Nuclear modification factor of inclusive charged particles in Au+Au collisions at $\sqrt{s_{NN}} = 7.7$-27 GeV with the STAR experiment

Author: Alisher Aitbayev[1]

[1] *Joint Institute for Nuclear Research (JINR)*

Corresponding Author: a.ali.24@mail.ru

The Quantum Chromodynamics (QCD) phase diagram, characterized by temperature (T) and baryon chemical potential (μ_B), features a transition from hadronic matter to a deconfined quark-gluon plasma (QGP). The Beam Energy Scan (BES) program at the Relativistic Heavy Ion Collider (RHIC) explores this phase structure by systematically varying the collision energy of Au+Au collisions, with a key focus on locating the QCD critical point.

During the first phase (BES-I, 2010–2014), the STAR experiment measured the nuclear modification factor (R_{CP}) of inclusive charged particles in Au+Au collisions in energy range $\sqrt{s_{NN}}$ = 7.7–27 GeV. In 2018, the STAR experiment initiated the second phase of the BES program (BES-II), which has a tenfold increase in statistics compared to the first phase. This will enable better precision R_{CP} measurements. By 2021, STAR collected 100 million Au+Au events at $\sqrt{s_{NN}}$ = 7.7 GeV, two orders of magnitude larger than the BES-I dataset at this energy.

In this talk, we present new measurements of charged-particle production and R_{CP} from the high-statistics BES-II data at $\sqrt{s_{NN}}$ = 7.7 GeV, comparing them with BES-I results. We further evaluate theoretical descriptions using UrQMD and hydrodynamic (SMASH+vHLLE) model predictions, testing their description of the experimental observations. By extending the analysis to higher transverse momenta (p_T), we probe potential jet quenching effects and assess implications for QGP formation and properties at lower collision energies.