

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

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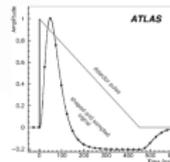
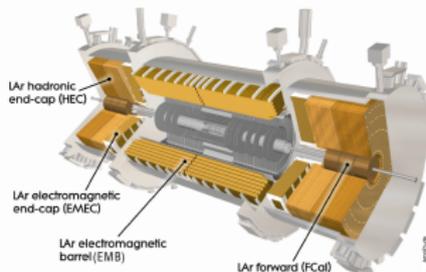


June 23, 2021

The LAr Calorimeter at HL-LHC



- High Luminosity Large Hadron Collider (HL-LHC) :
 - Upgrade in 2025-27
 - Instantaneous luminosity 5-7.5 times nominal
 - Integrated luminosity up to 4000 fb^{-1}
- Liquid Argon (LAr) Calorimeter :
 - Sampling calorimeter
 - Triangular ionization signal which is amplified, shaped and samples at 40 MHz
 - 182,468 channels
- New challenges for the LAr Calorimeter at HL-LHC :
 - Current front-end electronics radiation tolerance : $700\text{-}1000 \text{ fb}^{-1}$
 - Average number of interactions per bunch crossing from 35 to up to 200
 - Challenge for trigger electronics as well as energy and timing measurements



Upgrade Overview

Phase-II Upgrade :

- Full upgrade of main readout chain
- Provide full detector granularity to hardware trigger
- Transmit all data off-detector at 40 MHz for processing
- Radiation hard front-end electronics

Front-End :

- Custom ASICs in development for calibration system, preamplifier-shaper and digitization
 - Show promise to meet stringent requirements
- Slice test board shows full digital and readout chain functionality

Back-End :

- Fully functioning test-board design for back-end digital signal processing
- New energy reconstruction signal processing algorithms using machine learning techniques show promise

