Contribution ID: **60** Type: **not specified**

Upgrade of the ATLAS Liquid Argon Calorimeters for the HL-LHC

Wednesday, May 18, 2016 8:30 AM (20 minutes)

The increased particle flux at the high luminosity phase of the LHC (HL-LHC) with instantaneous luminosities of up to 7.5 times the original design value of 10^{34} cm^{-2} s^{-1} will have an impact on many sub-systems of the ATLAS detector. In particular, in the Liquid Argon (LAr) forward calorimeter (FCal), which was designed for operation at LHC luminosities, the associated increase in the ionization load at HL-LHC luminosities poses a number of problems that can degrade its performance, related to beam heating, space charge effects in the liquid Argon gaps and HV drop due to increased current drawn over the HV current-limiting resistors. One solution to these problems, which would require the opening of both endcap cryostats, is the construction and installation of a new FCal, with cooling loops, narrower liquid Argon gaps, and lower value protection resistors. In addition, the proposed new FCal, covering a pseudo-rapidty region of 3.1<$|\eta|$<4.9, will have an increased granularity in its front-most module leading to better pile-up rejection and higher resolution of jet substructure.

Effects of pile-up are furthermore planned to be reduced in the whole LAr calorimeter end-cap region, 2.5<$|\eta|$<5.0, by inserting a high-granularity timing detector (HGTD) at the front face of the end-cap cryostat.

Multi-layer sensors, interleaved with absorber material at lower $|\eta|$, are foreseen to provide precision timing information for charged and neutral particles with a time resolution of 30 ps in order to assign the particle tracks to different proton-proton collision vertices. Using the information from several hundred thousand sensor elements, the contribution from pile-up jets can be significantly reduced, while preserving a high efficiency for hard-scatter jets. Sensor technologies under investigation are Low Gain Avalanche Detectors (LGAD), pin diodes, and HVCMOS sensors.

The talk will review the design of the new high-granularity forward calorimeter and timing detectors for ATLAS, discuss the proposed detector technologies as well as the expected performance at HL-LHC luminosities.

Primary author: POLIFKA, Richard (University of Toronto (CA))

Co-author: LAMPL, Walter (University of Arizona (US))

Presenter: POLIFKA, Richard (University of Toronto (CA))

Session Classification: High Luminosity LHC