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Probing nuclear gluon distributions via coherent J/Ψ and $\Psi(2S)$ photoproduction in ultraperipheral PbPb collisions at CMS

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Ultraperipheral collisions (UPCs) of relativistic heavy ions provide a unique laboratory for studying photon-induced reactions due to their intense photon flux. Vector mesons, such as J/Ψ and $\Psi(2S)$, can be produced via γ + A interactions, offering a powerful tool for probing the gluonic properties of the target nucleus. The J/Ψ and $\Psi(2S)$ mesons introduce distinct hard scales, providing unique capabilities for exploring QCD phenomena at different energy scales. In this talk, we present new results of coherent charmonium photoproduction spanning over a wide rapidity coverage in PbPb UPCs with $\sqrt{s_{\mathrm{NN}}} = 5.36$ TeV data taken with the CMS experiment during the LHC Run 3. This measurement represents a significant increase in statistics and improved $\Psi(2S)$ detection. The $\Psi(2S)$ are reconstructed from both the J/Ψ + dipion channel, and the dilepton channel, and the J/Ψ are reconstructed from the dilepton decay channel. These results include precise measurements of the coherent photoproduction cross sections for both J/Ψ and $\Psi(2S)$ over the full 0 < |y| < 2.4 region, and exploit the forward neutron tagging technique to resolve the photon-emitter and target ambiguity. The expanded pseudorapidity coverage enables a more comprehensive exploration of the nuclear gluonic structure over a broad range of Bjorken-x values.

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