Quarkonia Melting Above Deconfinement

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We present a detailed analysis of quarkonium spectral functions and correlators from potential models. This analysis is the first one that describes lattice QCD data on correlators for all the charmonium and bottomonium channels. The analysis relies on a class of potentials constrained by the screening seen in lattice data on static quark-antiquark free energy [1]. While the correlation functions in the vector and pseudoscalar channel do not change much, we find no J/ψ and η_c states in the spectral functions. Only the 1S bottomonium ground state can survive deep in the deconfined phase. The analysis is first done in pure gluodynamics [1], for what extensive lattice data is available, and is extended to full QCD using preliminary lattice data in 2+1 flavor QCD with pion masses of 220 MeV from the RBC-Bielefeld Collaboration [2]. While for extreme choices of the potential that are still compatible with the lattice data, the spectral functions from the potential model show some bound state peaks, we find that color screening reduces the binding energies. This in turn makes it possible that the states dissociate by thermal activation [2]. Using estimates of the thermal activation rate and the calculated binding energies we give upper limits on the quarkonium dissociation temperatures in an equilibrated quark gluon plasma [2].
The more realistic situation, in which the quarkonium moves compared to the medium, is also discussed.

References

[1] Á. Mócsy and P. Petreczky, arXiv:0705.2559 [hep-ph], to be published in *Phys. Rev. D*
[2] Á. Mócsy and P. Petreczky, arXiv:0706.2183 [hep-ph], to be published in *Phys. Rev. Lett.*