

Investigation of charm hadronisation and early magnetic field in ultrarelativistic heavy-ion collisions via D^{*+} -meson spin alignment with ALICE

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The production of hadrons containing charm and beauty quarks has been extensively studied in hadronic collisions, improving the understanding of the hadronisation mechanisms. One aspect of the transition of the heavy quark to the final-state hadron not yet settled regards the spin properties of particles produced in the quark hadronisation. In proton–proton (pp) collisions, the observation of a polarisation of heavy-flavour vector mesons would imply a spin-dependent fragmentation function of the fragmenting heavy quark.

Heavy quarks are produced at the initial stage of heavy-ion collisions. In the presence of a large angular momentum and initial magnetic field, they can be polarised. The quark polarisation is expected to be transferred to the hadron during the hadronisation process, and it can be probed by measuring the ρ_{00} parameter of the spin density matrix element of spin-1 hadrons.

We will present the final measurement of the ρ_{00} of D^{*+} mesons in pp collisions obtained with data collected by ALICE during the LHC Run 2, and preliminary results on the extension to a wider transverse-momentum interval with the first samples collected in Run 3. The measurement is performed for promptly produced D^{*+} mesons and those originating from B-meson decays.

The first measurement of prompt D^{*+} -meson ρ_{00} in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV will also be presented and compared with the J/ψ polarisation measurement.

Category

Experiment

Collaboration

ALICE

Primary authors: COLLABORATION, ALICE; LI, Mingze (Central China Normal University CCNU (CN))

Presenter: LI, Mingze (Central China Normal University CCNU (CN))

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