Strangeness production in Au+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 27$ and 54.4 GeV at STAR

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Strangeness production is a classic tool to study properties of the quark gluon plasma (QGP). The ratios of particle yields involving strange particles are often utilized to study various properties of nuclear matter, such as the strangeness chemical potential and the chemical freeze-out temperature. In particular, the yield ratios $N_K N_\Xi / N_\phi N_\Lambda$ and $N_K N_\Omega / N_\phi N_\Xi$ are suggested in Ref. [1] to be sensitive to strange quark density fluctuations. Studying this ratio as a function of collision energy may provide a unique probe to explore the vicinity of the critical endpoint in heavy ion collisions via the fluctuation of strange quark densities. In addition, studying the central-to-peripheral nuclear modification factor R_{CP} of strange hadrons may provide insight into strangeness production mechanisms in nuclear collisions.

In this poster, we will present new measurements of strange baryons $\Lambda(\bar{\Lambda})$, $\Xi(\bar{\Xi})$ and $\Omega(\bar{\Omega})$ at mid-rapidity using $\sqrt{s_{\mathrm{NN}}} = 27$ and 54.4 GeV Au+Au collisions taken in years 2017 and 2018 by STAR, respectively. With the large data samples (a factor of 10 more minimum bias events compared to previous runs at similar collision energies) and supervised machine learning techniques, we can extend the previous measurements to lower and higher p_T regions that have never been explored by STAR. Collision centrality and transverse momentum dependence of the yields will be discussed and compared with thermal calculations. The yield ratios $N_K N_\Xi / N_\phi N_\Lambda$ and $N_K N_\Omega / N_\phi N_\Xi$ at $\sqrt{s_{\mathrm{NN}}} = 27$ and 54.4 GeV will be presented and compared with those at other collision energies, and the physics implications will be discussed.

[1] EPJ Web of Conferences 171, 03002 (2018)