Status of the Optical Multiplexer Board 9U Prototype

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The Optical Multiplexer Board is one of the elements present in the Read Out chain of the Tile Calorimeter in ATLAS experiment. Due to radiation effects, two optical fibers with the same data are sent from the Front End Boards to this board, which has to decide in real time which one carries good data and pass them to Read Out Driver motherboard for processing.
The paper describes the design, tests and status of the first prototype, implemented as a 9U VME64x slave module, including both hardware and firmware aspects. In this last, algorithms for Cyclic Redundancy Code checking are used to make the decision. Besides, the board may be used as a data injector for testing purposes of the Read Out Driver motherboard.

Summary

TileCal is the hadronic calorimeter of the ATLAS experiments. It consists, electronically speaking, of 10000 channels to be read each 25 ns. Data gathered from these channels are digitized and transmitted to the data acquisition system (DAQ) following the assertions of a three level trigger system.
The main component of the back-end electronics of the TileCal sub-detector is the Read-Out Driver (ROD) which is placed between the first and the second level trigger level. The ROD has to pre-process and gather data coming from the Front End Boards (FEB) and send these data to the Read-Out Buffers (ROB) in the second level trigger.
To reduce data loss due to radiation effects, the TileCal collaboration decided to include data redundancy in the output links of the FrontEnd. This was accomplished using two optical fibres which transmit the same data. At ROD system level, data redundancy is used to discard the fibre with errors due to radiation.
The checking is based on rightness of the Cyclic Redundancy Codes (CRC) of the data packets on both fibres. This is also necessary as the ROD motherboard is expecting just one fibre per channel. For this purpose a new module, called Optical Multiplexer Board (OMB) was conceived. This board would be able to provide, in case of error in one link, the correct data to the ROD input by analyzing the Cyclic Redundancy Codes (CRC) of the data packets on both fibers coming from the FEB.
In the development of the work a new functionality for OMB was proposed. Because RODs should be tested in production stages and provided that in the first moments of LHC operation data may not always be available from front-end, it was suggested to include a "Data Injector Mode"to use the OMB like data pattern injector for ROD test and verification tasks.
The interest of this project was justified in February 2003, when a preliminary study appeared. This proposal shown a solution for OMB based on exhaustive on-line analysis of the data carried by both of the fibbers, using FPGAs for implementation.
The excellent results of the first OMB 6U prototype are described in this paper as well as the functional description and technical specifications of the final OMB 9U prototype. In this paper we show the status of this new OMB 9U Prototype.

Primary author: Dr TORRES PAIS, Jose (Universidad de Valencia)

Co-authors: Mr VALERO, Alberto (Instituto de Física Corpuscular); Dr FERRER, Antonio (Instituto de Física Corpuscular); Ms RUIZ-MARTINEZ, Arantxa (Instituto de Física Corpuscular); Ms SALVACHUA, Belen (Instituto de Física Corpuscular); Mr SOLANS, Carlos (Instituto de Física Corpuscular); Mr CUENCA, Cristobal (Instituto de Física Corpuscular); Dr HIGON, Emilio (Instituto de Física Corpuscular); Dr SANCHIS, Enrique (Universidad de Valencia); Dr FULLANA, Esteban (Instituto de Física Corpuscular); Mr ABDALLAH, Jalal (Instituto de Física Corpuscular); Mr POVEDA, Joaquin (Instituto de Física Corpuscular); Dr VALLS, Juan Antonio (Instituto de Física Corpuscular); Dr GONZALEZ, Vicente (Universidad de Valencia); Ms CASTILLO, Victoria (Instituto de Física Corpuscular)

Presenter: Dr TORRES PAIS, Jose (Universidad de Valencia)

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