

Study of strange matter in STAR with express analysis

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The STAR experiment provides a perfect machinery for studying strange matter for more than two decades. Recently, we applied the express analysis, which allows online monitoring of the collected physics results. High quality of express calibration and reconstruction provide 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 BES 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 at low energy heavy-ion collisions. The production mechanism of hypernuclei together with measurement of 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 HLT farm. The collected data were sufficient to observe the ${}^5_{\Lambda}\text{He} \rightarrow {}^4\text{He}\pi^-$ with more than 11σ significance, measure binding energy as a function of hypernuclei mass, and study hypernuclei decay properties with the Dalitz plot technique.

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