



Contribution ID: 405

Type: **Contributed Talk**

Towards continuum results of the heavy quark momentum diffusion coefficient

Tuesday, 20 May 2014 15:40 (20 minutes)

Among quantities playing a central role in the theoretical interpretation of heavy ion collision experiments at RHIC and LHC are so-called transport coefficients. Out of those heavy quark diffusion coefficients play an important role e.g. for the analysis of the quenching of jets containing c or b quarks (D or B mesons) as observed at RHIC and LHC.

We report on a lattice investigation of heavy quark momentum diffusion within pure $SU(3)$ plasma above the deconfinement transition, with the quarks treated to leading order in the heavy mass expansion. We measure the relevant “colour-electric” Euclidean correlator and based on several lattice spacings perform the continuum extrapolation. This extends our previous study [1,2] progressing towards a removal of lattice artifacts and a physical interpretation of the results.

We find that the correlation function clearly exceeds its perturbative counterpart which suggests that at temperatures just above the critical one, non-perturbative interactions felt by the heavy quarks are stronger than within the weak-coupling expansion. Our results will be compared to heavy quark diffusion coefficients [3] obtained from charmonium vector correlation functions.

[1] A. Francis, O. Kaczmarek, M. Laine, M. Müller, T. Neuhaus and H. Ohno, “Towards the continuum limit in transport coefficient computations”, arXiv:1311.3759.

[2] A. Francis, O. Kaczmarek, M. Laine and J. Langelage, “Towards a non-perturbative measurement of the heavy quark momentum diffusion coefficient”, arXiv:1109.3941.

[3] H.T. Ding, A. Francis, O. Kaczmarek, F. Karsch, H. Satz and W. Soeldner, “Charmonium properties in hot quenched lattice QCD”, Phys.Rev.D86 (2012) 014509, arXiv:1204.4945.

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Session Classification: Heavy flavor

Track Classification: Open Heavy Flavour and Quarkonia