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

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The coherent photon-nucleus and photon-photon interactions has been studied in detail at RHIC and LHC to probe the gluon distribution in nucleus and to test QED 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. Assuming that the coherent photonuclear production is response for the observed J/ψ excess, the coherent two-photon process should be there and contribute to the dilepton production. According to above, STAR made measurements of e^+e^- pair production at very low p_T , and indeed, a significant excess is observed in peripheral collisions. The survival of photoproduced J/ψ and electron pair merits theoretical investigations, which are currently absent on the market.

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.

Content type

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Collaboration

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