



Coaching station for FIT on-call shifters

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for the ALICE collaboration

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ALICE

**Warsaw University
of Technology**

ALICE Fast Interaction Trigger (FIT)

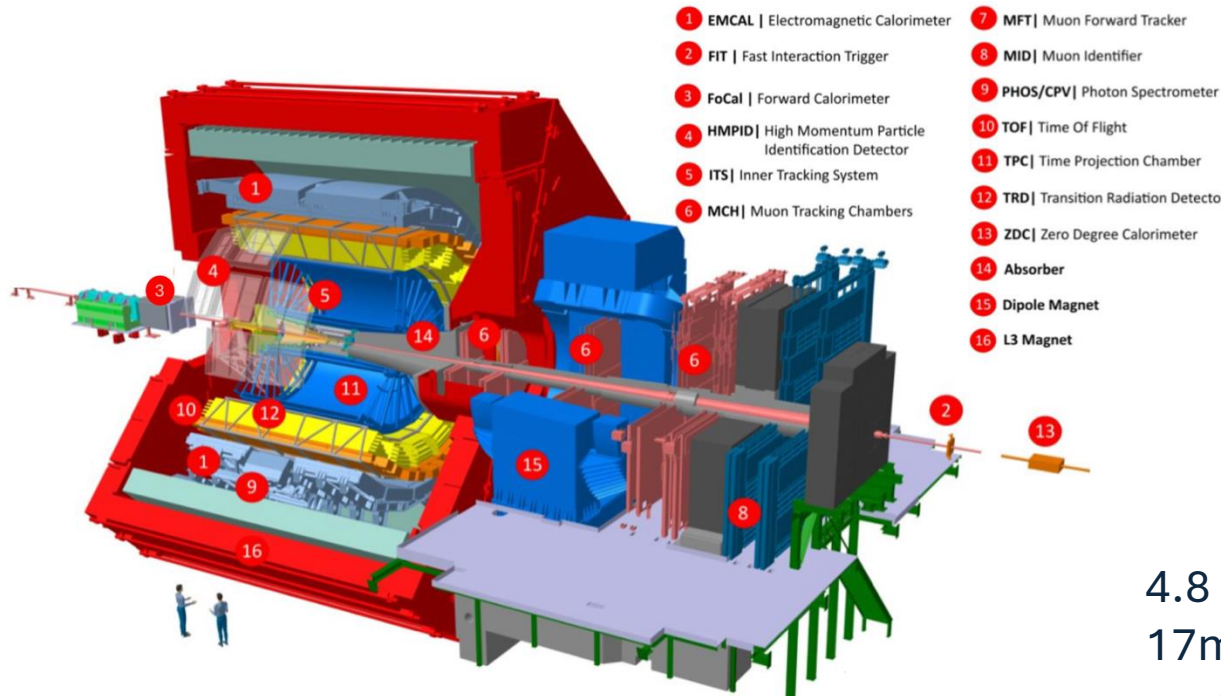


Fig. 1: ALICE detector

Delivered Functionality

- Fast min. bias collision trigger with latency < 425 ns;
- Time resolution: 5 ps in Pb-Pb and 18 ps in pp collisions;
- Luminosity and background monitor;
- Centrality measurement;
- Event plane determination;

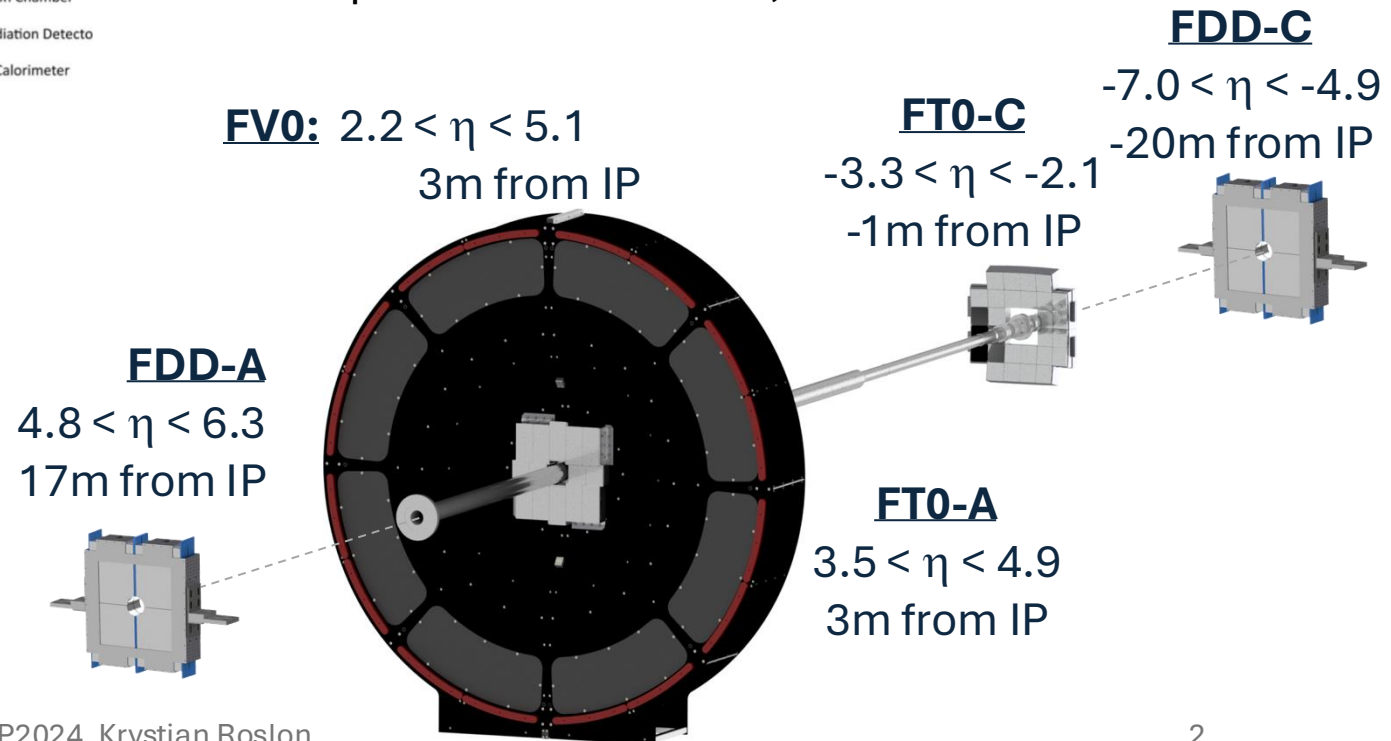


Fig. 2: ALICE FIT detector

ALICE Fast Interaction Trigger (FIT)

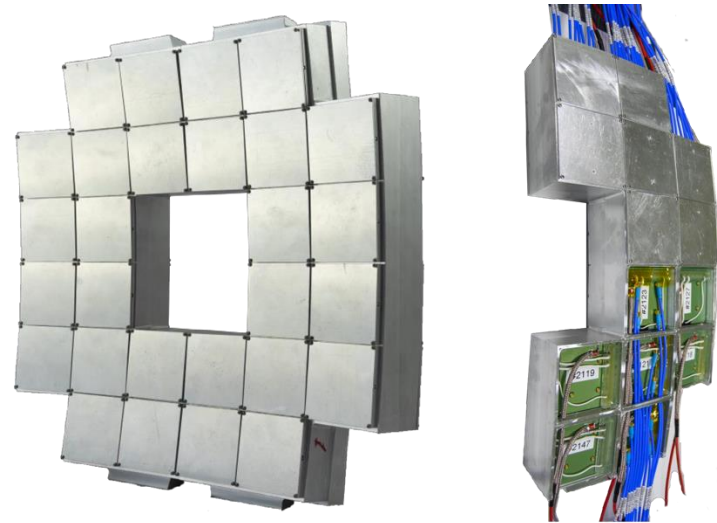


Fig. 3: FT0 – Cherenkov counter;
 $96+112 = 208$ channels;



Fig. 4: FV0 – scintillator detector;
48 channels;

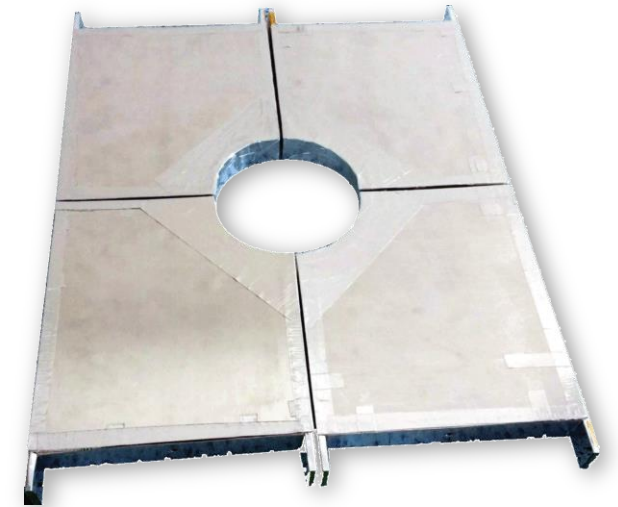


Fig 5: FDD – scintillator detector;
 $8+8 = 16$ channels;

Motivation

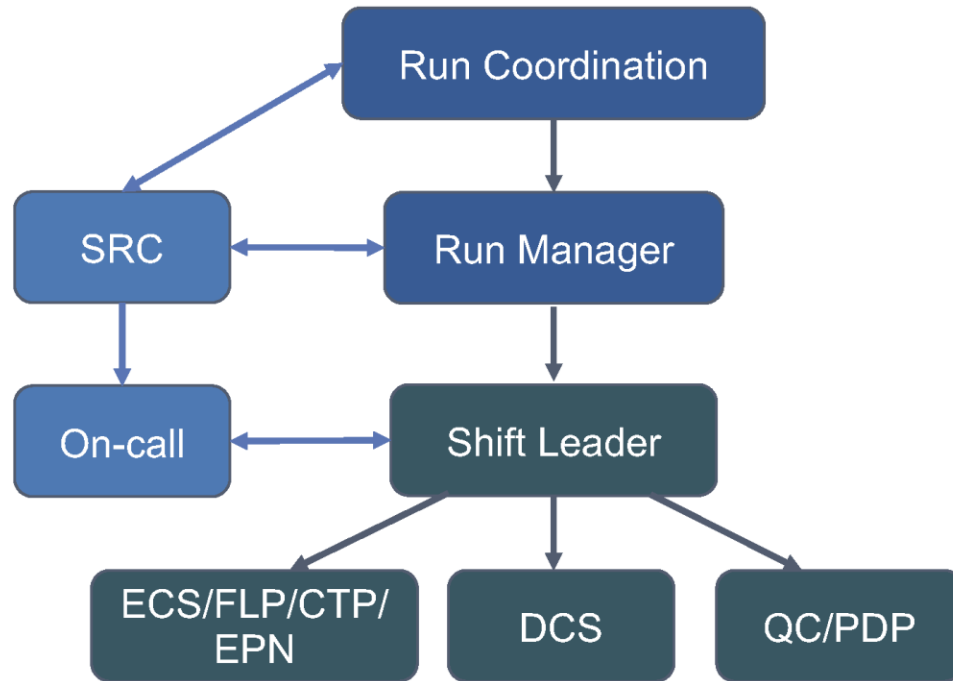


Fig. 6: ALICE experiment supervisor hierarchy

The shift crew receives support from a group of on-call specialists who can be reached by the crew when expert intervention is required. Each subsystem's on-call expert are **trained and overseen** by their respective System Run Coordinators (SRC).

Because of the 24/7 data-taking regime, it's **impossible** to schedule training sessions **during ALICE operation**.

Hands-on training can only be conducted during **beam-off periods** or when a **technical intervention** is ongoing. Such moments are scarce during the regular LHC operation.

-Is it possible to prepare the coaching station for all FIT sub-detectors?

- Yes.
- Why?



Unified FIT control system

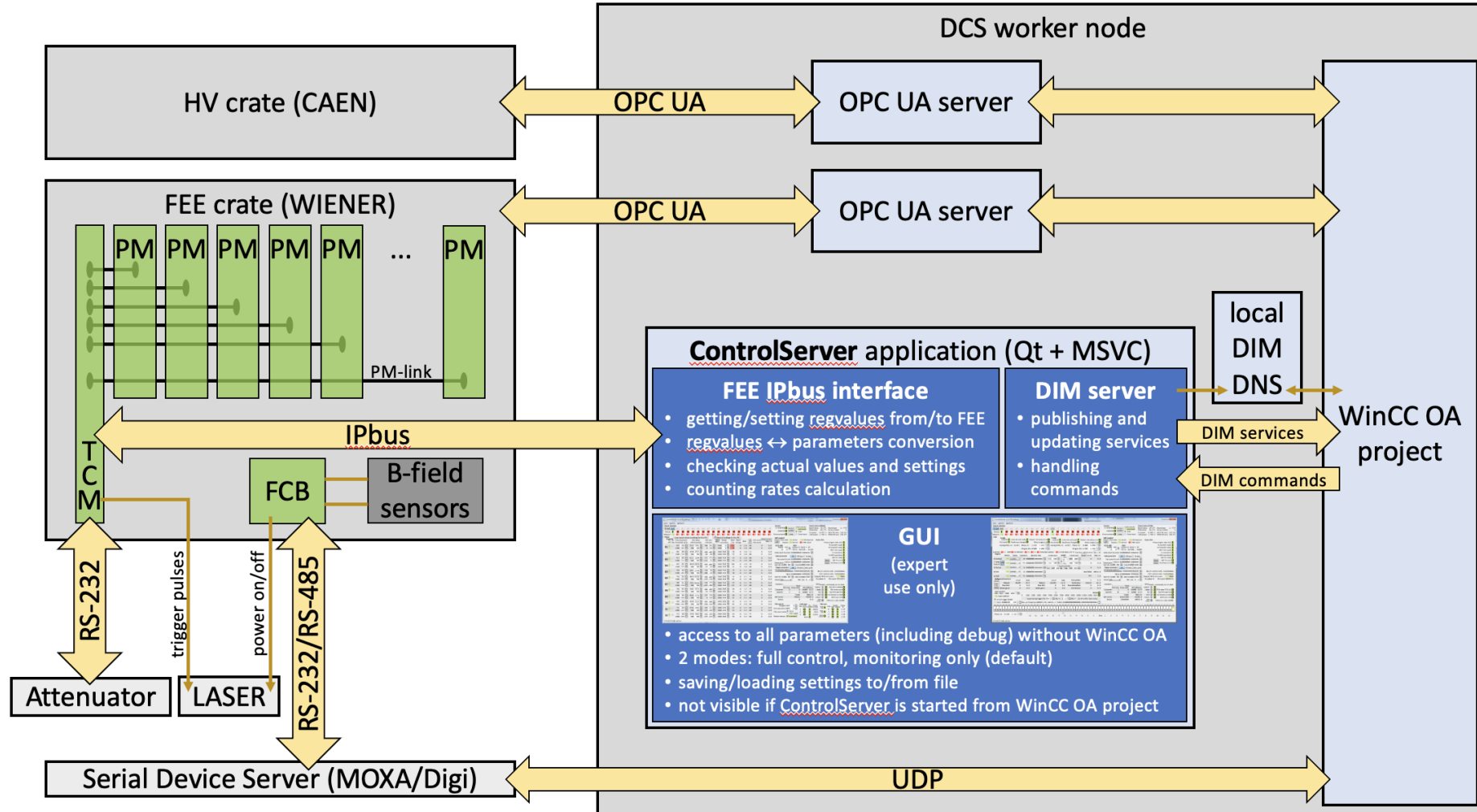


Fig. 7: ALICE FIT control system

Unified FIT WinCC Projects

Project properties:

- Individual;
- Unified;
- Modular;
- Scalable;

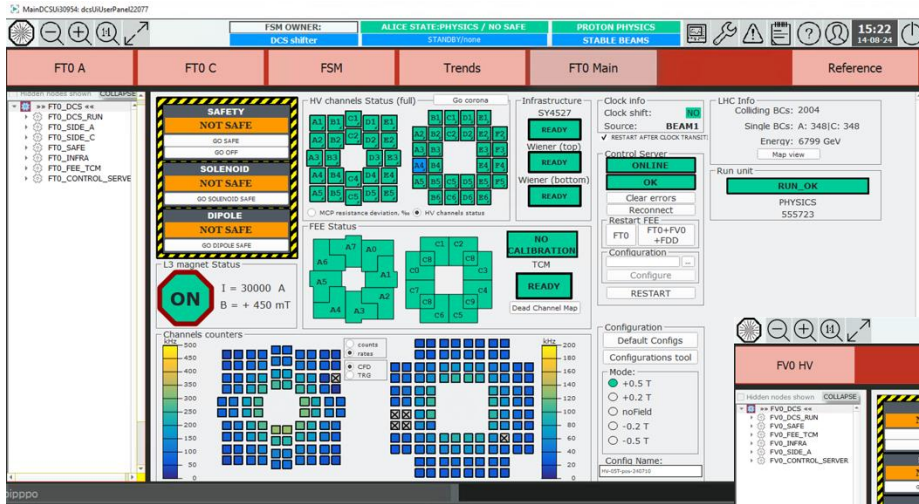


Fig. 8: FT0 – WinCC Project

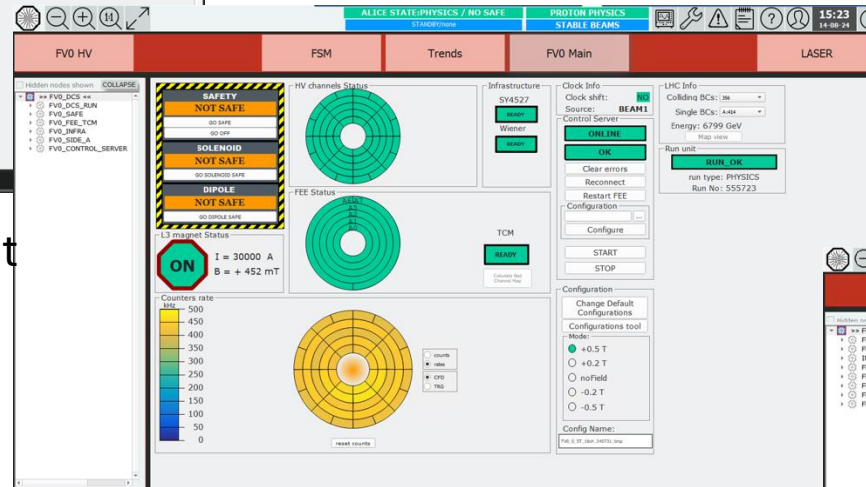


Fig. 9: FV0 – WinCC Project

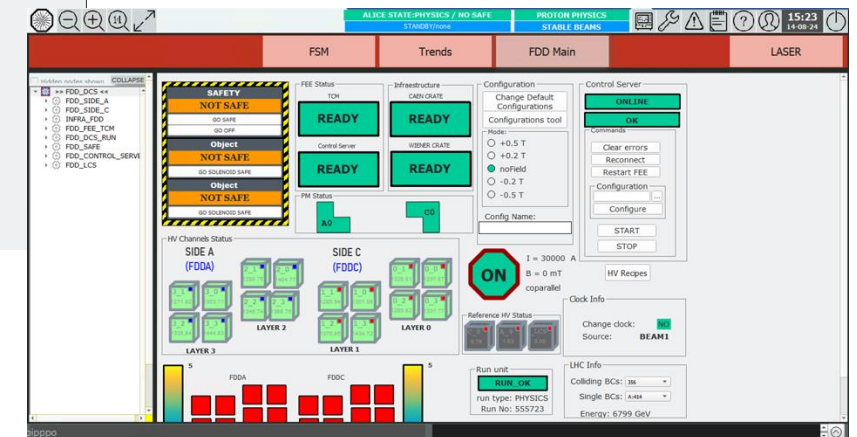


Fig. 10: FDD – WinCC Project

ALICE detector setup

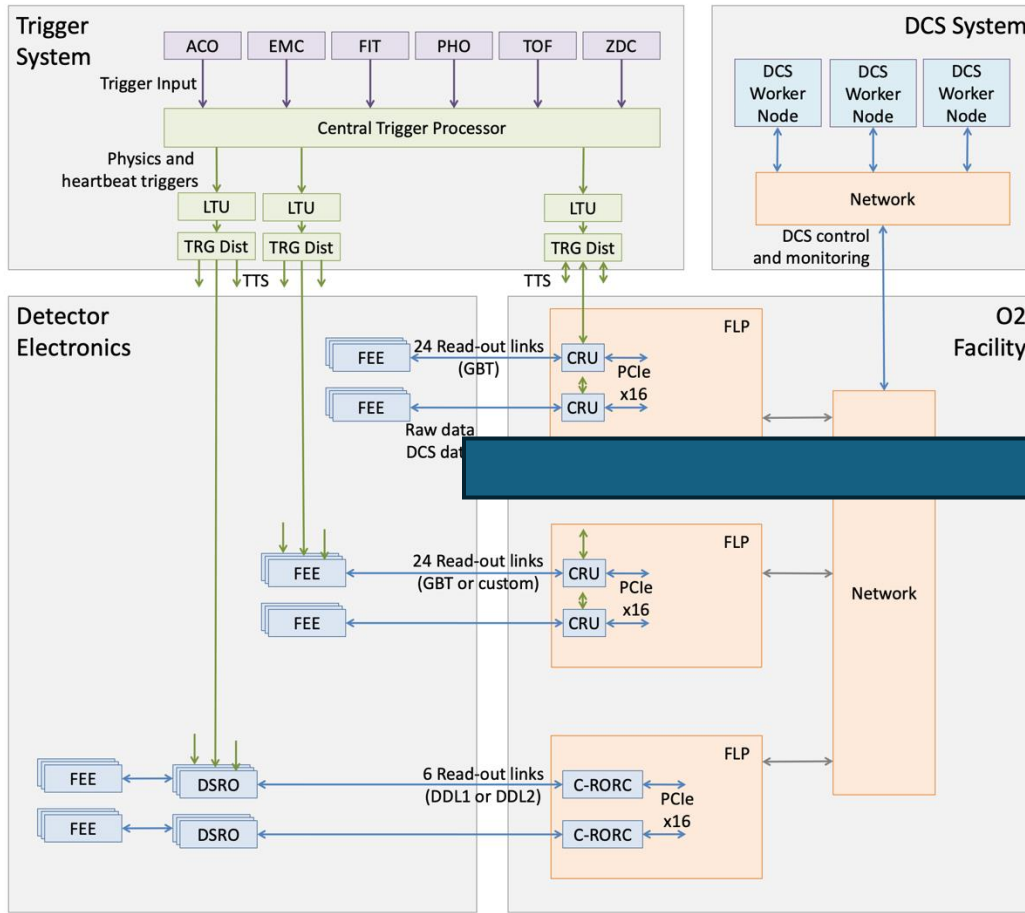


Fig. 11: Detector read-out and interfaces of the O2 system with the trigger, detector electronics and DCS.

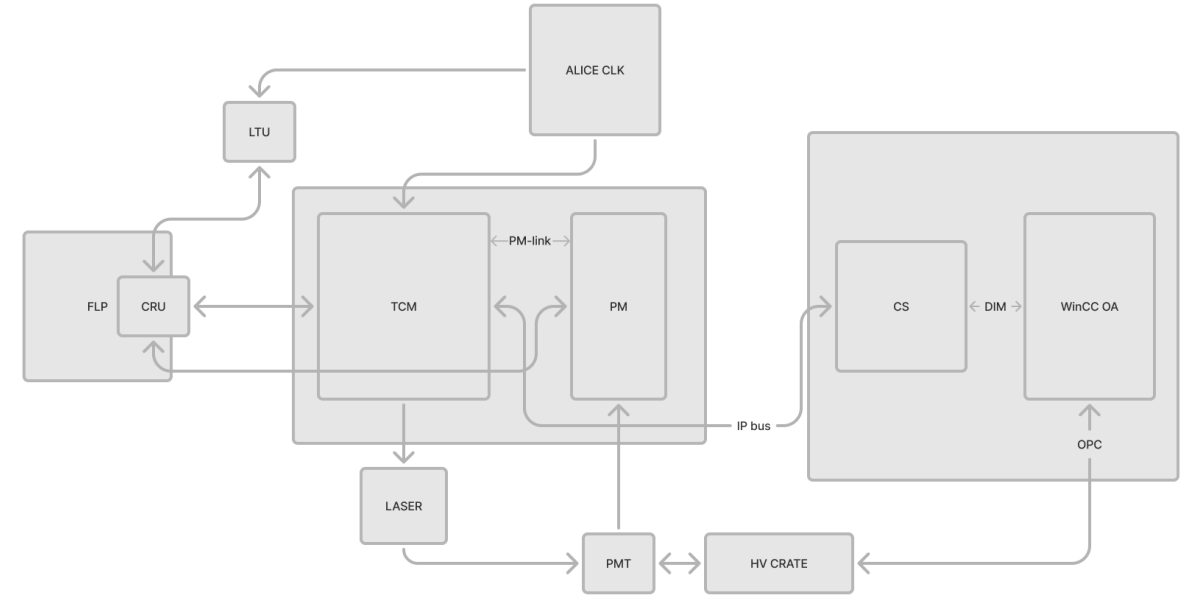
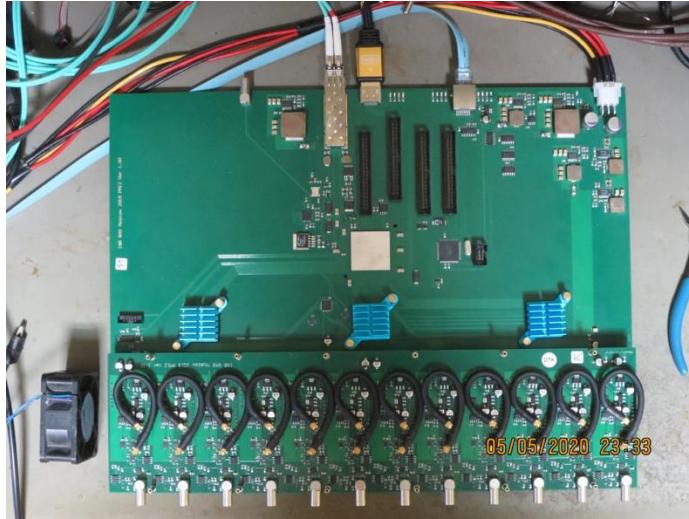


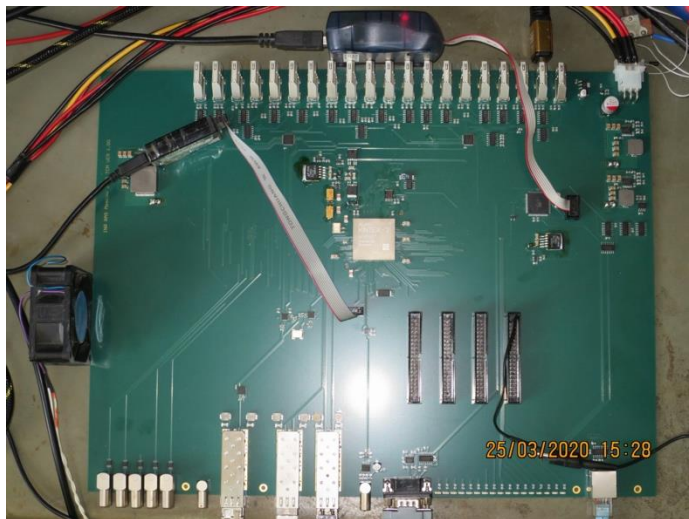
Fig. 12: Schema of the FIT laboratory setup.

ALICE FIT laboratory setup



FIT PM (Processing Module):

- 12 independent inputs;
- Very similar for all FIT detectors;



FIT TCM (Trigger and Clock Module):

- One TCM;
- May connect 20 PMs via an HDMI cable;
- Connected to the FIT DCS via IPbus;

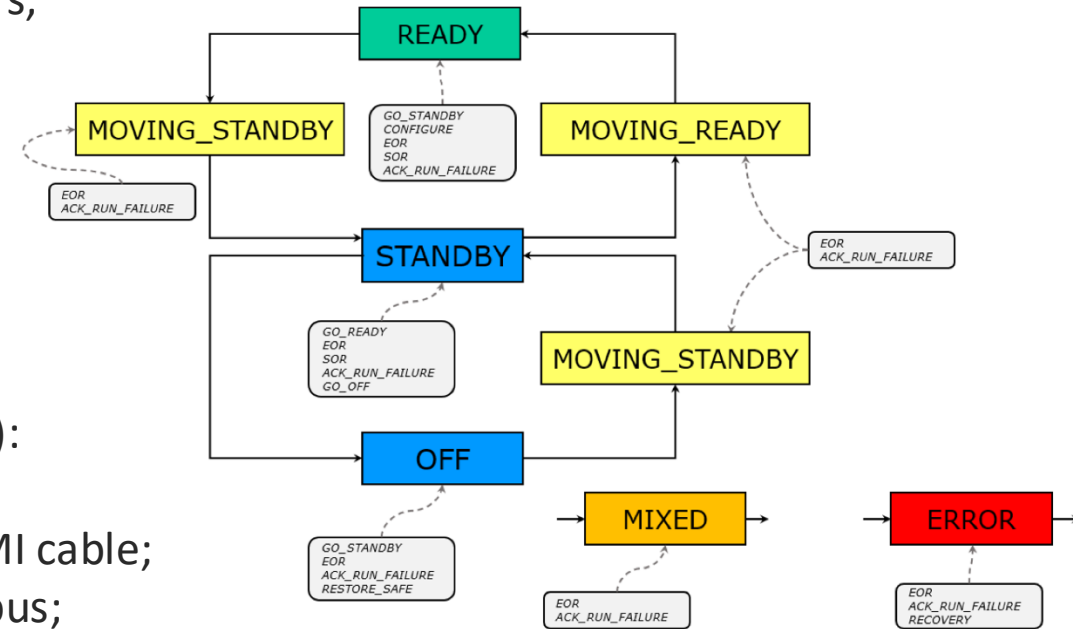


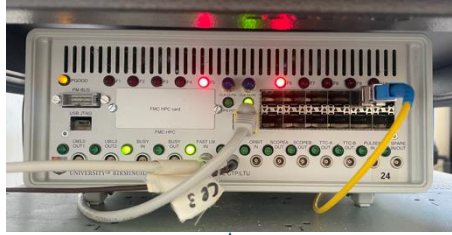
Fig. 13: Finite State Machine (FSM) of the FIT laboratory setup.



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ALICE FIT laboratory setup

WUT



LTU

FIT FEE



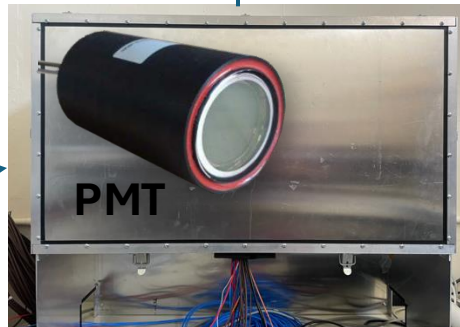
Node



FLP with CRU



PMT BOX



LASER SYSTEM



HV CRATE





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TCM Module



- DIM status
- TCM status
- Switches
- Trigger settings
- Background counters
- Laser system
- Laser panel
- Laser phase

The screenshot shows the TCM Module control interface with several key sections:

- Board selection:** A grid of boards (A0-C9) with status indicators. A0 is highlighted as 'CONNECTED'.
- System status:** Includes 'System' (Restart, Clock source: Internal), 'Board status (TCM)' (Temperatures, Power), and 'Status bits' (Rx wordclk ready, Tx reset done, etc.).
- GBT readout:** Controls for GBT readout, including 'Reset', 'FSM reset', and 'bypass'.
- BCID shift & RDH:** Controls for BCID shift and RDH, including 'Data select trg mask' and 'System ID'.
- Data generator:** Controls for data generation, including 'Trg respond mask' and 'Pattern'.
- Trigger generator:** Controls for trigger generation, including 'Continuous pattern' and 'Value'.
- Statistics:** A table showing 'GBT words' and 'Events'.
- Background counters:** A table showing counts and rates for Noise, True OrA, Beam-gas, and Laser system.
- Laser system:** Controls for laser system, including 'Laser enabled' and 'on Cal trigger'.
- Laser panel:** A grid of laser panels (63-0) with status indicators.
- Laser phase:** A phase control section with a scale from -12 to 12.

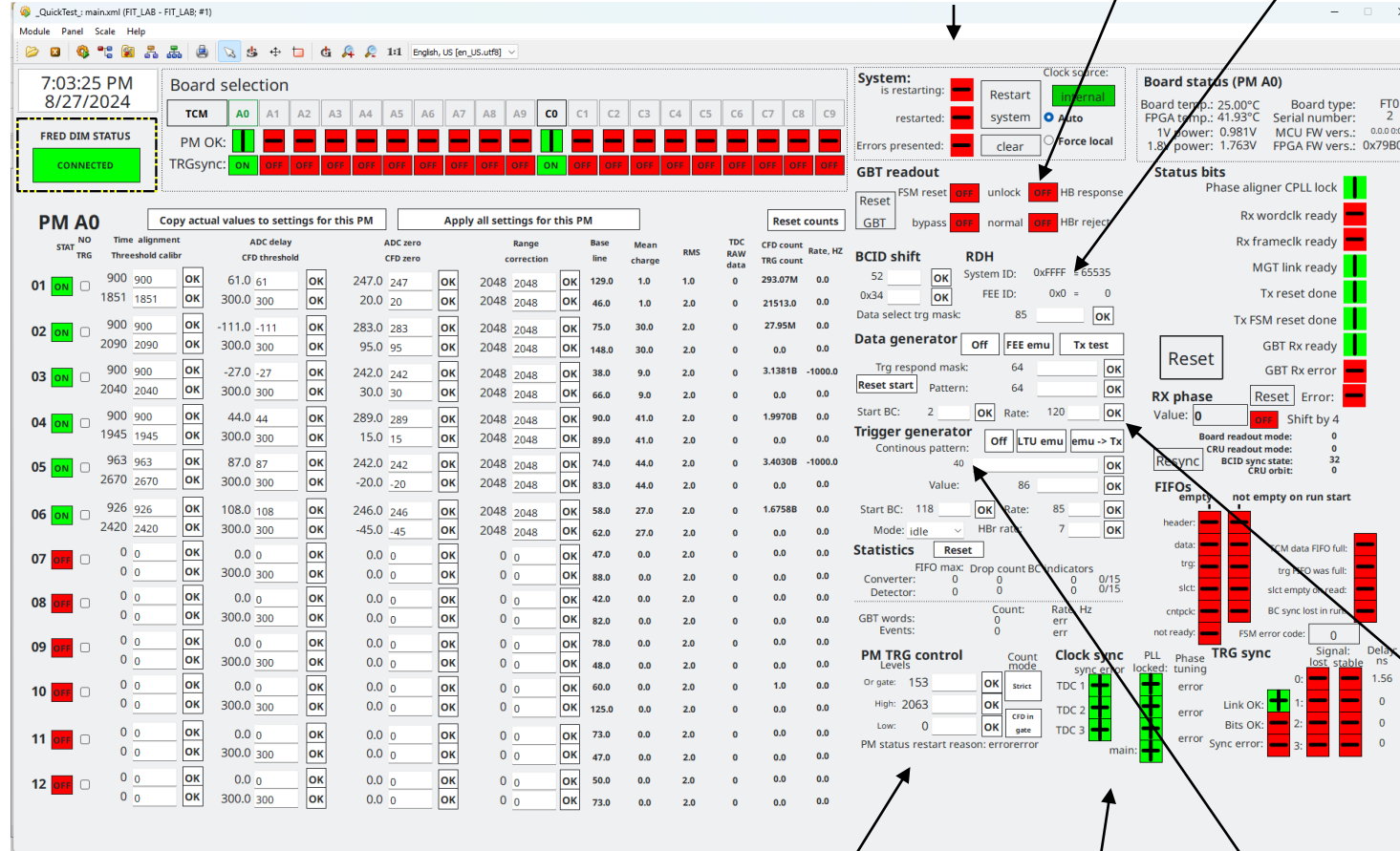
External labels on the right side of the interface include:

- Board status (TCM)
- Status bits
- RX phase
- Board status (TCM)
- Data generator
- Trigger generator
- Statistics

PM Module

GBT readout BCID shift&RDH

System status



The screenshot displays the PM Module control interface with several key sections:

- System status:** Located at the top right, showing system restart options (Restart, system, Auto, Force local) and error handling (clear).
- Board status (TCM):** Located at the top right, displaying board temperature (25.00°C), board type (FT0 2), and other hardware details.
- Status bits:** A vertical column of indicators for various system components like Phase aligner CPLL lock, Rx wordclk ready, and Tx reset done.
- GBT readout:** A section for GBT readout control, including reset options (FSM reset, unlock, HBR response) and bypass settings.
- BCID shift & RDH:** Controls for BCID shift (System ID, FEE ID) and RDH (Data select trg mask).
- Data generator:** Controls for data generation, including Trg respond mask, Reset start, and Pattern.
- Trigger generator:** Controls for trigger generation, including Continuous pattern and Value.
- Statistics:** A section for monitoring system statistics like Converter, Detector, and GBT words.
- PM TRG control:** Controls for PM TRG control, including Or gate, High, Low, and Count mode.
- Clock sync:** Controls for clock synchronization, including PLL locked and Phase tuning.
- TRG sync:** Controls for TRG synchronization, including Link OK, Bits OK, and Sync error.
- Board status (TCM) (bottom):** A section for board status monitoring, including RX phase, FIFOs, and TRG sync.

Board status (TCM)

Status bits

RX phase

Board status (TCM)

Data generator

TRG sync

PM TRG control

Clock sync

Trigger generator

PM options

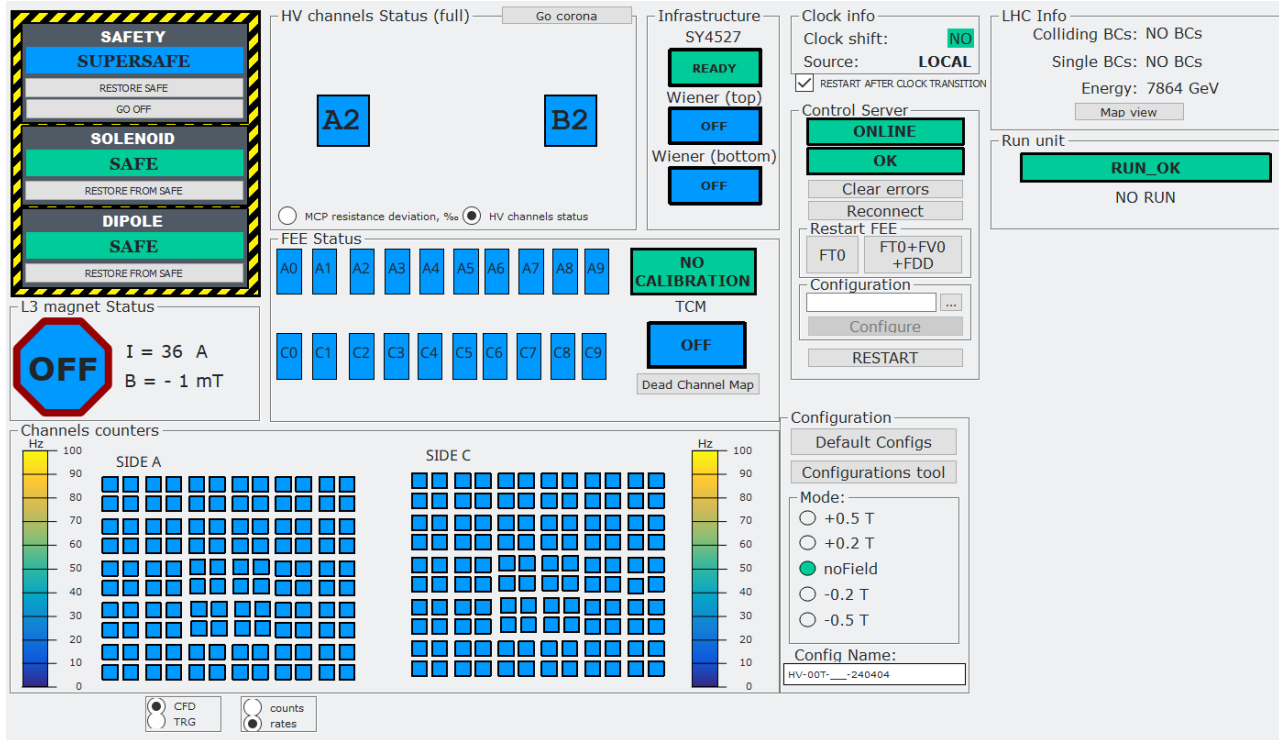


Fig. 14: LAB – WinCC Project

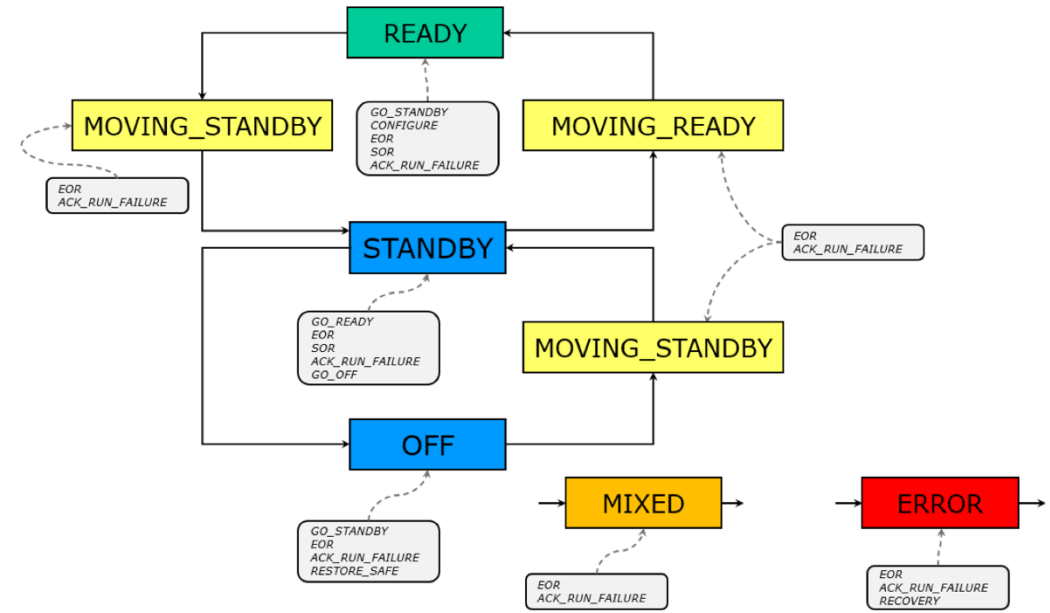
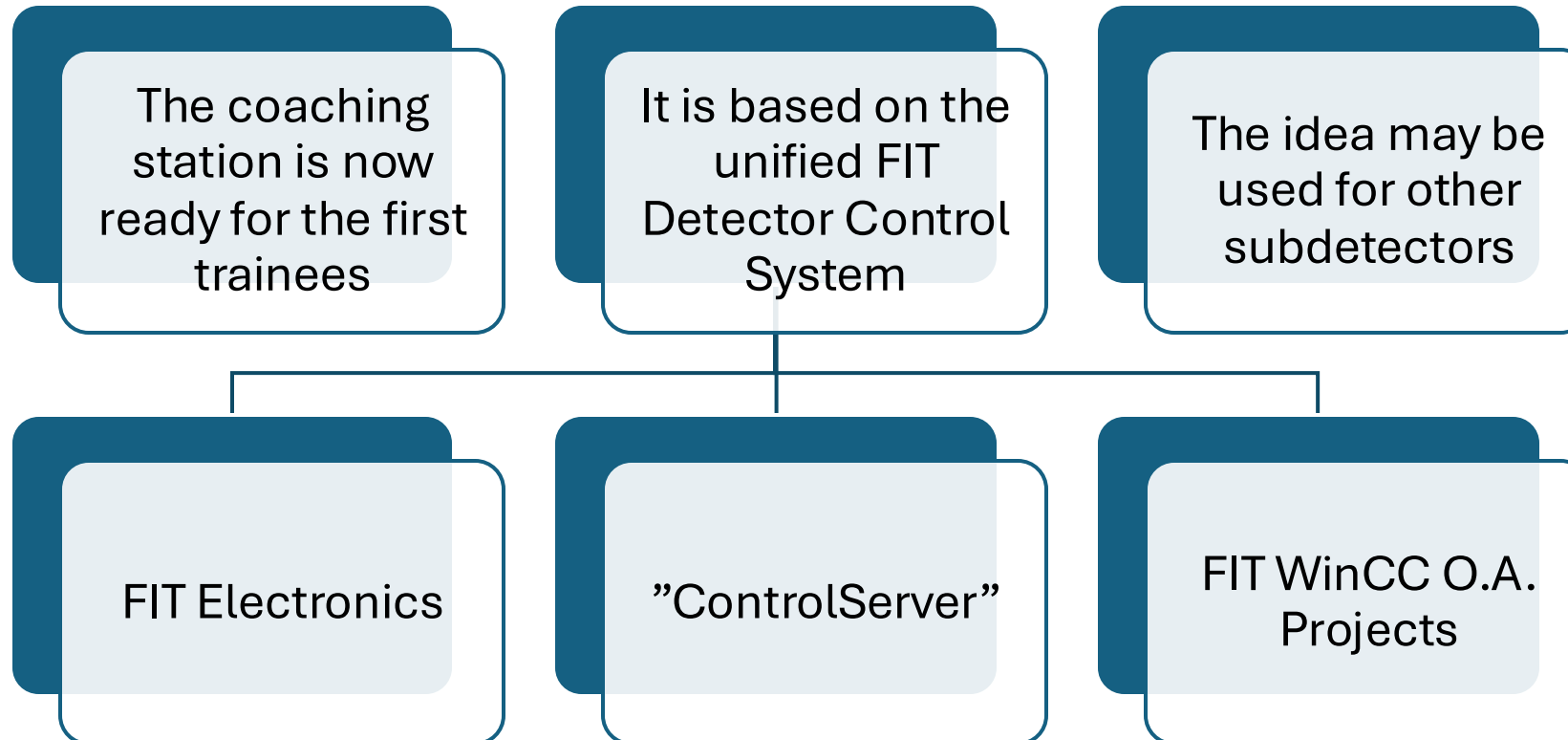


Fig. 13: Finite State Machine (FSM) of the FIT laboratory setup.

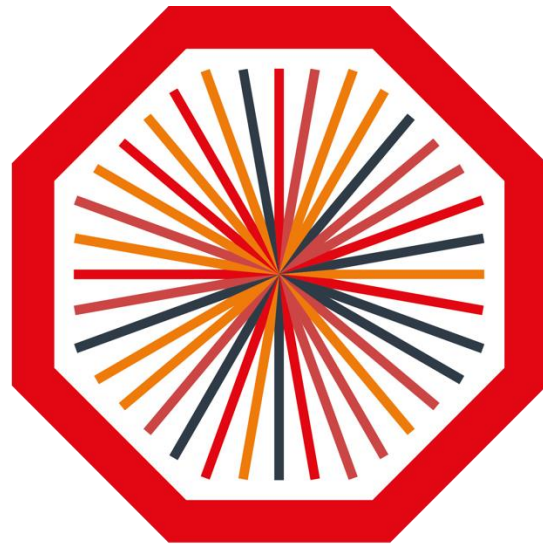
Conclusions



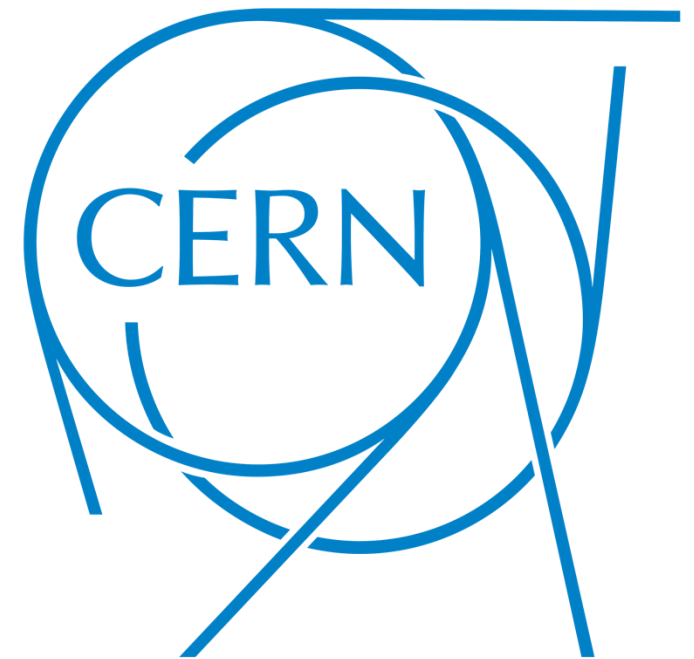
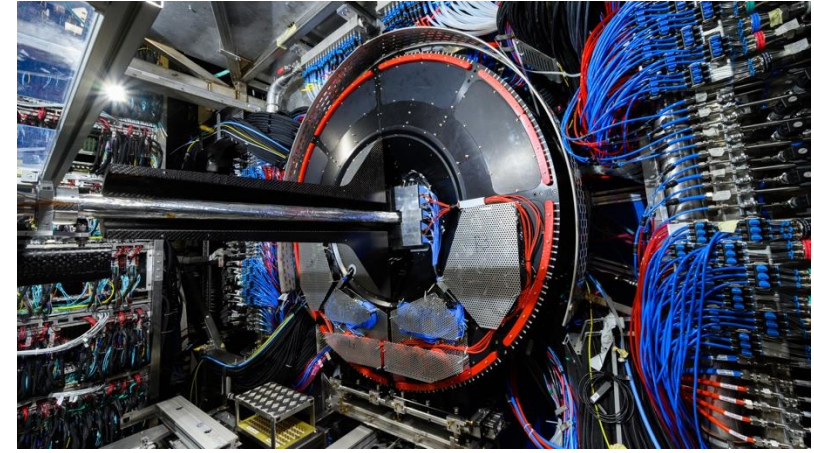
Thank you for your attention

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BACKUP slides



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Laboratory setup

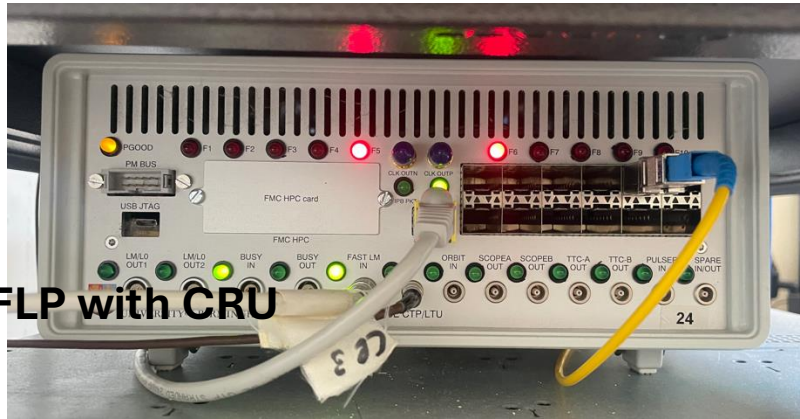
WUT

LTU

Node



FLP with CRU

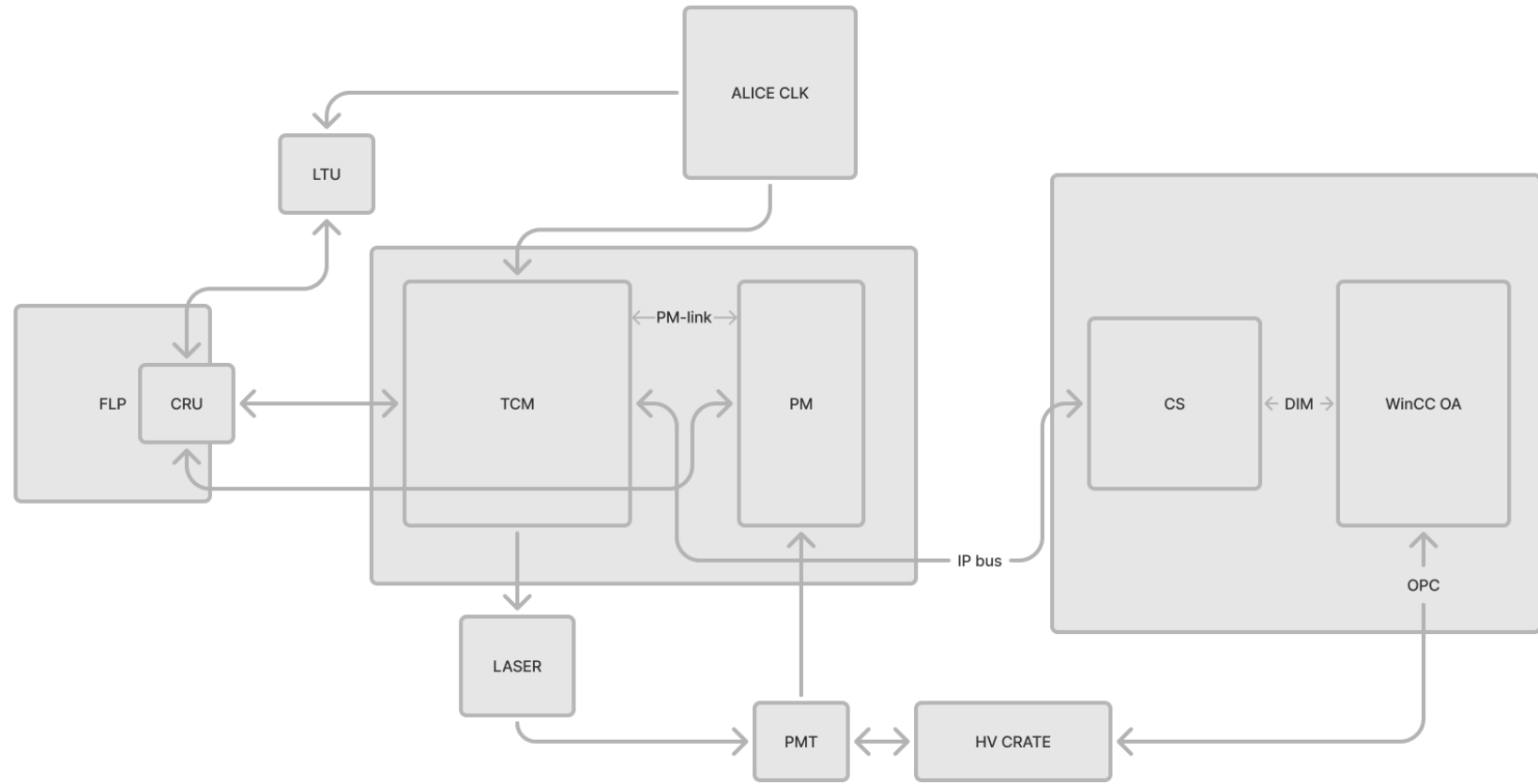


FEE



SYSTEM





Schema of the FIT laboratory setup.