A lattice calculation of medium effects at short and long distances

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Abstract

Screening of external fields and generation of quasi-particle masses are the most outstanding properties of QGP. In general the perturbative study of these phenomena is of restricted validity. For a quantitative discussion of experimental signatures of QGP formation (e.g. J/psi suppression, dilepton production rate), however, it is important to make contact between this non-perturbative long distance physics and the perturbative short distance behavior. We approach this problem by analyzing the heavy-quark potential at distances $1/(16T) < r < T$, i.e down to distances $0.1fm$ on the lattice. This is relevant for the discussion of heavy quark spectroscopy. Lattice simulation were done in the quenched approximation of QCD on $48^3 \times 12$ and $64^3 \times 16$ lattices for $T_c < T < 3T_c$. We also discuss the momentum dependence of the temporal quark and gluon propagators which are relevant for the calculation of dilepton production rate.

Preprint submitted to Elsevier Preprint *20 December 2000*