Contribution ID: **2** Type: **not specified**

Spin Polarization and Anomalous Magnetic Moment in a (2 + 1)-flavor NJL model in the magnetized background

We investigate the magnetized QCD matter and chiral phase transition in a (2 + 1)-flavor Nambu–Jona-Lasinio (NJL) model at finite temperature and chemical potential by comparing the contributions from the tensor spin polarization (TSP) and anomalous magnetic moment (AMM) of quarks. For light u and d quarks, when TSP and AMM are not considered, the magnetized system is characterized by magnetic catalysis. The introduction of TSP will further enhance the magnetic
catalytic characteristics. On the other hands, when AMM is introduced, the phase transition temperature decreases with the magnetic field, which is the feature of inverse magnetic catalysis. The phase diagram of u and d quarks will change from the crossover phase transition to the first order phase transition with the increase of magnetic field and chemical potential when AMM is induced. The phase diagram will not change from the crossover phase transition to the first order phase transition when TSP is induced. For the phase diagram of strange s quark, whether TSP or AMM is induced, the phase diagram will keep a crossover phase transition with the increase of magnetic field and chemical potential.

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