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Theory and Phenomenology of Relativistic Heavy-Ion Collisions

In high-energy physics, the study of the Theory and Phenomenology of Relativistic Heavy-Ion Collisions examines how atomic nuclei behave when they collide at exceedingly fast speeds, nearly at the speed of light. These collisions produce rich observable signatures that can provide insight into the properties of quark-gluon plasmas (QGPs), a state of matter believed to exist at high temperatures and densities. This study will focus on understanding the various stages of Relativistic Heavy-Ion Collisions (RHIC), as well as the signatures associated with some of the stages. One of the key signatures of QGP formation is the suppression of J/ψ mesons, the bound states of charmed and anti-charmed quarks. This suppression is based on the strong forces between quarks and antiquarks being screened by the hot and dense medium produced by the collisions. The degree of J/ψ suppression can provide information about the temperature and density of the QGP. The increase in strangeness production is another key indicator of QGP formation. Strangeness is a characteristic of a few subatomic particles, including the strange quark, and it is not preserved in strong interactions. In QGP, the presence of many strange quarks and antiquarks is thought to increase the abundance of strange particles.

Overall, the research on these signatures of heavy ion collisions sheds light and provides important insights into the properties of QGPs and how matter behaves in extreme conditions. Furthermore, the study will review on how recent high energy heavy ion experiments at RHIC and LHC are consistent with the production of the quark gluon plasma in high energy Pb+Pb collisions.

Abstract Category

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