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CMS Drift Tubes Readout Phase 1 Upgrade

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The CMS Drift Tubes (DT) readout system has been upgraded during the 2017-2018 technical stop to a new uTCA-based system (uROS) to deliver the performance required by the increase of LHC luminosity. It comprises 3 uTCA crates with up to 25 boards, each processing 3 sectors from each CMS wheel. The uROS board is built around a Virtex-7 FPGA, and is able to receive 72 input links. The 240-Mbps inputs are deserialized using oversampling and adaptive phase detection. Event building, synchronization, data integrity monitoring and error correction have been implemented. The uROS system is fully operational, taking collision data satisfactorily.

Summary

The CMS Drift Tubes (DT) readout system, responsible of the data acquisition of the time information from the muon DT chambers, has gone through an upgrade during the 2017-2018 short technical stop to overcome the limitations of event processing speed due to the increase of LHC luminosity during Phase 1. A new higher performance uTCA based system (uROS board) has replaced the legacy VME based electronics (ROS-25 and DDU). The uROS system is built out of 3 utCA crates that host up to 25 boards, each board reading out 3 sectors from each CMS wheel (72 ROBs, located at chamber level). The uROS boards are built around a Virtex-7 FPGA and share the hardware with the TwinMux board, responsible of the DT upgraded trigger system, though the firmware has been built ad-hoc for the different requirements. Each uROS board deserializes up to 72 input links at 240 Mbps, with an innovative adaptive oversampling method. Event building and synchronization, data integrity monitoring and error stream correction whenever possible have been implemented, together with data transmission to the AMC13 board and further CMS DAQ chain. At present the uROS system is fully operational, taking collision data satisfactorily. The performance of the new system will be presented in this contribution.

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