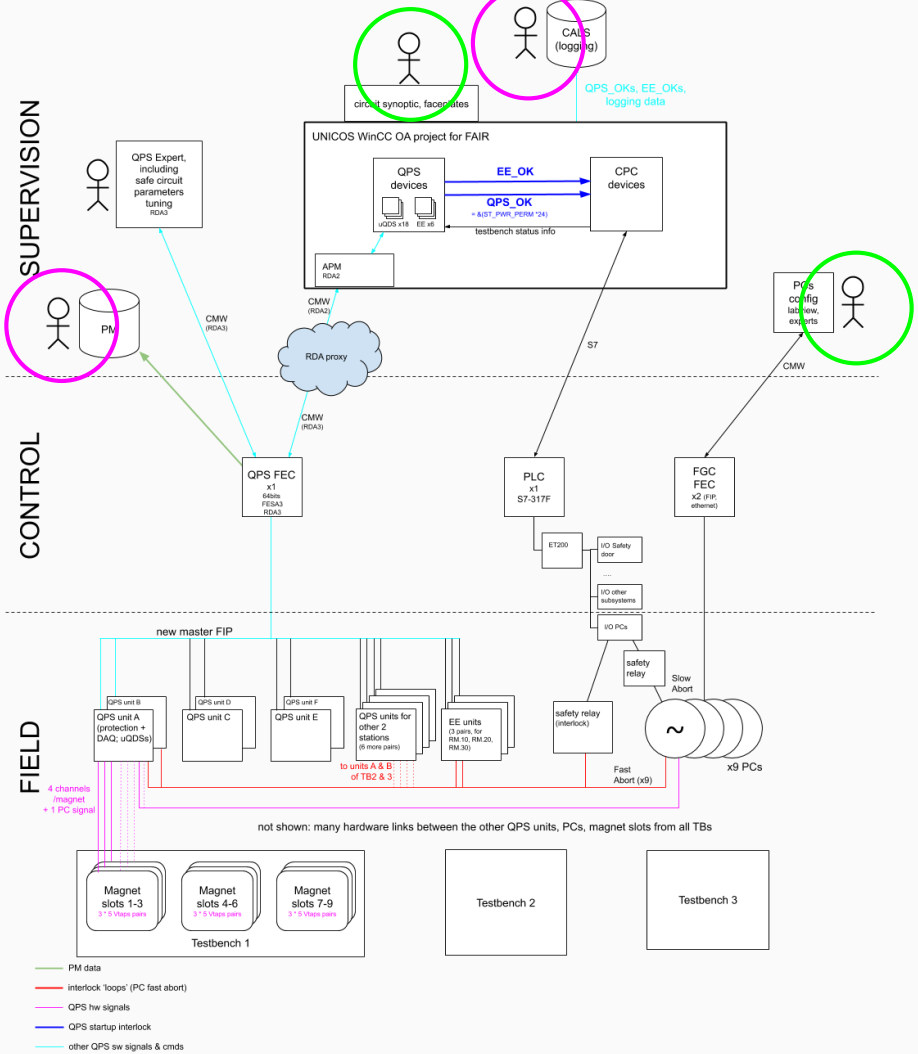
# FAIR
# Magnet Protection System software layer

# Protection System integration insights

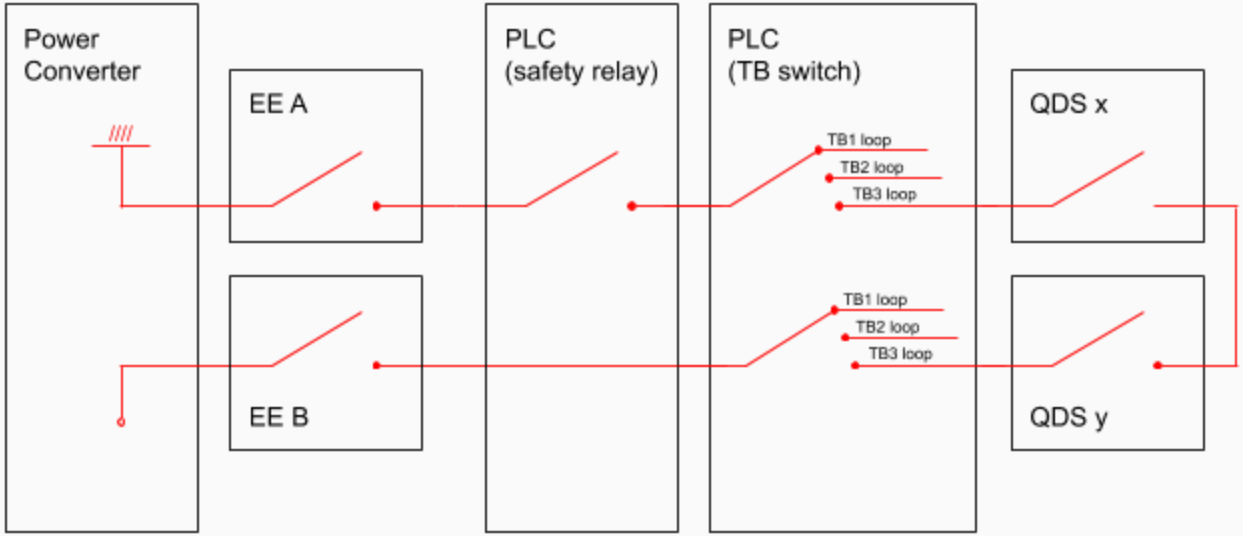
supervision

acquired data access

# Protection, EE, Powering and Interlocks - integration overview



# Protection system setup: interlock loops



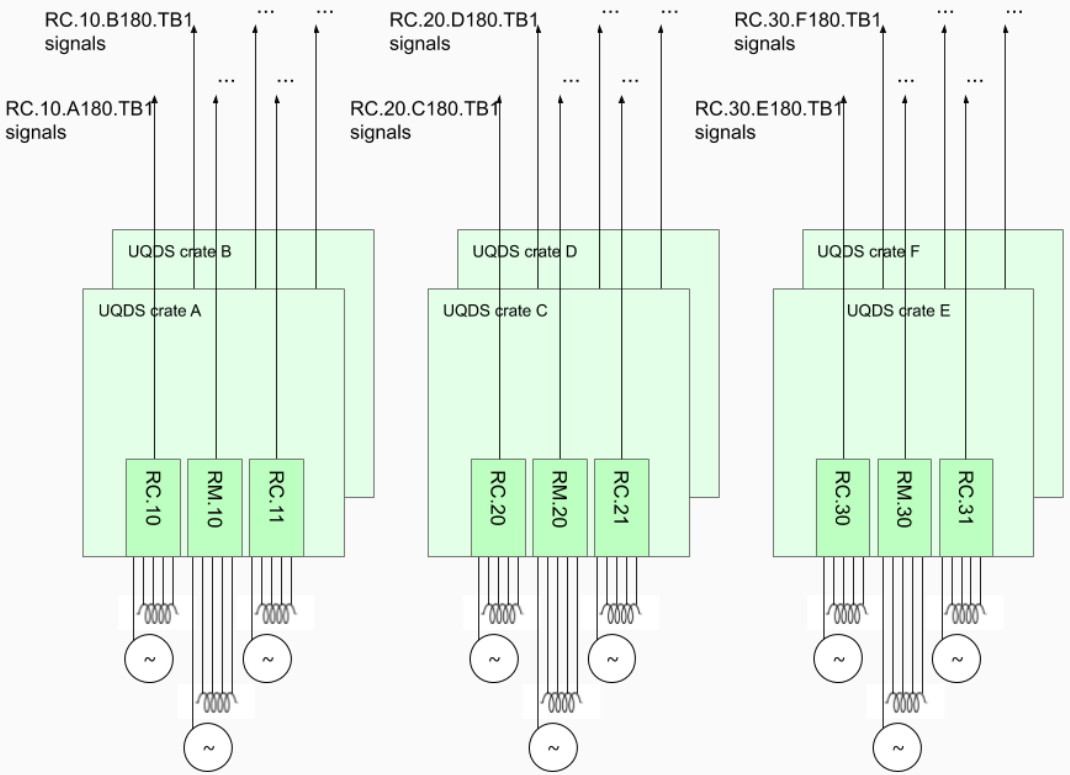

simplified diagram

- Energy Extraction is only present in 3 circuits out of 9
- Actual cabling and position within the loop may be different
- The ‘red line’ really represents 9 interlock loops, 1 for each circuit

# Protection system setup - key points

- There is only one set of 9 Power Converters (+ their Energy Extraction units where relevant) for all 3 testbenches
- QDS units are deployed to all testbenches, not just to circuits
- A switch allows to ‘complete’ the interlock loop of either testbench, by plugging together PCs and QDS, and thus enabling the protection of all circuits by the protection units dedicated to a particular testbench

# The origin of protection signals




each magnet slot may or may actually not be plugged to a magnet, depending on the assembly being tested

# The origin of signals - key points

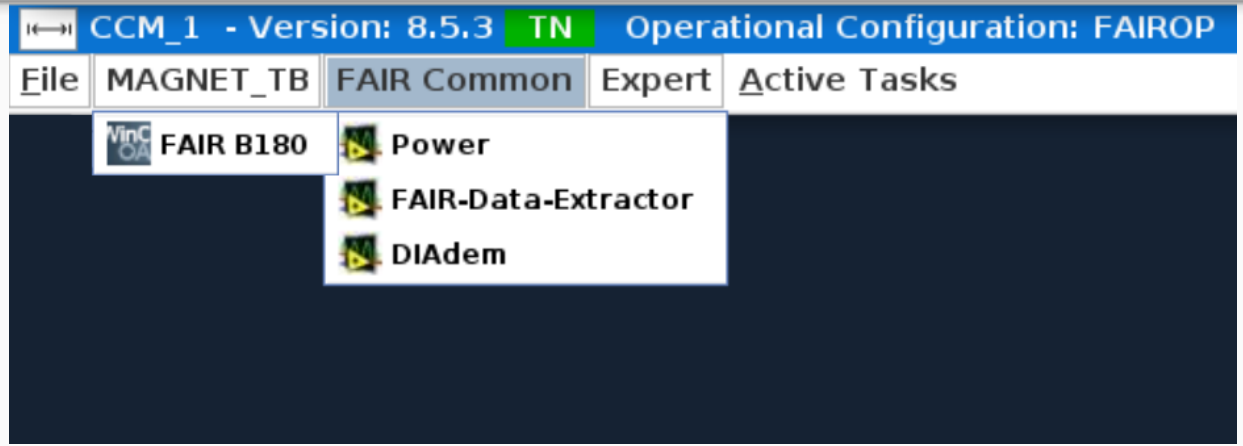
- Virtually all protection signals (measurements, interlocks, statuses, etc.) originate from field devices
- Each protection device can protect up to 3 circuits/magnets
- Each testbench has a dedicated set of 3 pairs (for redundancy) of protection devices
  => each set can protect up to 9 magnets i.e. 1 full long assembly
  => in total, 18 protection devices will be deployed to the facility
  => currently only 2 are deployed, to TB1, enough to fully protect the first assembly
- Signals are named consistently, with a clear indication of their origin:
  - The testbench, TB1 or TB2 or TB3
  - The circuit, e.g RC.10 or RM.20
  - The protection device (QDS), A, B, C, D, E or F

# Protection system - detection parameters of the protection devices

- For now, detection parameters are defined and managed by the experts
- A dedicated tool to allow operators to safely adjust them has been foreseen
- It will (or not) be deployed depending on the actual requirements to adjust these parameters; return of experience from both the operators and experts after the tests on the first assembly are required on this point

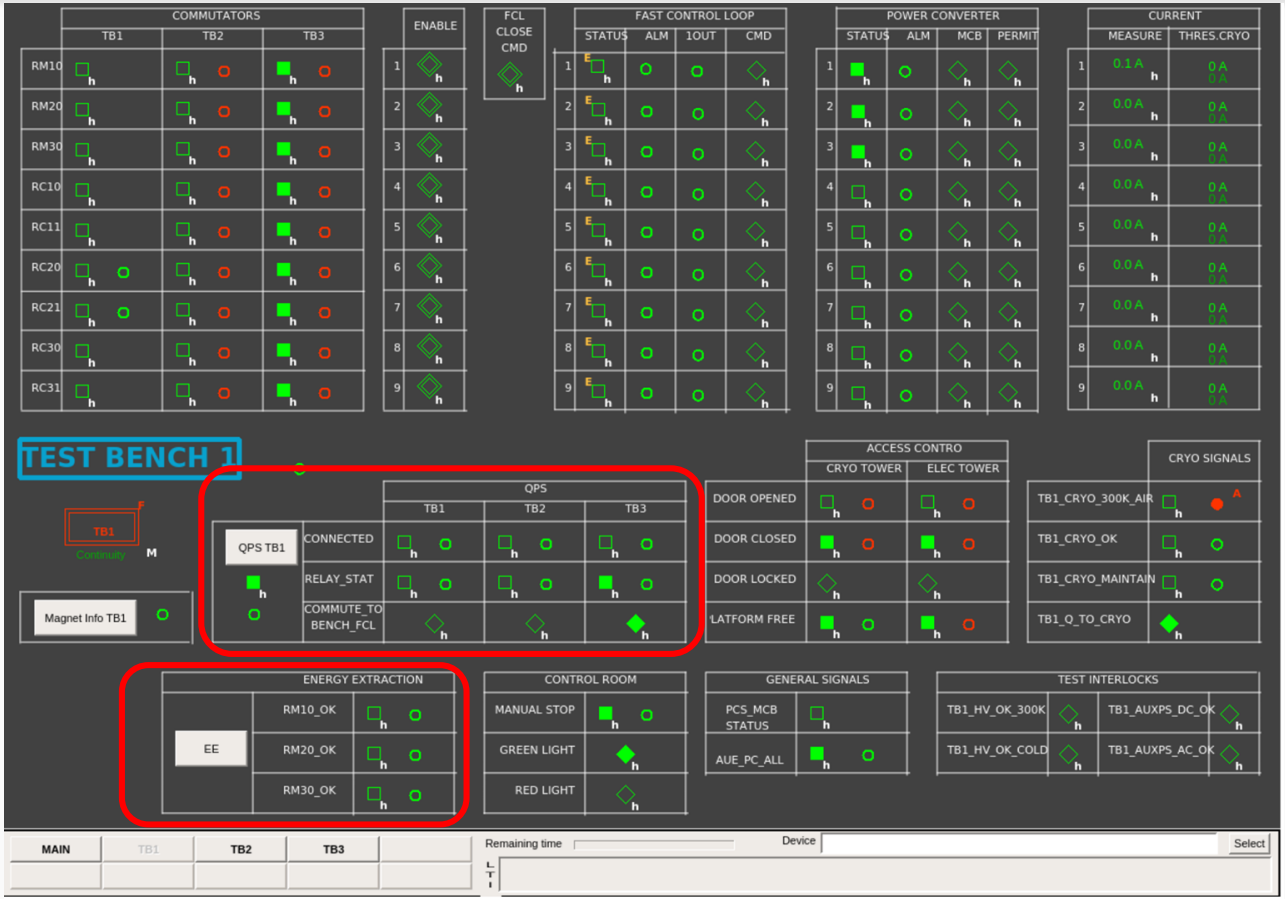
# Supervision tools

# Supervision tools - unified access to tools via the Common Console Manager (CCM)

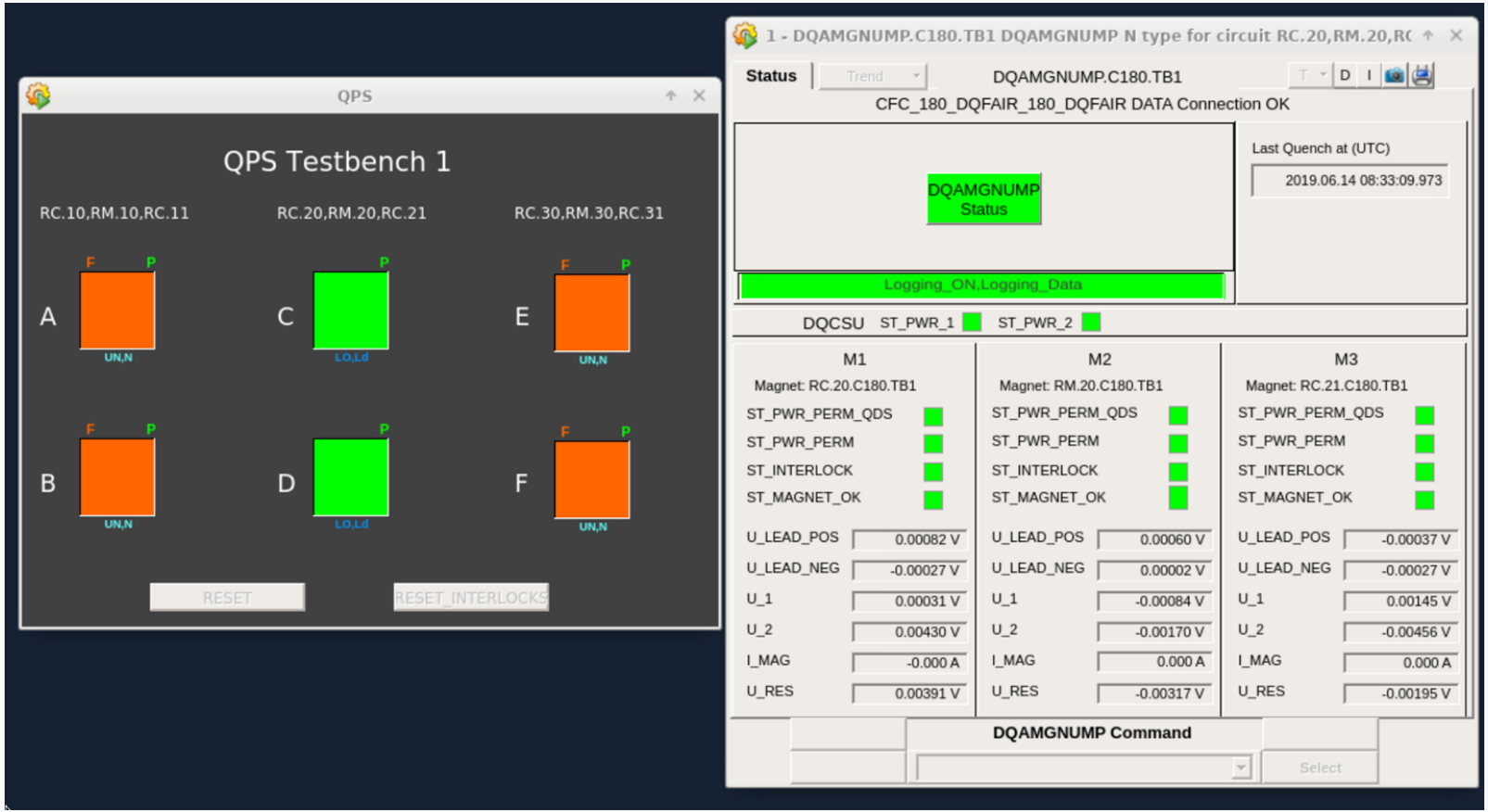



- WinCC OA supervision
  - Power & interlocks supervision, see Maryline's presentation
  - Protection supervision
- Power application, dedicated supervision tool for Power equipment, see Maryline's presentation
- Data extraction and analysis tools

# Supervision tools - WinCC OA synoptic



# Supervision tools - Protection devices details



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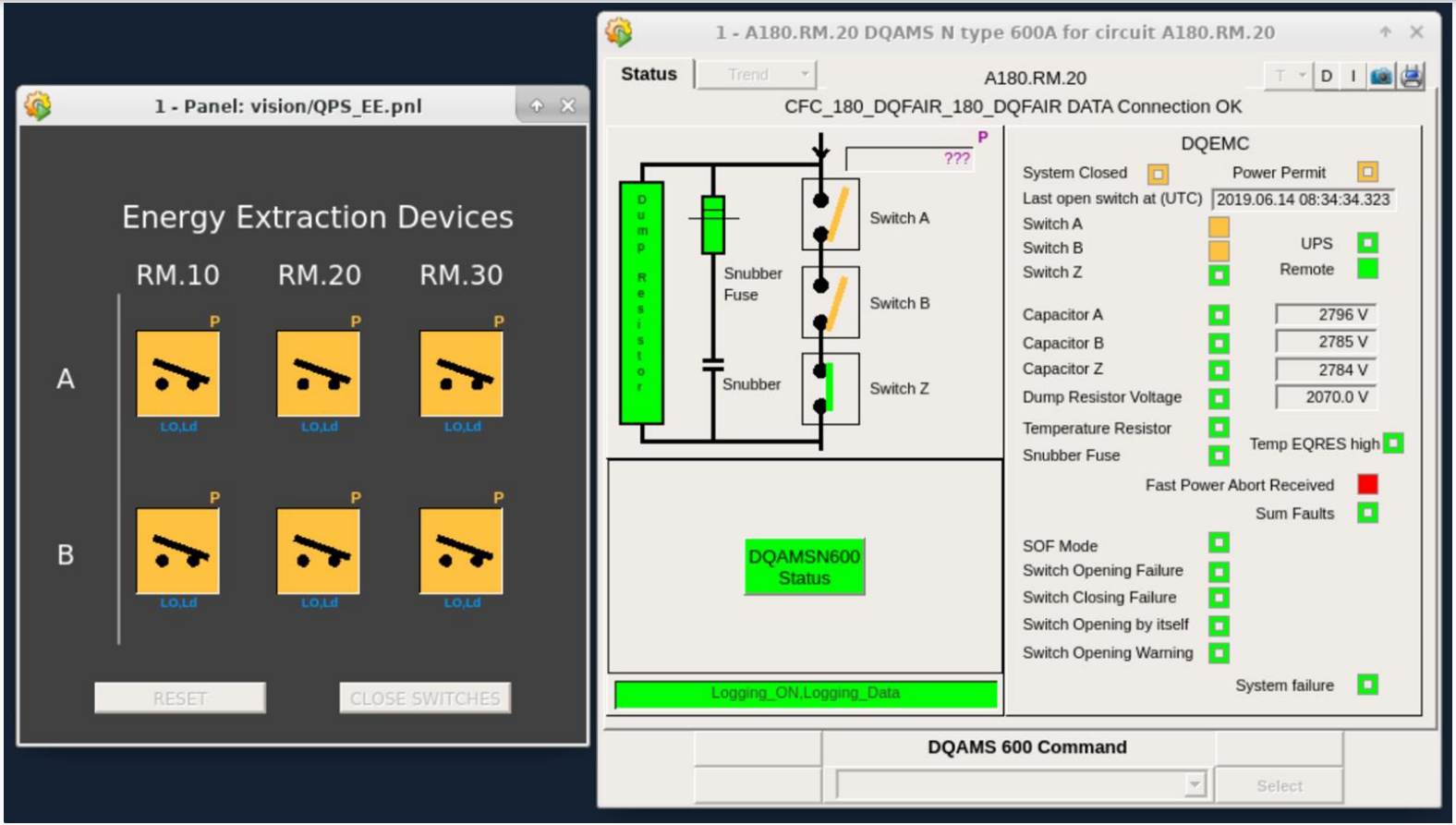


# Supervision tools - user actions

- 2 high level actions for the QDS devices of a testbench:
  - Plain reset
  - Unlatch of the interlocking state (interlock reset)
- 2 high level actions for the Energy Extraction devices:
  - Plain reset
  - Closing of the interlock switches
- **Procedures definition, dedicated training, to be done together, along with the other supervision tools**
- /!\ as for other systems, data consistency is conditioned by the proper input of the magnet info /!\ (assembly id, magnets details)

# Data archiving and access

# Data archiving and access

- Protection signals comply with the common naming convention (as mentioned, indicate the TB, circuit, …), allowing straightforward correlation with data from other systems (Cryo, interlocks, etc.)

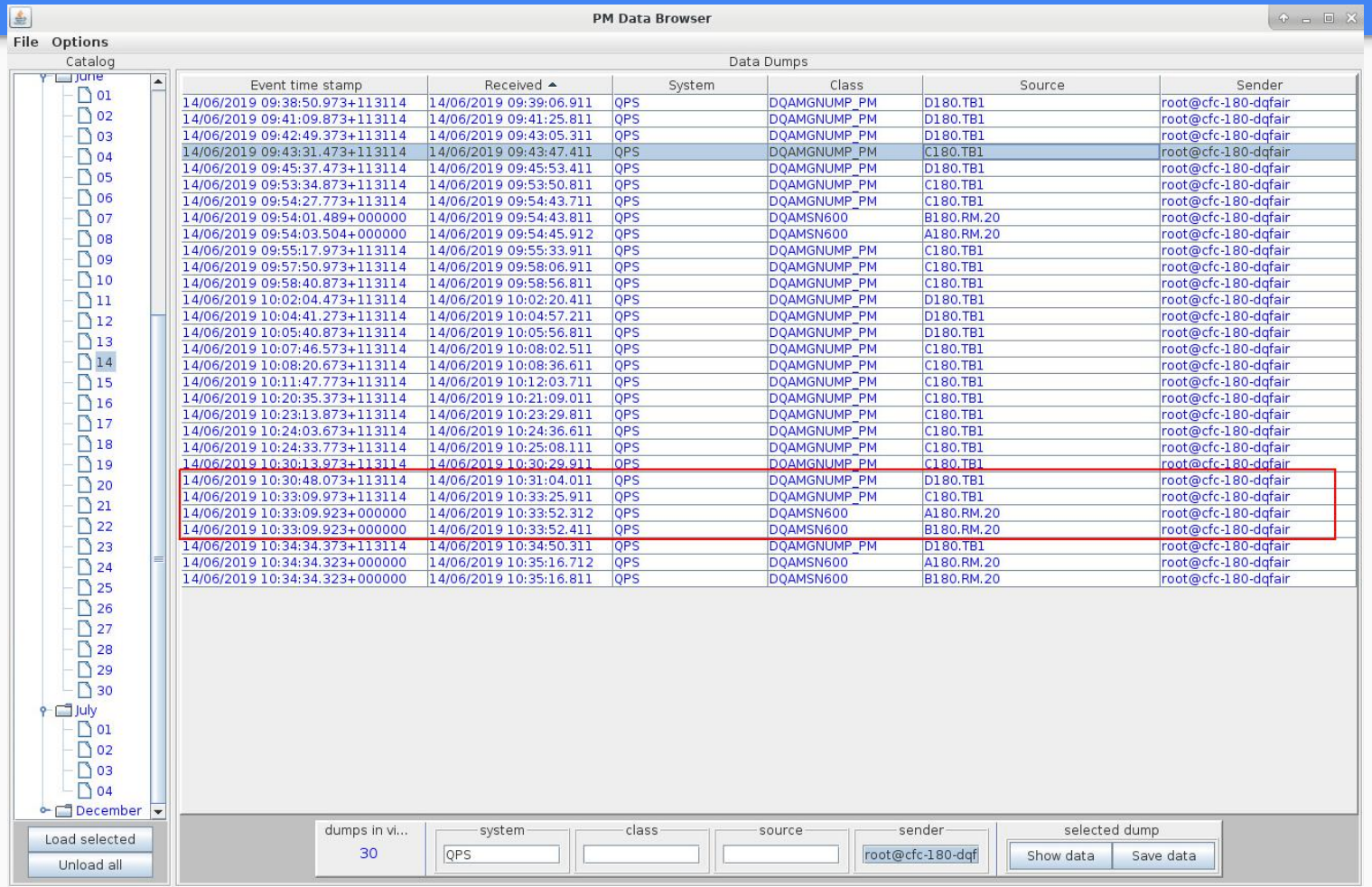
- Sampling rate is:
  - 10Hz for continuously logged data (aka Logging)
  - higher rate (10kHz, adjustable by experts) for event based acquired data (aka Post Mortem)

- Data has the same lifetime as CERN accelerators data, ie it is kept for the foreseeable future

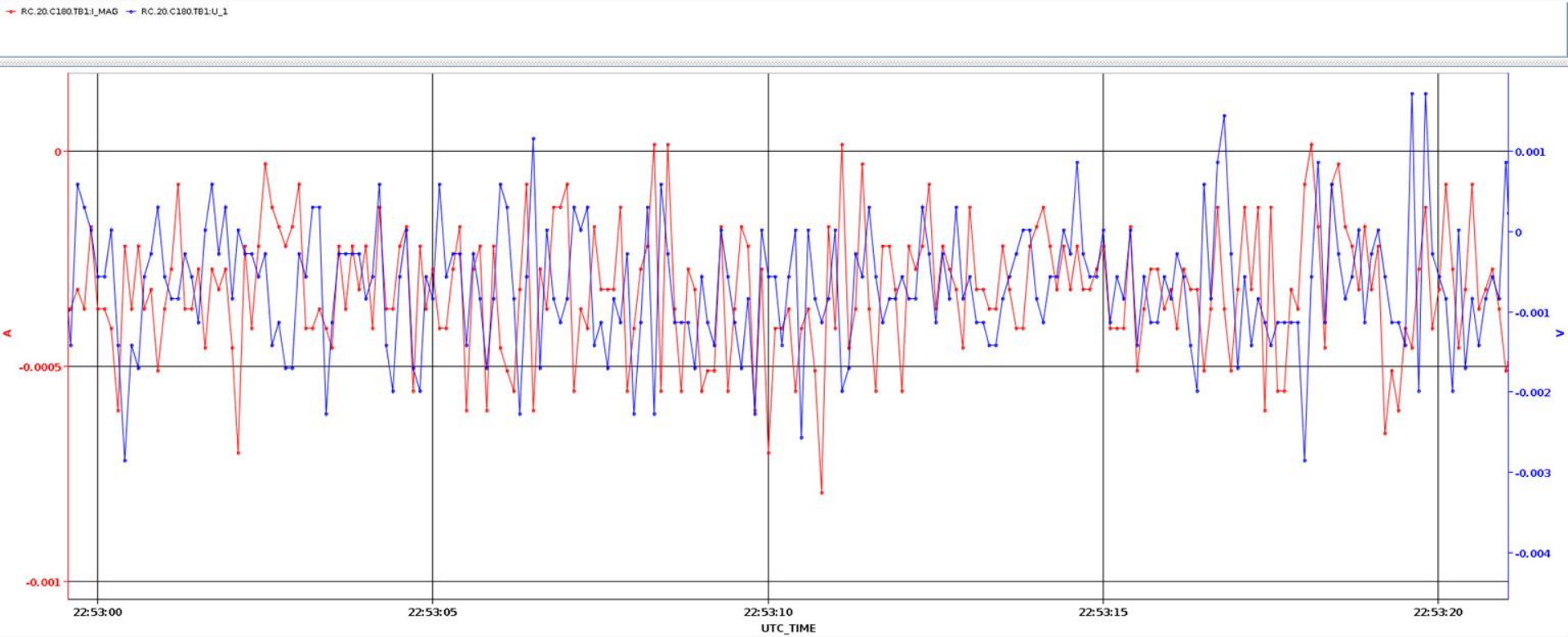
- Data is accessible through the CERN standard infrastructure (PM Browser, Timber) to experts and users alike

- Data is meant to accessed by users using the Data Extractor tool (see Antonella's and Maryline's presentations)

# Post Mortem data



# Logging data



# Future

# Dependency on CERN Accelerators Controls stacks

- Infrastructure and services at CERN evolve, especially during LS2
- This is relevant to FAIR installations, and upgrades to the software infrastructure in particular are foreseen.
  e.g.:
    - redeployment of the control layer before the end of the year, as the current middleware communication infrastructure (RDA2) is retired, superseded by RDA3
    - data acquisition services are replaced by a new generation system (NXCALS)
- In principle, transparent to end users, noting it will require a time slot in the tests plan
- The good news: new and improved tools will come along the upgrades.
  e.g.: Web interfaces for raw data browsing, Advanced data analysis tools (Spark)
    - more of concern to tools providers (e.g. Data Extractor, not the end users)