

Study of Quark-Gluon Plasma in Relativistic Heavy-Ion Collisions

The study of quark-gluon plasma (QGP) is one of the most important research areas in modern high-energy physics. According to Quantum Chromodynamics (QCD), strongly interacting matter undergoes a phase transition from hadronic matter to a deconfined state of quarks and gluons at extremely high temperatures and energy densities. Such conditions can be recreated in laboratories through relativistic heavy-ion collisions at facilities such as the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC). This research paper presents a detailed discussion of the theoretical foundations of QGP, experimental methods used in heavy-ion collisions, and key signatures such as collective flow, jet quenching, and strangeness enhancement. The results provide compelling evidence for the formation of a strongly interacting, nearly perfect fluid known as the quark gluon plasma.

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