

Dissipative Hydrodynamics and Heavy Ion Collisions

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We briefly review the recent progress in causal dissipative hydrodynamics. In causal dissipative hydrodynamics, dissipative fluxes are treated as extended thermodynamic variables and relaxation equations for the dissipative fluxes are solved simultaneously with the energy-momentum conservation equations. We discuss in detail the evolution and subsequent particle production in causal dissipative hydrodynamics. Dissipation opposes the expansion and under similar conditions, lifetime of the fluid is extended. Compared to ideal hydrodynamics, in dissipative hydrodynamics large p_T particle production is enhanced and elliptic flow is reduced. With the ADS/CFT lower limit of viscosity ($\eta/s = 1/4\pi$), dissipative hydrodynamics excellently reproduces the experimental data on the transverse momentum spectra of identified particles in all the centrality ranges of Au+Au collisions. Contrary to ideal dynamics, where the experimental p_T spectra are reproduced only upto $p_T \approx 1.5$ GeV, minimally viscous dynamics reproduces the spectra throughout the experimental p_T range. Minimally viscous hydrodynamics also reproduces the elliptic flow much better than in ideal hydrodynamics. In mid-central Au+Au collisions, experimental elliptic flow data are explained up to $p_T \approx 3$ GeV. However, in very central/peripheral collisions, elliptic flow is under/over predicted. It also appears that the saturation of elliptic flow at large p_T is beyond the viscous dynamics.