Poster 28

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

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ANIMMA Conference, Liège, Belgium
June 19–23, 2017
The ATLAS LAr Calorimeters

- sampling calorimeters consisting of liquid argon and absorber material
- 164,000 readout channels, 40M beam crossings per second
- cover a wide range of scattering angles and physics processes
5 – 7 times the design luminosity, up to 8 times more pile-up events

⇒ input to trigger system with high accept rate (1–4 MHz) to improve background suppression
Readout Electronics Upgrade

- new front-end boards (FEB-2), new LAr Signal Processors (LASP)
- FEB-2 sends unbuffered data to the back end (“free running design”)
Front-End Board (FEB-2)

- low noise in all components
- new pre-amplifier designs:
  - wide dynamic range
  - strict linearity requirements
- new ADC designs:
  - 2 gain levels
  - 16 bit/channel required
  - commercial and custom solutions explored

LAr Signal Processor (LASP)

- input data rate of 275 Tbit/s
- up to 400 modules
- 35 000 optical links from the front-end boards

Fully-Differential FE Amplifier with Passive Feedback

- Input impedance $R_{in} = R/(N+1)$
- Resistor noise $4kT/R << 4kT/R_{in}$
- Very stable termination ($R, N$ indep. of signal current and active components)
- Fully-differential output
Upgrade Simulation

- AREUS simulates readout electronics and digital filtering
- highly configurable for different test scenarios:
  - electronics noise
  - number of pile-up events
  - filter algorithms
  - ...