Contribution ID: **432**   Type: **Oral**

Revealing the collision energy dependence of η/s in RHIC-BES Au+Au collisions using Bayesian statistics

Tuesday 7 February 2017 16:50 (20 minutes)

Significant progress has been made in the past few years in determining QGP properties, such as the temperature dependence of shear viscosity over entropy density ratio η/s. However, η/s might depend also on the baryochemical potential μ_B, as has been hinted at in a recent beam energy scan study [1].

It is generally difficult to determine the uncertainties associated with the extracted values of QGP properties, as the computational models used in the analysis typically have numerous interconnected parameters. We utilize novel optimization techniques based on Bayesian statistics and Markov Chain Monte Carlo (MCMC) methods to calibrate the computational model to data. The end result of such an analysis is a conditional probability distribution, which provides a set of data-calibrated parameter values with a full uncertainty quantification. Gaussian process emulators are also used in the analysis to overcome its significant computational expense and predict model results for all needed input parameter combinations. These statistical methods have already been applied with great success to Pb+Pb collisions at the LHC [2].

In this presentation we investigate the μ_B dependence of η/s, with collision energy as the control parameter, by performing a Bayesian analysis on RHIC beam energy scan data, applying the same UrQMD + viscous hydrodynamics hybrid model as in [1], to verify if the reported differences between the energies remain significant even when uncertainties are included. We determine the probability distributions for the model parameters for Au+Au collisions at 19.6, 39, and 62.4 GeV; the results indicate that while the uncertainty on the optimal value of η/s does increase at lower collision energies, the probability for a large value of the ratio is much higher at 19.6 GeV with the median value 0.24, compared to 62.4 GeV with median value 0.07 [3]. Moreover, we also find that multi-strange hadron yields provide significant constraints on the switching condition between the hydrodynamic evolution and the hadron transport afterburner and thus are essential for a proper model-to-data comparison [4].

[1] Iu. Karpenko et al., PRC 91 6, 064901 (2015);
[2] J. E. Bernhard et al., PRC 94 2, 024907 (2016);
[3] S. A. Bass, talk at CPOD2016 (arXiv:1610.00590);
[4] J. Auvinen et al., talk at SQM 2016 (arXiv:1610.00589).

Preferred Track

Baryon-Rich QCD Matter and Astrophysics

Collaboration

Not applicable

Author: AUVINEN, Jussi (Duke University)

Presenter: AUVINEN, Jussi (Duke University)

Session Classification: Parallel Session 4.1: Baryon-Rich QCD Matter and Astrophysics (I)

Track Classification: Baryon-Rich QCD Matter and Astrophysics