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Development of the ATLAS Liquid Argon Calorimeter Backend Readout Electronics for the HL-LHC

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In 2029 the High-Luminosity LHC will start to be operational. It will allow to collect ten times more data than what have been achieved by the LHC.

This will be effectively done by increasing the number of collisions by bunch crossing, leading to higher radiation doses and busier events. To cope with those harsher data taking conditions, the ATLAS Liquid Argon Calorimeter more advanced data processing will have to be running to measured the deposited energies.

To achieve this a new ATCA compliant signal processing boards ("LASP") has been designed. It will receive the detector ADC data at 40 MHz and for two different gains. In total the 278 LASPs will have to receive 345 Tbps of data via 33000 links at 10 Gbps.

On each of the LASP board 2 high end Agilex FGPAs will perform online energy and time reconstruction. A subset of the computed energies will be sent with low latency to the hardware trigger system. Meanwhile the the full set of data are buffered until the reception of trigger accept signals. For the trigerred event teh data are sent to the aquisition via a Smart Rear Transition Module (SRTM).

Given the high number of particles created per collision, it will become much more frequent to have overlapping pulses. Adavanced neural netwok technics are foreseen to be used to disentangle the energy value of each deposit. Those machine learning techniques will have also to be inserted onto the LASP firmware.

In addition to the LASP a timing system allowing to control and synchronize the on-detector electron have been designed. Profitting from the newest electronic a very compact LATOURNETT board allows to control up to 72 on-detector boards.

Latest developements on the HW and firmware of the LASP, SRTM and LATOURNETT system will be presented on this contributions.

Collaboration

Role of Submitter

The presenter will be selected later by the Collaboration

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