Contribution ID: **90**   Type: **Poster presentation**

A new electronic board to drive the Laser calibration system of the ATLAS hadron calorimeter

Tuesday 7 June 2016 15:00 (1h 30m)

The LASER calibration system of the ATLAS hadron calorimeter aims at monitoring the ˜10000 PMTs of the TileCal. The
LASER light injected in the PMTs is measured by sets of photodiodes at several stages of the optical path. The monitoring of the photodiodes is performed by a redundant internal calibration system using an LED, a radioactive
source, and a charge injection system.

The LASer Calibration Rod (LASCAR) electronics card is a major component of the LASER calibration scheme. Housed in
a VME crate, its main components include a charge ADC, a TTCRx, a HOLA part, an interface to control the LASER, and
a charge injection system. The 13 bits ADC is a 2000pc full-scale converter that processes up to 16 signals stemming
from 11 photodiodes, 2 PMTs, and 3 charge injection channels. Two gains are used (x1 and x4) to increase the dynamic
range and avoid a saturation of the LASER signal for high intensities. The TTCRx chip (designed by CERN) retrieves
LHC signals to synchronize the LASCAR card with the collider. The HOLA mezzanine (also designed by CERN) transmits
LASER data fragments (e.g. digitized signal from the photodiodes) to the DAQ of ATLAS. The interface part is used
during the pp collisions when the LASER is flashed in empty bunch-crossings. A time correction may then be performed, depending on the LASER intensity requested. The charge injection part aims at monitoring the linearity of
the photodiode preamplifiers by injecting a 5V max signal with a 16-bits dynamics. All these features are managed
with a field-programmable gate array (FPGA Cyclone V) and a microcontroler (Microchip pic32) equipped with an
ethernet interface to the Detector Control System (DCS) of ATLAS.

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Session Classification: Poster session 1