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Coherent photo-production of ρ^0 mesons in ultra-peripheral Pb+Pb collisions at the LHC, measured by ALICE

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Collaboration

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Abstract content

Ultra-peripheral collisions are characterized by an impact parameter exceeding the sum of the two nuclear radii. The photon flux of heavy ions such as Pb is enhanced by the nucleus charge squared. This allows to study gamma-nucleus processes, such as the production of ρ^0 vector mesons decaying into two pions, as well as gamma-gamma processes, e.g., the continuum production of electron pairs. Coherent processes are characterized by the emission of low pt photons ($p_t \leq 200$ MeV) coupling to almost all the nucleons. As a consequence, the produced vector meson has low pair-transverse momentum which can be used to separate coherent production from non-coherent processes. The ALICE experiment at the LHC is well-suited for measuring ultra-peripheral processes at low invariant masses at mid-rapidity since its acceptance extends down to very low track momenta. The ALICE collaboration implemented a dedicated trigger, requiring activity at mid-rapidity and using the forward detectors as a veto. Neutrons, generated by nuclear breakup, can be detected in the two zero-degree calorimeters (ZDC), situated at about $\pm$100 m from the interaction point. Due to the excellent energy resolution of the ZDCs, single neutrons can be detected. We will present the differential ρ^0 cross section at mid-rapidity ($-0.5 < y < 0.5$) measured by the ALICE experiment in Pb-Pb collisions, as well as the total ρ^0 cross section obtained by model-based extrapolation to all rapidities. The measured cross sections are compared to various model predictions, as well as to earlier measurements at RHIC. In addition, nuclear breakup probabilities will be shown for different breakup modes and compared to models.

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