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Calculations of coherent photon-nucleus and photon-photon interactions in hadronic A+A collisions at RHIC and LHC

Summary

The coherent photon-nucleus and photon-photon interactions has been studied in detail at RHIC and LHC to probe the gluon distribution in nucleus at low Feynman x via relativistic heavy-ion collisions. These kind of interactions are traditionally thought to only exist in ultra-peripheral collisions, where there is no hadronic interactions. Recently, a significant excess of J/ψ yield at very low transverse momentum ($p_T < 0.3$ GeV/c) was observed by the ALICE and STAR collaborations in peripheral A+A collisions, which points to evidence of coherent photoproduction of J/ψ in violent hadronic interactions. The survival of photoproduced J/ψ merits theoretical investigation. In addition, with respect to the expectation of theoretical calculations, the excess yield of J/ψ in hadroinc heavy-ion collisions may served as a good probe to test the cold and hot medium effects.

In this presentation we report on calculations of coherent photon-nucleus ($\gamma + A \rightarrow J/\psi + A$) and photon-photon ($\gamma+\gamma \rightarrow e^+ + e^-$) interactions in hadronic A+A collisions at RHIC and LHC energies. We also address the questions about how the electromagnetic field translates into a flux of equivalent photons in hadronic A+A collisions: if the photons is emitted from the whole nucleus, or if only the spectator fragments contribute to the photon emission. Similarly, for photon-nucleus interactions, it is not clear whether the whole nucleus or only spectator fragment act as photon target. The model used to calculate the cross section will be discussed and the expected yield will be compared with experimental results from RHIC and LHC. The differential centrality, rapidity and transverse momentum distributions from calculations will also be compared between different scenarios.

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