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Impact of baryon anti-baryon annihilation on strangeness enhancement (baryon sector) at SPS energy

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A deconfined medium of quarks and gluons called Quark-Gluon Plasma (QGP) is produced when heavy-nuclei are collided at relativistic energies. The formation of QGP is often characterized by a phenomenon called strangeness enhancement where the production of strange-to-non-strange particles are enhanced relative to peripheral or proton-proton interactions. Besides the enhancement in K/π ratios, a non-monotonic energy dependence was also reported for Λ to \tilde{p} ratios at CERN SPS, attributed to a signature for the strangeness enhancement . As anti-particles are produced directly from the reaction, the Λ / \bar{p} ratios are considered as a cleaner probe for the strangeness enhancement. However, at this energy range hadronic interactions are dominant and, particularly for Λ and \bar{p} , processes like baryon-anti-baryon (BB) annihilation can significantly modify final yields and spectral shape which may lead to an apparent enhancement in the Λ/\bar{p} ratios. In this work, we use UrQMD hadronic transport model, to investigate the role of baryon-anti-baryon (BB) annihilation on Λ , Λ hyperon production and its effect on Λ/\bar{p} ratios. The UrQMD calculations with BB annihilation can produce the trend of average transverse mass spectra for Λ and Λ , as well as, the characteristic enhancement in Λ/\bar{p} ratios in data as a function of centrality and collision energy. Furthermore, Λ/\bar{p} ratios extracted from the feed-down corrected SPS data are in good agreement with UrQMD model calculations with BB annihilation. This suggests that Λ/\bar{p} enhancement can not be interpreted as a direct signature for strangeness enhancement and BB annihilation has a significant role to play.

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