Bottomonium suppression in relativistic heavy ion collisions

T. Song, K.C. Han, and C.M. Ko

Using the two-component model that includes both initial production from nucleon-nucleon hard scattering and regeneration from produced quark-gluon plasma [1], we have studied bottomonia production in heavy-ion collisions at RHIC and LHC by including medium effects on the thermal properties of bottomonia and their dissociation cross sections [2]. With the expansion dynamics of produced hot dense matter described by a schematic viscous hydrodynamics and including the thermal dissociation of bottomonia as well as the regeneration of bottomonia by using a rate equation, our model describes successfully the experimental data from RHIC and reasonably those from LHC on bottomonia suppression as shown in Fig.1. Our results indicate that the contribution of regenerated bottomonia is small. We have also studied the cold nuclear matter effect due to the shadowing at LHC or antishadowing

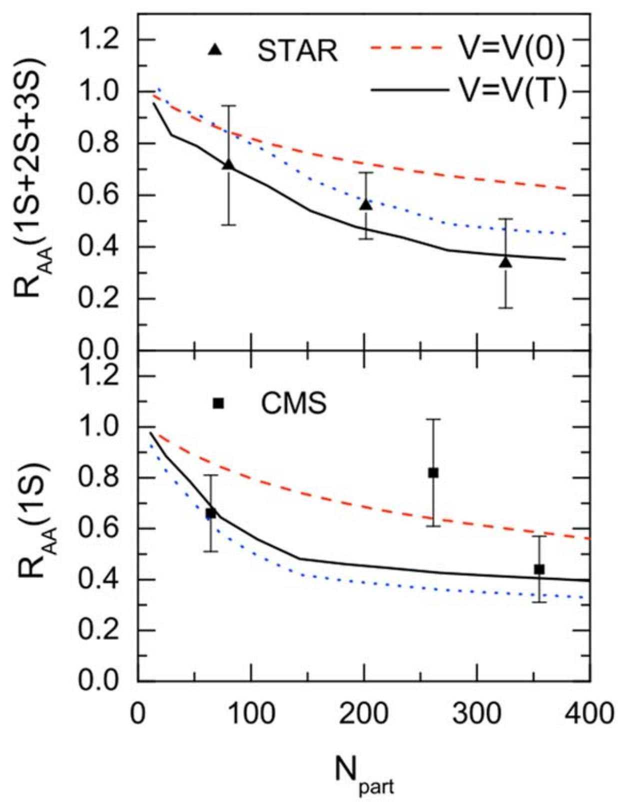

FIG. 1. Nuclear modification factor R_{AA} of the sum of Υ(1S), Υ(2S), and Υ(3S) in Au + Au collisions at $\sqrt{S_{NN}}$= 200 GeV at RHIC (upper panel) and that of Υ(1S) in Pb+Pb collisions at $\sqrt{S_{NN}}$ = 2.76 TeV at LHC (lower panel) as functions of the participant number. Solid and dashed lines are, respectively, results with and without medium effects on bottomonia. Dotted lines are results including also the shadowing effect. Experimental data are from Ref. [3] for RHIC and Ref.[4] for LHC.

at RHIC of the parton distribution function in the nucleus. This was found to increase the nuclear modification factor of bottomonia at RHIC but decrease that at LHC. Our results with and without the cold nuclear matter effect are, however, both consistent with the experimental data because of their large errors. Furthermore, our study shows that the inclusion of medium effects on bottomonia is essential for describing the experimental observations at both RHIC and LHC.

[1] T. Song, C.M. Ko, S.H. Lee, and J. Xu, Phys. Rev. C **83**, 014914 (2011).
[2] T. Song, K.C. Han, and C.M. Ko, Phys. Rev. C **85**, 014902 (2012).
[3] R. Reed *et al.* (STAR Collaboration), J. Phys. G **38**, 124185 (2011).
[4] CMS Collaboration, CMS-PAS-HIN-10-006, 2011 (unpublished).