The ALICE FMD

Shift Training — 1st Session

Overview

Motivation

An overview of the FMD

Shifter Responsibilities

The System

Control

Taking Data

Data Quality

Access

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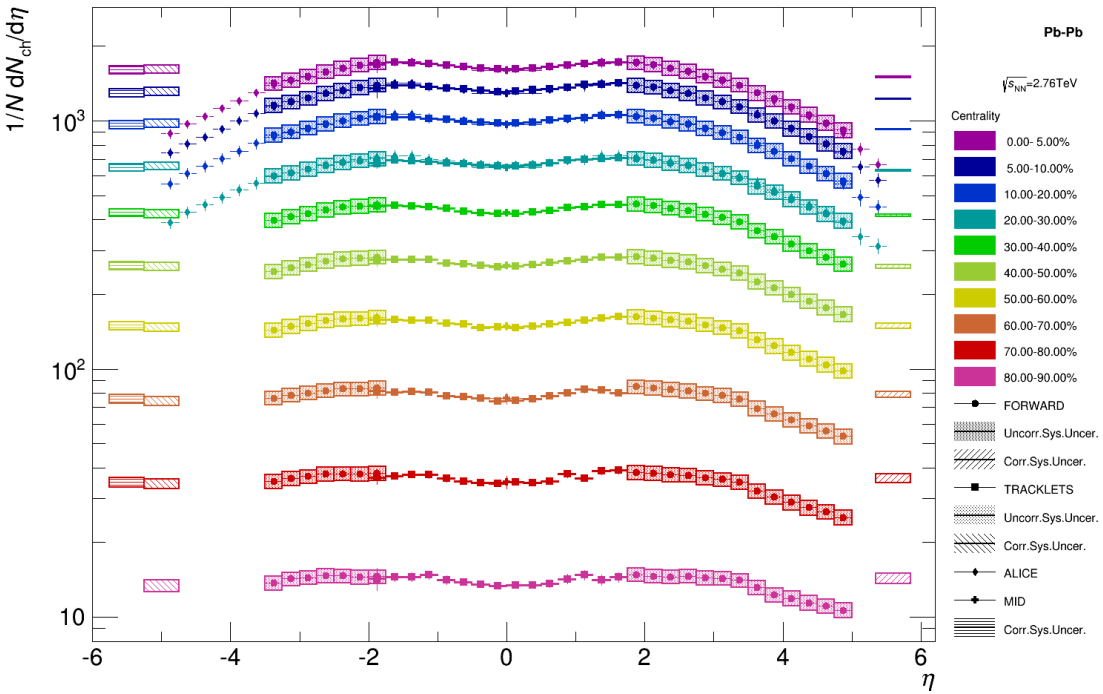
Measure $\frac{1}{N}\frac{\mathrm{d}N_{\mathrm{ch}}}{\mathrm{d}\eta}$ in forward directions



- Only N_{ch}
- No $\vec{p}$ or PID
- Also
  - $P(N_{\mathrm{ch}})$
  - v_n
  - b

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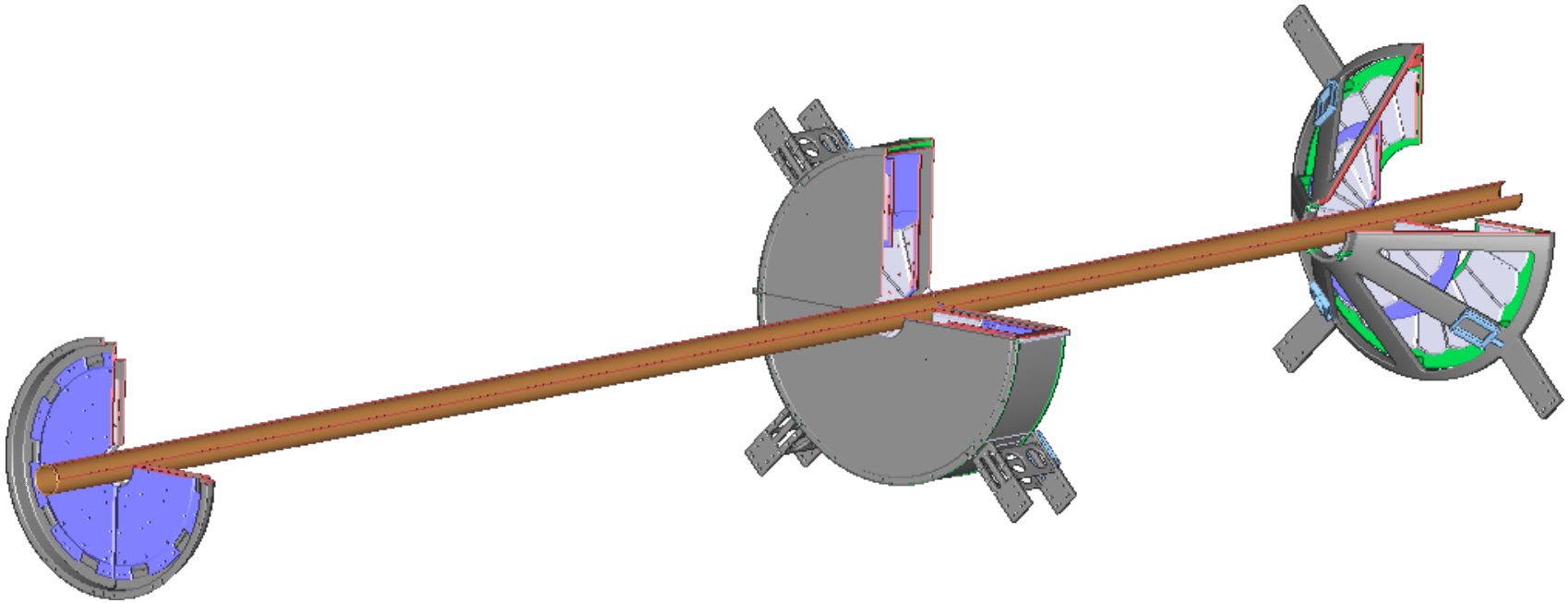
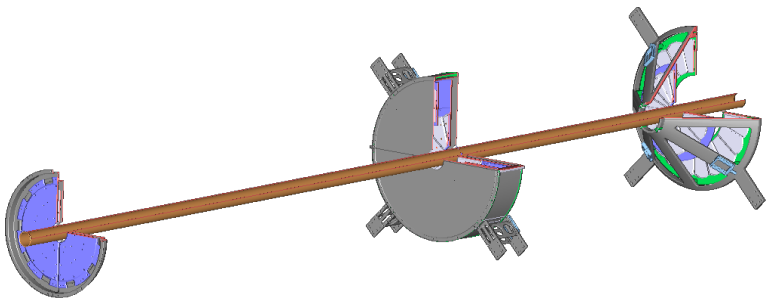
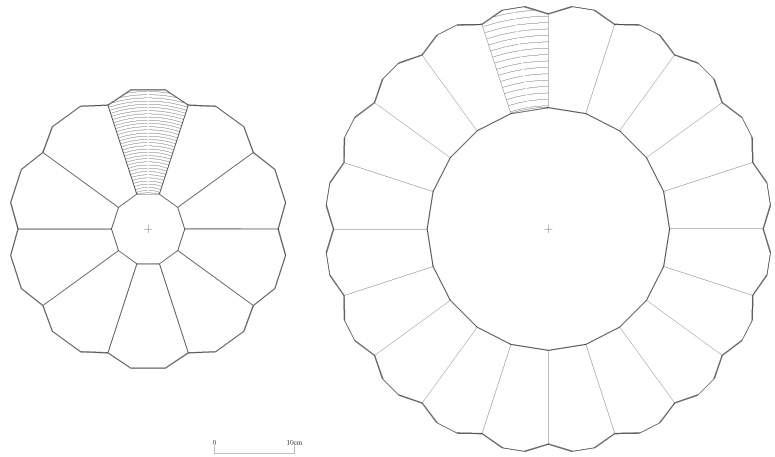
Placement



- 3 sub–detectors: FMD1,2,3
- 2 type rings: *inner* & *outer*
- Si–strip
- 51,200 read-out channels

Some numbers





Sub–detector/ Ring	Azimuthal sectors	Radial strips	z [cm]	r range [cm]			η coverage		
FMD1i	20	512	320	4.2	–	17.2	3.68	–	5.03
FMD2i	20	512	83.4	4.2	–	17.2	2.28	–	3.68
FMD2o	40	256	75.2	15.4	–	28.4	1.70	–	2.29
FMD3i	20	512	-75.2	4.2	–	17.2	-2.29	–	-1.70
FMD3o	40	256	-83.4	15.4	–	28.4	-3.40	–	-2.01

$$\eta = -\log\left[\tan\left(\frac{\vartheta}{2}\right)\right]$$

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Shifter Responsibilities

The shifter must at all time ensure smooth operation of the FMD, and ensure that quality of the recorded data is as good as it can be.

In bullets

- Register shift
- Know current run plan
- Know current status of FMD
- Deal with problems
- Daily report to RC
- Keep record in log–book
- Assert run quality
- Take calibration runs
- Monitor data

This session will give you the background to fulfill these tasks.

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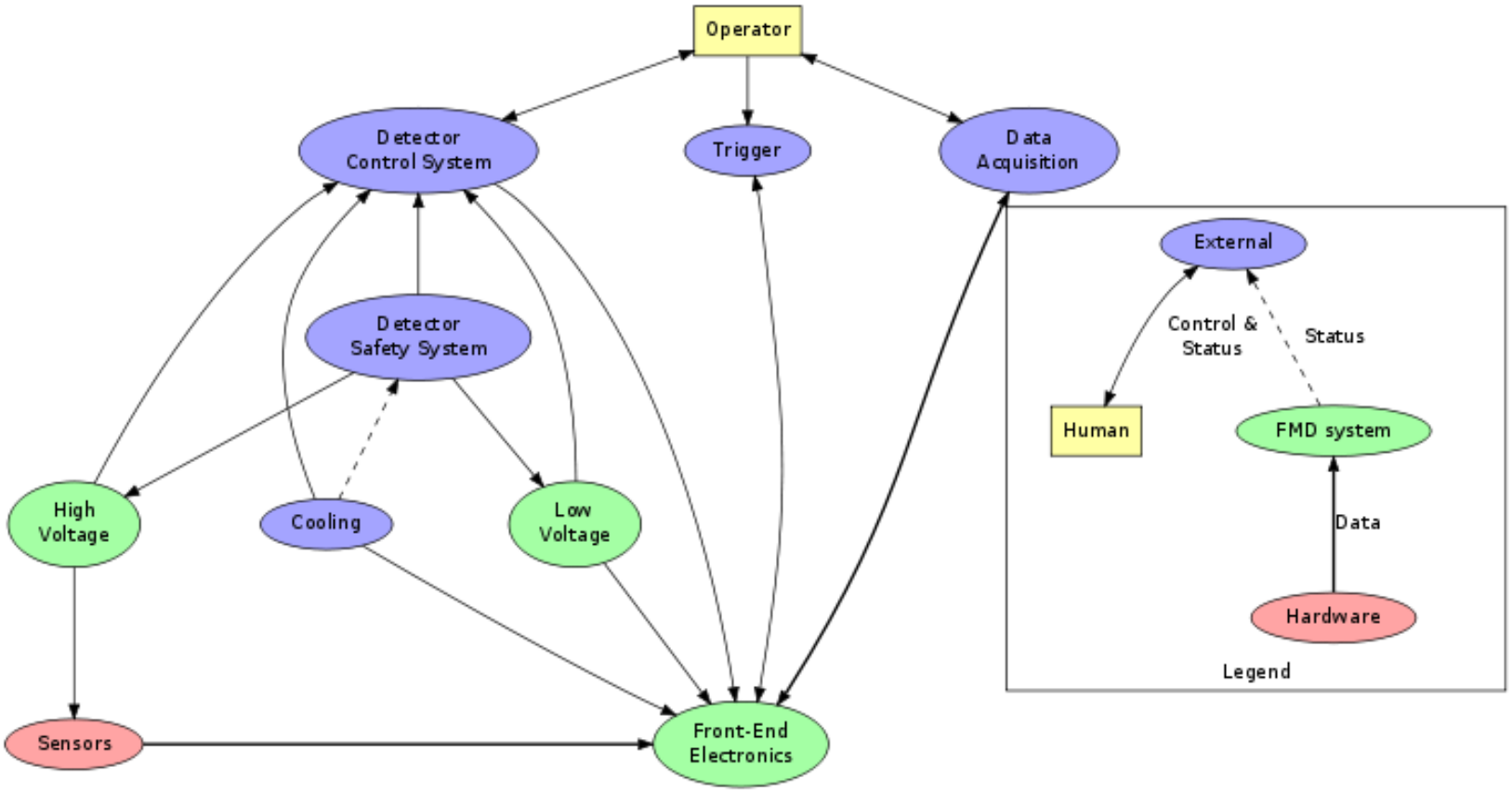
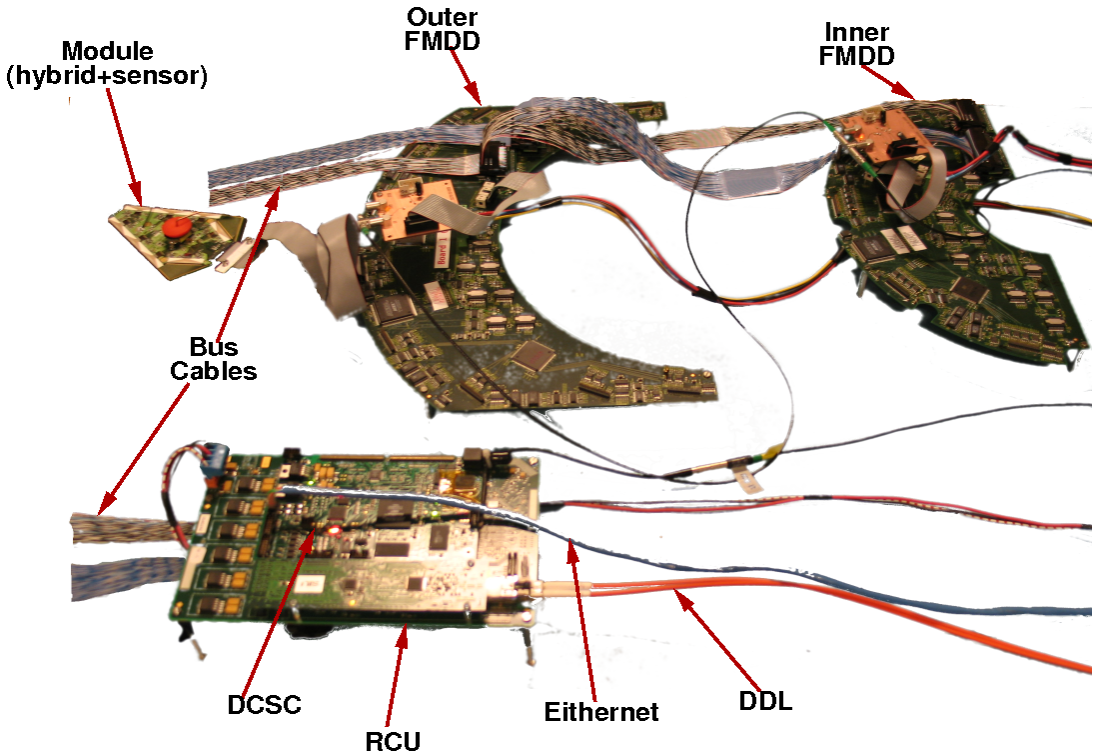
In Blobs

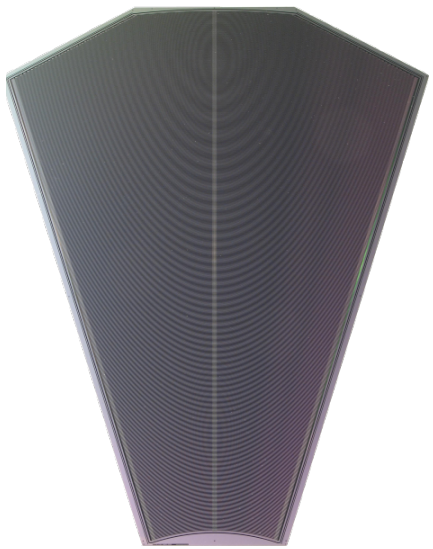

Operator
Detector Control System
Trigger
Data Acquisition
Detector Safety System
High Voltage
Cooling
Low Voltage
Sensors
Front-End Electronics
External
Control & Status
Status
Human
FMD system
Data
Hardware
Legend

The path of the Data



- Signal in sensor
- Pre-amp.'d in hybrid
- Digitized on FMDD
- Send to RCU
- Via DDL to DAQ

Sensors & Hybrids



- Si–strip
- High–voltage (70–130V) over sensor front/back
- Each strip bonded to Hybrid
- 128 strips pre-amp.'d by one VA1 pre-amp.
- Pre-amp.s take 4 Low Voltages (from FMDD)
- 128 strips multi–plexed into one (analogue) data line

Digitizer Card — FMDD

- 4/8 Analogue signals from hybrid to ALTROs (ADC)
- Receive trigger information
- Digitize signal and store
- Data handed off on request
- Asserts busy during signal processing

- Board Controller (BC) monitors currents, voltages, temperatures
- BC regulates voltage to pre-amp.s
- Specialized calibration circuit
- Configuration needed

Read–out Control Unit — RCU

- Handles triggers
- Collects digitized data from ALTROs
- Data pushed to DAQ over optical fibre.
- Facilitates comm. to/from digitizer to outside world.
- Embedded Computer (custom Linux) provides access from Detector Control System
- Needs configuration

Other systems

Cooling

- Active electronics generate heat
- RCUs and FMDDs cooled
- Leach on TPC cooling plant

Power Crate

- Allows control of power supplies
- One part in CR4 w/High Voltage modules
- One part in gallery in pit w/Low Voltage

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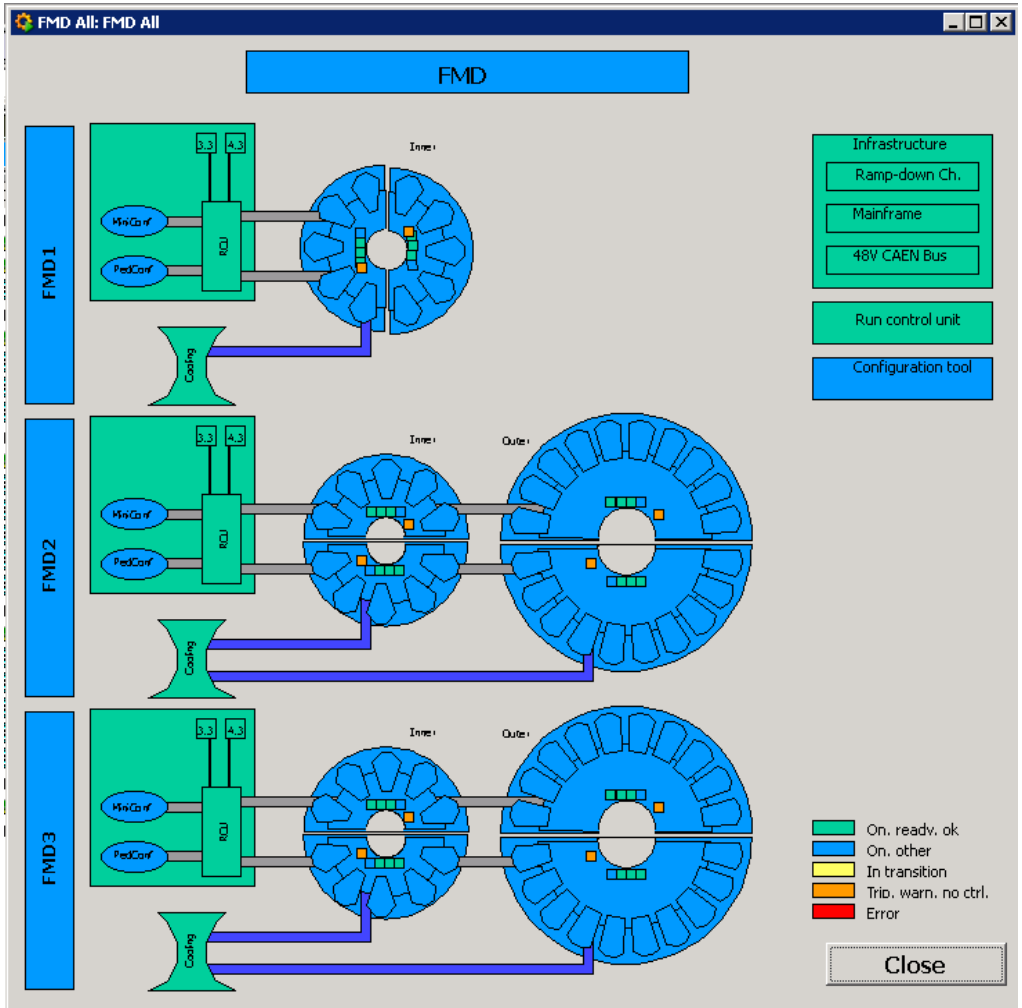
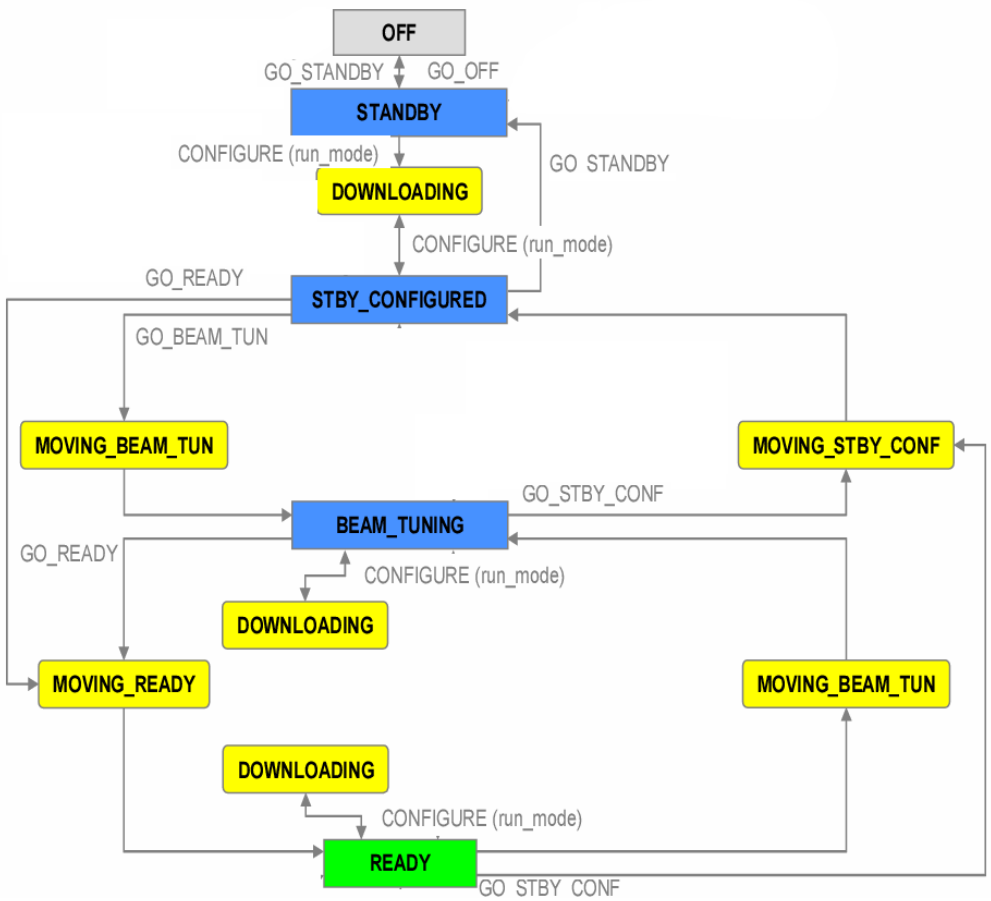
Detector Control System



- Hierarchical control
- Control Cooling, LV, HV, FEE (RCU & FMDD)
- State–machine to ensure safe operation and procedures
- Does configuration of FEE

The State Diagram



- Physics only in `READY` (all is on)
- `BEAM_TUNNING` is *safe* stand–by state (most LV is on, HV is off)
- `OFF` is *super–safe* stand–by state (all is off)
- `ERROR` state possible from any state

  (try `RESET` before panicking)

Configuration

3 types:

Physics

- Baseline subtraction
- Zero–suppression

Pedestal

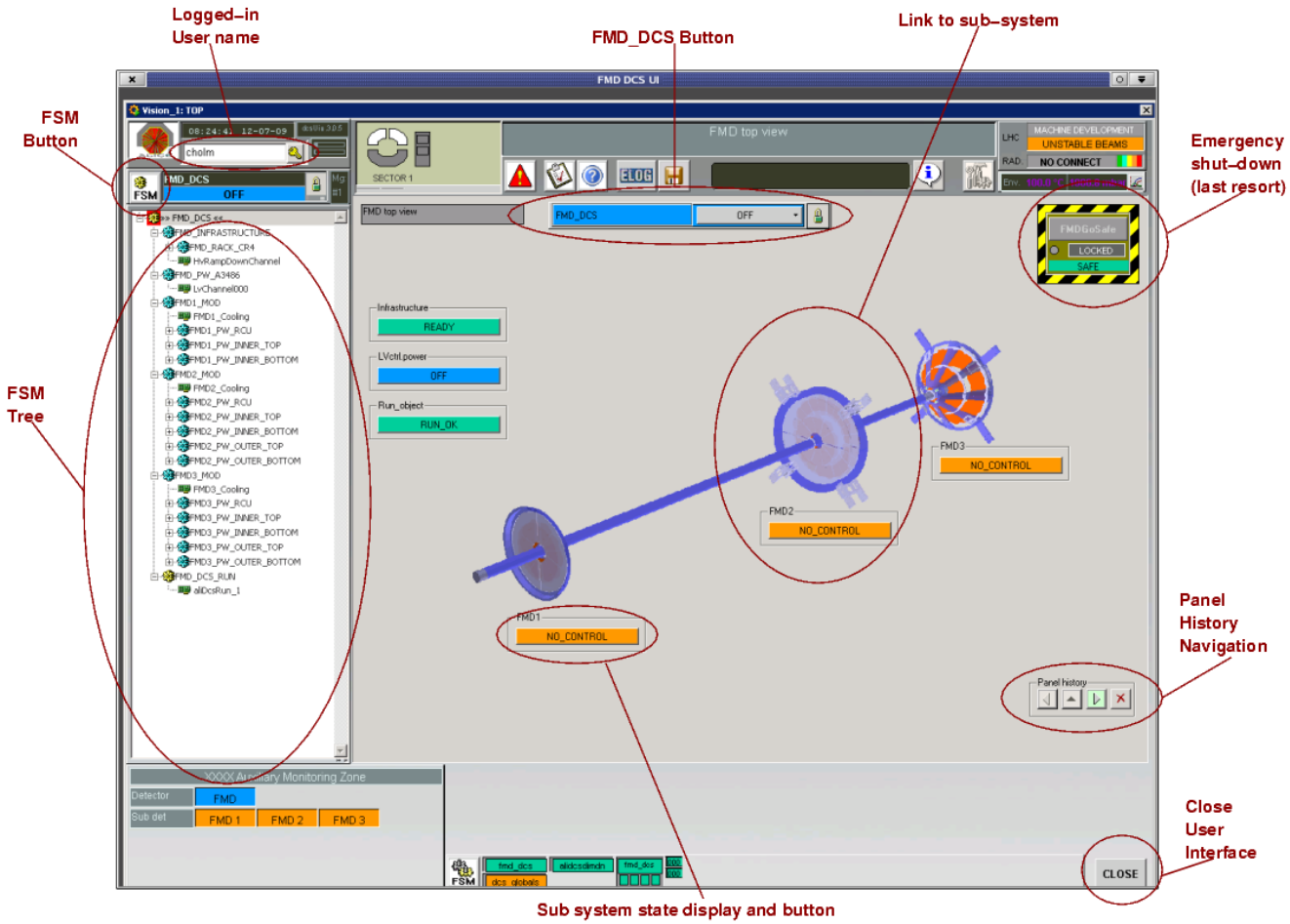
- No subtraction
- No suppression
- No beam required

Gain

- No subtraction
- No suppression
- Special settings for FMDD
- No beam required

Selected at top–level when `CONFIGURE`

The User Interface



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Taking data with the FMD (alone)

- Through Experiment Control System (ECS)
- Controls DAQ and Trigger
- Ensures detector in proper state
- (access a bit convoluted, covered at later session)

3 types of runs

ECS type	DCS Conf.	Beam OK?	Description
STANDALONE	PHYSICS	yes	Testing chain
PEDESTAL_EVALUATION	PEDESTAL	no!	Evalute baseline and store
GAIN_EVALUATION	GAIN	no!	Evalute strip gain (ADC/MIP) and store

- PEDESTAL at least once every 3 days
- GAIN at lease once a week
- Follow by STANDALONE to ensure quality
- (will perhaps be automatised)

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Monitor data for quality

Two modes:

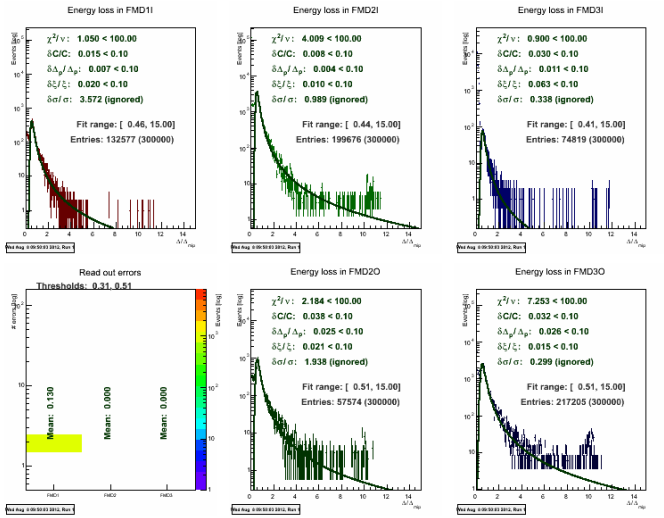
On–line

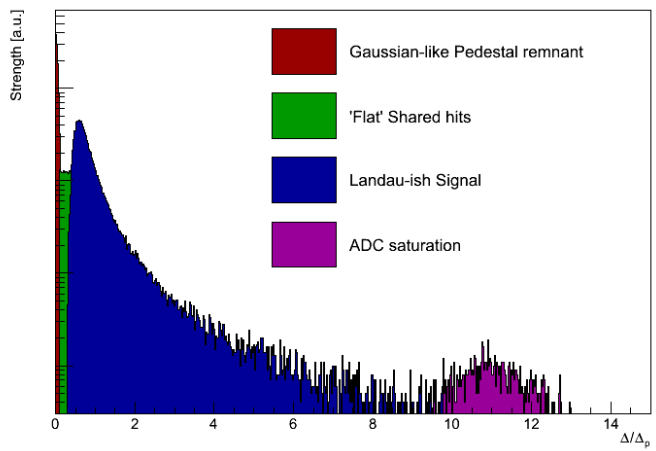
- Done centrally (DQM shifter)
- FMD shifter should also check–in
- Uses clients in DAQ network
  (access a bit convoluted, dealt with later)

Post–Run

- Through DAQ WWW log–book
- FMD shifter must assert run quality for `PHYSICS` runs longer than 10min within 24hours.

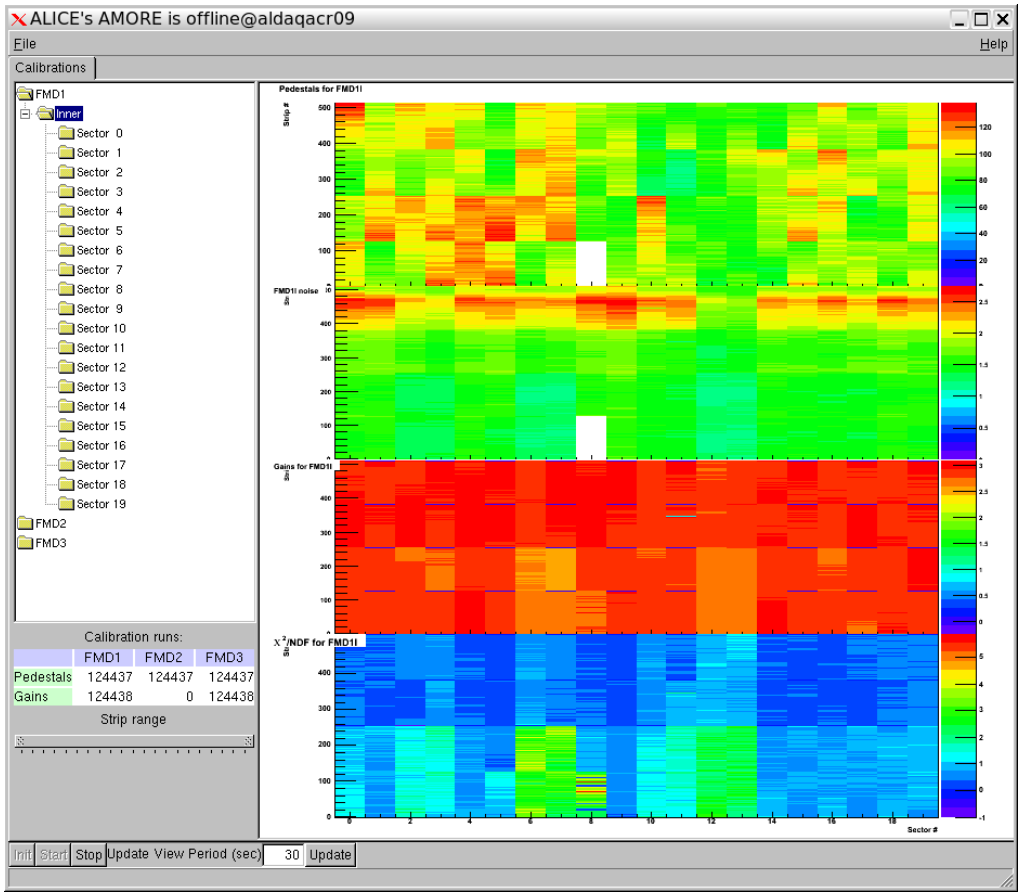
Monitor Data plots





- Energy loss
- Fits to distributions
- Read–out errors
- Look for
  - Too many read–out errors
  - Too large ‘sharing’ region

Monitor Calibration plots



- Not updated immediately
- Must do `STANDALONE` first.
- Check for abnormal patterns

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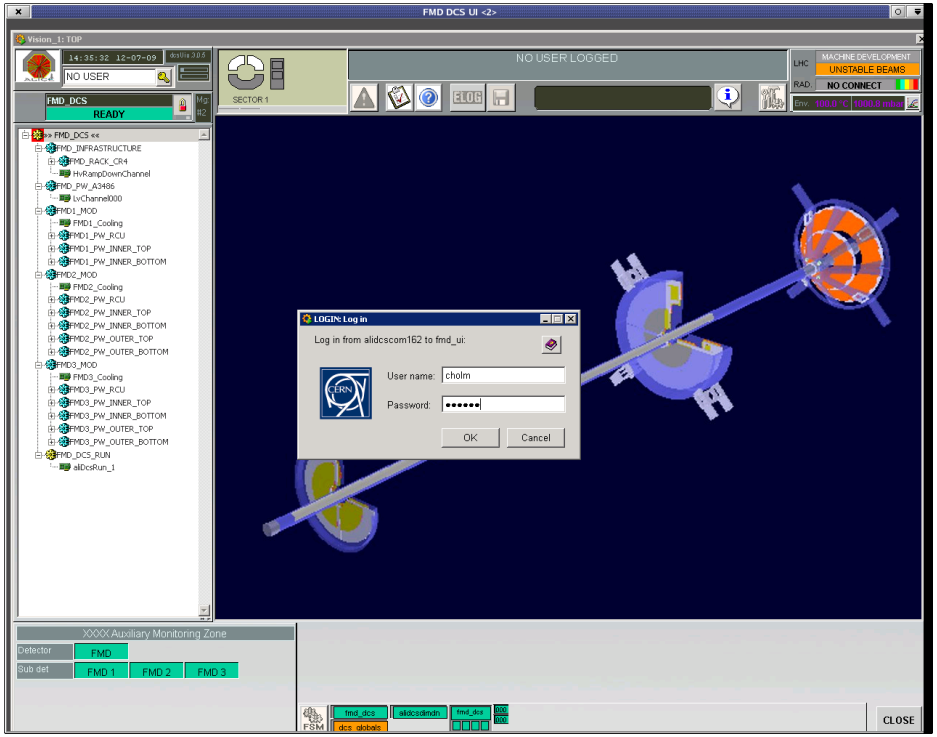
How to get to the controls

- Open your Remote Desktop Client (`rdesktop` on Linux)
- Log in to `cernts.cern.ch` using your CERN credentials (remember domain is `CERN`)
- Now open Remote Desktop Client on `cernts.cern.ch`
- Log into `alidcsgw001.cern.ch` using your CERN credentials (remember domain is `CERN`)
- Again, open the Remote Desktop Client on `alidcsgw001.cern.ch`
- Log into `alifmdon001.cern.ch` using your CERN credentials (remember domain is `CERN`)
- Select entry `Programs`→`WinCC`→`Project`→`User Interface` from the ‘Start’ menu.

Take Control



- Click key icon and type in your CERN user name and ‘top secret’ password
- Normally control taken by central shifter — call shift leader if you need it