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Studying magnetic fields in heavy-ion collisions using net-proton fluctuations with ALICE

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Fluctuations of conserved charges, such as baryon number, electric charge, and strangeness, are a unique tool for studying the phase diagram of strongly interacting matter. The cumulants of the distributions of the conserved charges in heavy-ion collisions can be related to the equation of state in lattice QCD (LQCD), making first-principles calculations accessible in the experiment. Recent results from LQCD suggest that the thermodynamic susceptibilities, which are related to the experimentally measurable cumulants of the conserved charges, are significantly affected by strong magnetic fields.

In this talk, measurements of the second-order cumulants of the (anti-)proton and net-proton numbers in Pb–Pb collisions with the ALICE detector at the LHC are presented. The moments of the net-proton number, used as a proxy for the baryon number, are calculated using the Identity Method to avoid the problem of misidentification. The new results cover a large momentum acceptance and the centrality range. The ratios of the cumulants in peripheral to central events give insight into the magnetic fields produced in the heavy-ion collisions.

Category

Experiment

Collaboration (if applicable)

ALICE

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