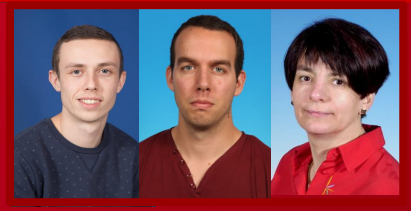
DE LA RECHERCHE À L'INDUSTRIE

cea



Irfu

nBLM

Control and Monitoring System

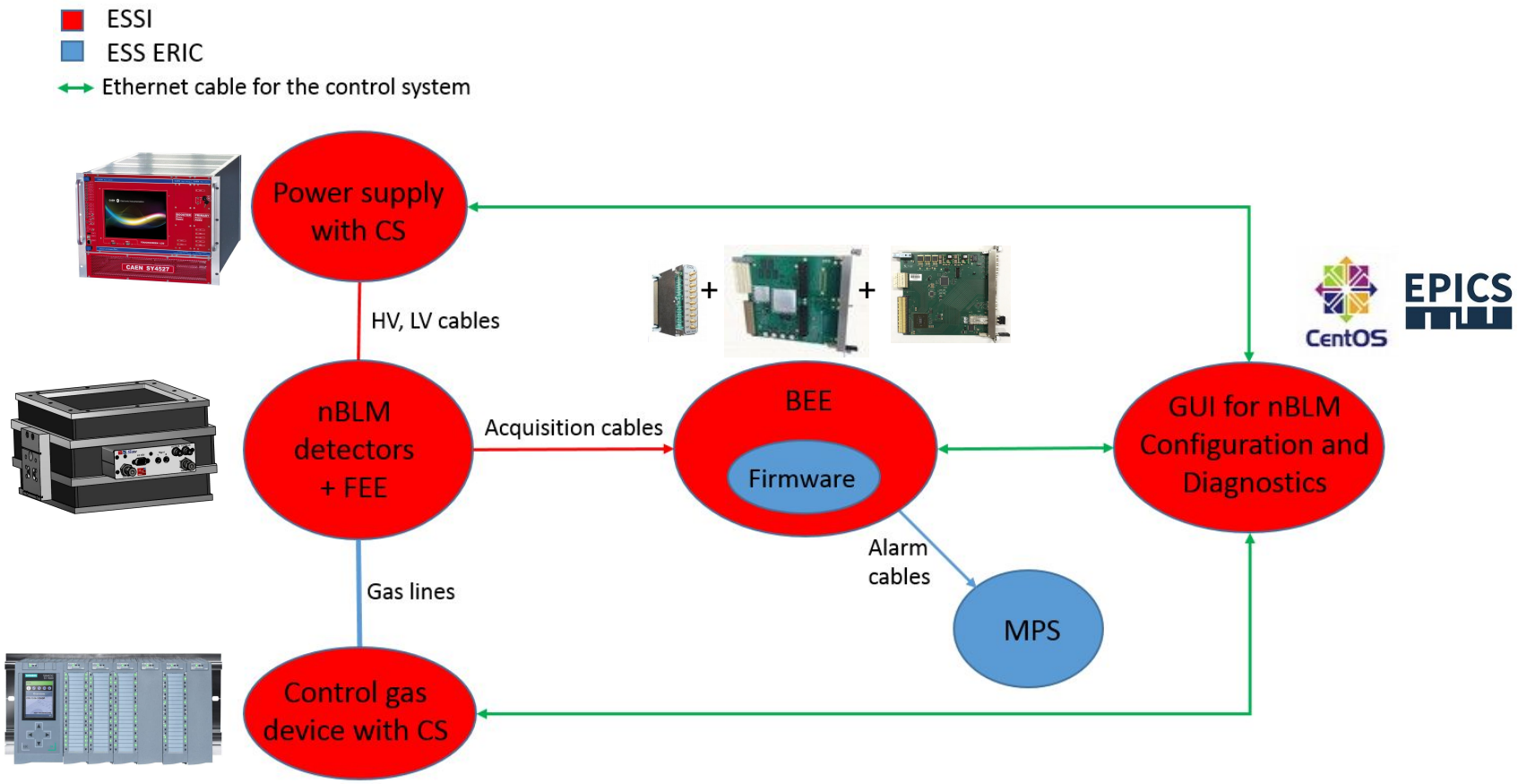
Yannick Mariette
2019 / 02 / 12

ess EUROPEAN SPALLATION SOURCE

OVERVIEW

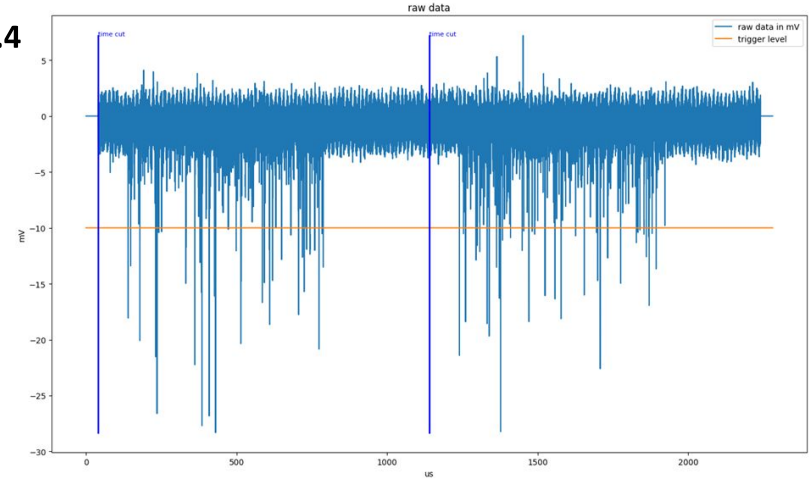
1. Facilities and interfaces overview
2. First firmware tests at CERN
3. HV tests
4. HV/LV control and monitoring
5. Gas control and monitoring
6. Neutron detection control and monitoring
7. New control system strategy
8. CS planning
9. Tests stand at Saclay
10. Views for Vertical Integration Tests

Facilities and interfaces overview



First firmware tests at Cern november 2018

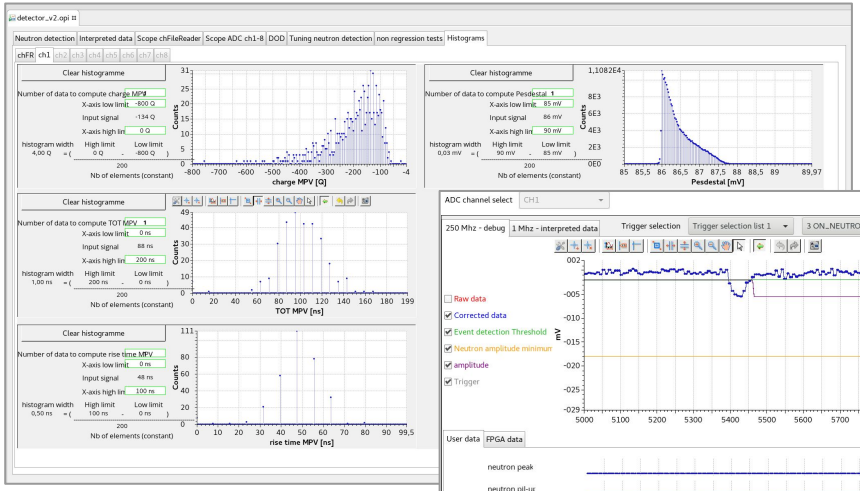
- During the CERN tests, we have tested the FPGA firmware **version 0.4**
- 3 seconds of raw acquisition
- As the pulse was less than 1 Hz, a file could contain 2 pulses
- We have done 3 runs (3 files)
- Python script to display data. With a trigger level the python script could concatenate and display interesting sections (see the adjacent picture, trigger level, pre-trigger and post-trigger could be set)

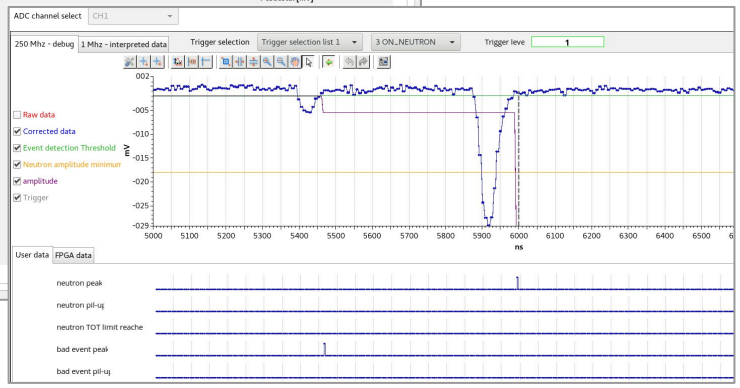


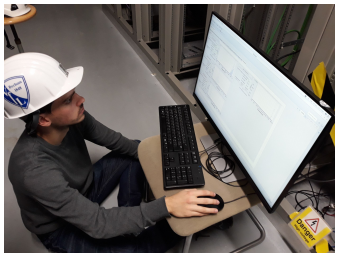
Work fine but many boot was needed before having a working acquisition system.

Dumping data into a file takes ~7 min

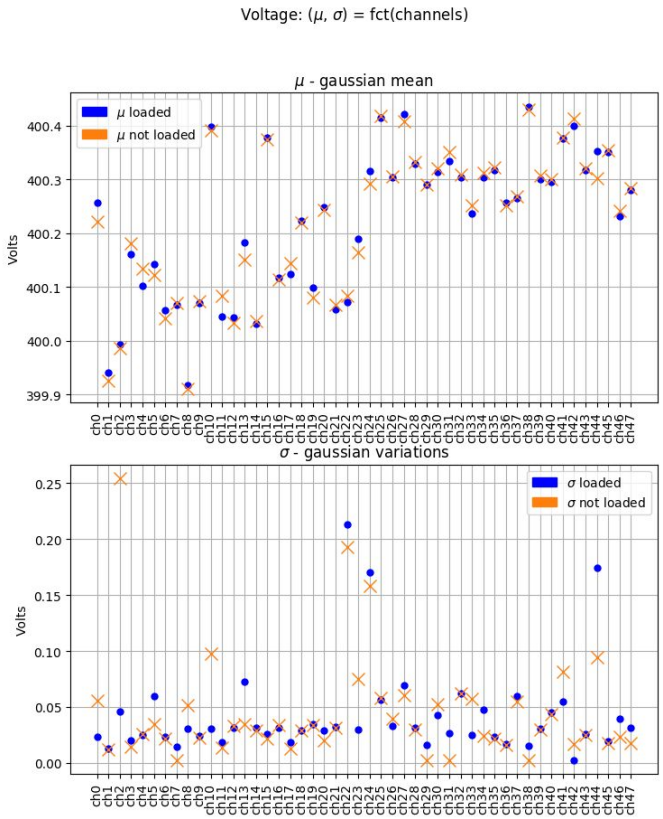
In parallel we used the ACT (Acquisition Chain Tester) for displaying several histograms in real time in order to try to discriminate neutron from gammas

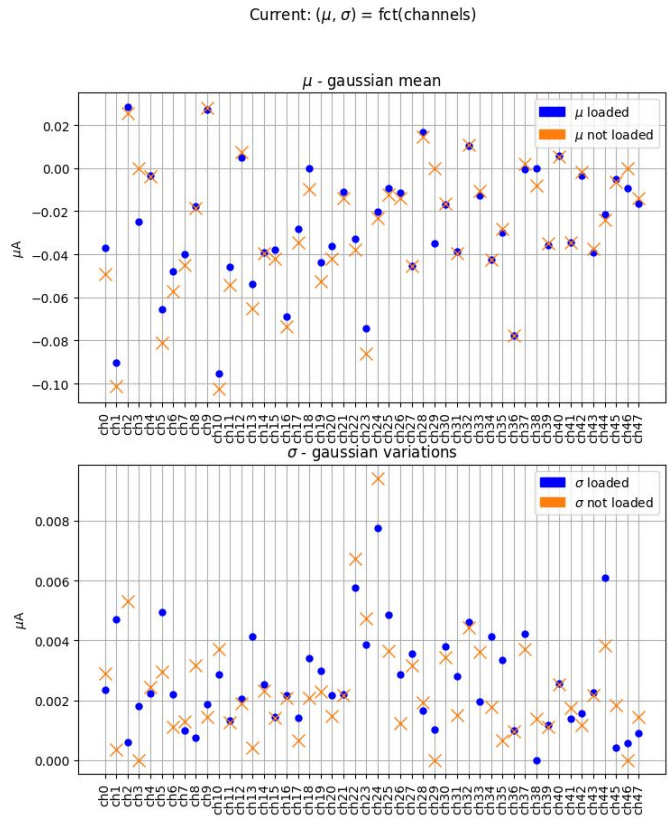






HV TESTS WITH THE SY4527 IOC

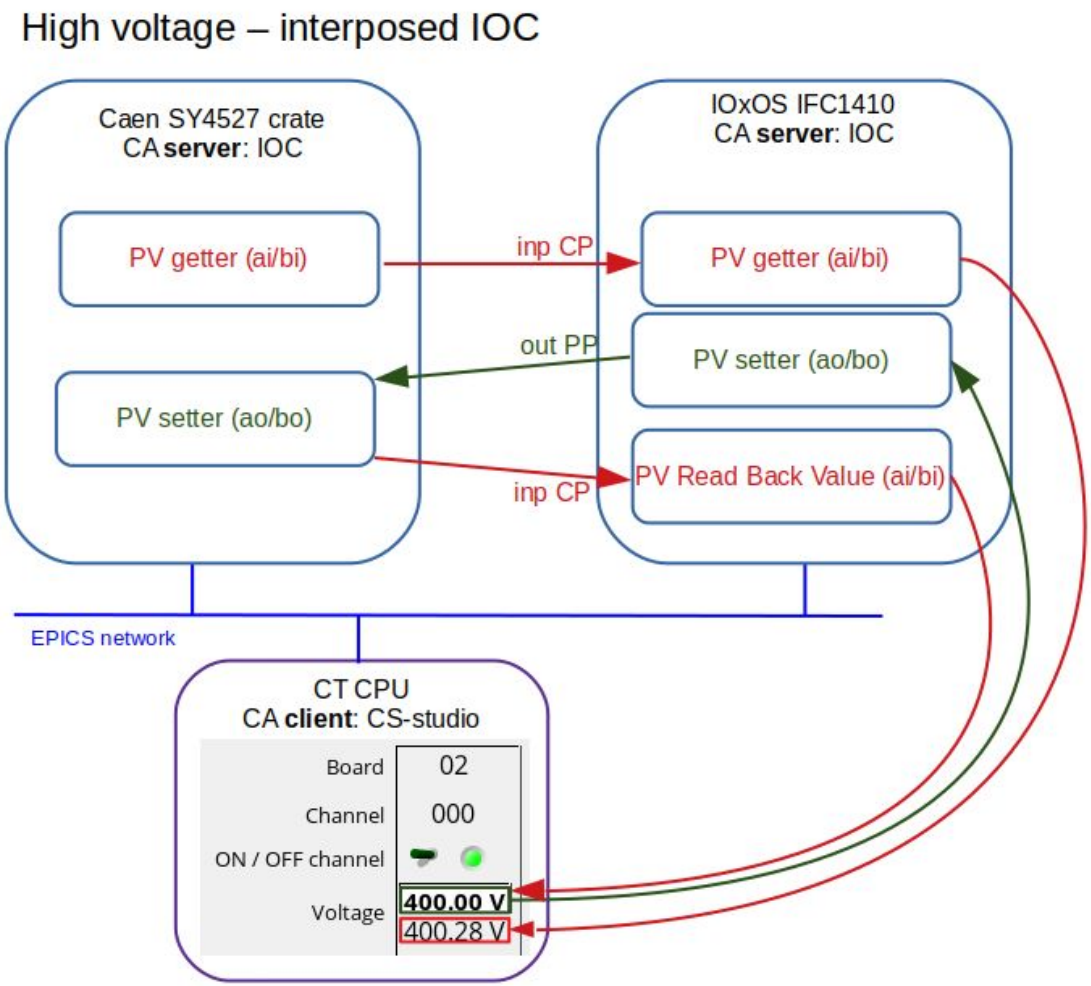




Goal: test High Voltage stability (voltage and current)

- We provided the tool to CEA/DEDIP to store and analyse data over a long time (EPICS archiver + python scripts)
- First test of the CAEN IOC in real situation: send our feedbacks to CAEN

HV/LV CONTROL AND MONITORING

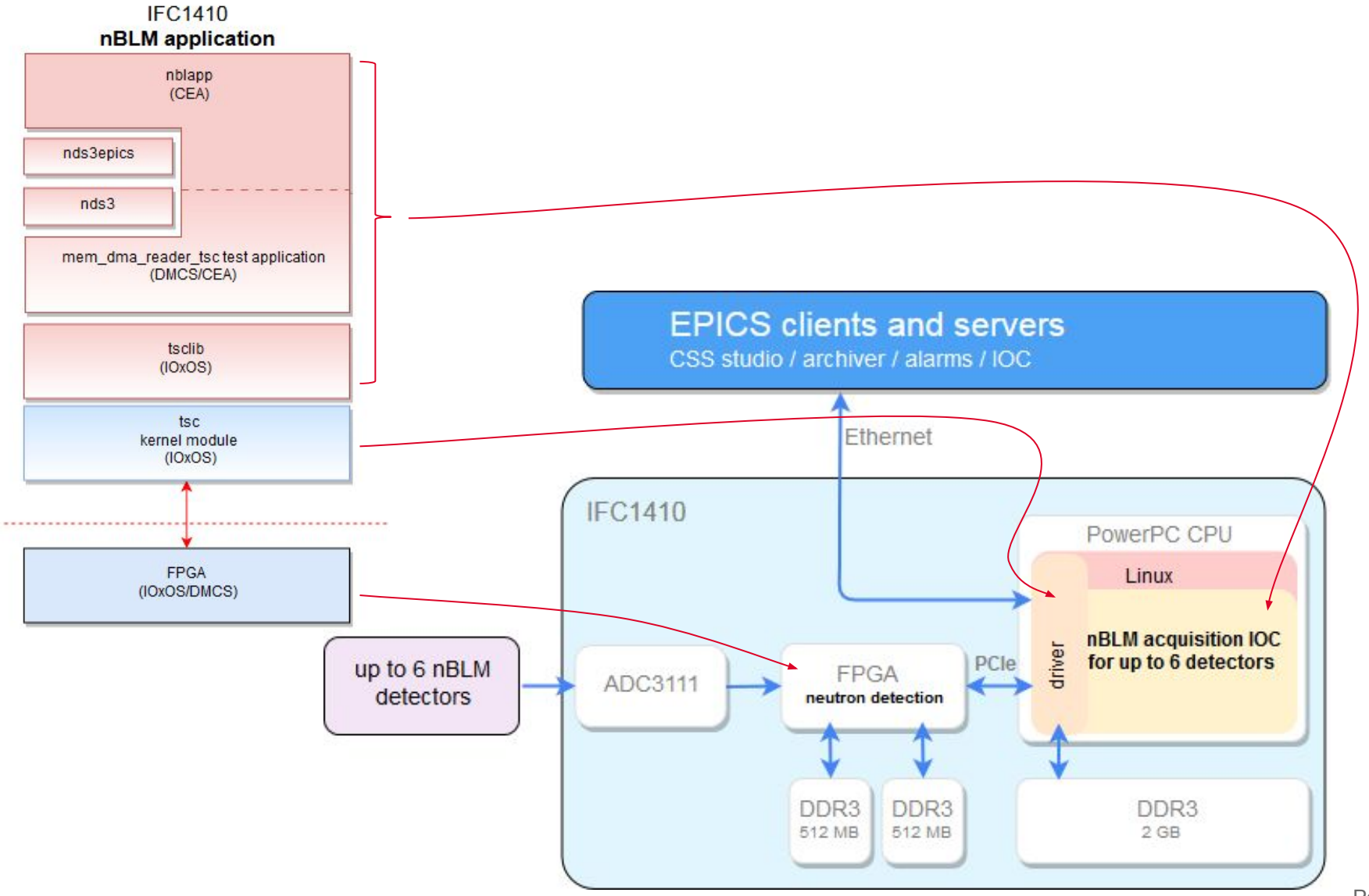


- Naming and Timestamping are not ESS compliant => interposed IOC
- Minor drawbacks:
  - SY4527 PV is still accessible by Channel Access
  - it doubles the number of PVs for controlling nBLM high voltages

GAS CONTROL AND MONITORING

- PLC factory not used
- S7PLC and Modbus server: compliant with ESS (S7PLC for monitoring and Modbus for setting)
- CEA tools:
  - PLC parser tool (CSS plugin): builds the communication IOC from a Siemens development environment
  - DXF2OPI tool (CSS plugin): autocad view conversion to CSS view
- First distribution rack integration: end of March

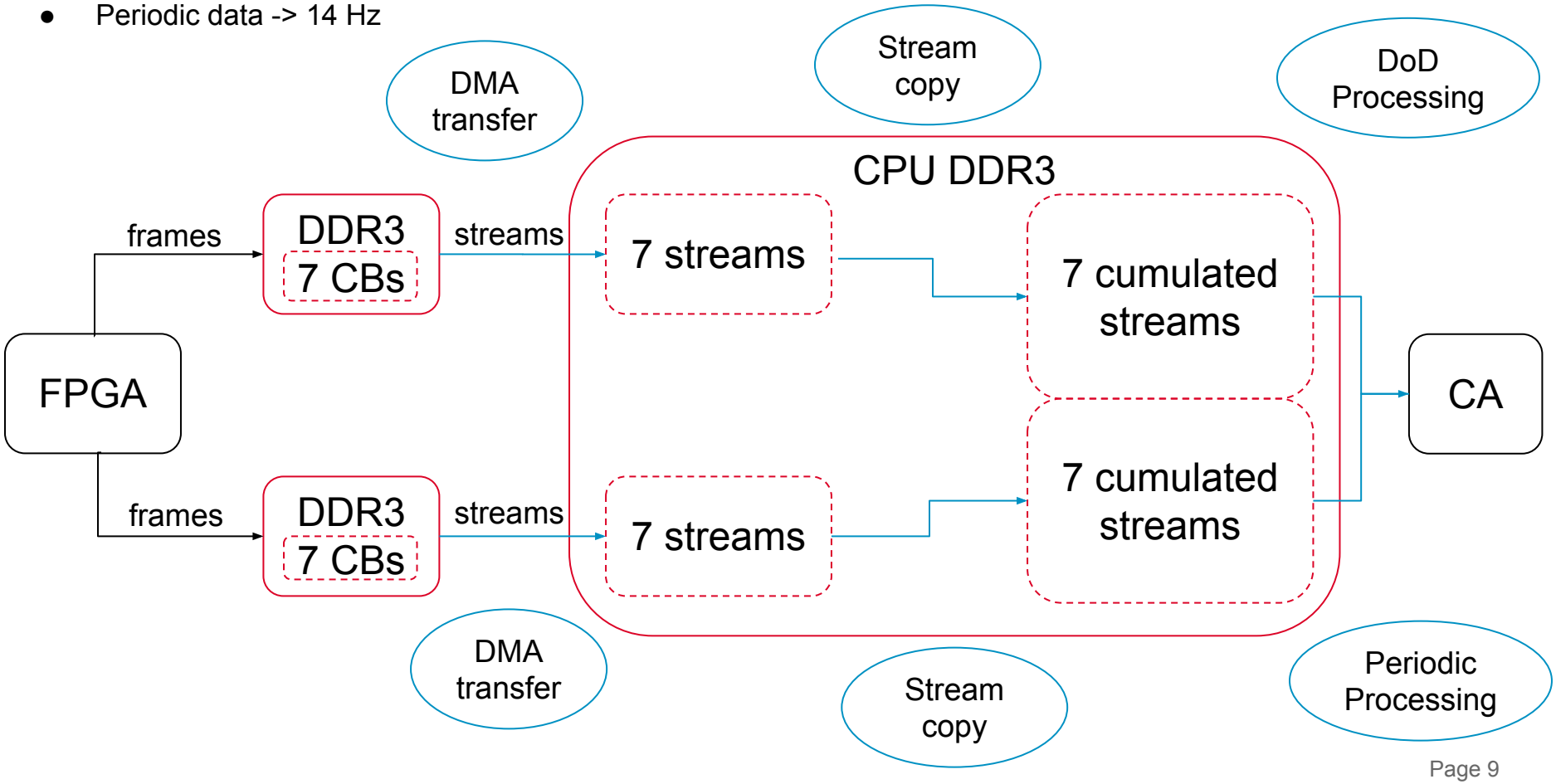
Neutron detection control and monitoring: Software layer



Neutron detection control and monitoring: Data flow

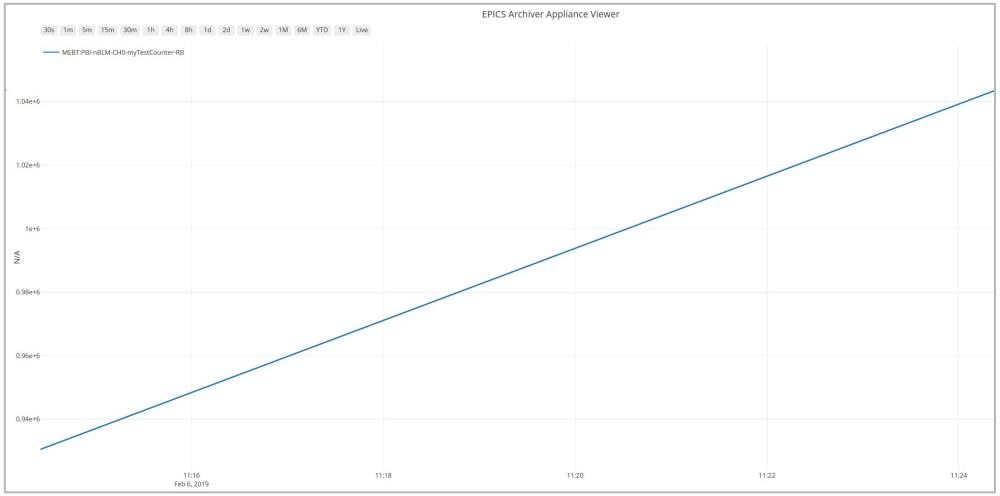
Type of data sample (bit structure associated to a CB channel)

- Event info -> asynchrone
- Neutron count -> 1 MHz
- Raw data -> 250 MHz
- Periodic data -> 14 Hz



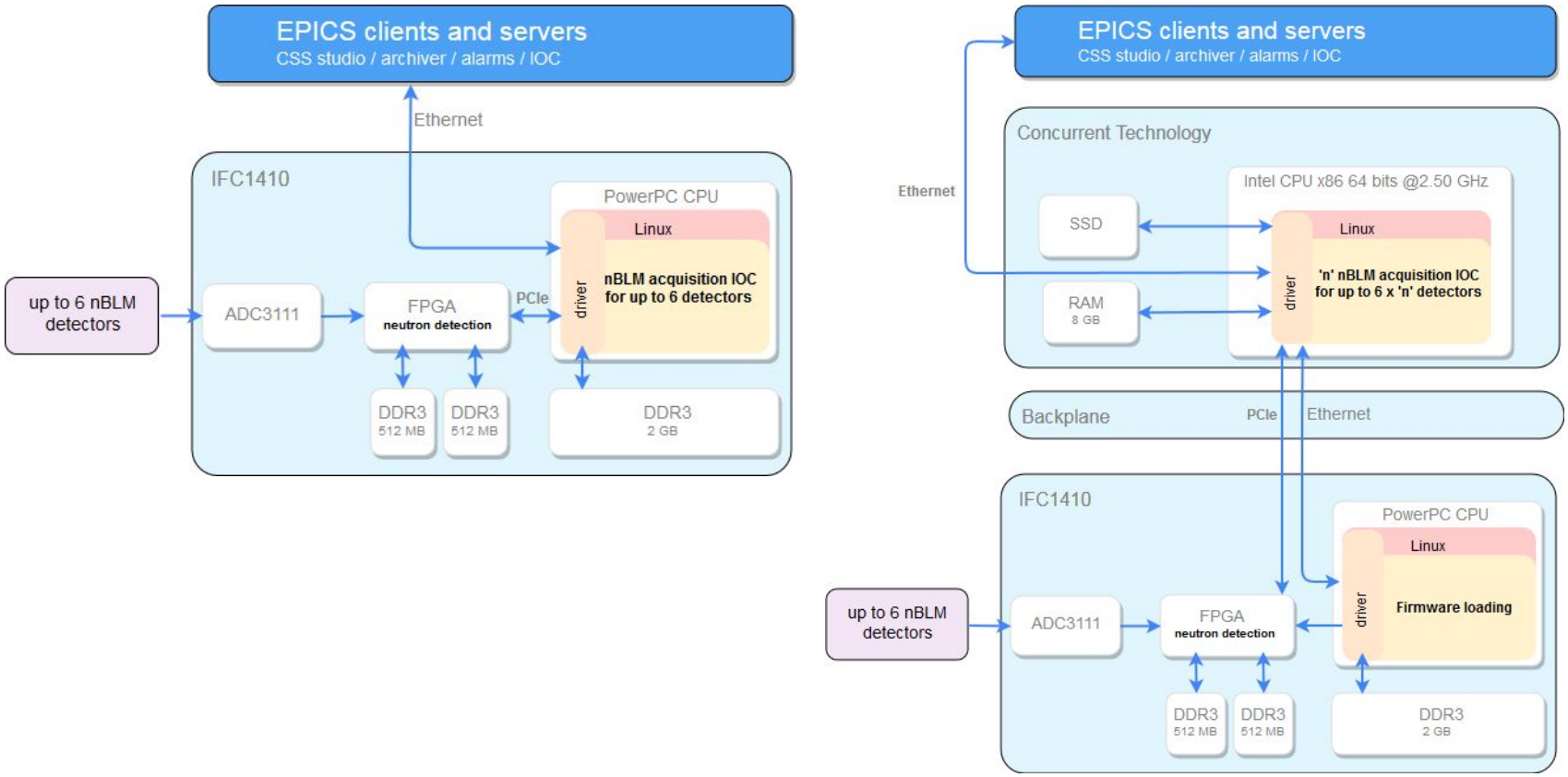
Neutron detection control and monitoring: Observed limitations

- With firmware v0.5 boot problem has disappeared
- Registers readback does not work for multiplexed registers
- Software/firmware stability : run with all circular buffers activated during 2 days
- 1 DMA transfer at once
- Software overcharge: many software DoD (with PVs instead files)
  Periodic data at 100 Hz => linear counter in archiver



counter (100 Hz) when periodic data are pushed

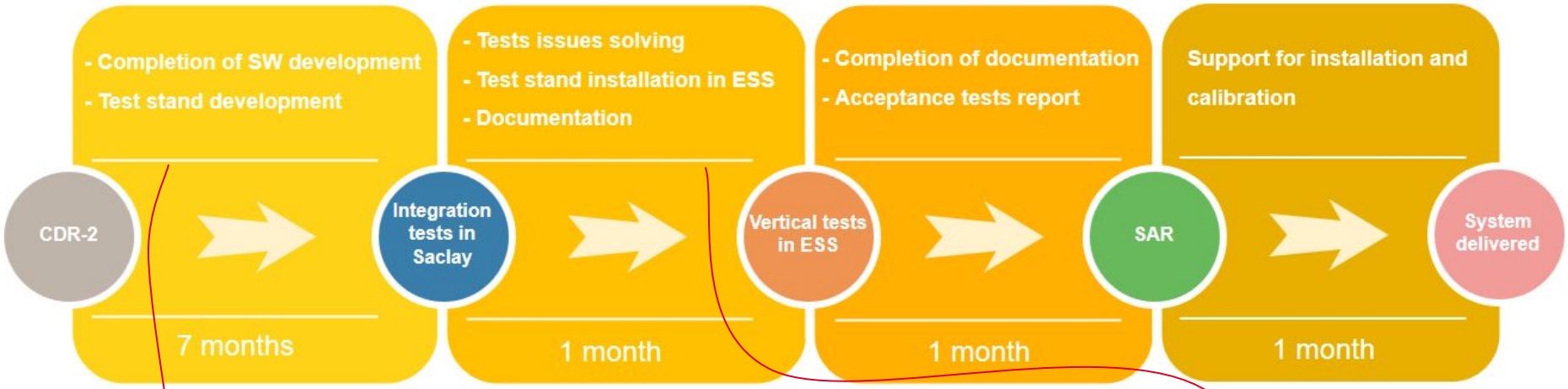
NEW CS STRATEGY



Questions/Tests will done by ICS:

- Is one CT CPU is enough powerful for up to 6 IFC1410 in a crate ?
- How many working DMA channel we have ? could we have one IOC per IFC1410 ?
- Performances: All IOs runs on CT (EVR, intermediate HV/LV, gas, neutron detection IOCs)

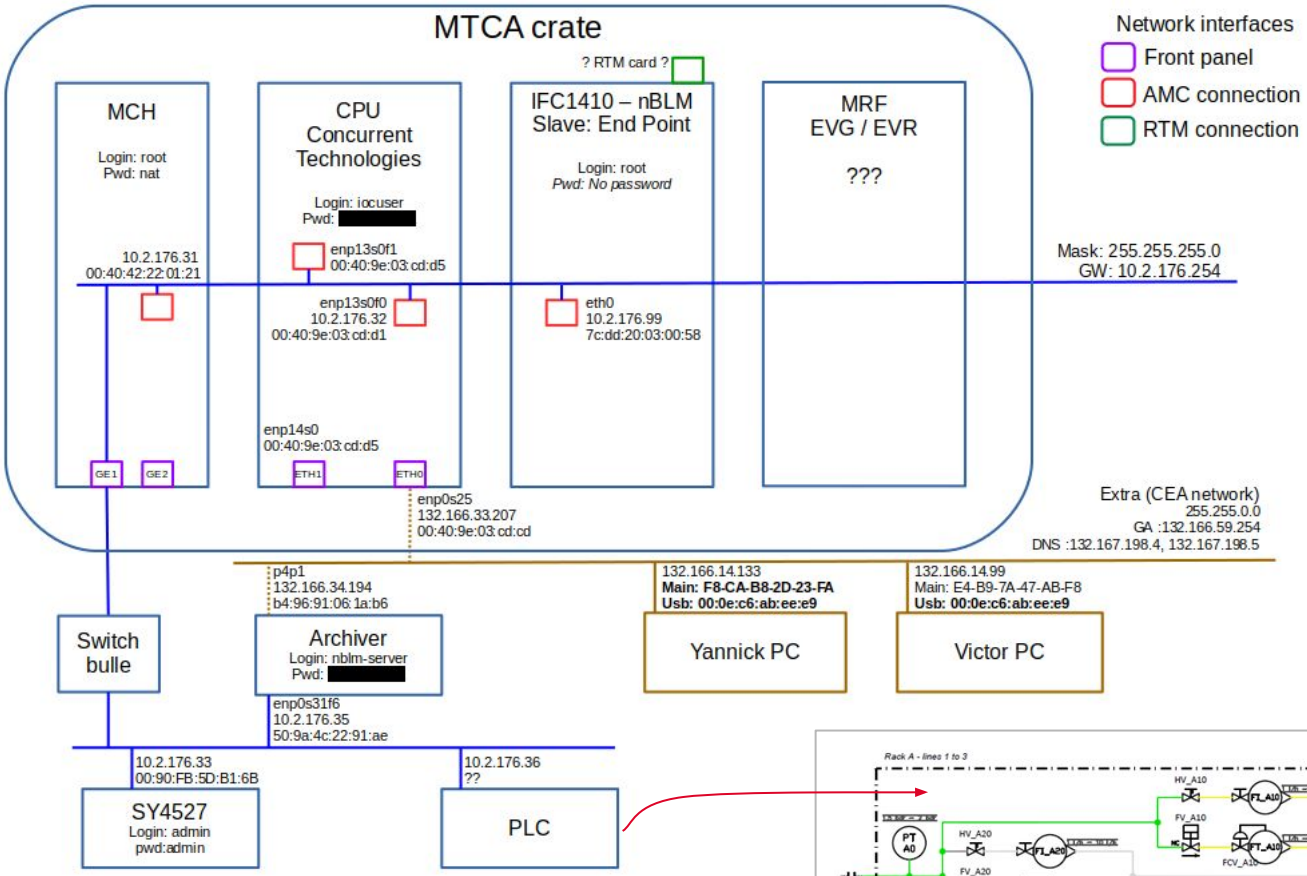
CONTROL SYSTEM PLANNING

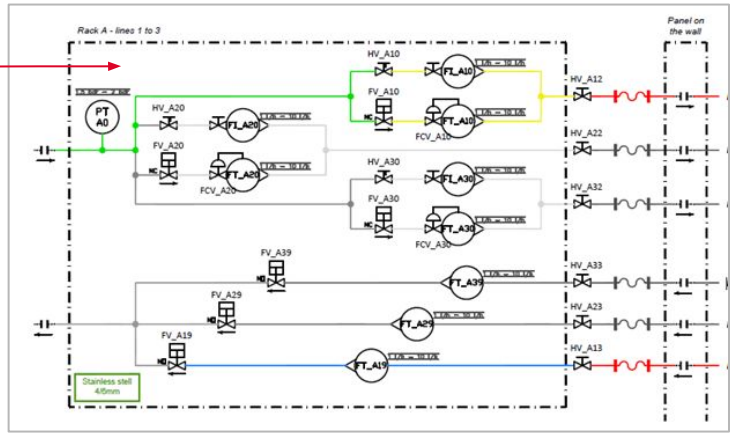


- **Move to new strategy (IOC on CT)**
- Completion of acquisition development : conversion, file transfer, firmware update adaptation
- MRF-EVR development and integration
- Completion of PLC process development
- Software development for PLC gas (communication and database)
- CSS development for a complete system
- Individual test for each subsystem development
- Acceptance tests development
- Saclay test stand preparation : archiver, EEE/alarm server, gas chassis, MTCA

- Migration to E^3 (depends on complexity and ICS support)
- Migration with PLC factory (depends on complexity and ICS support)
- Correction of issues
- Documentation
- ESS test stand preparation and installation

TESTS STAND AT SACLAY

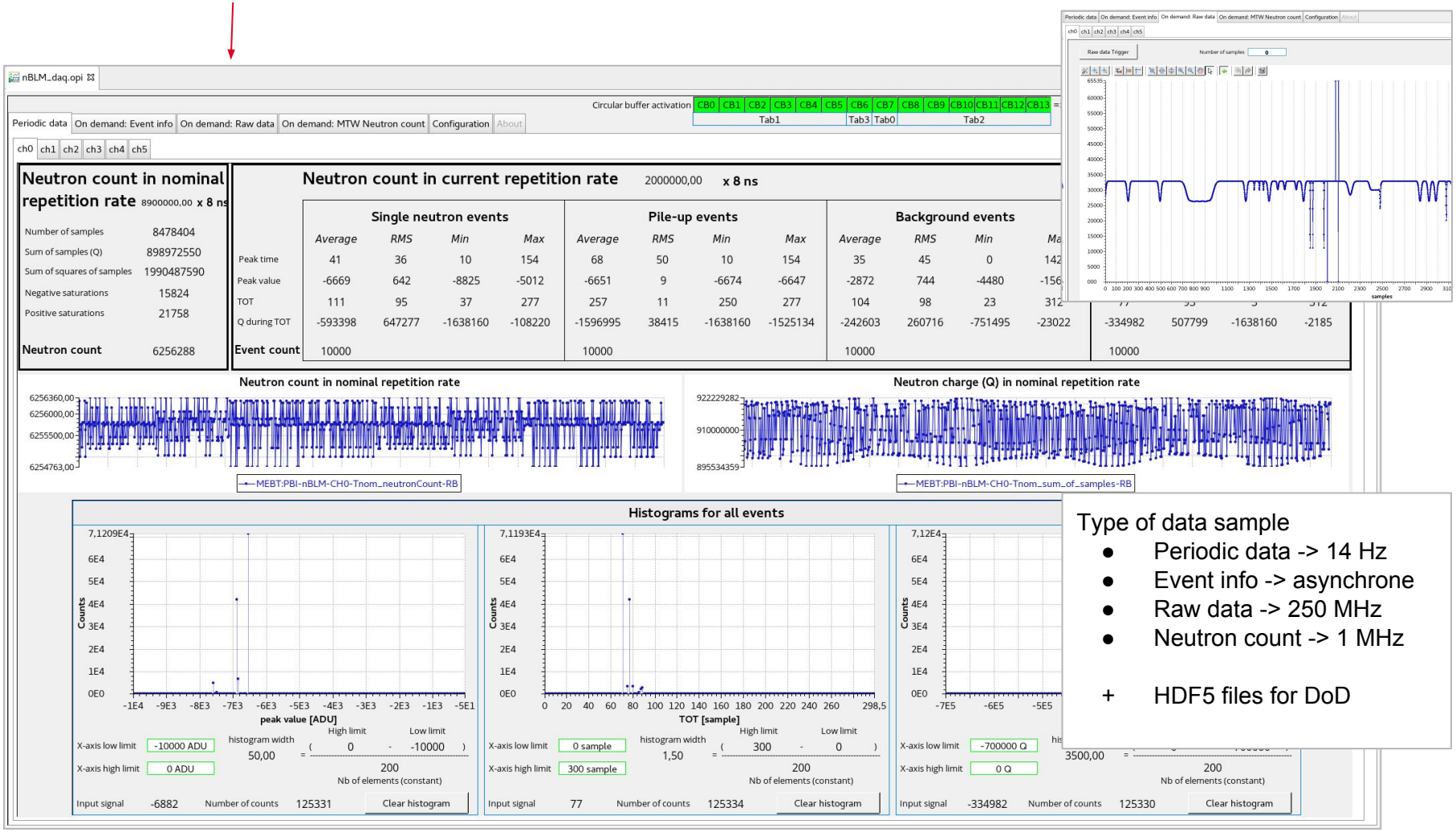




- First step: Tests stand in Saclay
- Second step: Vertical integration tests

CSS VIEWS FOR THE VERTICAL INTEGRATION TESTS

3 mains tabs:
nBLM neutron detection | Devices settings per detector | Line device settings



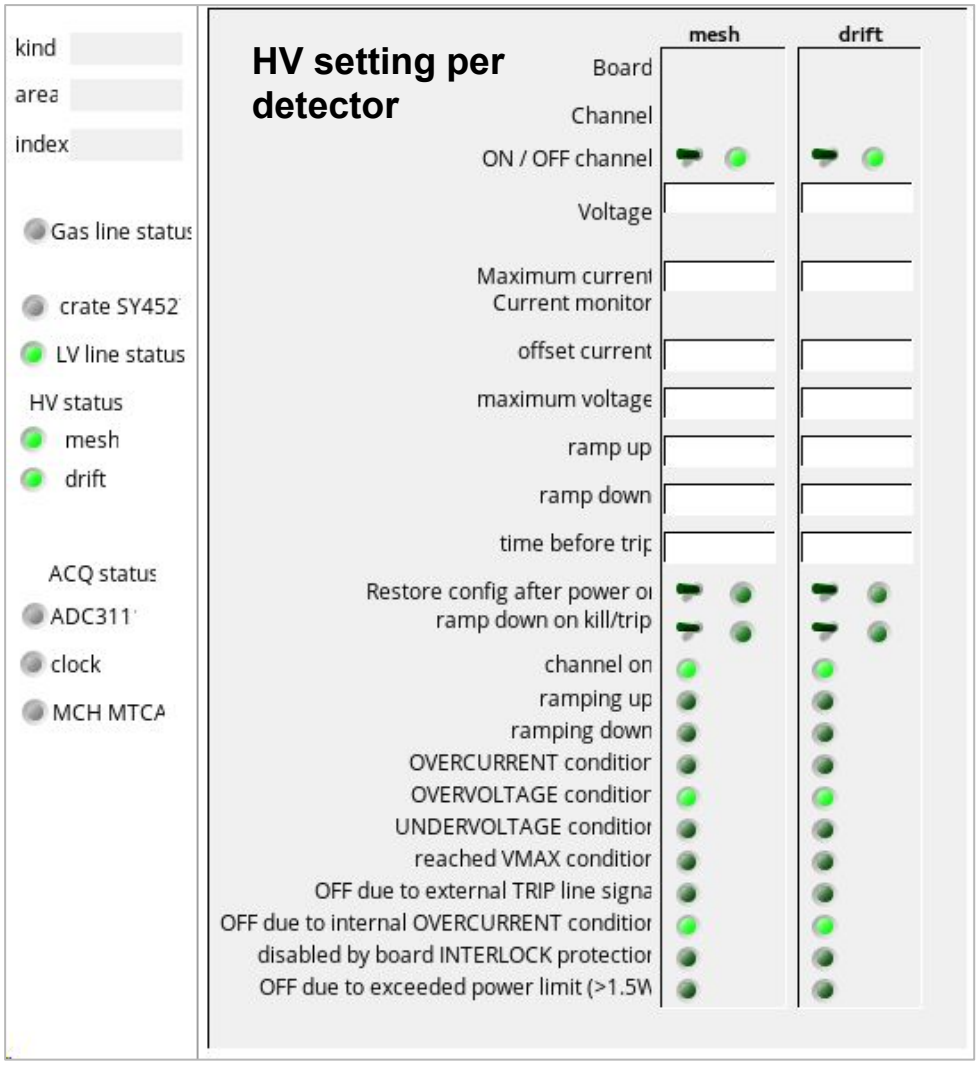
Type of data sample

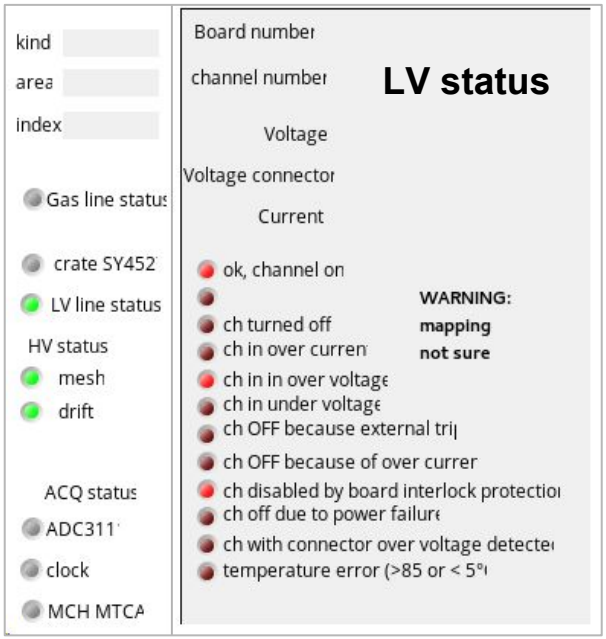
- Periodic data -> 14 Hz
- Event info -> asynchrone
- Raw data -> 250 MHz
- Neutron count -> 1 MHz

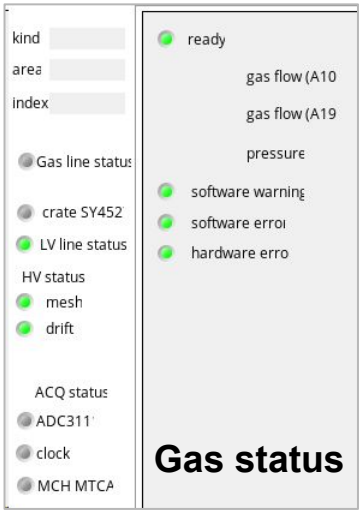
\+ HDF5 files for DoD

CSS VIEWS FOR THE VERTICAL INTEGRATION TESTS

2nd tab: Devices settings per detector



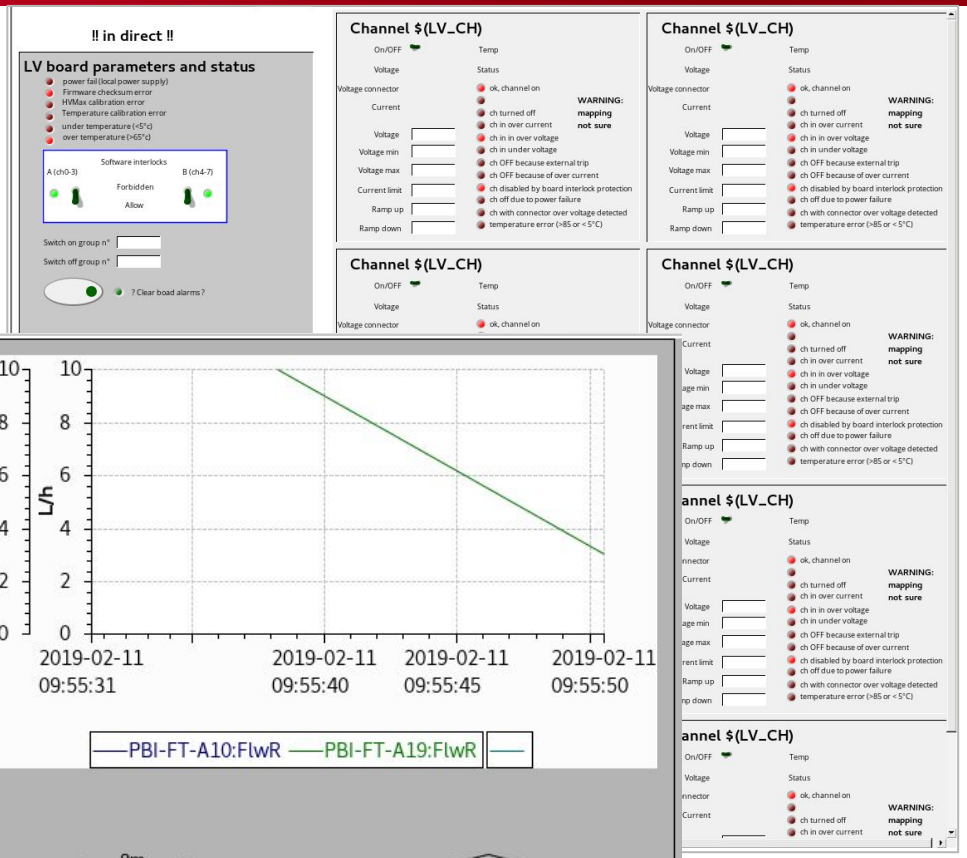




CSS VIEWS FOR THE VERTICAL INTEGRATION TESTS

3rd tab: Line Devices settings

- per gas line
- per LV line (8 channels each)



Thank you for your attention

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