



Contribution ID: 36

Type: **parallel**

## Anomaly-induced transport in heavy-ion collisions

Thursday 7 August 2014 15:00 (20 minutes)

Anomaly-induced transport effects, like the chiral magnetic effect or the chiral separation effect, have recently attracted much attention. These effects represent the existence of dissipationless vector and axial currents along the magnetic field and are expected to occur in ultra-relativistic heavy-ion collisions. It has been pointed out that the coupling between the chiral magnetic effect and the chiral separation effect provokes a novel type of gapless collective excitation in the plasma, called chiral magnetic wave (CMW).

The experimental search for anomaly-induced transports in heavy-ion collisions is now ongoing. Since the CMW leads to an electric charge quadrupole deformation in the quark-gluon plasma (QGP) created in heavy-ion collisions, the elliptic flow parameter  $v_2$  would be charge-dependent, which can be considered as a signal of anomalous transports [1]. The STAR Collaboration observed such a charge dependent elliptic flow for pions  $\Delta v_2(\pi_{\pm})$  [2]. This result seems to be consistent with the prediction from a simple model [1], in which propagation of non-interacting waves under spatially and temporally uniform temperature and homogeneous magnetic field is considered. However, since the QGP created in heavy-ion collisions is drastically expanding, it is necessary to describe the space-time evolution of the QGP together with that of electromagnetic fields in order to assess the contribution from anomalous transports.

In this study, we numerically solve anomalous hydrodynamic equations and apply it to the dynamics of heavy-ion collisions [3]. We develop a numerical code which is applicable to the description of the QGP under arbitrary external electromagnetic fields. We describe the propagation of the CMW in the expanding QGP under spatially and temporally inhomogeneous external electromagnetic fields. We analyze the charge-dependent elliptic flow  $v_2^{\pm}$  and discuss possible implications for experimental observations of anomalous transport effects.

### References:

- [1] Y. Burnier, D. E. Kharzeev, J. Liao, and H. -U. Yee, Phys. Rev. Lett. 107, 052303 (2011)
- [2] G. Wang [STAR Collaboration], Nucl. Phys. A904-905 2013, 248c (2013)
- [3] M.Hongo, Y. Hirono, T. Hirano, [arXiv: 1309.2823]

**Author:** HONGO, Masaru (The University of Tokyo)

**Co-authors:** HIRANO, Tetsufumi (Sophia Univ); HIRONO, Yuji (Stony Brook University)

**Presenter:** HONGO, Masaru (The University of Tokyo)

**Session Classification:** Initial state physics