J/ψ production in Au+Au and Cu+Cu collisions at PHENIX

Susumu Oda[1], for the PHENIX collaboration

[1] Center for Nuclear Study, Graduate School of Science, University of Tokyo, 7-3-1 Hongo, Bunkyo, Tokyo 113-0033, Japan

Contact e-mail: oda@cns.s.u-tokyo.ac.jp

The quark gluon plasma (QGP) is a state of deconfined quarks and gluons and is expected to be created in relativistic heavy ion collisions.

Measurement of heavy quarkonia (J/ψ, ψ', χ_c and Υ) has long been considered to be one of the most important probes to study formation and properties of the QGP since it is predicted that the heavy quarkonia dissolve in the QGP due to the color Debye screening and those yields are suppressed. Especially, the J/ψ is the most promising probe because of its large production cross section and di-lepton decay channels which are easily detected.

However, recent lattice QCD calculations indicate that the J/ψ may survive until well above the critical temperature (T_c) while the χ_c and ψ' are expected to dissolve at lower temperatures due to smaller binding energies. Since about 40% of the J/ψ comes from the feed down of the χ_c and ψ' decays, this leads reduction of the J/ψ yield even if the primordial J/ψ is not suppressed.

There are also other competing effects in the J/ψ production in heavy ion collisions at RHIC, reduction of the initial J/ψ yield due to cold nuclear matter effects, destruction of the J/ψ due to interactions with thermal gluons, and enhancement of the yield due to coalescence of uncorrelated charm pairs.

To understand the behavior of the J/ψ with these competing effects in the heavy ion collisions, it is important to measure the J/ψ yield with several system sizes and collision energies systematically.

The PHENIX experiment has measured the J/ψ yield in Au+Au and Cu+Cu collisions at $\sqrt{s_{NN}} = 200$ GeV at both mid rapidity and forward rapidity via di-lepton decays. The latest results will be presented and discussed.