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# Equivalent photons in proton-proton and ion-ion collisions at the LHC

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The LHC can be considered as a photon-photon collider with photons produced in ultraperipheral collisions of charged particles. Ultraperipheral collision is a kind of collision when the colliding particles pass at large distance from each other and collide with their electromagnetic fields. The particles remain intact after the collision. Electromagnetic field of an ultrarelativistic particle can be represented as a bunch of almost real (equivalent) photons distributed according to a known spectrum. Thus, ultraperipheral collisions at the LHC are a rich source of events to study $\gamma\gamma \to$ something reactions.

Photon flux in an ultraperipheral collision is proportional to $(Z_1 Z_2)^2$ where $Z_1$ and $Z_2$ are charges of the colliding particles. In this respect collisions of lead ions with $Z = 82$ look very promising for the search of New Physics in photon-photon collisions even though the *pp* luminosity is a lot higher. However, the invariant mass of the produced system is limited by the maximum momentum of a virtual photon that the colliding particle can interact with in its reference frame without breaking apart. For the protons colliding with the energy of 13 TeV, the invariant mass can reach 2.8 TeV, while in the case of lead-lead collision with the energy of 5.02 TeV/(nucleon pair) production cross section falls rapidly after 100 GeV.

Production cross section of ultraperipheral collisions is very sensitive to electromagnetic form factors of the colliding particles. The data for $^{208}$Pb available in the literature is somewhat controversial. Nevertheless, the calculated production cross section for a pair of muons closely follows the experimental points. Production of muons in proton-proton collisions is described within the experimental uncertainty.

Ultraperipheral collisions at the LHC can be used to improve limits on supersymmetry in the region where chargino and neutralino masses are nearly equal. Final state protons can be registered by the forward detectors (ATLAS Forward Proton Detector or CMS-TOTEM Precision Spectrometer), and momenta of charginos produced in the collision are known. This information is used to greatly reduce the background from the Standard Model processes.

The talk is mostly based on the paper arXiv:1806.07238.

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## Abstract Title

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