Contribution ID: **142** Type: **Oral Presentation**

Measurements of dileptons and photon pairs from two-photon scattering in ultra-peripheral and hadronic Pb+Pb collisions with the ATLAS detector

Tuesday, 5 November 2019 08:40 (20 minutes)

In ultra-relativistic heavy-ion collisions, one expects copious rates of $\gamma + \gamma$ processes through the interaction of the large electromagnetic fields of the nuclei, which can produce new particles (e.g. leptons) or even lead to light-by-light scattering via loop diagrams. The latter process is a notable prediction of QED and was only recently observed by ATLAS using the full 2018 dataset. In ultra-peripheral collisions (UPCs), characterized by large impact parameter between the nuclei, the outgoing leptons and photons are produced exclusively, and exhibit a strong back-to-back momentum correlation, with long tails induced by higher-order QED effects. This talk presents measurements of dilepton production and light-by-light scattering performed by the ATLAS collaboration. The angular correlations as well as differential production cross sections in UPCs are measured and compared to theoretical models, including final state QED radiation. The role of forward neutron production in disentangling pure QED and dissociative processes will also be discussed. Finally, limits on axion-like particle production, from the observed light-by-light cross sections, will be discussed. Muon pairs produced the same two-photon scattering process in hadronic Pb+Pb collisions also potentially provide a sensitive probe of the quark gluon plasma. First measurements by ATLAS and STAR of dileptons produced via two-photon scattering in non-ultra-peripheral (non-UPC) nucleus-nucleus collisions showed an unexpected centrality-dependent broadening of the angular correlation between the two leptons and/or of the two-lepton p_T distribution. ATLAS has recently measured dimuons produced via two-photon scattering in non-UPC Pb+Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$~TeV using data collected during the 2018 Pb+Pb run at the LHC corresponding to an integrated luminosity of $1.73\ \mathrm{nb}^{-1}$. This data set represents a factor of ~ 4 increase in statistics over the 2015 data set used for the first ATLAS measurement. The increased statistics allow new features to be observed in the data, as well as differential studies of the dependence of the pair-distribution on the transverse-momentum and pseudorapidity of the two muons. The results of the new measurement and the possible physics implications will be discussed.

Primary author: PALNI FOR THE ALICE COLLABORATION , Prabhakar (AGH University of Science and Technology (PL))

Presenter: PALNI FOR THE ALICE COLLABORATION , Prabhakar (AGH University of Science and Technology (PL))

Session Classification: Parallel Session - EM probes I

Track Classification: Electromagnetic probes