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Dynamical evolution of eletromagnetic field in out-of-equilibrium Quark-Gluon Plasma

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In high energy heavy-ion collisions, the pre-equilibrium stage of the quark-gluon plasma (QGP) is the most crucial ingredient in the estimate of electromagnetic (EM) fields, especially for the lifetime of the magnetic field that plays a key role in the chiral magnetic effect (CME).

In this talk, we present a theoretical estimate for the realistic dynamical evolution of EM fields in the pre-equilibrium QGP meidum at RHIC and the LHC energies, from the solution of coupled Boltzmann equation for quarks and gluons and Maxwell equation the EM fields. The Boltzmann equation, with a diffusion approximation applied with respect to QCD scatterings among quarks, anti-quarks and gluons, has been used to describe a 1D expanding QGP evolving from far from equilibrium towards hydrodynamization [1]. When EM fields are involved, splittings between the out-of-equilibrium quark and anti- quark distributions are induced. Accordingly, an effective electric conductivity can be obtained in the pre-equilibrium QGP, which determines the dynamical evolution of EM fields. The dynamical decay of EM fields is found to be delayed comparing to the case of vacuum, but still faster than the expectation in a QGP in equilibrium [2].

[1]N.Tanji and R.Venugopalan, Phys.Rev.D 95, 094009(2017)
[2]L.McLerran and V. Skokov, Nucl.Phys.A929, 184(2014)

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