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The ATLAS Transition Radiation Tracker and Zero Degree Calorimeter: the progress on triggering on ultraperipheral processe

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A subset of heavy-ion collisions are ultra-peripheral collisions (UPC), where the ions collide with a large impact parameter, causing them to interact primarily through their intense electromagnetic fields. These interactions allow for the study of various photon-induced processes at high energies. The products of exclusive UPC interactions are typically characterized by very low transverse momenta products, which present several challenges to efficiently select with a trigger. In Run 3, the ATLAS Transition Radiation Tracker (TRT) FastOR trigger provided a novel tool to trigger on these processes at Level 1. The TRT trigger was, for the first time, adapted for use in heavy-ion collisions, allowing it to trigger on low-p_{T} particles ($p_{\mathrm{T}} > 200$ MeV), including muons from coherent J/Psi decays. Another feature of many UPC collisions is single-sided nuclear breakup or multiple photon exchange, which causes one or both of the colliding ions to emit forward neutrons.
The Zero-Degree Calorimeter (ZDC) detects these neutrons and provides a fully digital trigger. This tool allows for triggering on many distinct neutron topologies within the Level 1 system. In Run 4, the new joint ATLAS-CMS HL-ZDC will be installed, providing similar triggering capabilities in the more challenging environment of the HL-LHC. The combination of the ZDC and TRT along with other calorimeter systems allows for the efficient collection of data for many distinct UPC processes.

Category

Experiment

Collaboration (if applicable)

ATLAS Collaboration

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