Contribution ID: **40** Type: **Oral**

Phase-I Upgrade of the Trigger Readout Electronics of the ATLAS Liquid-Argon Calorimeters and the Expected System Performance

Tuesday, 24 September 2013 14:51 (24 minutes)

The Phase-I luminosity upgrade of the LHC, planned for 2018, requires an improved trigger performance of the LHC detectors in order to suppress increasing pile-up noise. In the Phase-I upgrade of the read-out electronics of the ATLAS LAr Calorimeters high-granularity signals are provided to the Calorimeter trigger system for improved trigger feature extraction. The general design of the future LAr Calorimeter read-out system is being presented, including the newly developed system components for analog and digital signal processing, and high-bandwidth optical data transmission. Recent results of the simulated system performance for digital signal filtering and trigger feature identification will also be reported.

Summary

The ATLAS Liquid Argon (LAr) calorimeters produce a total of 182,486 signals which are digitized and processed by the front-end and back-end electronics at every triggered event. In addition, the front-end electronics is summing analog signals to provide coarsely grained energy sums, called trigger towers, to the first-level trigger system, which is optimized for nominal LHC luminosities. However, the pile-up noise expected during the High Luminosity phases of LHC will be increased by factors of 3 to 7. An improved spatial granularity of the trigger primitives is therefore proposed in order to improve the identification performance for trigger signatures, like electrons, photons, tau leptons, jets, total and missing energy, at high background rejection rates.

For the first upgrade phase in 2018, new LAr Trigger Digitizer Board (LTDB) are being designed to receive higher granularity signals, digitize them on detector and send them via fast optical links to a new LAr Digital Processing System (LDPS). The LDPS applies a digital filtering and identifies significant energy depositions in each trigger channel. The refined trigger primitives are then transmitted to the first level trigger system to extract improved trigger signatures.

This talk will present the general concept of the upgraded LAr calorimeter readout together with the various electronics components to be developed for such a complex system. The R&D activities as well as architectural and performance studies undertaken by the ATLAS LAr Calorimeter group will be described. The on-going design of mixed-signal front-end ASICs, of radiation tolerant optical-links, and of the high-speed off-detector FPGA based LDPS units will be presented.

The presentation will be completed by the simulated performance of the future system. In particular, recent studies of digital filter algorithms for energy reconstruction and bunch crossing identification based on FIR filters and on filters applying an active event-by-event pile-up correction are reported, together with the expected trigger performance exploiting the new fine-granularity read-out.

Presenter: GROHS, Johannes Philipp (Technische Universitaet Dresden (DE))

Session Classification: Systems, Planning, Installation, Commissioning and Running Experience