

Study of strange matter in STAR with express analysis

Ivan Kisel
(for the STAR Collaboration)

The STAR experiment provides a perfect machinery for studying strange matter for more than two decades. Recently, we developed the express stream procedure, which allows online monitoring of the collected physics data. The high quality of express calibration and reconstruction provides a unique possibility to run the express production and observe almost in real time strange particles including mesons, hyperons, resonances and even hypernuclei.

The STAR Beam Energy Scan II program, including fixed target Au+Au collisions taken in 2018–2021, is particularly suited to study hypernuclei. Light hypernuclei are expected to be abundantly produced in low energy heavy-ion collisions. Measurements of hypernuclei production mechanism and their properties will provide information on the hyperon-nucleon interactions, which are essential ingredients for understanding of nuclear matter equation-of-state at high net-baryon densities, and, hence, the structure of neutron stars.

With the heavy fragment trigger introduced for the 2021 data taking, we were able to run the express stream production at the STAR High Level Trigger farm. The collected data were sufficient to observe the decay process of ${}^5_{\Lambda}\text{He} \rightarrow {}^4\text{He}p\pi^-$ with more than 11σ significance, measure binding energy as a function of hypernuclei mass, and study hypernuclei decay properties with the Dalitz plot technique.