

ATLAS operation

Marina Kholodenko
On behalf of LIP group



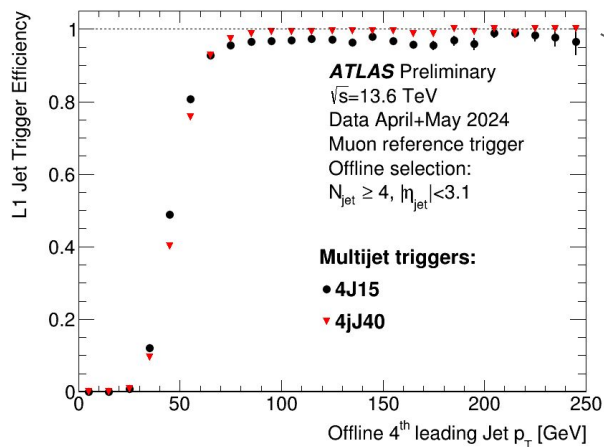
Outline

ATLAS operation activities:

- **ATLAS Forward Proton tagging detectors (AFP)**
 - Co-coordination of Detector Control System (Luis Seabra), vacuum and movement controls
- **Trigger**
 - Coordination of Jet Trigger Signature group (Inês Ochoa)
 - Co-coordination of the HLT Calo group (Nuno Fernandes)
- **Hadronic Tile calorimeter (TileCal):**
 - Coordination of Data Preparation and Performance (Helena Santos)
 - Co-coordinator of the HL-LHC Upgrade Performance studies (Rute Pedro)
 - The Detector Control System (Filipe Martins)
 - Caesium calibration (Marina Kholodenko)
 - Laser Calibration (Beatriz Pereira)
 - The scintillator and fiber ageing study using caesium and laser data (Rute Pedro, Beatriz Pereira)
 - The study of the scintillators and fibres ageing with Cs and Laser data (Rute Pedro, Beatriz Pereira)

Trigger

- Coordination of Jet **Trigger Signature group** (Inês Ochoa)
- New in 2024:
 - High-level jet trigger switched to new “Phase-I” upgraded Level-1 seeds (legacy system now fully disabled)
 - Ongoing commissioning of new pile-up robust algorithms for multi-jet triggers.

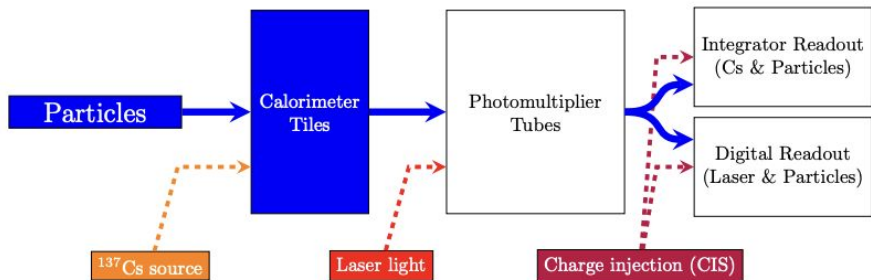
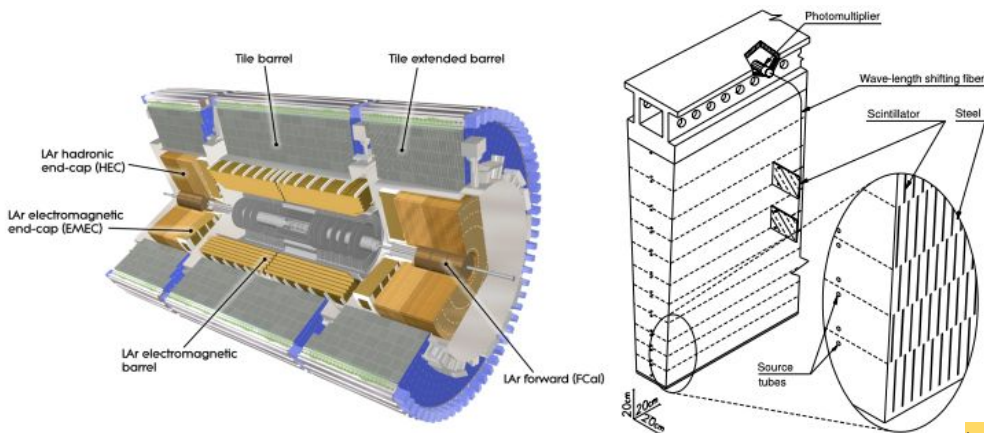


Higher efficiency of Phase-I system due to higher granularity: allows for better resolution of close-by jets.

HLT Calo group (Nuno Fernandes)

- Trigger online support
- Software-based reconstruction

Hadronic Tile Calorimeter



- Particle, jet and missing transverse energy measurements
- **Three partitions with 64 modules**
- **Absorber:** steel plates (14 mm)
- **Active material:** organic scintillator (3 mm)
- **The tiles** - along the radius from the beam pipe (11 tile rows of different size).

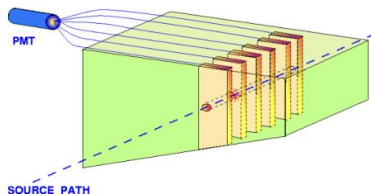
Three calibration systems: the electronic charge injection system, the cesium radioactive γ -source system and the laser system;

The caesium and laser systems - the degradation of the TileCal signals due to their exposure to a high radiation level

$$E[\text{GeV}] = \frac{A[\text{ADC}]}{f_{pC \rightarrow \text{GeV}} f_{Cs} f_{Las} f_{ADC \rightarrow pC}}$$

Caesium and Laser Calibration (Marina Kholodenko, Beatriz Pereira)

Cesium calibration system



- Caesium γ -source propelled by hydraulic system
- Traverse all modules, deposit the energy of γ -ray
- To monitor the whole optical path
- Requires 6-8 hours without pp collisions (scintillating tiles, fibers, PMT)

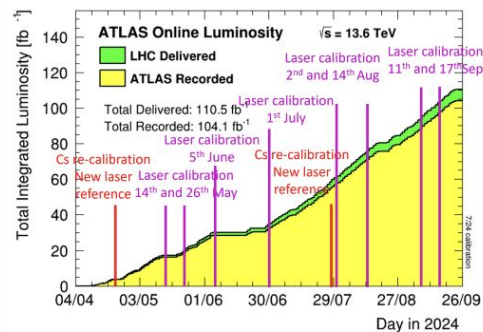
The main calibration of the energy scale - the cesium system

Relative calibrations are accomplished between two cesium scans using the laser system

Update of cesium and laser calibration constants in DB: during data taking and for reprocessing

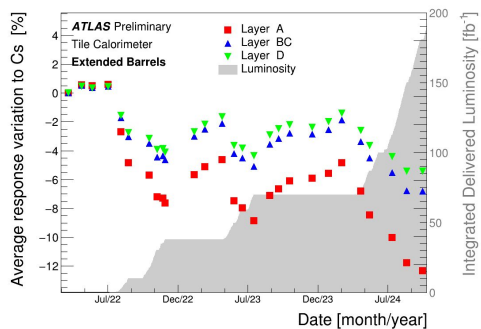
Laser calibration system

- Laser source
- Light guides and beam expanders
- An optical filter wheel to adjust the light intensity
- beam splitters to dispatch the light to the Tile Calorimeter PMTs
- 400 clear optical fibres, 100 to 120 m long
- To monitor PMT response

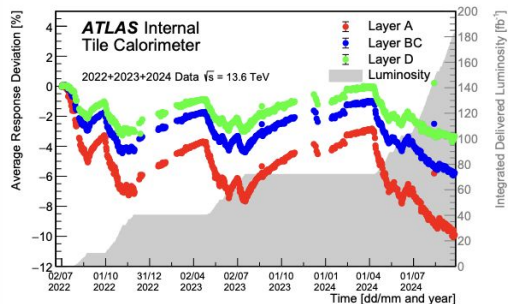


Cesium and Laser Calibration (Marina Kholodenko, Beatriz Pereira)

Caesium response variation for 3 radial layers

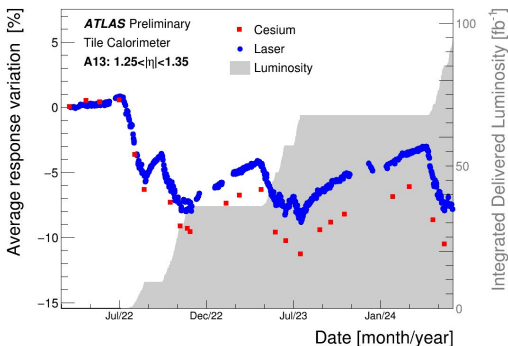


Laser response variation for 3 radial layers



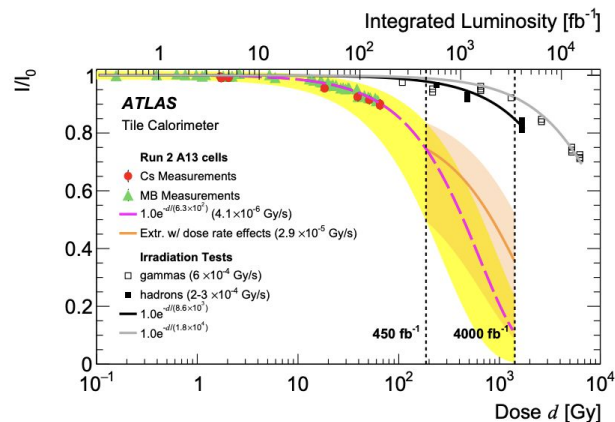
The average response variation in caesium and laser for the most affected cell

The difference in calorimeter response to the laser versus caesium - the effect of damaged and ageing of scintillators and WLS fibers



The study of the scintillators and fibres ageing with Cs and Laser data

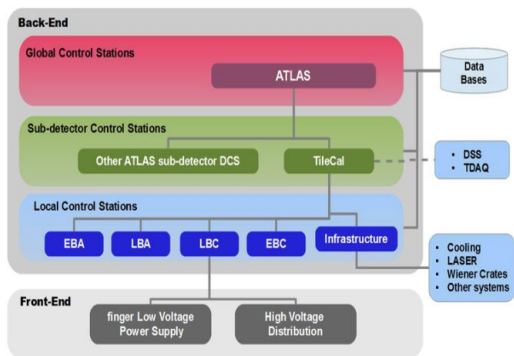
- extrapolating for the HL-LHC
- the corresponding paper draft is in internal approval.



TileCal: Data preparation/DCS/HL-LHC performance studies

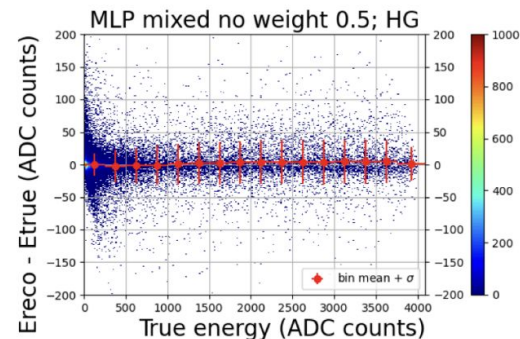
DP&P coordination (Helena Santos): calibration constant updates, Data Quality, electromagnetic scale and uniformity validation using cosmic and collision muons, signal reconstruction studies, E/p analysis, request production of specific DAODs

DCS system (Filipe Martins): Update and development of new component, implementation of new alarms/safety routines, training sessions for on-call experts.



HL-LHC Upgrade Performance studies

(Rute Pedro): Scintillator ageing and energy reconstruction techniques, pile-up noises, L0 calorimeter/Tile-muon trigger studies, jet performance studies, calibration strategies.



Thank you!