Zero mode contribution to quarkonium correlators and heavy quark kinetics

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Heavy quarks play an important role as diagnostic tools of the quark gluon plasma and therefore it is important to learn as much as possible about their in-medium properties from lattice calculations. Recently it has been realized that the dominant source of the temperature dependence of quarkonium correlators is due to the zero mode contribution, i.e. to the contribution coming from the low energy ($\omega \ll T$) part of the corresponding spectral functions [1-2]. Therefore the zero mode contribution contains information on the transport properties of heavy quarks, namely effective masses, thermal velocity and heavy quark diffusion constant. In this contribution I am going to discuss the calculation of the zero mode contribution to quarkonium correlators using lattice data generated on isotropic as well as anisotropic lattices at several lattice spacings which cover the temperature interval $T = 1.06T_c - 3T_c$. From the zero mode contribution to the vector current correlators I extract the thermal velocity of heavy quarks which appears to be significantly smaller than the naive estimate in the entire temperature range. Furthermore, the thermal velocity shows a rapid drop close to the transition temperature. By comparing the obtained zero mode contribution in the scalar and axial-vector correlators to the gas of quasi-free heavy quarks I extract the effective heavy quark masses and possible consequences for the heavy quark dispersion relations. Finally, I plan to discuss to what extent current lattice data can constrain the value of the heavy quark diffusion constant. Preliminary results from these investigations have been reported in Refs. [3,4].

References

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