

The RHIC Beam Energy Scan Phase II Physics and Upgrades

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The exploration of the QCD phase diagram has been one of the main drivers of contemporary nuclear physics. The Relativistic Heavy Ion Collider (RHIC) at BNL is uniquely suited for this task through its Beam Energy Scan (BES) program which allowed for a large range in baryon chemical potential μ_B as was successfully demonstrated after the completion of Phase 1 in 2014. Phase 2 of the BES at RHIC is scheduled for 2019–2020 and will explore with precision measurements the intermediate-to-high μ_B region of the QCD phase diagram, 5 energies $\sqrt{s_{NN}}$ from 19.6 to 7.7 GeV in the collider mode and 8 energies $\sqrt{s_{NN}}$ from 7.7 to 3.0 GeV in the fixed-target mode. Some of the key measurements are: the net-protons kurtosis that could pinpoint the position of a critical point, the directed flow that might prove a softening of the EOS, and the chiral restoration in the dielectron channel. These measurements will be possible with an order of magnitude better statistics provided by the electron cooling upgrade of RHIC and with the detector upgrades planned to improve STAR's acceptance. The talk will review the BES Phase-2 program and the physics opportunities enabled by these upgrades.

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