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Temperature Dependence of Heavy Quark Diffusion from 2+1-Flavor Lattice QCD

We present new lattice results for the heavy quark diffusion coefficient in 2+1 flavor QCD in the temperature range from 163 MeV to 10 GeV. Compared to previous lattice calculations with unphysical light quark masses, we consider near-physical values and a much wider temperature range. Our results for the spatially heavy diffusion coefficient near the crossover temperature are considerably smaller than the estimates obtained by comparing phenomenological models with experimental data and by T-matrix calculations, and are close to the AdS/CFT limit. At high temperatures, however, the spatial heavy diffusion coefficient increases and approaches the NLO weak coupling prediction within the estimated errors. We also find that the dependence of the spatial heavy quark diffusion coefficient on the heavy quark mass on the lattice is weaker compared to the model calculations. Above 10 GeV, lattice calculations lose access to the correlation functions, so in a sense our calculations represent the wider temperature range that can be reliably extracted with lattice techniques, and also represent the only available results for near-physical light quark masses.

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