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Charmonium mass in hot and dense hadronic matter from QCD sum rules

Charmonia in medium provide us information on the change of the confinement property induced by the medium. We have developed an approach based on QCD sum rule which connects temperature dependent QCD condensates to the spectral function through the operator product expansion of the current correlation function.
The leading contribution to the OPE is the dimension four gluon condensate which suddenly drops in the vicinity of the deconfinement transition temperature therefore can be regarded as an effective order parameter. We showed that this behavior is related to the corresponding change of the spectral property of the charmonia and is consistent with lattice QCD measurement of the imaginary time correlators.
In this work, we further extend our prescription to utilize more realistic gluon condensates measured by lattice QCD with physical quark masses. By making use of the resonance gas model, we determine the gluon condensates at nonzero baryonic chemical potential and explore the charmonia at temperature and chemical potential which are accesible with current and future experiments. We show that the reduction of the charmonium mass will lead to change of particle ratio in the statistical hadronization scenario.

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