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Violation of mass ordering for multi-strange hadrons at RHIC and LHC

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We study effects of hadronic rescattering on final observables for multi-strange hadrons in high-energy nuclear collisions within an integrated dynamical model. We simulate the whole collision process on an event-by-event basis by using a fully (3+1)-dimensional ideal hydrodynamic description for the quark gluon plasma (QGP) and a subsequent kinetic transport description for the hadron resonance gas.

The QGP created in a collision expands, cools down and then turns into hadron gas. In the last stage of the collisions, hadrons continue to scatter with each other. Therefore observed hadron spectra are, in general, contaminated by the hadronic rescatterings. In order to probe the QGP more directly, multi-strange hadrons, in particular ϕ-meson and Ω-baryon, can be utilized since multi-strange hadrons have small scattering cross-sections and less scatter with non-strange hadrons. Thus final observables of ϕ-mesons and Ω-baryons are expected to reflect the properties of the system just after hadronization.

Some years ago, violation of mass ordering in $v_2(p_{\mathrm{T}})$ was predicted by using a hydro + cascade hybrid model and thereafter observed by the STAR collaboration. Following this work, we scrutinize multi-strange hadron spectra at both RHIC and LHC energies by using a more sophisticated integrated dynamical model towards comprehensive understanding of this phenomenon. In addition to $v_2(p_{\mathrm{T}})$, we investigate the hadronic rescattering effects on mean transverse momenta ($\langle p_{\mathrm{T}} \rangle$) and p_{T}-averaged v_2 of hadrons including heavier multi-strange hadrons such as Ξ- and Ω-baryons. We also discuss the collision energy dependence of the hadronic rescattering effects on the violation of mass ordering behavior and show that multi-strange hadrons can be used as "penetrating probes" of the QGP.

On behalf of collaboration:

NONE

Primary authors: TAKEUCHI, Shiori (Sophia Univ); HIRANO, Tetsufumi (Sophia Univ)

Co-authors: MURASE, Koichi (The University of Tokyo); HUOVINEN, Pasi (Goethe-Universität); NARA, Yasushi (Akita International University)

Presenter: TAKEUCHI, Shiori (Sophia Univ)

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