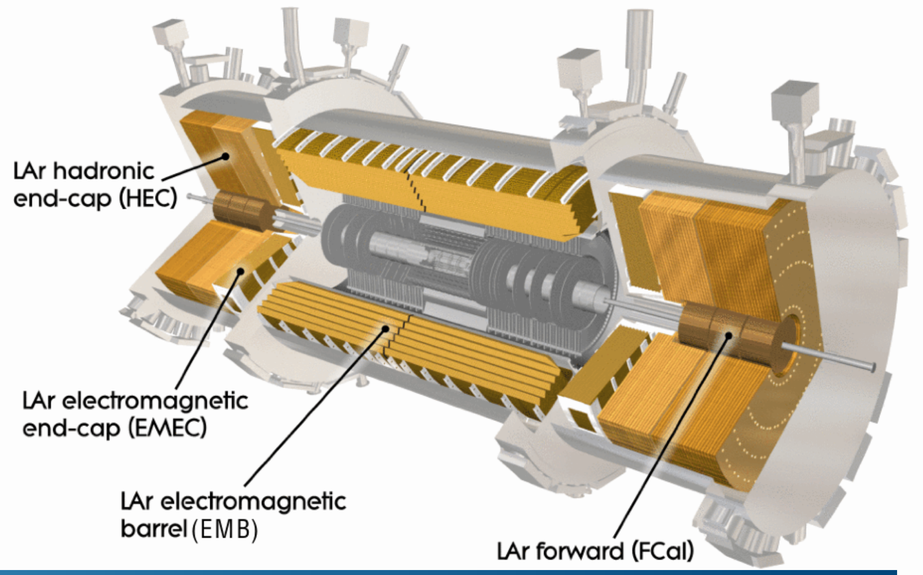
LHCP2020 Poster Session, 28-29 May 2020

ATLAS Liquid Argon Calorimeter Commissioning for LHC Run-3

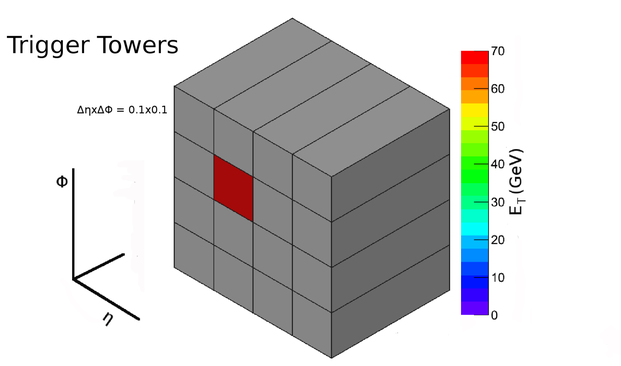
ATLAS Liquid Argon Calorimeters

- Sampling calorimeter using liquid argon as active material
- Electromagnetic calorimeters in barrel and endcap regions have accordion-like structures with absorber lead plates enabling a full azimuthal coverage.
- Hadronic endcap calorimeter has a conventional parallel plate design using copper plates.
- Forward calorimeter has a paraxial electrode structure with copper and tungsten as absorber material.

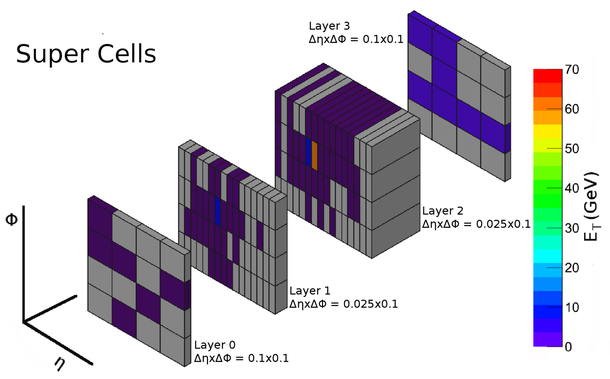


Phase-I Upgrade

- Level-1 trigger readout system is being upgraded to replace old *trigger towers* with *supercells* (with finer granularity) in order to improve object discrimination capability at trigger level.
- This allows to keep the trigger p_T thresholds at the same level, even with future increases in luminosity.

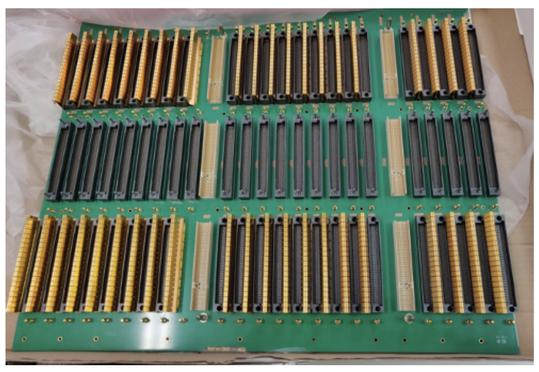


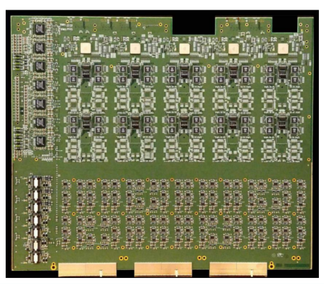
(a)

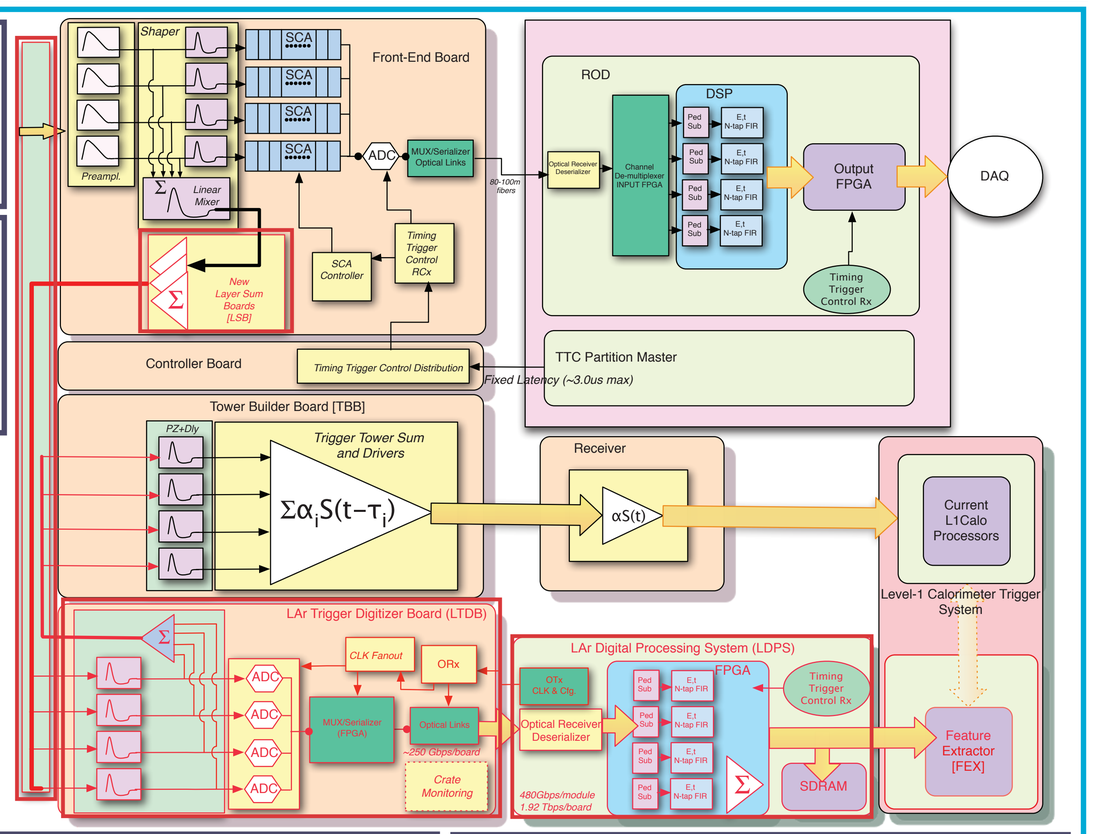


LSB (Layer Sum Board)
- to produce finer cell signal sums every readout board needs to be taken out of the cavern and refurbished

New Baseplanes
- allocates new slots for LTDBs
- routes supercell signals
- routes signal sums such that legacy trigger path is kept operational



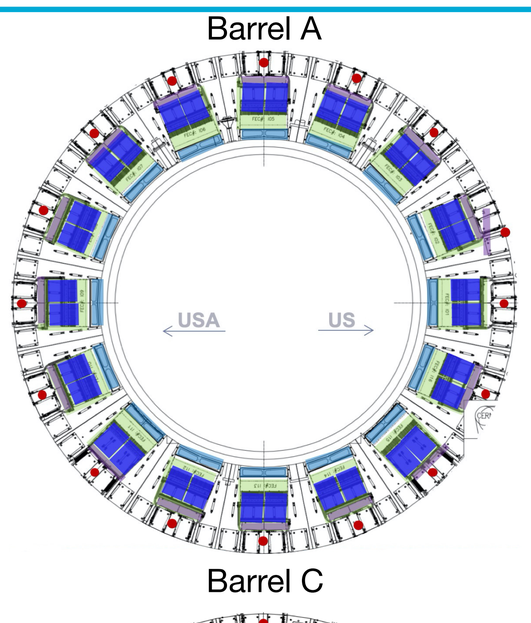


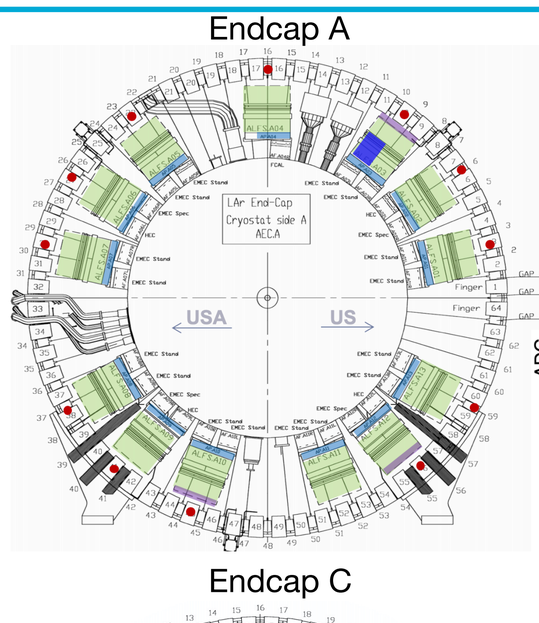


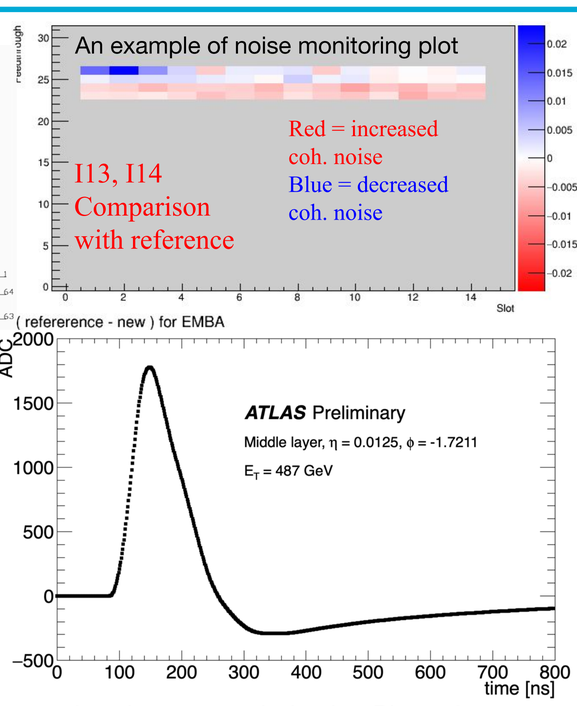
LTDB (LAr Trigger Digitizer Board)
- digitize analog signals and send to back-end digital processors
- form layer sums similar to those in Run 2 and send to legacy readout, leaving this readout system unaffected

LDPS (LAr Digital Processing System)
- receive digital signals from front-end
- calculate supercell E_T and identify bunch crossing ID of the signal
- send this information to the Level-1 Calo Trigger system at 40 MHz

Installation and Commissioning Status







pulse shape recorded using Phase-I system.

Legend and order of interventions

- Untouched FEC with two feed-throughs
- FEC with boards extracted (1st step)
- FEC with baseplane exchanged (2nd step)
- FEC with legacy boards reinstalled (3rd step)
- FEC two of two LTDBs installed (4th step)
- Cabled FEC, in commissioning (5th step)
- Completely refurbished and recabled FEC with two LTDBs and replaced LVPS cooling hoses
  * LVPS intervention performed in parallel to the installation

- The production of LSBs, baseplanes and boards for LDPS is complete. For LTDBs the production is on hold due to lab closures.
- Baseplane replacement and refurbishment of FEBs with new LSBs were progressing well before CERN closure. These tasks have resumed recently.
- 33 LTDBs are received and installed.
- 4 LDPS units have been installed.

Commissioning of newly refurbished crates:
- **Main Readout:** Readout boards refurbished with new LSBs are tested through measurement of calibration parameters and coherent noise values.
- **Legacy Trigger Readout:** This is tested to ensure it maintains its functionality since it will be kept operational until at least 2022. These tests are done by taking Level-1 Calo gain and timing scans of trigger towers.
- **New Trigger Readout:** The digital sums produced by new front-end and back-end boards are read and processed to calculate the energy and timing of calibration pulses.

★ There are significant ongoing efforts towards testing and validating the readout paths of newly refurbished crates.

★ Despite the pause in installation due to COVID-19 lockdown, the opportunity was used for improving online tools and remote testing of the system.

Sana Ketabchi (University of Toronto) for the ATLAS Collaboration

UNIVERSITY OF TORONTO

ATLAS EXPERIMENT