Contribution ID: **88** Type: **Short Talk**

Integration and Commissioning of the Software-based Readout System for ATLAS Level-1 Endcap Muon Trigger in Run 3

Tuesday, 18 May 2021 11:29 (13 minutes)

The Large Hadron Collider and the ATLAS experiment at CERN will explore new frontiers in physics in Run 3 starting in 2022. In the Run 3 ATLAS Level-1 endcap muon trigger, new detectors called New Small Wheel and additional Resistive Plate Chambers will be installed to improve momentum resolution and to enhance the rejection of fake muons. The Level-1 endcap muon trigger algorithm will be processed by new trigger processor boards with modern FPGAs and high-speed optical serial links. For validation and performance evaluation, the inputs and outputs of their trigger logic will be read out using a newly developed software-based readout system. We have successfully integrated this readout system in the ATLAS online software framework, enabling commissioning in the actual Run 3 environment. Stable trigger readout has been realized for input rates up to 100 kHz with a developed event-building application. We have verified that its performance is sufficient for Run 3 operation in terms of event data size and trigger rate. The paper will present the details of the integration and commissioning of the software-based readout system for ATLAS Level-1 endcap muon trigger in Run 3.

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Session Classification: Online

Track Classification: Online Computing