

Photoproduction of vector mesons: from ultraperipheral to semi-central heavy ion collisions

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Collaboration

Abstract content

We shall present nuclear cross section for $AA \rightarrow AAV$ and $AA \rightarrow AAVV$ processes where A means a nucleus (lead or gold) and V denotes ρ^0 or J/ψ vector meson. Analysis is done in the impact parameter space equivalent photon approximation. This approach allows to consider a particular process taking into account distance between colliding nuclei. We consider both ultraperipheral and for the first time semi-central collisions.

We get very good description of the latest ALICE data [1] for single J/ψ photoproduction for different centrality bins. We are first group which undertook a study of this process. We show that a correct interpretation of data needs to use a modification of a photon flux. Finally, we obtained reasonable results but we will try to discuss ‘open questions’.

Next, total and differential cross section for double-scattering mechanism in the exclusive $AA \rightarrow AAVV$ reaction in ultrarelativistic ultraperipheral heavy ion collisions will be presented. In this context we shall consider double photoproduction and photon-photon processes. Simultaneously, we will present very good agreement of our results with STAR [2] (RHIC), CMS [3] and ALICE [4,5] (LHC) experimental data for single ρ^0 and J/ψ vector meson production. The cross section for $\gamma A \rightarrow V A$ is parametrized based on an existing model. Our analysis includes a smearing of ρ^0 mass using a parametrization of the ALICE Collaboration.

We will show importance of $\rho^0(770)$ and $\rho^0(1450)$ decay into $\pi^+\pi^-$ channel. Additionally, we shall present a comparison of our predictions for exclusive four charged pions production.

In our calculations we use so-called realistic form factor which is a Fourier transform of the charge distribution in nuclei. This talk will be based mainly on analyses which were studied in Ref. [6] and [7].

References:

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- [5] ALICE Collaboration, E. Abbas et al., Eur. Phys. J. **C73** (2013) 2617
- [6] M. Kłusek-Gawenda and A. Szczurek, Phys. Rev. **C89** (2014) 024912
- [7] M. Kłusek-Gawenda and A. Szczurek, arXiv: nucl-th/1509.03173

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