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Recent developments for the Upgrade of the LHCb readout system

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The LHCb collaboration has chosen to evaluate the ATCA architecture as form-factor for the LHCb readout system. A same board can satisfy all the requirements for data transmission, timing and fast control as well as slow control. First developments rely on a generic ATCA carrier board equipped with four dense AMC mezzanine able to interface a total of 144 bidirectional optical links at up to 10 Gbits/s. Early results and measurements will be presented.

Summary

The upgraded LHCb readout system aims at a trigger-free readout of the entire detector at the bunch-crossing rate. This implies a major architectural change for the readout system that must capture the data at 40 MHz instead of 1 MHz. One of the key component of this upgrade system is the readout board.

The LHCb collaboration has chosen to evaluate the ATCA architecture as form-factor for the readout board. The readout system architecture relies on a unique board able to satisfy all the requirements for data transmission, timing and fast control as well as slow control. A generic ATCA carrier board has been developped. It is equipped with four dense AMC mezzanine able to interface a total of 144 bidirectional optical links at up to 10 Gbits/s. This boards embeds 4 high end Stratix V GX devices for data processing and a programmable set of commutation functions allowing to reconfigure the connectivity of the system in a flexible way.

The overall architecture will be presented and how the cards map over each functionality.
We will explain the rationale for using or not some features of the ATCA architecture and give some perspective on the "xTCA for Physics"compatibility.

First results and measurements will be described in particular those related to the use of new highly integrated optical devices.

At last we will present the incremental development methodology used in this project.

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