Production of pions, kaons, and (anti-)protons in Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ GeV at RHIC

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Abstract

Quantum Chromodynamics (QCD) predicts the existence of a deconfined state of matter called Quark-Gluon Plasma (QGP) at sufficiently high-temperature and/or high-energy density. In order to investigate the phase diagram of QCD matter, the first phase of the Beam Energy Scan (BES-I) program started at the Relativistic Heavy Ion Collider (RHIC) in the year 2010. In continuation of BES-I, a high statistics dataset from Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ GeV was recorded by the STAR experiment at RHIC in the year 2017. The transverse momentum ($p_T$) spectra of identified hadrons are essential to study the bulk properties such as integrated yield ($dN/dy$), average transverse momenta ($\langle p_T \rangle$), particle ratios, and freeze-out parameters of the medium produced. The systematic study of bulk properties can shed light on the particle production mechanism in heavy-ion collisions.

In this talk, we will present the $p_T$-spectra of hadrons ($\pi^\pm$, $K^\pm$, p, and $\bar{p}$) at mid-rapidity ($|y| < 0.1$) in Au+Au collisions at $\sqrt{s_{NN}} = 54.4$ GeV. The centrality dependence of $dN/dy$, $\langle p_T \rangle$, particle ratios, chemical freeze-out and kinetic freeze-out parameters will also be presented and compared with the measurements at other beam energies.