APR08-2008-000377

Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

Modeling strongly coupled quark gluon plasmas: hydro vs transport vs general relativity

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The discovery of near perfect fluid flow and very high jet opacity in nuclear collisions at 200 AGeV at RHIC/BNL have challenged traditional weak coupling perturbative QCD modeling of quark gluon plasmas. A critical assessment of current theoretical uncertainties facing competing approaches based on relativistic hydrodynamics, quasi-parton transport dynamics, and novel string theory inspired general relativity modeling will be presented. Special focus will be on identified (charm and bottom) heavy quark jets that will serve as powerful probes in upcoming RHIC and LHC experiments to better constrain the initial conditions as well as energy loss mechanisms leading to rapid equilibration in ultra-relativistic nuclear collisions.