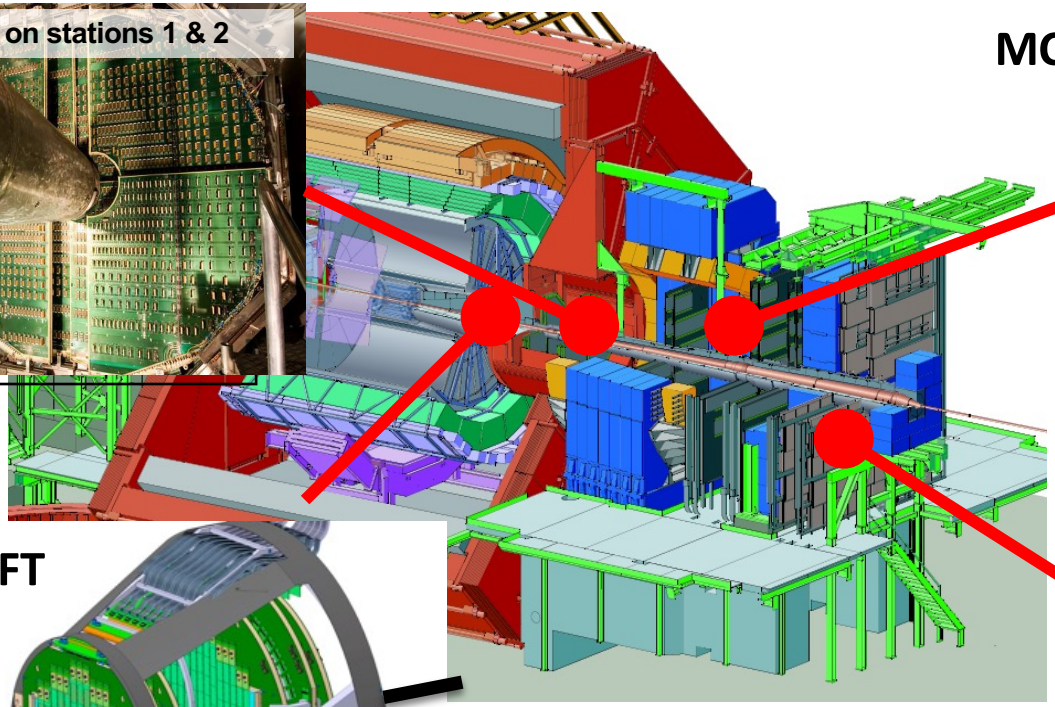
MCH status

21 luglio 2022

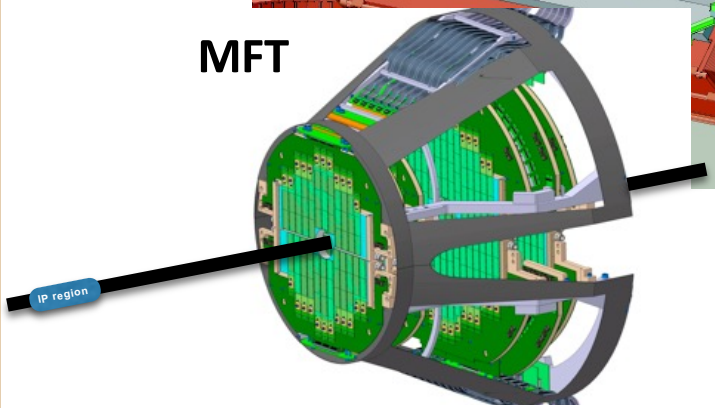
Corrado Cicalò – Cagliari

Il muon tracking

MCH

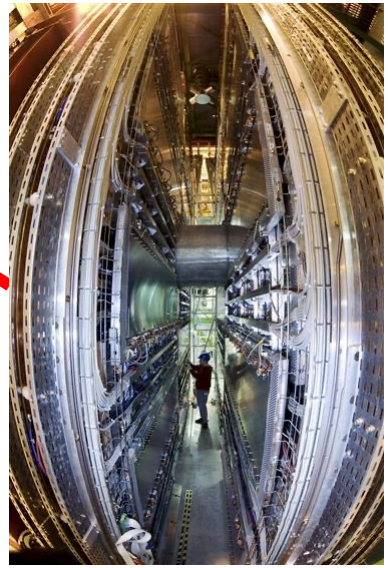


MFT

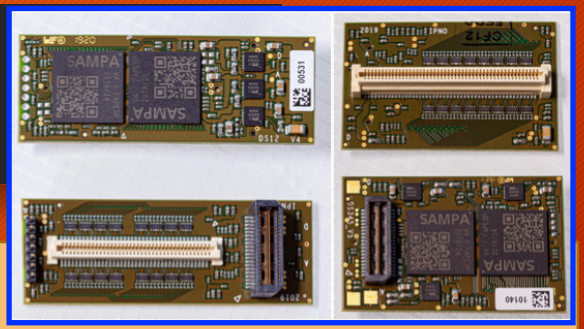


MCH

MTR

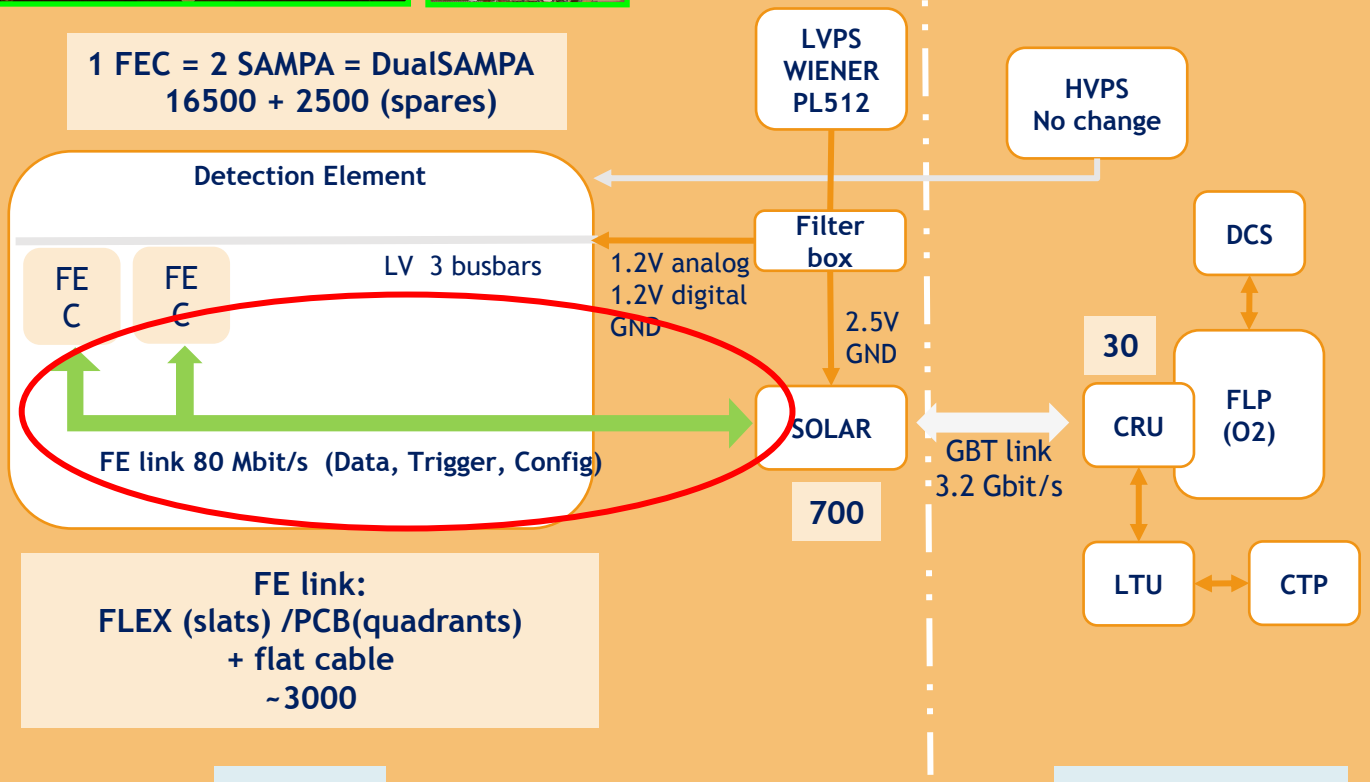


MCH upgrade project



DualSampa FEC

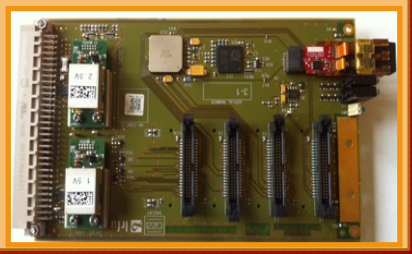
1 FEC = 2 SAMPA = DualSAMPA
16500 + 2500 (spares)



SAMPA: Brazil
CRU: Hungary, India

FEC: Orsay
FLEX: Cagliari
SOLAR : Saclay
CRU: India
(Kolkata,Aligarh)

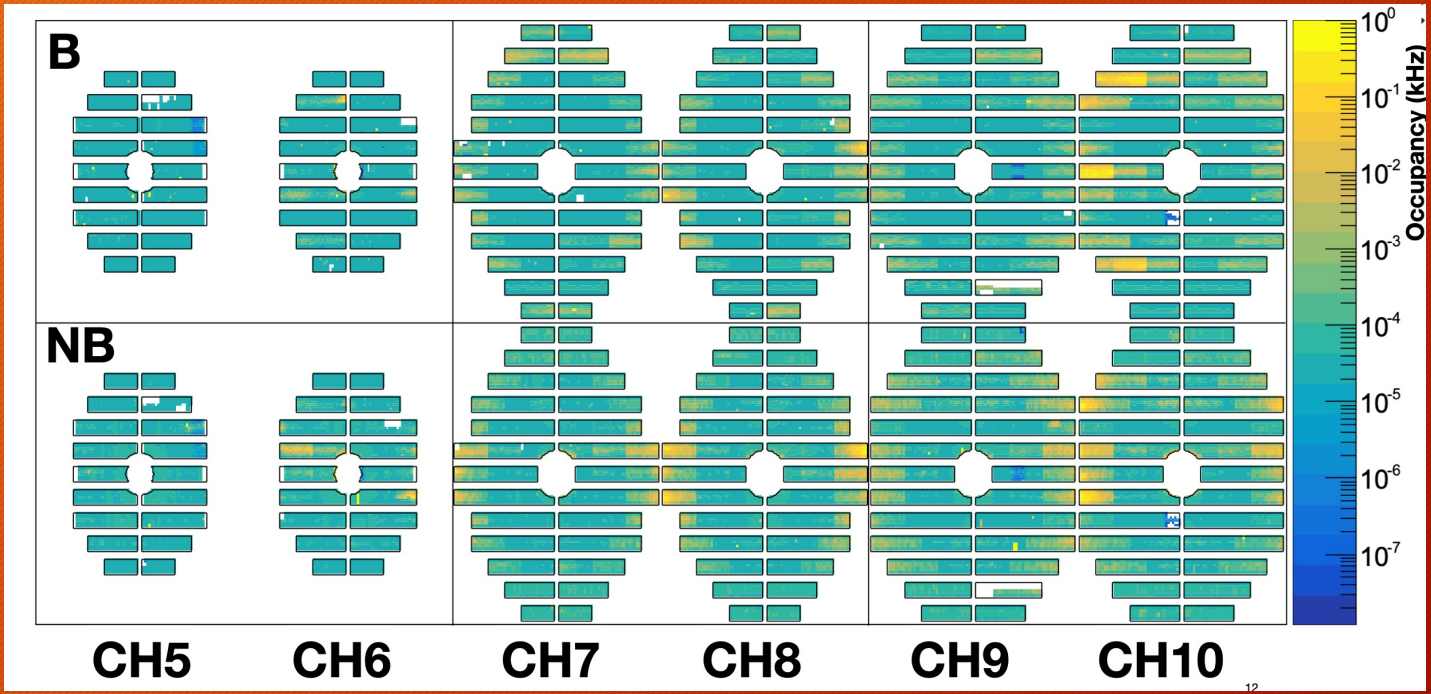
FE link:
FLEX (slats) /PCB(quadrants)
+ flat cable
~3000



SOLAR board

Situazione Upgrade

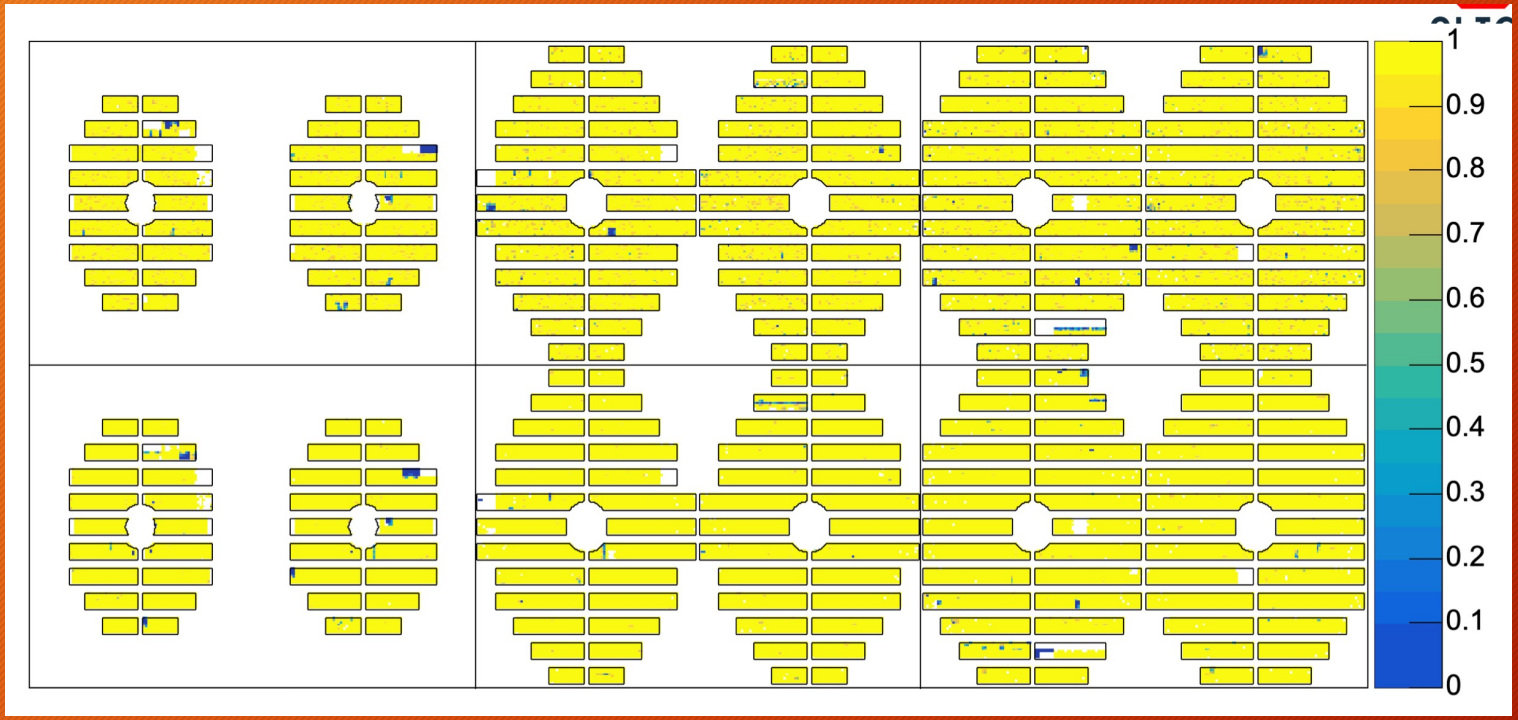
- Istallazione e commissioning nuova elettronica completati all'inizio del 2022
- In corso RUN @ HIGH RATES



Occupazione Regolare

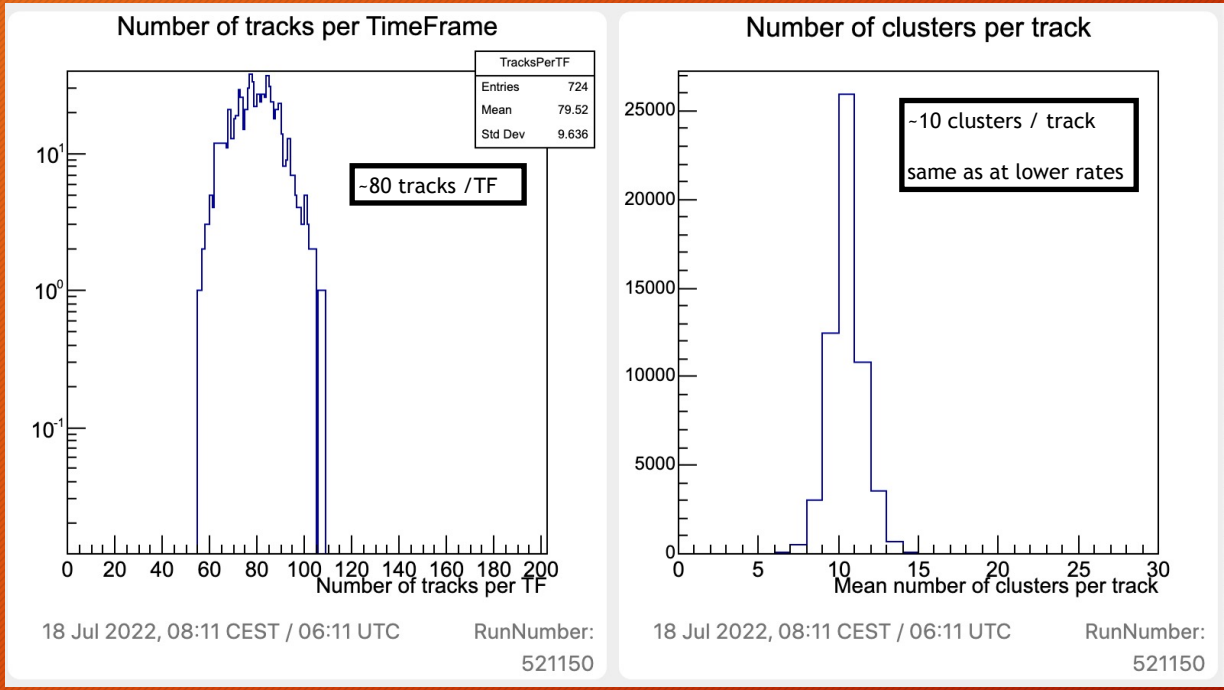
RUN N. 519499 del 27/6/2022

ST345 Pseudo-efficiency 2D Maps (run 519499 – 27/6/22)

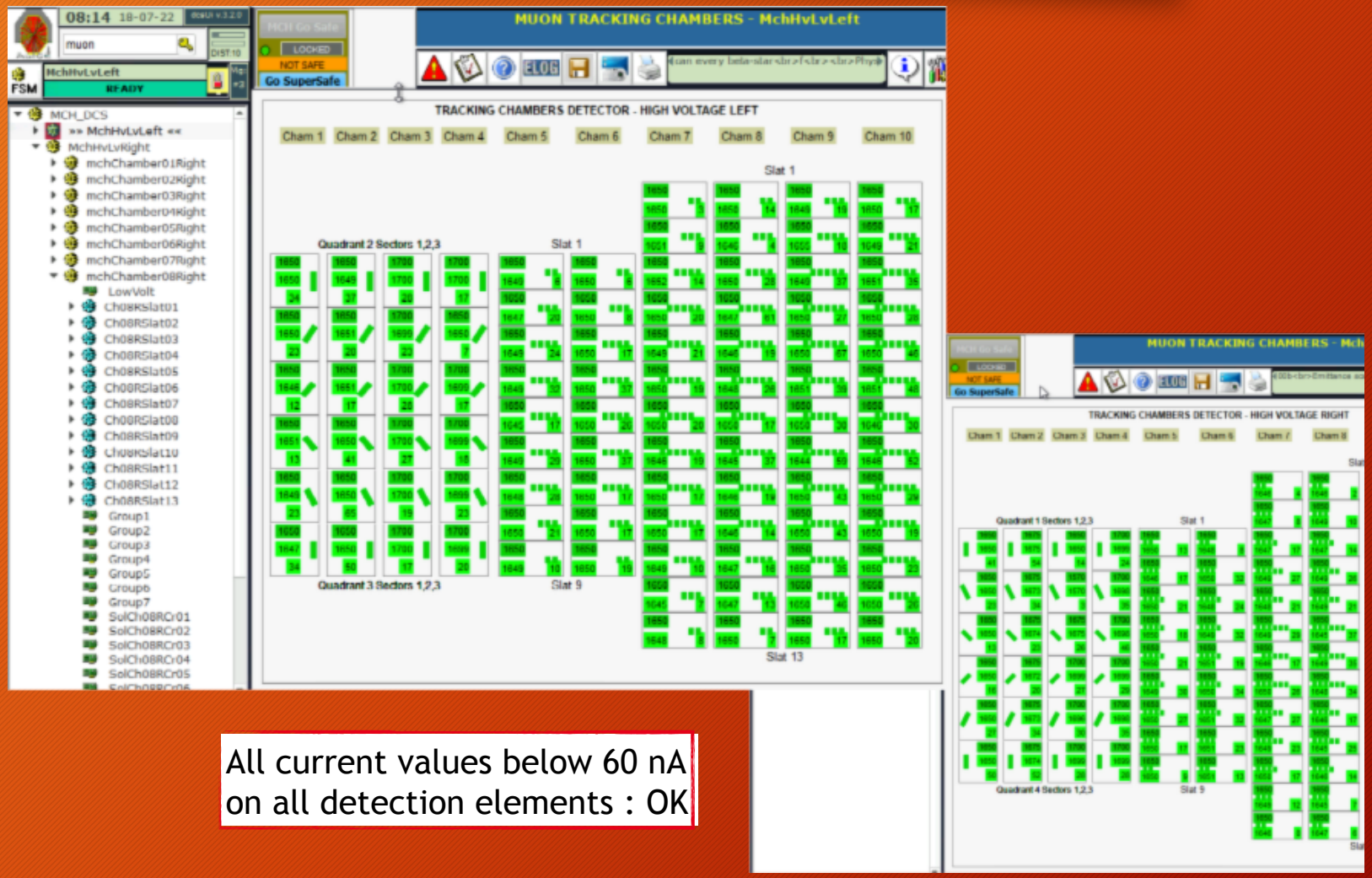


MCH @ High Rates

- **Run 521150:** Inst. luminosity ~ 3.4 Hz/μb ↔ FT0VTX rates ~ **200 kHz**
  - increase in avg. number of tracks as expected wrt lower rates
  - High-voltage currents on detectors **OK**



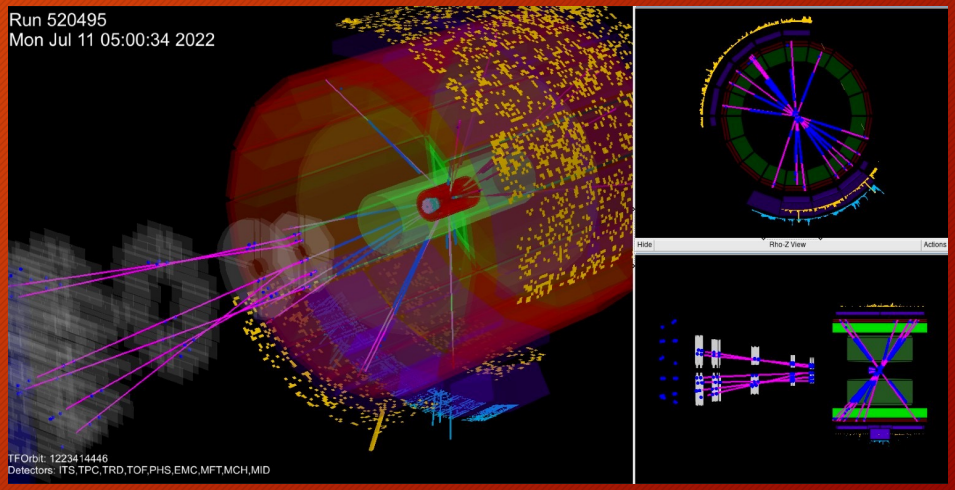
MCH @ High Rates



All current values below 60 nA on all detection elements : OK

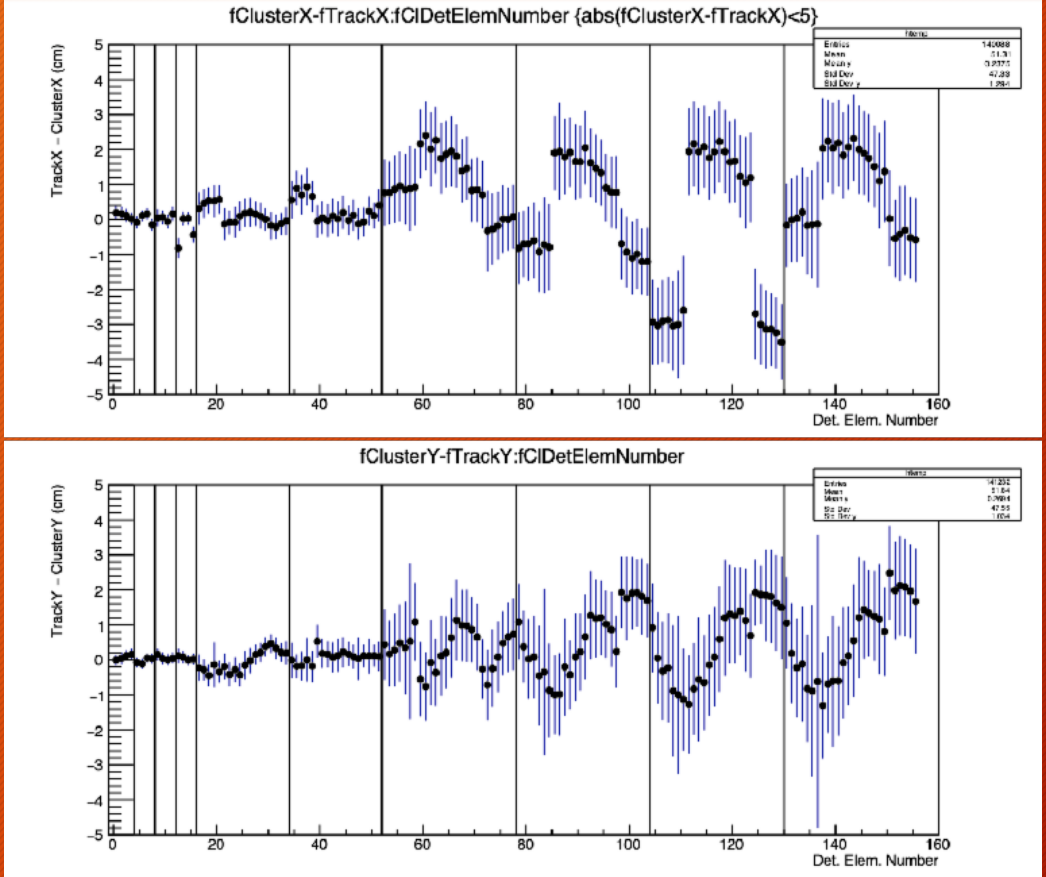
Muon Spectrometer Alignment

- About **6h of B=0 data** for muon spectrometer alignment:
  - **RUN**: **520496, 520497, 520498, 520499, 520500 520506, 520507, 520508, 520509**
  - **10 kHz trigger rate**
  - **>10M MCH tracks from first estimates**
  - Analysis started on a small data sample to test the "machinery"
  - Asynchronous processing of B=0 data **needed ASAP**, as full alignment procedure will require at least a couple of months…



First Look at MCH Alignment

Track-cluster residuals from ~10k MCH+MID tracks



Non Bending

Bending

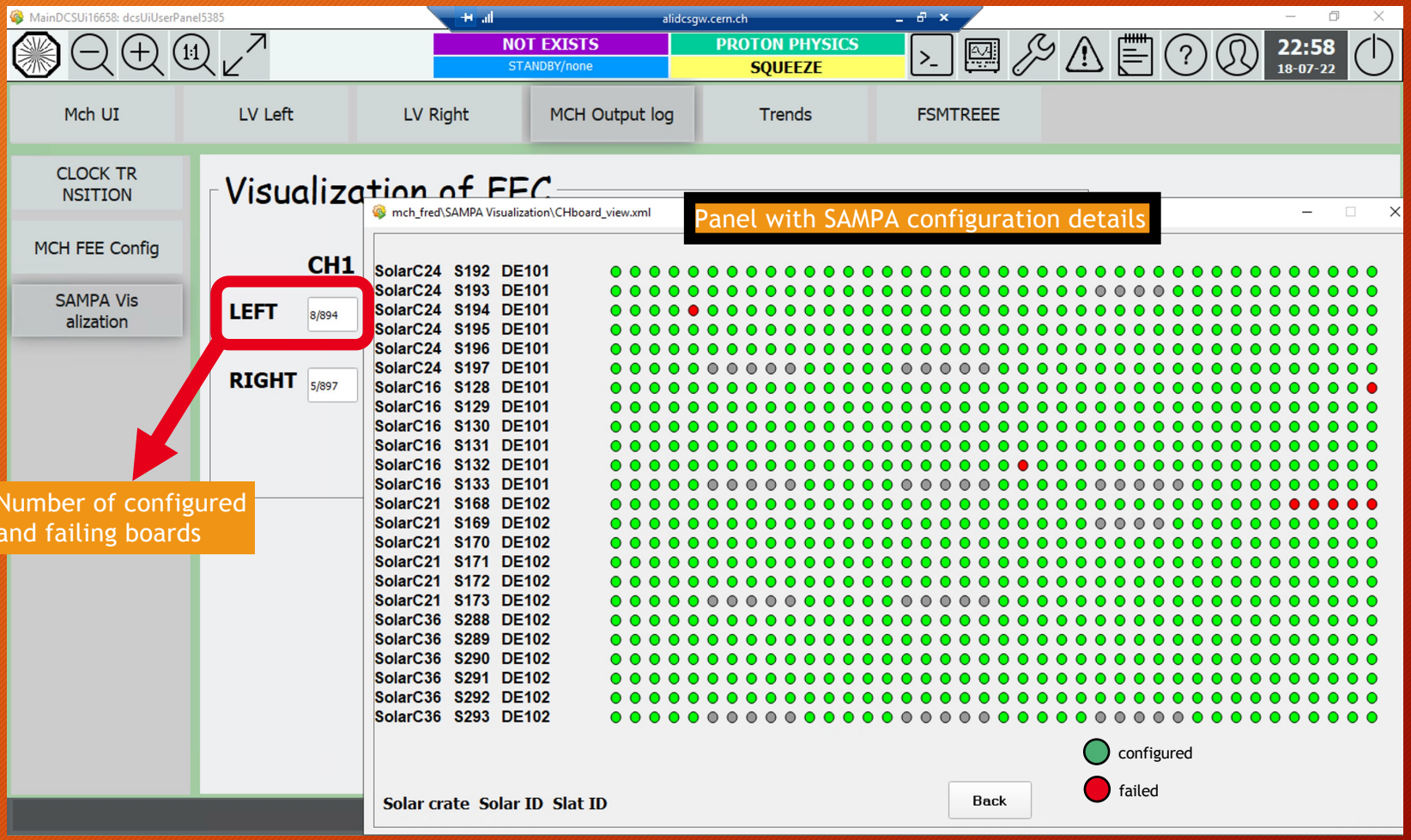
MCH DCS - Automated FEE Configuration

- **Fully automated SOR(Start of Run) procedure** → VALIDATED
  - ✓ "PEDESTALS" mode for calibration
  - ✓ "PHYSICS" mode for normal data taking
    - two additional SOR parameters to set TRIGGERED/CONTINUOUS mode and enable the SAMPA cluster sum
  - ✓ At SOR the scripts check the last known configuration type and avoid re-configuration if already OK
  - ✓ Re-configuration can still be forced if needed…

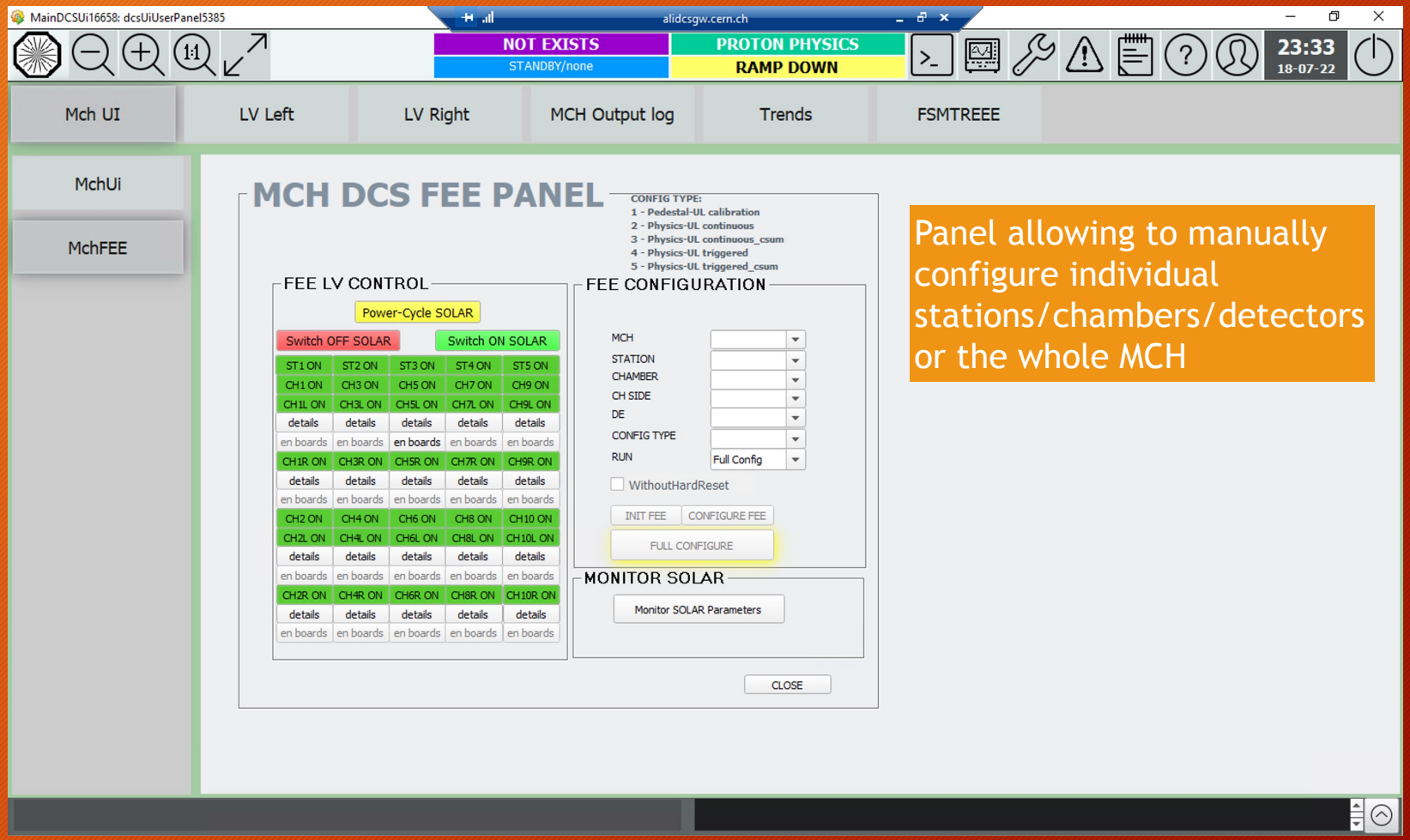
- Visualization panels showing status of SAMPA boards after configuration
  - Part of Joyful Mdhluli's (South Africa PhD student) service work

- Log screen showing the processing flow during the configuration of FEE

MCH DCS - FEE Configuration Summary Panel



New MCH DCS UI - Manual FEE Configuration



Panel allowing to manually configure individual stations/chambers/detectors or the whole MCH

MCH DCS - Automated Clock Transition Handling

- **Fully automated recovery** of GBTx links from **clock transitions** → VALIDATED
  - during transition countdown: **switch OFF** the GBTx LVs
  - at end of transition: **switch back ON** the GBTx LVs

- Power-cycling of GBTx links that **do not come up properly**
  - use IC reads/writes to “probe" the link status
  - all links always UP after few iterations

- **FEE re-configured** according to the last known run type

- Procedure integrated within SOR scripts

Quality Control Status

- **Basic analysis of raw data decoding:**
  - detector occupancy (2D maps + detection element averages)
  - digit time distributions
  - monitoring of decoding errors frequency

- **Higher-level analysis of event reconstruction:**
  - **time clustering**: ROFs occupancies and time distributions
  - **pre-clustering**: signal charge integral, cluster size distribution, cluster occupancies, pseudo-efficiencies (from geometrical correlation between B and NB planes)
  - **tracking**: fit quality, angular distributions, invariant mass

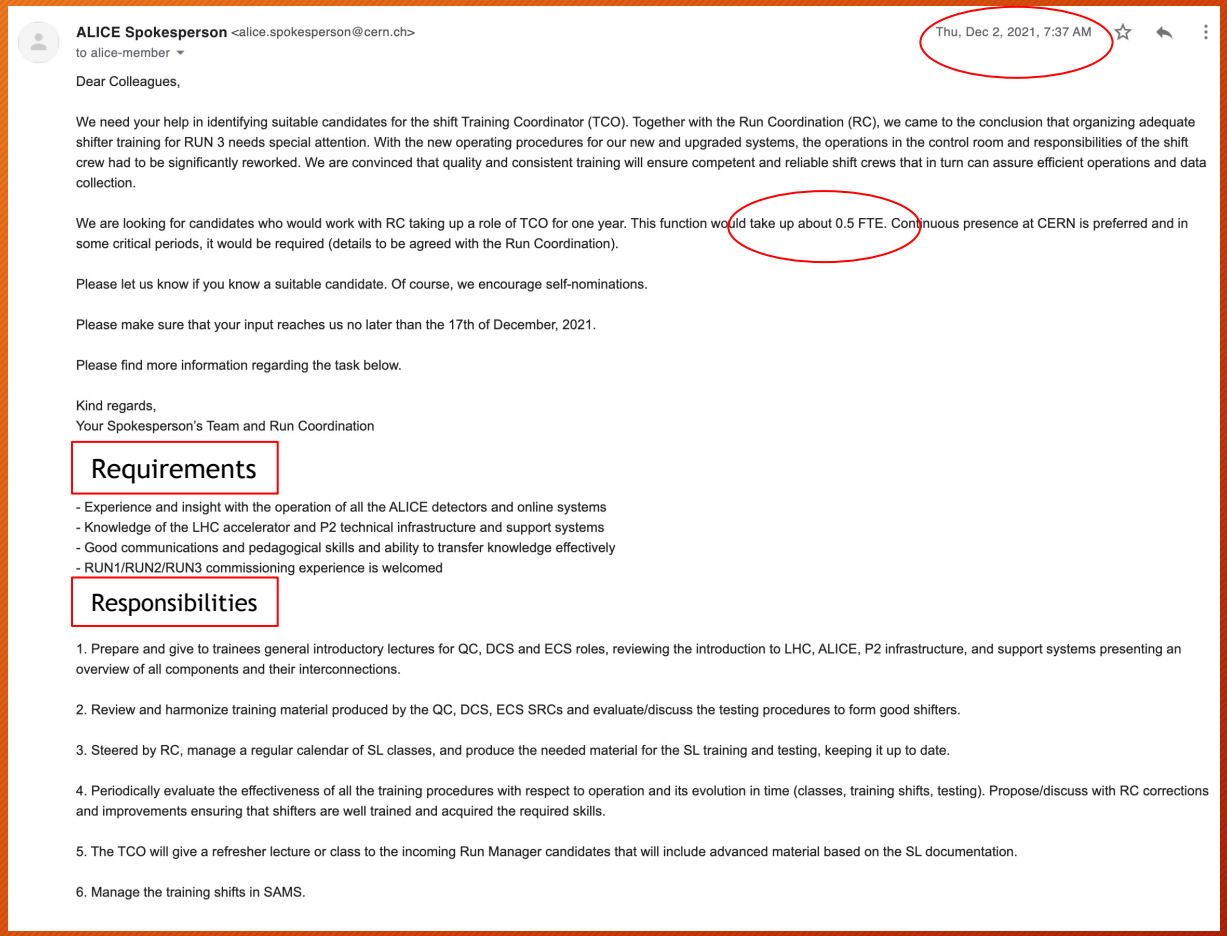
    ✓ now available for both standalone MCH tracks and matched MCH+MID tracks

Outlook

- System in good shape for Pb-Pb RUN
- Few issues due to LVPs failure
- Some maintenance intervention foreseen during shutdown

ALICE training run coordinator (TCO)

- **ROLE AND OPEN CALL (12/2021)**



ALICE Spokesperson <alice.spokesperson@cern.ch>
to alice-member

Thu, Dec 2, 2021, 7:37 AM

Dear Colleagues,

We need your help in identifying suitable candidates for the shift Training Coordinator (TCO). Together with the Run Coordination (RC), we came to the conclusion that organizing adequate shifter training for RUN 3 needs special attention. With the new operating procedures for our new and upgraded systems, the operations in the control room and responsibilities of the shift crew had to be significantly reworked. We are convinced that quality and consistent training will ensure competent and reliable shift crews that in turn can assure efficient operations and data collection.

We are looking for candidates who would work with RC taking up a role of TCO for one year. This function would take up about 0.5 FTE. Continuous presence at CERN is preferred and in some critical periods, it would be required (details to be agreed with the Run Coordination).

Please let us know if you know a suitable candidate. Of course, we encourage self-nominations.

Please make sure that your input reaches us no later than the 17th of December, 2021.

Please find more information regarding the task below.

Kind regards,
Your Spokesperson's Team and Run Coordination

Requirements

- Experience and insight with the operation of all the ALICE detectors and online systems
- Knowledge of the LHC accelerator and P2 technical infrastructure and support systems
- Good communications and pedagogical skills and ability to transfer knowledge effectively
- RUN1/RUN2/RUN3 commissioning experience is welcomed

Responsibilities

1. Prepare and give to trainees general introductory lectures for QC, DCS and ECS roles, reviewing the introduction to LHC, ALICE, P2 infrastructure, and support systems presenting an overview of all components and their interconnections.

2. Review and harmonize training material produced by the QC, DCS, ECS SRCs and evaluate/discuss the testing procedures to form good shifters.

3. Steered by RC, manage a regular calendar of SL classes, and produce the needed material for the SL training and testing, keeping it up to date.

4. Periodically evaluate the effectiveness of all the training procedures with respect to operation and its evolution in time (classes, training shifts, testing). Propose/discuss with RC corrections and improvements ensuring that shifters are well trained and acquired the required skills.

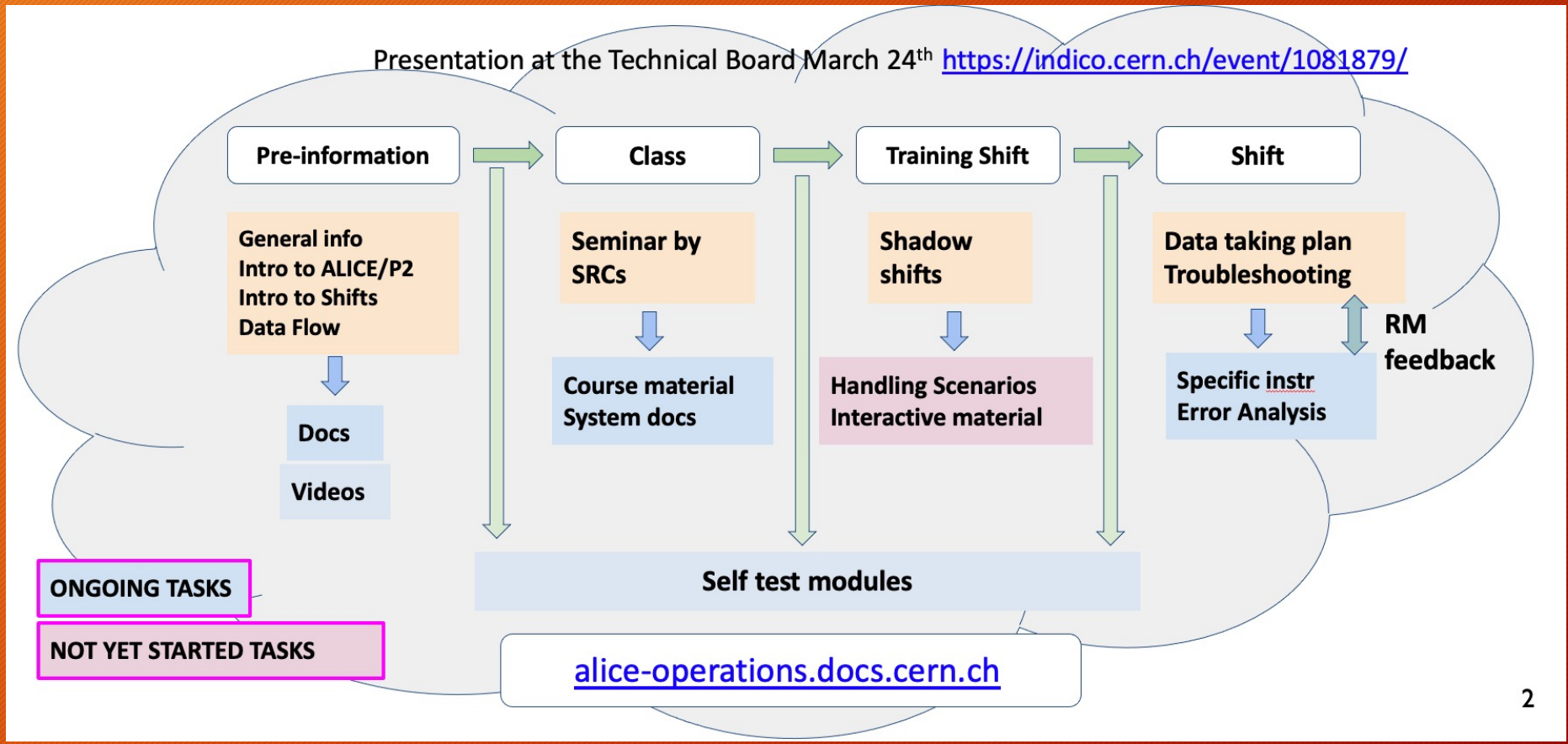
5. The TCO will give a refresher lecture or class to the incoming Run Manager candidates that will include advanced material based on the SL documentation.

6. Manage the training shifts in SAMS.

Together with the Run Coordination (RC), we came to the conclusion that organizing adequate shifter training for RUN 3 needs special attention

- 0.5 FTE
  - 6 months devoted to TCO
- Presence at CERN preferred in 2022

CLASSES AND DOCUMENTATION PRODUCTION

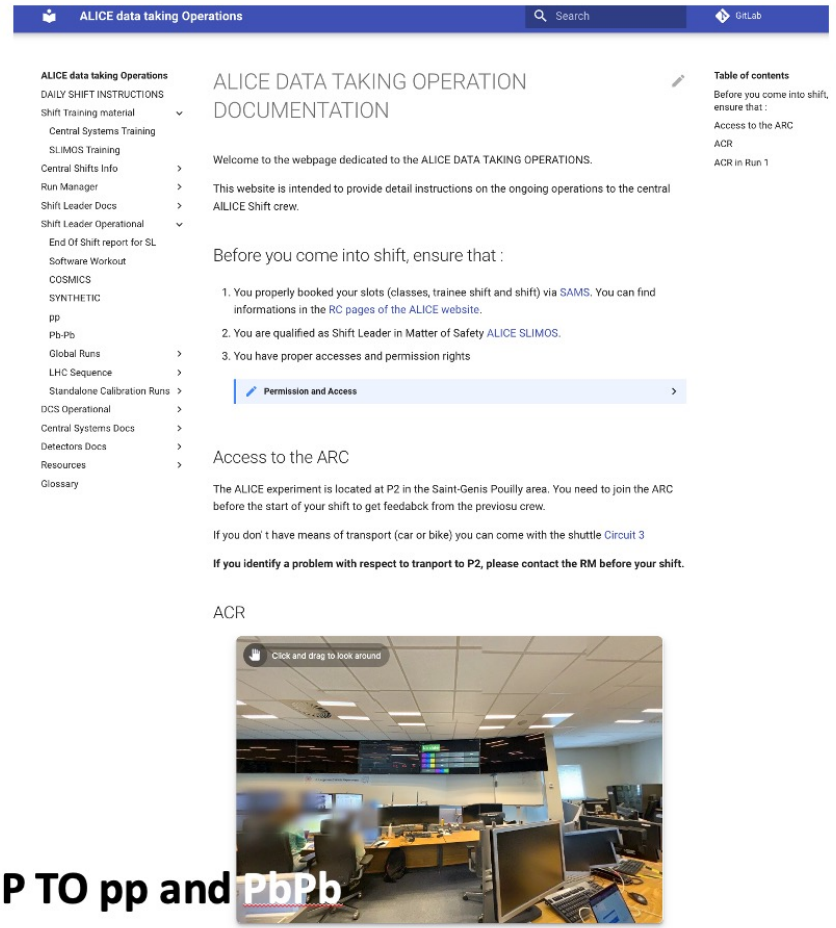


Information for RUN Coordinator

A Large Ion Collider Experiment

RC INFORMATION HUB

- alice-operations.docs.cern.ch
  - Single point information source
- Classes
- Training
- Shifts Manuals
- Shift Instructions
- Run Manager Duties and Instructions
- Central Systems Documents
- Detector Documents
- Resources
  - Link to online systems
  - Link to monitoring systems
- Glossary

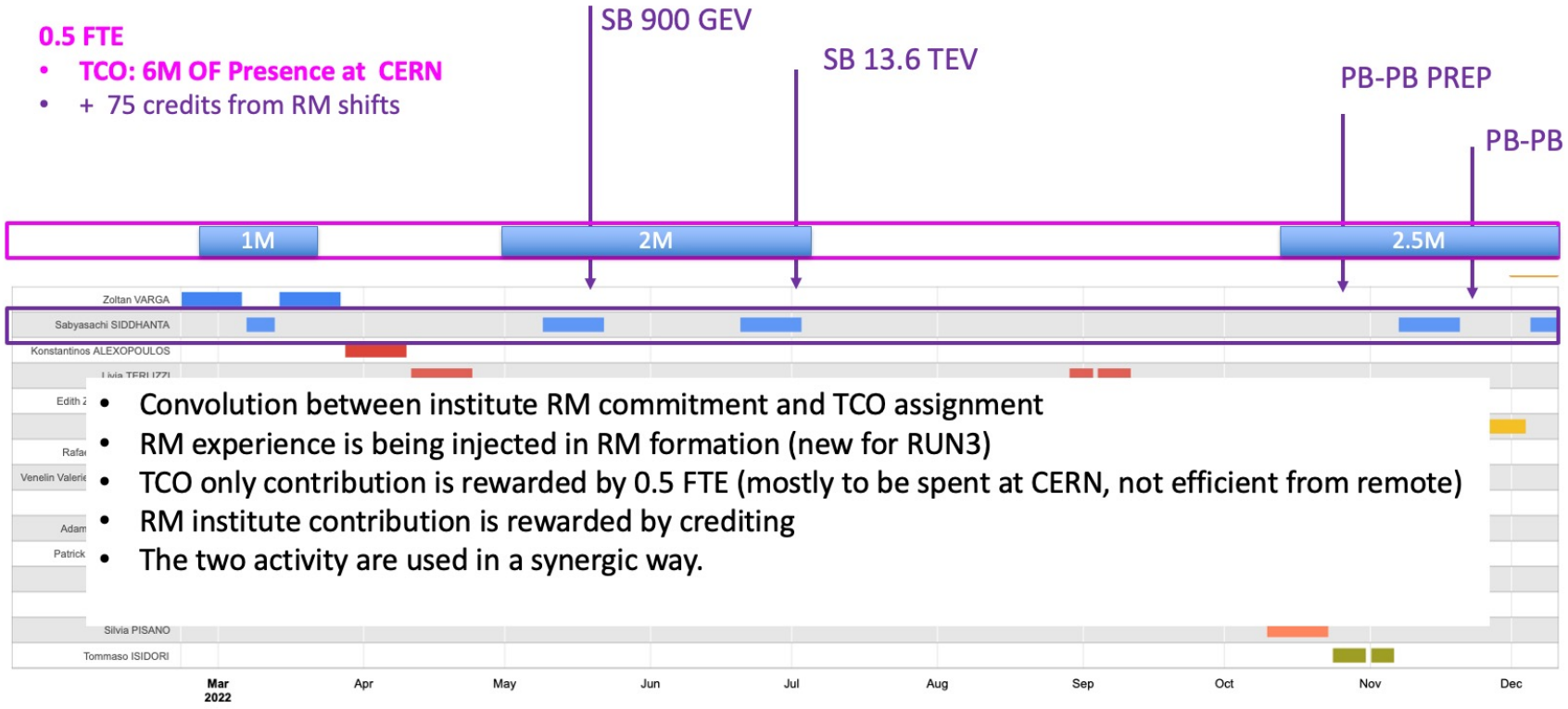


NEED CONTINOUS INTEGRATION UP TO pp and PbPb

2022 COMMITMENT

0.5 FTE

- **TCO: 6M OF Presence at CERN**
- + 75 credits from RM shifts



- Convolution between institute RM commitment and TCO assignment
- RM experience is being injected in RM formation (new for RUN3)
- TCO only contribution is rewarded by 0.5 FTE (mostly to be spent at CERN, not efficient from remote)
- RM institute contribution is rewarded by crediting
- The two activity are used in a synergic way.

Richiesta straordinaria 2022

- Sul capitol missioni: 7 kEuro per permettere le ativita' al CERN del TCO e le manutenzioni pre-run del MCH (avevamo sottratto 10keuro s.j. da questa voce a giugno su indicazione dei referee)

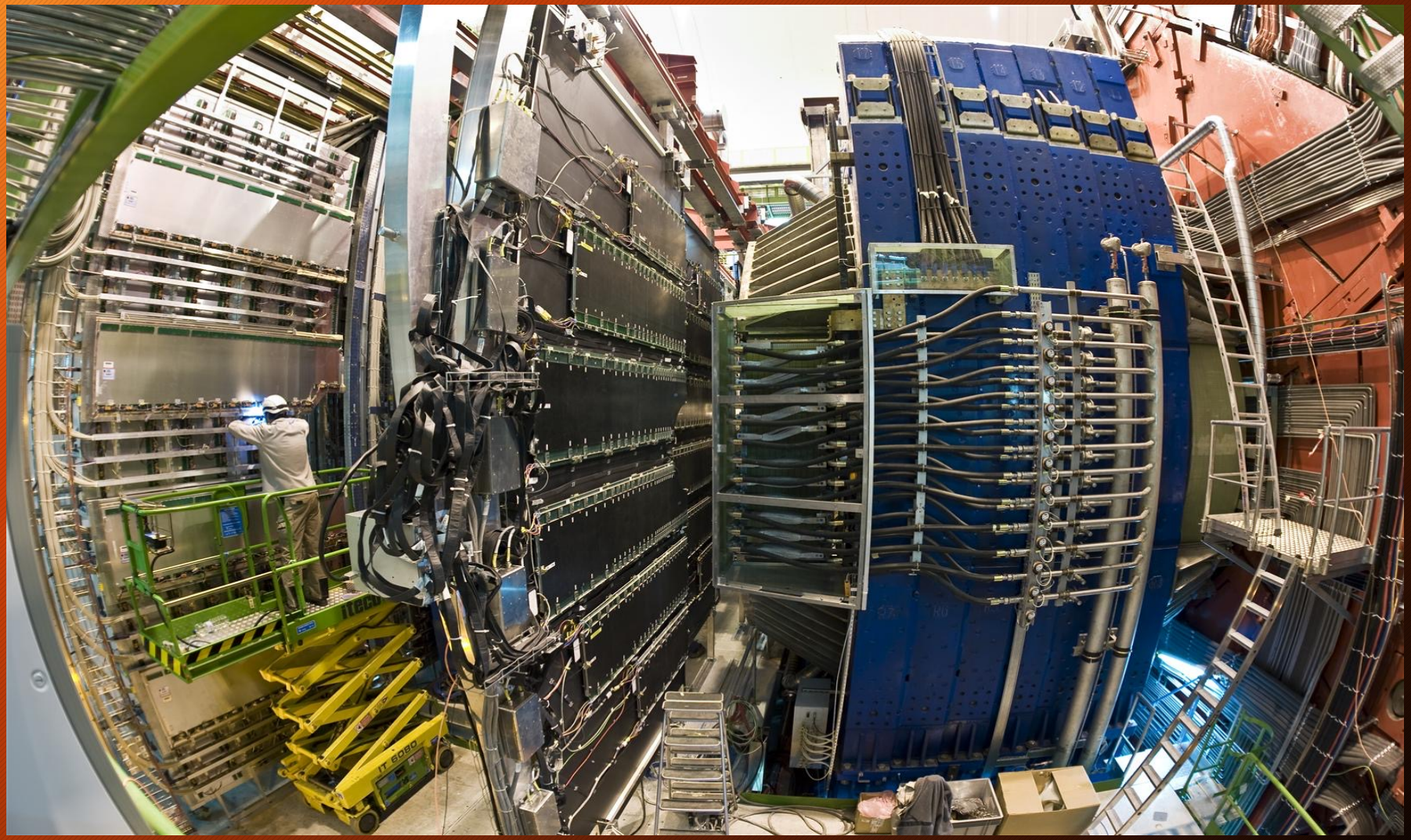
Richieste per il 2023

Composizione del gruppo ALICE Cagliari: 11.5 FTE

- **Sigle Sinergiche: CA_2020 terminata. FTE riconfluiti su ALICE**
- **Richieste specifiche Missioni:**
  - Per interventi sull'apparato: 10 kEuro
  - Training RUN coordinator: 15 kEuro
- **Richieste specifiche consumo:**
  - 4.5 keuro auto CERN x turni e oncall
  - 1.5 keuro consumo per interventi su MCH (e ZDC)

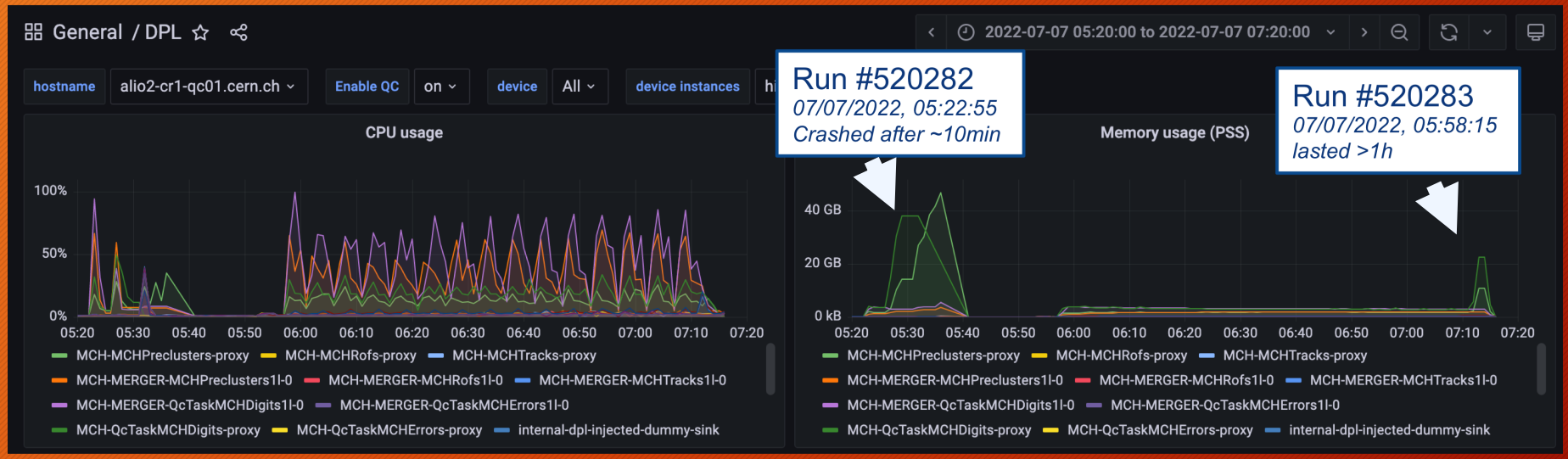
Training Run Coordinator

END



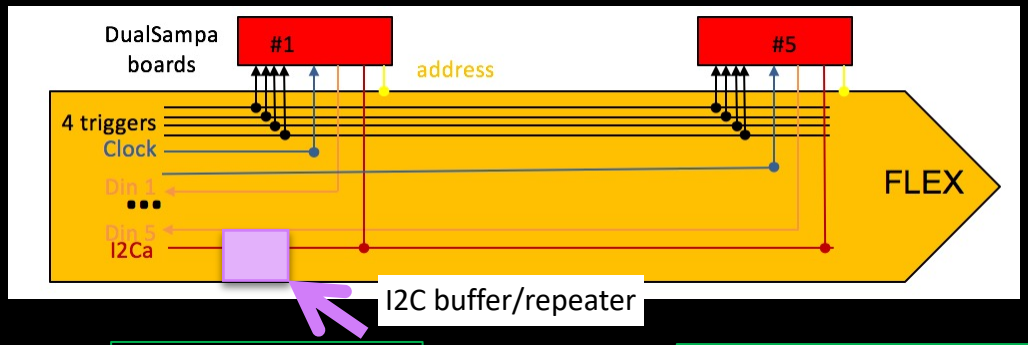
QC Processing and Merging Issues

- **Several runs stopped due to MCH QC errors/crashes on merger node:**
  - Probably due to large number of plots being merged
  - No clear pattern: some runs crashed very quickly, other lasted for > 1h



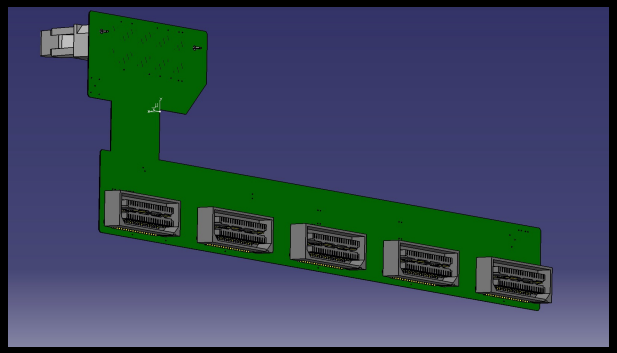
- **Current mitigation measure**: longer cycle duration for pre-clusters task, to reduce load on merger
- Also missing plots in calibration runs from time to time since last software update
  Reason not yet clear, might be due to the way processes are stopped/killed on the EPNs…

MCH Upgraded Readout – Interface PCBs



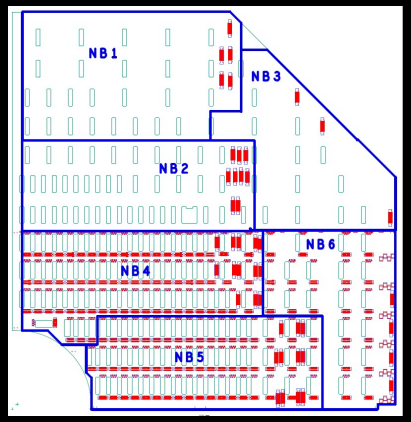
- **DATA : 1 differential line per DS**
- **Clock: 1 differential line per DS**
- **4 triggers (ϕ, Heartbeat, Sync, Hard Reset) will be chained on 5 DS**
- **1 I2C line will address 5 DS**
  - I2C buffer/repeater added to improve stability

FLEX: INFN Cagliari

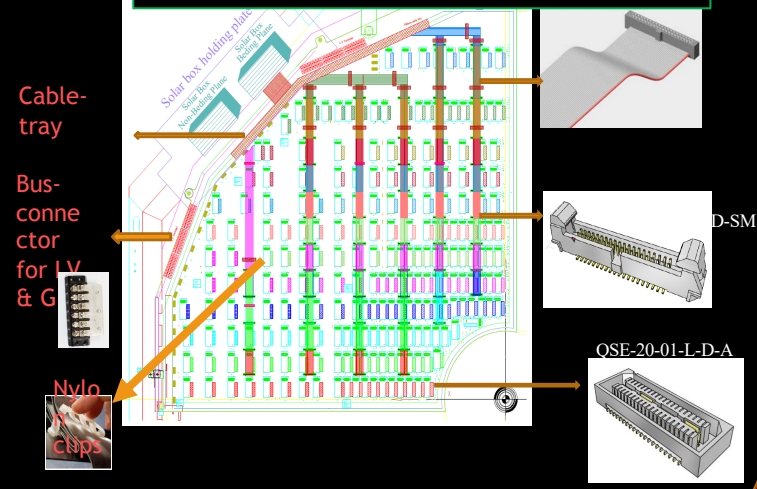


New design, more compact
Rigid pads→Hybrid circuit

PCB Station 1: IPN Orsay

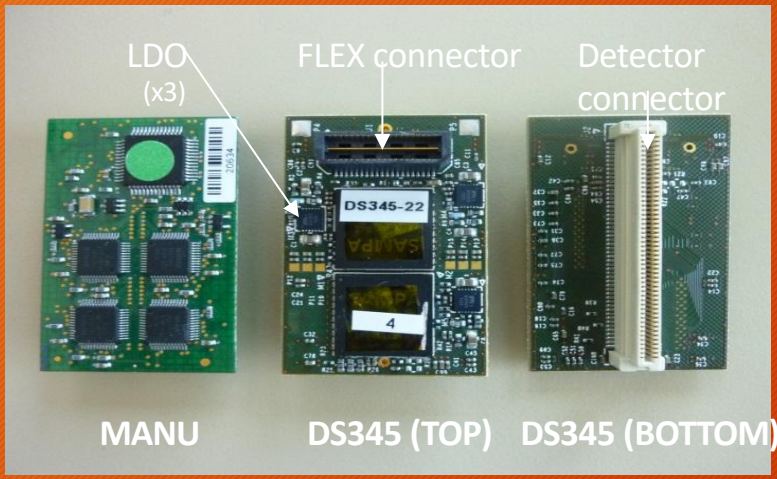


PCB Station 2: India Kolkata+ Aligarh



MCH Upgraded Readout - DualSAMPA Front-end Boards

IPN Orsay



2 SAMPA chained on one DualSAMPA board

2 types of DualSAMPA:

DS12 for quadrants,

DS345 for slats