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First measurement on the energy and Mandelstam-t dependence of both coherent and incoherent J/X photonuclear production

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A new phenomenon, gluon saturation, is expected to appear at high energies in QCD, where the splitting and production of gluons achieve a dynamic balance. Gluon saturation is expected to appear at lower energies in large nuclei. Due to its high sensitivity to the gluon distribution, the diffractive photoproduction of J/Ψ is an ideal tool to search for the onset of gluon saturation.

ALICE has a unique coverage of the photon-nucleon centre of mass energy, ranging from 20 GeV to 800 GeV, to study the energy dependence of this process with a single detector over three orders of magnitude of Bjorken-x from around 10-2 to 10-5.

In this talk, we will review the latest ALICE result on the energy dependence of coherent J/Ψ production, which samples the average gluon distribution in Pb, and present the new results on the energy dependence of incoherent J/Ψ production at different Mandelstam-t, which samples the variance of the gluon distribution at different size scales as Bjorken-x decreases. These results test the current models of the high-energy limit of QCD in an unprecedented way.

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