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Intermediate mass dileptons as a speedometer of QGP equilibration

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We compute the spectrum of dileptons produced by the quark-gluon plasma in the intermediate mass range $1 < M < 5$ GeV using state-of-the-art QCD kinetic theory. Our calculation takes into account the anisotropy of the quark and gluon momentum distributions at early times, as well as the underpopulation of quarks relative to gluons. The resulting dilepton spectrum satisfies approximate transverse mass scaling, up to a modest breaking which results from the momentum anisotropy. We discuss the dependence of dilepton production on system size, centrality, and collision energy, on the basis of dimensional arguments. Our main result is that the viscosity to entropy ratio, which controls the equilibration time of the quark-gluon plasma, can be extracted from the inverse slope of the transverse mass spectrum. We evaluate the background from the Drell-Yan process and argue that future detector developments can suppress the additional background from semileptonic decays of heavy flavors.

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