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Strange hadron production in different collision systems at $\sqrt{s_{NN}}$ = 200 GeV at STAR

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The study of high-energy collisions of small systems has generated significant discussions about the initial conditions, including the size of the system, needed to generate the Quark-Gluon Plasma (QGP). Results from asymmetric small systems, such as p+Au and p+Pb, exhibit some QGP-like signatures (e.g., flow and enhancement of strangeness production) but not others (e.g., jet quenching). However, recent results from RHIC and LHC provide strong indications of jet quenching in O+O collisions, suggesting a long-lived QGP may be created in these collisions. Therefore, new studies on strangeness production in O+O collisions are essential to explore additional potential QGP signatures in this system.

A key question for strangeness production is the dependence of the collision system at a fixed energy. This dependence can be studied with STAR because RHIC has an extensive and diverse existing data collection with different collision systems and energies. For example, the Ω/ϕ ratio and the (multi) strange-hadron-to-pion yield ratios as a function of multiplicity in different collision systems can help us investigate and possibly identify the threshold for QGP production.

In this talk, we will present new STAR measurements of strange hadron production in d+Au, O+O, Zr+Zr, and Ru+Ru collisions at $\sqrt{s_{NN}}$ = 200 GeV, including their transverse momenta spectra, yields and their rapidity dependence, nuclear modification factors, antibaryon-to-baryon ratios, and baryon-to-meson ratios. We will compare these results with existing p+p, p+Au, and other larger symmetric systems used at RHIC (Au+Au, Cu+Cu), as well as with predictions from theoretical model calculations.

Authors: PONCE, Iris (Yale University); STAR COLLABORATION

Presenter: PONCE, Iris (Yale University)

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