

# World-line approach to chiral kinetic theory

*Wednesday 9 August 2017 15:00 (30 minutes)*

In heavy-ion collisions, an interesting question of phenomenological relevance is how the chiral imbalance generated at early times persists through a fluctuating background of sphalerons in addition to other “non-anomalous” interactions with the QGP. To address this question, we construct a relativistic chiral kinetic theory using the world-line formulation of quantum field theory. This permits an intuitive and elegant interpretation of chiral kinetic dynamics in terms of a supersymmetric world-line action for spinning, colored, Grassmanian point particles in external backgrounds. We outline how Berry’s phase arises in this framework, and how its effects can be clearly distinguished from those arising from the chiral anomaly.

We will outline how this framework can be matched to classical statistical simulations at early times and to anomalous chiral hydrodynamics at late times. Finally, we will briefly discuss the applications of our framework to the transport of chiral fermions in other many-body contexts.

References:

- [1] The chiral anomaly, Berry’s phase and chiral kinetic theory, from world-lines in quantum field theory, N. Mueller and R. Venugopalan, arXiv:1701.03331 [hep-ph], submitted to Phys. Rev. Lett.
- [2] World-line construction of a covariant chiral kinetic theory, N. Mueller and R. Venugopalan, arXiv:1702.01233 [hep-ph], submitted to Phys. Rev. D

**Author:** Dr VENUGOPALAN, Raju (BNL)

**Co-author:** Mr MUELLER, Niklas (University of Heidelberg)

**Presenter:** Dr VENUGOPALAN, Raju (BNL)

**Session Classification:** Parallel 1

**Track Classification:** Parallel Session