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Results from the Beam Energy Scan program at STAR

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A significant goal of high-energy nuclear collisions is to determine the Quantum Chromodynamics (QCD) phase diagram for the strongly interacting matter. The most experimentally accessible way to characterize the QCD phase diagram is to scan in temperature (T) and the baryon chemical potential (\mu_B). The hadronic matter exists in a state where the fundamental constituents, quarks and gluons, are confined in composite particles. At high energy densities, QCD predicts a phase transition from a hadronic gas to a state of deconfined matter - the quark-gluon plasma (QGP). In hot and dense state QCD matter is melted into their constituent quarks, and the strong interaction becomes dominant. In addition, a chiral phase transition is predicted. QCD-based models predict a first-order phase transition and the existence of a critical point (CP) at higher \mu_B. However, the exact locations of the first-order phase transition and the CP are still unknown. Experiments at the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC) have provided compelling evidence of the formation of a QGP matter close to \mu_B = 0. In order to study the QCD phase structure experimentally as a function of T and \mu_B, the Beam Energy Scan (BES) program at RHIC was proposed. Several collision energies are used to create systems described by various initial coordinates of T and \mu_B. The experimental goals of the BES program are the following: search for threshold energies for the QGP signatures, search for signatures of a first-order phase transition, search for a CP, and search for possible signatures of chiral symmetry restoration. In this talk we will present the current status of the BES program at the STAR experiment.

In-person participation

No

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