

Recent results from STAR beam energy scan II program

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Abstract

STAR detector at the Relativistic Heavy Ion Collider (RHIC) has successfully completed data taking for the second phase of the Beam Energy Scan (BES-II) program in year 2021. During this program STAR has collected experimental data on Au-Au collisions in the energy range from $\sqrt{s_{NN}} = 3$ to 13.7 GeV in the fixed target mode and from $\sqrt{s_{NN}} = 7.7$ to 54.4 GeV in the collider mode. Major detector upgrades have greatly increased detector capabilities to track charged particles produced in the collisions. This energy range covers a broad region in the QCD phase diagram, reaching up to baryon chemical potential of 750 MeV. Measurements in this region will help understand nature of the phase transition from hadron matter to the QGP phase and search for the existence of the QCD critical point.

A wide range of results on particle production, anisotropic flow, correlations and other topics has been obtained from BES-II data. New results on the collective phenomena like test of number of constituent quarks (NCQ) scaling at low collision energies and cumulant ratio of net-proton multiplicity distribution have been measured with high precision. Investigating effects at low collision energies can help to track the effects of the critical point and location of the phase boundary. Precise analysis of variety of effects like energy dependence of coalescence parameters and hypernuclei lifetime measurements are presented. Also, new data on global polarization and spin alignment are presented.