Charmed exotics in heavy ion collisions

S. H. Lee,[1] S. Yasui,[1] W. Liu, and C. M. Ko
[1]*Institute of Physics and Applied Physics, Yonsei University, Seoul 120-749, Korea*

Based on the consideration of the color-spin interaction between diquarks, which describes reasonably the mass splittings between many hadrons and their spin flipped partners, we have shown that tetraquark mesons and pentaquark baryons that consist of two charmed quarks could be bound. Using the quark coalescence model, their yields in heavy ion collisions at both the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC) are estimated [1]. Although the results depend on the oscillator frequencies used for quark wave functions as shown in Fig. 1 for the abundance of the tetraquark meson T_{cc}, the expected large charm quark number in central Pb+Pb collisions at LHC makes its value appreciable. For an oscillator frequency of 0.3 GeV, appropriate for charmed hadrons, the abundance of the tetraquark meson T_{cc} at LHC is about 10^{-4}, while that of pentaquark baryon Θ_{cs} is about 10^{-3}. For the doubly charmed baryon Ξ_{cc}, the estimated number is about 3.2×10^{-4} at LHC. Charmed hadrons would be more abundantly produced, particularly the T_{cc}, if charm quarks are produced from the quark-gluon plasma formed in these collisions. The open and hidden charmed hadron physics is expected to be an interesting subject in the forthcoming heavy ion collision experiments.

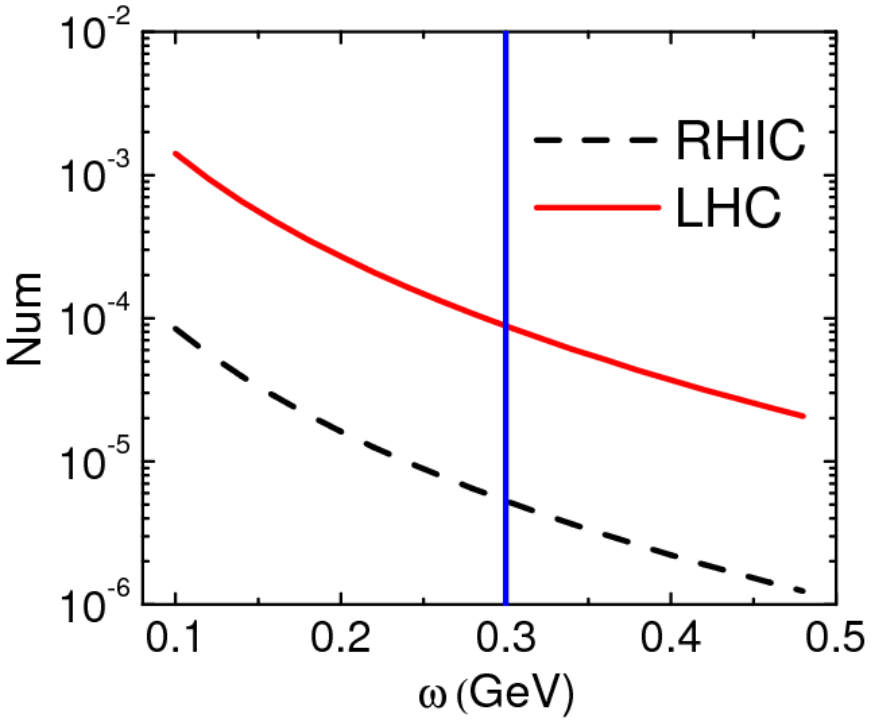

Figure 1. Number of T_{cc} produced at RHIC and LHC as a function of the oscillator frequency used for the quark wave functions in T_{cc}.

[1] S. H. Lee, S. Yasui, W. Liu, and C. M. Ko, Eur. Phys. J. C **54**, 259 (2008).