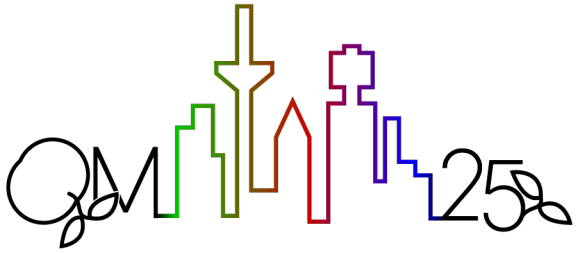

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First Observation and Studies of Exclusive ϕ Photoproduction in Ultraperipheral Collisions with the CMS Experiment

A key objective of high-energy nuclear physics is the search for the onset of gluon saturation phenomena in the limit of extreme gluon densities. Photon-induced vector meson production in ultraperipheral heavy-ion collisions (UPCs) offers a unique and powerful probe of the gluon distribution in nuclei. The ϕ meson, with its mass around 1 GeV, lies at the boundary of hard scales between the perturbative and nonperturbative QCD regimes, making it uniquely suited to probe the transition between these two domains. However, the significant challenge in detecting those extremely low transverse momentum (around 100 MeV) kaons from exclusive ϕ decays has hindered the measurement of its production in UPCs for the past decades. In this talk, we present the first observation and measurement of exclusive ϕ photoproduction via the K^+K^- decay channel in PbPb UPCs at a center-of-mass energy per nucleon pair of 5.36 TeV, using the CMS detector with a novel low-p_T reconstruction technique. The differential cross sections for coherent ϕ meson photoproduction are reported as a function of ϕ rapidity. The results are compared to various theoretical models and provide new insights into the small-x nuclear gluonic structure at a critical scale.

Category

Experiment

Collaboration (if applicable)

CMS

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