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Photoproduction of vector mesons at low p_T in peripheral and semi-central Pb+Pb collisions at the LHC

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The cross section for photoproduction of vector meson in ultra-peripheral collisions, i.e. collisions without nuclear overlap ($b > 2R$), is huge at high collision energies. This process can, however, occur also in peripheral and semi-central nucleus-nucleus collisions, where there are large spectator fragments, which can act as photon sources and targets.

As this presentation will show, one can expect significant photoproduction of J/ψ in Pb+Pb collisions with impact parameters in the range 10 - 15 fm at the LHC. This contribution is important to understand in order to be able to determine the true centrality dependence of the J/ψ yield from hadronic sources. It also addresses some interesting questions about how the electromagnetic field translates into a flux of equivalent photons in a semi-central collision: if the number of photons is “frozen” before the collision and all protons contribute to the photon flux, or if only the protons in the spectator fragments contribute. Similarly, it is not clear if the photon target is restricted to the spectator fragments or if production can occur also in the participant region. In the latter case, photoproduction will provide a novel probe of strongly interacting matter, and the interplay with hadronic production, e.g. regarding regeneration and thermalization, would merit further experimental and theoretical study.

The model used to calculate the photoproduction cross section will be discussed and the expected yield as function of centrality will be compared with the expected hadronic contribution. The transverse momentum and rapidity distributions of the two production mechanisms will be compared. The calculations indicate that the yield from photoproduction changes from a few percent of the hadronic yield for the 50-60% most central collisions to around 50% of the hadronic yield for the 80-90% most central collisions.

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