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Chiral and Weibel Instabilities in Quark Gluon Plasma

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Kinetic theory can be applied to understand a variety of many body problems arising in various branches of physics. However, it leaves out an important class of phenomena requiring triangle anomaly. Recently, using Berry curvature corrections, Son and Yamamoto have developed a modified kinetic theory that incorporate triangle anomalies and the chiral magnetic effect (CME). They have shown that the modified kinetic theory gives the same results for the parity odd correlation function as computed from the
perturbation theory in the next to leading order hard dense loop approximation. Using this modified kinetic theory it has also been shown that the presence of net chiral imbalance can lead to the instabilities in the transverse branch of the dispersion relation in the quasi-static limit. Such an instability is known as chiral instability. However in many realistic situations, e.g. plasma physics, condensed matter physics and quark gluon plasma created in heavy ion collisions, it is important to consider equilibrium distribution function to be anisotropic in the momentum space. It is well known that momentum anisotropy can leads to the instabilities known as Weibel instabilities. In the seminar I shall discuss modified kinetic theory to describe anisotropic chiral plasma and show how the two instabilities (Chiral and Weibel) can occurs and compete with each other in the quasi-static limit.

References:
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