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Exploring quantum chromodynamics phase transitions at RHIC and LHC

The Standard Model of particle physics describes the fundamental constituents of matter, leptons and quarks. The interactions amongst quarks are described by Quantum Chromodynamics (QCD), which is the theory of strong interactions, an integral part of the Standard Model. Under extreme conditions of temperature and/or energy density, normal hadronic matter goes through a phase transition to the QCD matter, consisting of de-confined quark-gluon plasma (QGP). The QGP might have been the primordial matter, which filled the Universe until a few microseconds after the Big Bang. The formation of QGP and the nature of the phase transition have been explored at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory and the Large Hadron Collider (LHC) at CERN, by colliding heavy-ions at ultra-relativistic energies. The QGP discovery and present understandings of the QCD phase diagram will be discussed based on experimental data, especially those from the STAR experiment at RHIC and ALICE at LHC, where the Indian groups have made major contributions.