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Coherent J/ψ photoproduction and polarization in peripheral Pb-Pb collisions with ALICE

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Photonuclear reactions are induced by the strong electromagnetic field generated by ultrarelativistic heavy-ion collisions. These processes have been extensively studied in ultraperipheral collisions, in which the impact parameter is larger than twice the nuclear radius. In recent years, the observation of coherent J/ψ photoproduction has been claimed in nucleus–nucleus (A–A) collisions with nuclear overlap, based on the measurement of an excess (with respect to hadroproduction expectations) in the very low transverse momentum (p_T) J/ψ yield. Such quarkonium measurements can help constraining the nuclear gluon distribution at low Bjorken-x and high energy. In addition, they can shed light on the theory behind photon induced reactions in A–A collisions with nuclear overlap, including possible interactions of the measured probes with the formed and fast expanding quark-gluon plasma. In order to confirm the photoproduction origin of the very low-p_T J/ψ yield excess, polarization measurement is a golden observable. It is indeed expected that the produced quarkonium would keep the polarization of the incoming photon due to s-channel helicity conservation. ALICE can measure inclusive and exclusive quarkonium production down to zero transverse momentum, at forward rapidity ($2.5 < y < 4$) and midrapidity ($|y| < 0.9$). In this contribution, we will report on the new preliminary measurement of the y-differential cross section and the new first polarization analysis at LHC of coherently photoproduced J/ψ in peripheral Pb–Pb collisions. Both measurements are conducted at forward rapidity in the dimuon decay channel. These results will be discussed together with the recent results on coherent J/ψ photoproduction as a function of centrality at both mid and forward rapidities. Comparison with models will be shown when available.

Category

Experiment

Collaboration (if applicable)

ALICE

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