Identifying multiquark hadrons from heavy ion collisions

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Using the coalescence model for hadron production [1], we have found that the yields of hadrons produced in heavy ion collisions are strongly affected by their internal structures [2]. As shown in Fig. 1, for the ratios of hadron yields at RHIC in the coalescence model to those in the statistical model [3], compared to hadrons with normal quark numbers, we have found that the yields of exotic hadrons are typically an order of magnitude smaller when they are compact multi-quark states and a factor of two or more larger when they are loosely bound hadronic molecules. We have further found that due to the appreciable numbers of charm and bottom quarks produced in heavy ion collisions at RHIC and even larger numbers expected at LHC [4], some of the newly proposed heavy exotic states such as $\bar{\boldsymbol{D}}$N and $\bar{\boldsymbol{D}}$NN [5] could be produced and realistically measured in these experiments. Studying hadron production in relativistic heavy ion collisions thus provides a promising new method to resolve the longstanding challenge in hadron physics of identifying hadronic molecular states and/or hadrons with multi-quark components either with or without exotic quantum numbers.

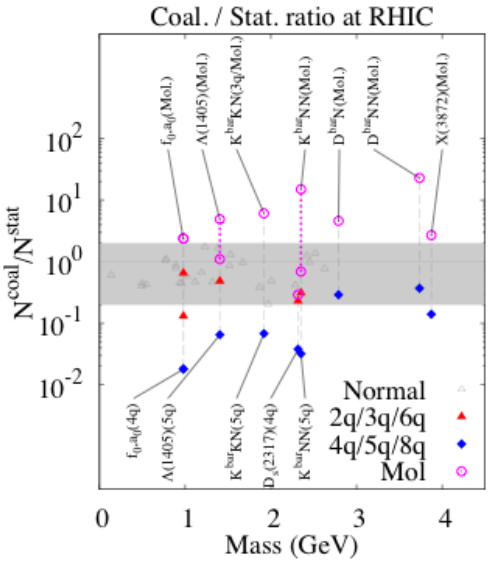

FIG. 1. Ratios of hadron yields at RHIC in the coalescence model to those in the statistical model for normal hadrons (gray band), hadronic molecules (above gray band), and multiquark states (below grey band).

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