

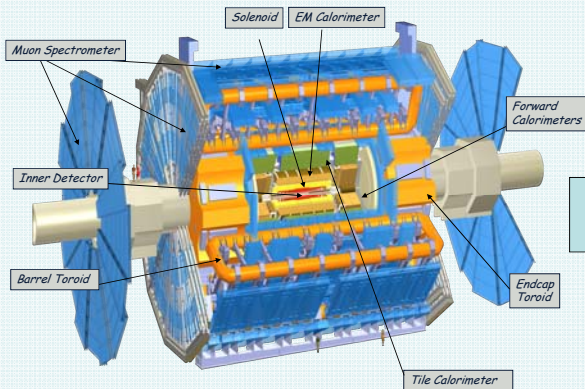


# MDT Data Quality Assessment at the Calibration Centers for the ATLAS experiment at LHC

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## MUON DETECTOR VIEW



MUON SYSTEM

### Muon Spectrometer Requirements

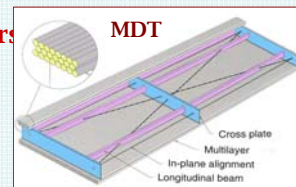
- Solid angle coverage
- Trigger capability for different muon momenta
- Operation in high rate and high background
- Good momentum resolution in the range 6GeV-1TeV

### Tracker Detectors

- Monitored Drift Tube Chambers
- Cathode Strip Chambers

### Trigger Detectors

- Resistive Plate Chambers
- Thin Gap Chambers

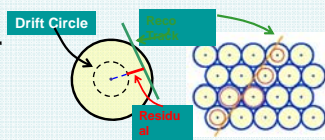


Toroidal magnetic field in air to minimize multiple scattering. Can operate as a **stand-alone** detector

### Muon MDT Spectrometer Performance

The nominal resolution of  $80\mu\text{m}$  on a single hit is required in the coordinate orthogonal to the B-field. Accuracy in the **precision of the drift time measurement** and of the detector mechanics.

Knowledge of the space-time (r-t) relation  
→ MDT CALIBRATION



## MUON STREAM

Continuous MDT calibration and alignment are needed to keep all effects under control

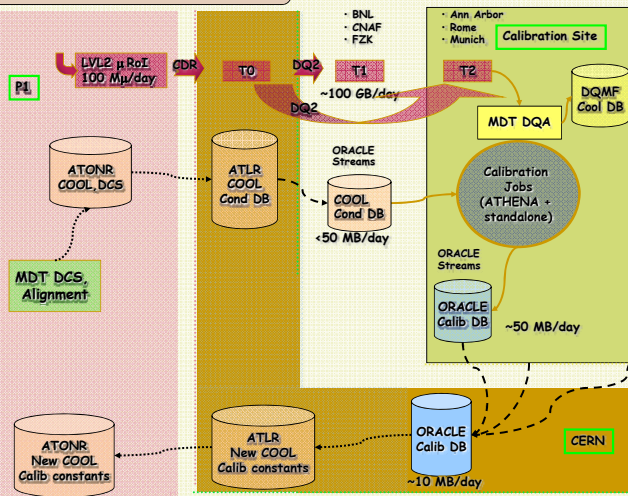
Weekly computation of single tube  $t_0$  (~20K muon tracks/tube)

Daily determination of the **r-t relation** of each chamber

→ ~108 muon tracks each day over the entire spectrometer!  
Not achievable using the standard ATLAS Data Flow (muon rate through the 3 trigger levels ~20Hz) → Need a **dedicated Muon Stream**

Muons are extracted from the second level trigger (LVL2), requiring a track in the MDTs pointing to the vertex (~1 KHz)  
Data are streamlined and processed in 3 Calibration Centres  
Ann Arbor, Munich, Rome;

- ~100 CPUs each.
- ~1 day latency for the full chain: data extraction, calibration computation at the Centres, storage of results in the Condition DB at CERN. Need to carefully design the data flow and the DB architecture.



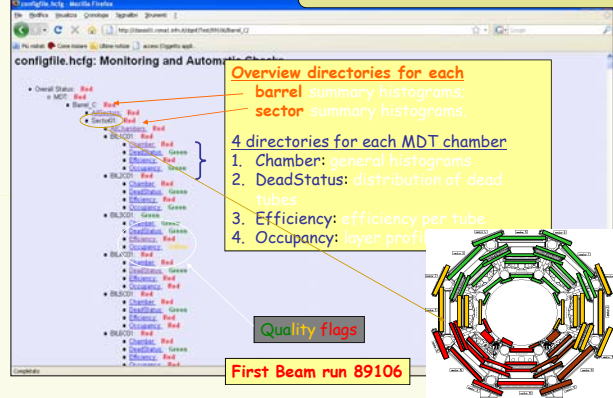
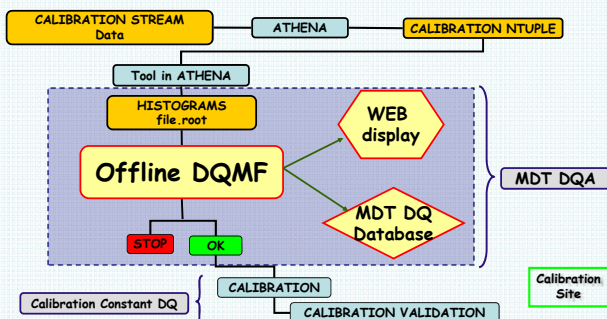
## DQMF ARCHITECTURE

## DQMF WEB DISPLAY

MDT Data Quality Assessment is performed using the "offline DQMF" package (Data Quality Monitoring Framework)

- Algorithms are applied on ROOT histograms, from the Calibration Stream, in an automated way.
- Histograms are compared respect to a reference.
- "Standard" and MDT dedicated algorithms are implemented in the package Results and summaries are published on WEB, stored in the **Conditions Database**.

DQMF is already used for MDT DQA by shifters at the calibration centers.



DQMF tool provides information about: Occupancy, DeadStatus, Efficiency and a global overview of the chamber status.

Based on dedicated analysis algorithms, general colour flags are produced to be stored in the Conditions DB.