

Prospects to probe early dynamics and magnetic field measuring D-meson directed flow in Pb-Pb collisions with ALICE

Under extreme conditions of temperature and pressure, Quantum Chromodynamics predicts the formation of the Quark-Gluon Plasma (QGP). Heavy-ion collisions at ultra-relativistic energies at the Large Hadron Collider produce the optimal conditions to form the QGP in the laboratory. The hot QCD matter is produced within an unprecedented strong magnetic field, whose properties and effects have not been yet explored. The magnetic field is created early in heavy-ion collisions by the charged spectator nucleons from the incident nuclei that do not participate in the collision. The charm quark is an ideal candidate to probe the properties of this magnetic field, because its formation time is comparable to the time at which the magnetic field is expected to attain its maximum and, in addition, the kinetic relaxation time of charm is similar to the QGP lifetime. Measuring the directed flow of D mesons will give access to early time dynamics, which are the least understood till now.

The status and perspectives of the measurement of the D-meson directed flow in Pb-Pb collisions at 5.02 TeV with ALICE will be presented. This measurement will provide observation of an effect of the magnetic fields produced in heavy-ion collisions, which will shed light on fundamental and unexplored properties of the QGP (e.g. conductivity and initial density) and it will allow to constrain theoretical models.

Summary

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