Contribution ID: **335** Type: **Talk**

The in-medium heavy quark potential from quenched and dynamical lattice QCD

Wednesday, 25 June 2014 12:50 (20 minutes)

We present the latest results from two projects focused on determining the temperature dependence of the heavy quark potential from lattice QCD. The real and imaginary part of this real-time potential is obtained from the position and width of the lowest lying peak in the Coulomb gauge Wilson line correlator spectral function [1]. Spectral information is extracted from Euclidean time data using a novel Bayesian approach different from the Maximum Entropy Method, which has been shown to be capable of reproducing the relevant spectral features in mock data tests [2].

Since the determination of the imaginary part is related to the extraction of a spectral width, a large N_\tau is required for a reliable result. Hence the first project deploys anisotropic quenched lattices 32^3xN_\tau (b=7.0 x=3.5) with N_\tau=24,32,40,48,56,64,72,80,96, corresponding to 838.8MeV \geq T\geq 209.7MeV [3]. We find that fits to the Debye mass are in good agreement with prediction from HTL perturbation theory even at rather low temperatures T\gtrsim T_C.

The second project provides for the first time a Bayesian spectral function based determination of the heavy quark potential in dynamical lattice QCD [4]. We use the isotropic Nf=2+1 48^3x12 ASQTAD lattices of the HotQCD collaboration [5] and find a clean transition from a confining to a Debye screened Re[V], while the small Nt precludes us from making a quantitative statement about Im[V]. Close agreement between the real part of the potential and the color singlet free energies at high temperatures or small distances is observed.

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Session Classification: Nonzero temperature and Density

Track Classification: Nonzero Temperature and Density