Contribution ID: **82** Type: **Oral**

Integrated test environment for a part of the LHCb calorimeter

Tuesday, 22 September 2009 15:25 (25 minutes)

An integrated test environment for the data acquisition electronics of the Scintillator Pad Detector (SPD) from the calorimeter of the LHCb experiment is presented. It allows to test separately every single board or to perform global system tests, while being able to emulate every part of the system and debug it. This environment is foreseen to test the production of spare electronics boards and help to the maintenance of the SPD electronics along the life of the detector. The heart of the system is an Altera Stratix II FPGA while the main board can be controlled over USB, Ethernet or WiFi.

Summary

The maintenance of the detector electronics shall become an issue along the LHC life. In effect, it is expected that potentially malfunctioning boards, repaired ones or even productions of new spares will have to be tested. Original test benches may have been dismantled or the original experts designing the board may not be available anymore. For this reasons, automated standalone test benches may be of use: they should allow an operator to diagnose or test a board along the detector lifetime. In this paper, we present such a test bench, for the Scintillator Pad Detector (SPD) of the LHCb calorimeter.

The SPD is the front layer of scintillator tiles of the LHCb calorimeter. The data acquisition electronics is basically divided in three boards: a Very Front End (VFE) board, a Regulator Board, providing the VFE power supply and a Control Board, linking the two to the experiment control system and performing some trigger calculations.

The integrated test system is capable of checking and diagnosing separately each type of board, namely the VFE boards, the Regulator boards and the SPD Control Boards, as well as their connectivity, including tests on a photomultiplier test bench and of the optical links. It can also perform global system tests using the various types of boards interconnected.

The system consists of a main printed circuit board which has connectors for all the boards. The system can be mounted in many different ways, from a completely simulated environment for a single board to a system fully connected to the real detector excepting one link connected to the test board. This is what gives the system its flexibility.

The board uses an Altera Stratix II EP2S60F484C5N mounted on a development board. It also contains 8 LVDS transmitters and 4 receivers at a total of about 8.6Gbps, an optical receiver at about 1.2Gbps and means to test the control cables which include I2C, a clock and a serial high speed link. It has a clock generator at the exact frequency of the experiment, in order to increase its autonomy.

It all works attached to a computer by USB but it is also prepared to work connected to a network by Ethernet or WiFi. It is possible to adapt the software to use the network connection to control the system. This could be useful to allow users to perform remote tests, but it also opens the possibility of running the control software directly on the board. Running software from the board allows any PC with no specific program or drivers to use the system.

We expect the strong points of the system, such as the capacity to test all types of boards in the SPD, together as well as standalone, the automation of the process and the remote control capacity to prove useful in the years to come for the maintenance of our electronics.

Primary author: Mr ABELLAN BETETA, Carlos (Universidad de Barcelona-Unknown-Unknown)

Co-authors: Mr COMERMA MONTELLS, Albert (Universidad de Barcelona-Unknown-Unknown); Mr GASCÓN FORA, David (Universidad de Barcelona-Unknown-Unknown); Mr PICATOSTE OLLOQUI, Eduardo (Universidad de Barcelona-Unknown-Unknown); Dr RIERA BABURÉS, Jordi (Universidad de Barcelona-Unknown-Unknown); Ms ROSELLÓ I CANAL, Maria del Mar (Universidad de Barcelona-Unknown-Unknown); Dr VILASÍS CARDONA,

Xavier (Universidad de Barcelona-Unknown-Unknown); Mr GASPAR DE VALENZUELA CUETO, Álvaro (Universidad de Barcelona-Unknown-Unknown)

Presenter: Mr ABELLAN BETETA, Carlos (Universidad de Barcelona-Unknown-Unknown)

Session Classification: Parallel session B2a - Production, testing and reliability

Track Classification: Production, testing and reliability