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# CARLOSrx: an on line Data Acquisition system for ALICE ITS SDD

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The data concentrator card CARLOSrx is a readout board developed for the ALICE ITS Silicon Drift Detector (SDD) experiment held at CERN.
CARLOSrx is a 9Ux400 mm VME board, containing 4 FPGAs with the purpose of processing data coming from 12 SDD detectors and sending them to a computer running the DATE software. Twentyfour boards are installed for SDD. We have implemented and tested a new firmware version of CARLOSrx able to communicate with 12 SDD detectors, trigger system and DAQ software.
The paper presents the results of these tests.

## Summary

Each CARLOSrx is a board of remarkable dimension, 9U x 400 mm VME, which will be inserted in a VME crate situated in a counting room during the run of ALICE experiment.The most important tasks of CARLOSrx are to receive data from SDD detectors and send them to ALICE Local Data Concentrator (LDC) for the correct reconstruction of the acquired events.
Each CARLOSrx communicates with the front end electronics via single mode optical fibers, in particular way the hardware configuration is able to download the configuration, clock and to receive the events for 12 SDDs detectors through 36 optical. To do that on the CARLOSrx board is mounted the CERN SIU board of the Detector Date Link (DDL) developed for the ALICE experiment. In the same time the board includes the CERN TTCrq mezzanine card that is used for trigger information, clock and busy management with ALICE Local Trigger Unit (LTU). The power supply and firmware configuration for this board is provide by VME bus.
CARLOSrx is composed principally of 4FPGAs (three process the data coming from detector and one handle the VME bus) and 4 FIFO hardware (256 Kword x 32 bits) that buffer the data during the operations of board.
The CARLOSrx firmware has been tested first in Bologna and Torino and now at CERN for long time and is able to send JTAG instructions and clock to all front end electronics, receive data coming from 12 modules (one module is composed by one detector and the front end electronic needed to digitalize and send data to CARLOSrx), pack and label data and finally send them to a LDC.
Each CARLOSrx was connected to 6, 8, or 12 modules, and it was able in every situations to send data correctly to LDC; the trigger rate with 12 modules connected to the board was 90 Hz producing a throughput of 160 MB/s, without compression. Every single event acquired was checked and no error was found.
Now it is under test a new firmware where has been implemented new features like, modularity with granularity 1, so CARLOSrx is able to receive data coming from one or more modules at the same time (this important feature permits CARLOSrx to eliminate a module with problem and continue to acquire data), error management. In this way CARLOSrx is able to reject events: this command is sent from the trigger system.
Moreover a RS232 interface has been developed to debug the board during data acquisition (a custom software takes the control of RS232 port of PC in this way is able to send some commands to CARLOSrx and check the value of some registers and signals during the run).
A custom software has been developed to analyze the data produced by CARLOSrx. This software is completely automatized and it is able to find eventual errors caused by a wrong behavior of CARLOSrx and or front end electronics.

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