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Modeling heavy ion collisions with CHIMERA

Precisely determining the essential properties of QGP, such as the ratio of shear viscosity to entropy density, eta/s, initial temperature, T_{init}, and energy density remains among the greatest challenges in the field of heavy ion physics.

To constrain these properties we have developed a software framework CHIMERA that is designed to perform statistical evaluation of multiple QGP signatures by comparing results from our multi-stage hydrodynamics/hadron cascade model of heavy ion collisions to the key soft observables (HBT, elliptic flow, spectra) measured at RHIC and LHC. All relevant data from different experiments are conveniently compiled into a single format. The unique feature of CHIMERA is that it utilizes both statistical and systematic uncertainties.

The hydrodynamics/hadron cascade model used in the framework incorporates different initial state conditions, pre-equilibrium flow, the UVH2+1 viscous hydro model, Cooper-Frye freezeout, the UrQMD hadronic cascade model, and the Correlation After Burner (CrAB). To test the sensitivity of the observables to the equation of state (EoS), we use several different EoS in the hydrodynamic evolution, including those derived from the hadron resonance gas model and lattice QCD.

For a particular selection of initial conditions and pre-equilibrium flow we consider T_{init}-eta/s grid. For each grid point and a particular observable we evaluate the extent of agreement between the model and experimental data by calculating chi-squared variable. The latest CHIMERA results are presented.

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