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Exotic hadrons, hardronic molecules and resonance production from relativistic heavy ion collisions

High energy heavy ion collisions are found to be excellent factories for producing heavy hadrons and composite particles including light (anti)nuclei. With upgraded detectors, we are now able to measure hadrons beyond ground states. Thus, heavy ion collisions provide new ways of studying exotic hadrons, which are the primary interests in hadron physics, as many experiments other than heavy ion collisions have already found exotic candidates and their existence itself is related to the fundamental problems in QCD.

We discuss here the production of exotic hadrons with strange, charm and bottom quarks in heavy ion collisions, and show how, if measured, the production rates can be used to discriminate between compact multiquark configuration from hadronic molecular configurations [1,2]. We extend our previous study to include newly discovered states such as Zb, X(5568) and Pc, and present realistic estimates on their production yields. We furthermore discuss feasibility of confirming their existence and discriminating their structure from measurements in heavy ion collisions at RHIC and LHC.

Specifically, we consider the coalescence and statistical hadronization model to calculate the production yields of exotic hadrons. We give detailed discussions on the application of the coalescence model to resonant states by including finite decay widths, and show that the production yields are sensitive to structures of exotic hadrons, namely compact multi-quark states or extended hadronic molecule states. We also investigate the production of scalar mesons, Lambda(1405), dibaryons, and Ds mesons in addition to charmonium-like and bottomonium-like states called X, Y, Z, which have been recently reported in several accelerator facilities, Belle, BaBar, BESS, LHCb and so on.

[1] S. Cho et al. [ExHIC Collaboration], Phys. Rev. Lett. 106, 212001 (2011).
[2] S. Cho et al. [ExHIC Collaboration], Phys. Rev. C 84, 064910 (2011).

Preferred Track

Future Experimental Facilities, Upgrades, and Instrumentation

Collaboration

Other

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