Measuring photon-induced dilepton pairs in proton collisions

A fundamental process in quantum electrodynamics is the production of pairs of leptons emerging from collisions between high energy photons. At the LHC we can produce this process in the laboratory by exploiting the LHC as a photon collider. The electromagnetic field surrounding LHC protons act as a cloud of high energy virtual photons. When LHC protons narrowly miss one another collisions between their surrounding photons can occur, reaching photon-photon energies up to the TeV scale.

The $\gamma\gamma \rightarrow \mu\mu$ process was measured by the ATLAS experiment in 2018 using 3.2 fb⁻¹ of data [1], however, a much larger dataset is now available. Differential measurements of this process are limited by data statistics, motivating measurement of this process with a larger dataset.

In this project we will study the $\gamma\gamma \rightarrow \mu\mu$ process. Simulated data will be used to select such events and to assess the potential yields which could be achieved. Time permitting, first steps towards a measurement of this process will be made by investigating 'unfolding' procedures to correct for detector effects.

[1] https://www.sciencedirect.com/science/article/pii/S0370269317310201

Group

FH-ATLAS

Project Category

B1. Physics data analysis and performance (software-oriented)

Special Qualifications

Any experience with bash shells, Python, C++ and ROOT would be advantageous

DESY Site

Hamburg

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