

Importance of mesons in light-by-light scattering in ultraperipheral lead-lead collisions at the LHC

Monday, 11 June 2018 16:05 (0:20)

Collaboration

Abstract content

We will report on our results for light-by-light scattering in ultraperipheral lead-lead collisions at the LHC. We calculate cross section for the elementary $\gamma\gamma \rightarrow \gamma\gamma$ subprocess taking into account the following contributions:

- box mechanisms with leptons and quarks in the loops,
- s-channel $\gamma\gamma \rightarrow$ pseudoscalar/scalar/tensor mesons which contribute to the $\gamma\gamma \rightarrow \gamma\gamma$ process and
- background from $\gamma\gamma \rightarrow \pi^0(\rightarrow \gamma\gamma)\pi^0(\rightarrow \gamma\gamma)$ process.

Our calculations of the corresponding UPC process are based on equivalent photon approximation in the impact parameter space. We use so-called realistic charge form factor of nuclei which is a Fourier transform of the charge distribution in nuclei. Our estimate shows that the $\gamma\gamma \rightarrow \gamma\gamma$ collisions can be measured at the LHC by ALICE and LHCb experiments for diphoton invariant mass > 2 GeV. We also discuss a possibility to study the $\gamma\gamma \rightarrow \eta, \eta' \rightarrow \gamma\gamma$ resonance scattering at the LHC. In our calculations we try to include several conditions and experimental limitation on, e.g. photon pseudorapidity, transverse momentum and energy of outgoing photons as well as experimental energy resolution. We predict that the $\gamma\gamma \rightarrow \eta, \eta' \rightarrow \gamma\gamma$ resonance scattering can be measured with rather good statistics. We will present many interesting differential distributions. We will discuss several trials how to reduce the $\pi^0\pi^0$ background.

This talk will be based on our analyses which will be presented in Ref. [1].

References:

[1] M. Kłusek-Gawenda, R. McNulty, R. Schicker and A. Szczurek, Measurements of light-by-light scattering in UPC of heavy ions at the LHC - smaller diphoton collision energies, paper in preparation.

Primary author(s) : KLUSEK-GAWENDA, Mariola (Institute of Nuclear Physics PAN,)

Presenter(s) : KLUSEK-GAWENDA, Mariola (Institute of Nuclear Physics PAN,)

Session Classification : Parallel Session A5