

Quark-gluon plasma shear viscosity at RHIC and the LHC

Thursday 15 November 2012 13:30 (25 minutes)

In this talk, we will review recent progress on extracting the QGP viscosity at RHIC and LHC energies, obtained from viscous hydrodynamics and viscous hydrodynamics + hadron cascade (VISHNU) hybrid model, which includes the following aspects:

- a) Using VISHNU [1], We extract the QGP shear viscosity at RHIC energies from the integrated elliptic flow data with a reliable uncertainty estimate. We show that, with the QGP viscosity extracted in [2], VISHNU yields an excellent description of all soft-hadron data from Au+Au collisions at top RHIC energy [3].
- b) Extrapolating to Pb+Pb collisions at the LHC, and comparing with recent experimental results, we show that the LHC data are again well described by VISHNU, with approximately the same constant QGP viscosity as at RHIC energies [4] We then discuss the recent investigations of the temperature dependent QGP shear viscosity [4,5].
- c) We discuss the recent development on initialization models (such as color charge fluctuations, initial flow fluctuations, etc.[6]), and evaluate their influence on the extracted value of the QGP viscosity [7].
- d) We discuss recent viscous hydrodynamic calculations from different groups (including simultaneously fitting v_2 and v_3 at LHC energies, higher-order flow harmonics at ultra-central collisions, event plan correlations and the systematic χ^2 fitting of the experimental data [8]), and then discuss the future prospects of the VISHNU calculations for even precise extraction of the QGP shear viscosity.

References:

- [1] H. Song, S. Bass and U. Heinz, Phys. Rev. C83, 024912 (2011).
- [2] H. Song, S. Bass, U. Heinz, T. Hirano and C. Shen, Phys. Rev. Lett. 106, 192301 (2011).
- [3] H. Song, S. Bass, U. Heinz, T. Hirano and C. Shen, Phys. Rev. C83, 054910 (2011).
- [4] H. Song, S. Bass and U. Heinz, Phys. Rev. C83, 054912 (2011).
- [5] C. Shen, U. Heinz, P. Huovinen and H. Song, Phys. Rev. C84, 044903 (2011); H. Niemi, G. S. Denicol, P. Huovinen, E. Molnar and D. H. Rischke, Phys. Rev. Lett. 106, 212302 (2011).
- [6] B. Muller and A. Schafer, Phys. Rev. D85, 114030 (2012); B. Schenke, P. Tribedy and R. Venugopalan, arXiv:1202.6646 [nucl-th]; L. Pang, Q.Wang and X. -N.Wang, arXiv:1205.5019 [nucl-th].
- [7] H. Song, arXiv:1207.2396 [nucl-th].
- [8] Z. Qiu, C. Shen and U. Heinz, Phys. Lett. B707, 151 (2012); Z. Qiu and U. W. Heinz, arXiv:1208.1200 [nucl-th]; R. Soltz, et. al, arXiv:1208.0897 [nucl-th]; M. Luzum, QM2012 talk.

Keywords

QGP, hydrodynamics, viscosity

Author: Dr SONG, Huichao (The Ohio State University)

Presenter: Dr SONG, Huichao (The Ohio State University)

Session Classification: Parallel 1A (Chair Xiaochun He)