QUARK MATTER 2015
Sep. 27 – Oct. 3, 2015 Kobe, Japan

Contribution ID: **544** Type: **Contributed talk**

What flows in the chirally anomalous transport?

Monday, 28 September 2015 12:35 (20 minutes)

The chirally anomalous transport including the chiral magnetic effect seems to get established from the theoretical side, but some theorists address serious concerns about the physical interpretation of $\langle\Omega|$ $boldsymbol{j}|\Omega\rangle$. In my talk I will emphasize how the conventional scenario can be verified from the dynamical process of the particle production.

If $|\Omega\rangle$ is an equilibrated static state, a current which is a real-time phenomenon, cannot flow and $\langle\Omega|$ $boldsymbol{j}|\Omega\rangle$ is not a current but should be a polarization. Such an interpretation is manifest for the chiral separation effect. Besides, in a quick derivation of the chiral magnetic effect using the Chern-Simons-Maxwell theory, the anomalous current appears in the same way as the Maxwell's displacement current, and we all know that the displacement current is a source of the magnetic field but there is no flow of electric carriers. Logically, it is possible that $\langle\Omega|$ $boldsymbol{j}|\Omega\rangle$ is also such a current containing no flow of charged particles, which is actually the case if the chiral magnetic current is formulated in the chiral perturbation theory.

I would however, emphasize that the genuine current generation occurs at the same time as the particle production with glasma flux tubes that locally violate P- and CP-symmetries together with an external magnetic field. The distribution function in momentum space is dynamically determined by microscopic processes of the particle production and I will present some results from the numerical simulation. A non-trivial observation found in the numerical simulation includes a quantitative estimate of the response time of the system until the anomalous current starts growing up after the switch-on of the background fields, which has a practically important implication for the detection of the physical observables sensisive to the chrally anomalous transport in experiments.

Primary author: FUKUSHIMA, Kenji (The University of Tokyo)

Presenter: FUKUSHIMA, Kenji (The University of Tokyo)

Session Classification: New Theoretical Development I

Track Classification: New Theoretical Developments