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Production of hypernuclei from excited nuclear residues in relativistic ion collisions: New opportunities for AFTER@LHC (30'+5')

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Investigation of hypernuclei is a rapidly progressing field of nuclear physics, since they open both opportunities to improve methods of traditional nuclear studies and new horizons for studying particle physics and nuclear astrophysics. Within dynamical and statistical theories we study the main regularities in the production of hypernuclei emerging from the projectile and target residues in relativistic ion collisions. This process will allow to study the mechanisms of peripheral collisions and the properties of hyper-matter of low temperatures, including hyperon-hyperon interactions at low energies. We demonstrate that the yields of hypernuclei increase considerably at beam energies above the energy threshold for Lambda hyperons, followed by a saturation for yields of hypernuclei with increasing the beam energy up to few TeV (LHC energies) [1]. These hypernuclei have a broad distribution in masses and isospin. They can even reach beyond the neutron and proton drip-lines since they are stable with respect to nucleon emission [2]. Weak decay of such hypernuclei may lead to formation of normal nuclei beyond the drip-lines also, thus providing a unique chance for reaching island of stability on the nuclear chart. The production of specific hypernuclei depend strongly on the isotopic composition of the projectile, therefore, it will be possible to obtain exotic hypernuclei that may be difficult to reach in traditional hypernuclear experiments [1]. The perspectives of hypernuclear studies involving these novel processes at the present accelerators are discussed.

[1] A.S. Botvina, K.K. Gudima, and J. Pochodzalla,
Phys. Rev. C88, 054605 (2013).

[2] N. Buyukcizmeci, A.S. Botvina, J. Pochodzalla, and M. Bleicher,
Phys. Rev. C88, 014611 (2013).

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