



Contribution ID: 197

Type: **Poster submission**

ATLAS Level-1 Endcap Muon Trigger for Run 3

Monday, 5 August 2019 15:40 (20 minutes)

Summary

The LHC is expected to increase its center-of-mass energy to 14 GeV and an instantaneous luminosity to $2.4 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ for Run 3 scheduled from 2021 to 2023. In order to cope with the high event rate, an upgrade of the ATLAS trigger system is required.

The Level-1 Endcap Muon trigger system identifies muons with high transverse momentum by combining data from a fast muon trigger detector, TGC. In the ongoing Phase-I upgrade, new detectors called the New-Small-Wheel (NSW) and RPC-BIS78, will be installed in the inner station region for the endcap muon trigger. Finer track information from the NSW and RPC-BIS78 can be used as part of the muon trigger logic to enhance performance significantly.

In order to handle data from both TGC and NSW, some new electronics have been developed, including the trigger processor board known as Sector Logic (SL). The SL board has a modern FPGA to make use of Multi-Gigabit transceiver technology, which will be used to receive data from the NSW. The readout system for trigger data has also been re-designed, with the data transfer implemented with TCP/IP instead of a dedicated ASIC. This makes it possible to minimize the use of custom readout electronics and instead use some commercial PCs and network switches to collect, format and send the data. This presentation describes the aforementioned upgrades of the Level-1 Endcap Muon trigger system. Particular emphasis will be placed on the new algorithm in Sector Logic. The expected trigger performance will also be discussed.

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Session Classification: Poster Session (Mon/Tue)

Track Classification: Accelerators, Detectors and Computing for HEP