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Dependence of net-hyperon production at mid-rapidity on beam energy and its implication on baryon number carrier

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The conventional picture of baryon number is that each valence quark inside a baryon carries 1/3 unit of baryon number. However, an alternative picture exists where the center of a Y-shaped topology of gluon fields, called the baryon junction, carries 1 unit of baryon number. Previous analysis of net-proton yield at mid-rapidity from the Beam Energy Scan program phase-I (BES-I) at RHIC showed that it depends on the beam rapidity exponentially, with a slope parameter of 0.64 ± 0.05. Within the baryon junction scenario, the net-hyperon yield at mid-rapidity should show a similar dependence, as junctions are flavor blind. This study aims to test this prediction by analyzing published data from BES-I program. We observe that net-hyperon yields, after correcting for strangeness production suppression, adhere to the expected exponential form. Furthermore, the fitted slope parameters for net-Λ, net-Ξ and net-Ω are similar, in favor of the baryon junction picture. Conventional models, such as Pythia, are unable to reproduce such stopping behavior, highlighting the limitations of existing models, most of which lack the inclusion of baryon junction dynamics.

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