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Exploring Strangeness Production across Beam Energies in Au+Au Collisions at STAR

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Strangeness production has been suggested as a sensitive probe of the early dynamics of the deconfined matter created in heavy-ion collisions. The measurements of the colliding energy dependence of (multi-)strange baryon-to-meson ratios can provide us with insights into the hadronization mechanism, which will contribute to the search for the energy threshold of the production of the Quark Gluon Plasma (QGP), one of the main goals of the Beam Energy Scan (BES) program at RHIC. The transverse momentum distribution of strange hadron production can be utilized to extract the features of the medium, such as the radial flow strength and the kinetic freeze-out temperature, which are also sensitive to QGP formation. Moreover, the rapidity density of (anti-)strange baryons may shed light on the baryon stopping mechanism. Recent datasets collected by STAR in Au+Au collisions at $\sqrt{s_{\rm NN}}$ = 7.7, 9.2, 11.5, 14.6, 17.3 and 19.6 GeV from the Beam Energy Scan II program provide us with an opportunity to carry out precise measurements of the observables mentioned above.

In this talk, we will present new measurements of strange hadron production in Au+Au collisions at $\sqrt{s_{\rm NN}}$ = 7.7, 9.2, 11.5, 14.6, 17.3, 19.6 GeV, including transverse-momentum spectra, rapidity spectra, nuclear modification factors, the averaged transverse momentum ($\langle p_T \rangle$) and mass ($\langle m_T \rangle - m_0$), antibaryon-to-baryon ratios and baryon-to-meson ratios. In particular, precise measurements of the energy and centrality dependence of Ω/ϕ ratios in Au+Au collisions at different energies will also be presented. These results will be compared with theoretical model calculations and the corresponding physics implications will be discussed.

Authors: STAR COLLABORATION; XU, Xiongxiong (Tsinghua University)

Presenter: XU, Xiongxiong (Tsinghua University)

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