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Unveiling the dynamics of little-bang nucleosynthesis

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High-energy nuclear collisions provide a unique site for the synthesis of both nuclei and antinuclei at temperatures of $kT \approx 100 - 150$ MeV. In these little bangs of transient collisions, a quark-gluon plasma (QGP) of nearly vanishing viscosity is created, which is believed to have existed in the early universe within the first few microseconds after the Big Bang. Analyses of identified particles produced in these little bangs based on the statistical hadronization model for the QGP have suggested that light (anti)nuclei are produced from the QGP as other hadrons and their abundances are little affected by later hadronic dynamics. Here, we find a strong reduction of the triton yield by about a factor of 1.8 in high-energy heavy-ion collisions based on a kinetic approach that includes the effects of hadronic re-scatterings, particularly that due to pion-catalyzed multi-body reactions. This finding is supported by the latest experimental measurements and thus unveils the important role of hadronic dynamics in the little-bang nucleosynthesis.

Auteur principal: SUN, kaijia (Institute of Modern Physics, Fudan University)

Co-auteurs: Prof. KO, Che-Ming; Prof. SHEN, Chun; Dr WANG, Rui; Prof. MA, Yu-Gang

Orateur: SUN, kaijia (Institute of Modern Physics, Fudan University)

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