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ATLAS ZDC for Run 3 and Run 4

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The ATLAS Zero Degree Calorimeters (ZDCs) detect neutral particles emitted at very forward rapidities in nuclear collisions at CERN's Large Hadron Collider (LHC). During Runs 1 and 2 of the ATLAS experiment, the ZDCs have been crucial for identifying spectator neutrons in lead-lead collisions and in selecting ultraperipheral collisions.

The ZDCs consist of modules of sampling hadronic calorimeters made up of alternating tungsten-fused silica rod layers that act as Cherenkov radiators. They have been upgraded for LHC Run 3 with new fused silica rods for better radiation hardness, along with low-attenuation air-core cables and new readout electronics based on the LUCROD card from ATLAS's LUCID detector. The electronic update facilitated a new all-digital triggering mechanism for improved event selections.

Also for Run 3, a new Reaction Plane Detector (RPD) was implemented. The RPD measures nuclear collision reaction planes by analyzing transverse shower profiles from spectator neutrons in the ZDC. Equipped with radiation-hard fused silica fibers of varying lengths in y direction and grouped in x direction, the 16 channels of RPD can image multi-neutron showers using a Convolutional Neural Network to optimize angular sensitivity.

The LHC absorber region will be completely rebuilt for the High Luminosity (HL) LHC, which will provide first beams in LHC Run 4. The ATLAS and CMS ZDC groups have proposed a joint project to build a next-generation HL-ZDC that will include an Electromagnetic (EM) and Hadronic section, as well as an RPD, all enclosed in a monolithic mechanical design that should simplify installation and thus reduce radiation exposure.

This talk will review the performance of the ATLAS ZDC in the first year of Run 3, and provide an outlook of the HL-ZDC detector, with particular attention to the upgraded EM section.

Collaboration

ATLAS

Role of Submitter

The presenter will be selected later by the Collaboration

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