper pairs very readily since the dominant interaction between quarks is attractive in some channels. As a result, quark matter will generically exhibit color superconductivity, with the favored pairing pattern at intermediately high densities being two-flavor pairing. In the light of several possible candidates for such self-bound quark stars, including the very low-mass central compact object in supernova remnant HESS J1731-347 reported recently, we carry out one field-theoretic model, the Nambu–Jona-Lasinio model, of investigation on the stability of beta-stable two-flavor color superconducting (2SC) phase of quark matter, nevertheless find no physically-allowed parameter space for the existence of 2SC quark stars.

Presenter: YUAN, Wen-Li (Peking University)