The QCD critical point from the Nambu-Jona-Lasinio model with a scalar-vector interaction

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Based on the NJL model with both two flavors and three flavors as well as with the inclusion of the Polyakov loop (PNJL), we have studied the effect of the eight-fermion scalar-vector coupled interaction, which has no effects on the QCD vacuum properties, on the critical endpoint of the first-order QCD phase transition line in the QCD phase diagram [1]. We have found that the location of the critical point in the temperature and baryon chemical potential plane is sensitive to the strength of this interaction and can be easily shifted by changing its value as shown in Fig.1 by the dashed and dash-dotted lines in Fig. 1 for the NJL and the PNJL models, respectively. This flexible dependence of the quark equation of state due to the quark scalar-vector coupled interaction is very useful for locating the phase boundary in

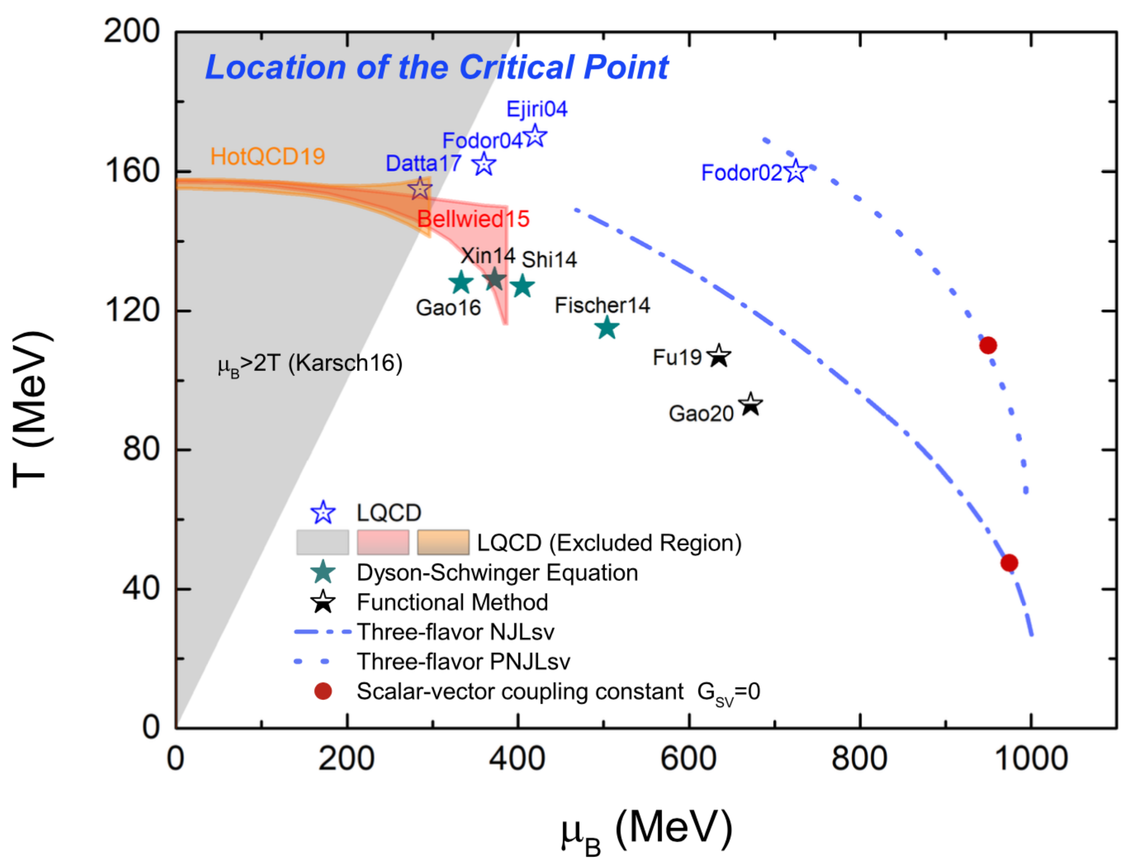

Fig. 1. Comparison of the location of the critical point in the plane of temperature T versus baryon chemical potential μ_B from the three-flavor NJL (dash line) and PNJL (dash-dotted line) models by varying the value of the scalar-vector coupling constant G_{SV}, with red solid circles denoting that obtained with $G_{SV} = 0$, with predictions from LQCD [2–8], Schwinger-Dyson equation [9–12], and the functional renormalization method [13, 14].

QCD phase diagram by comparing the experimental data with results from transport model simulations or hydrodynamic calculations based on equations of states from such generalized NJL and PNJL models.

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