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Decoupling the rates of charmonium dissociation and recombination reactions in heavy-ion collisions at LHC energy

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The charmonium states with their different binding energies and radii dissolve at different temperatures of the medium produced in relativistic heavy-ion collisions. Relative yields of charmonium and thus their survival have potential to map the properties of Quark Gluon Plasma, the medium created in the collisions. In this study, we estimate the combined effect of color screening, gluon-induced dissociation and recombination on charmonium production in heavy-ion collisions (Pb+Pb ions) at center of mass energy 5.02 TeV. This is a remarkable study that the rate equations of dissociation and recombination are decoupled and solved separately. To solve the recombination rate equation, we have used a naive approach of Bateman solution which ensures the dissociation of the recombined charmonium in the QGP medium and the effects of the correlated mechanism of recombination and the dissociation of newly formed pairs. The modifications of charmonium states are estimated with help of decoupled equations of gluon dissociation and recombination in an expanding QGP with the conditions relevant for Pb+Pb collisions at LHC.

Primary author: ABDULSALAM, Abdulla

Presenter: ABDULSALAM, Abdulla

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