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Search for the quark flavor dependence of the Chiral Magnetic Effect through charge-dependent correlations with identified hadrons at ALICE

Monday 7 April 2025 18:00 (20 minutes)

The interplay between the chiral anomaly and strong magnetic or vortical fields generated in off-central heavy-ion collisions is theorized to produce anomalous chiral effects in the quark–gluon plasma, such as the Chiral Magnetic Effect (CME) and the Chiral Vortical Effect (CVE). These effects have been actively studied by several experiments for over a decade as they could shed light on the topological structure of vacuum gauge fields and reveal potential local violations of P and/or CP symmetries in strong interactions. Although recent developments have shown that the signals are small, various underlying mechanisms remain unclear, including the quark flavor dependence and its contributions to both the signal and the background.
In this talk, we extend the ALICE measurements of charge-dependent two particle correlations from inclusive hadrons to identified hadrons (pions, kaons, and protons) in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}}$ = 5.36 TeV. Together with previous results of Λ–proton correlations aimed at searching for the CVE, we discuss several possible background mechanisms, including local charge conservation, coalescence, and flow. These studies offer new insights into the search for anomalous chiral effects and enhance our understanding of collectivity in heavy-ion collisions.

Category

Experiment

Collaboration (if applicable)

ALICE

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