Software
AD Cryogenic Current Comparator

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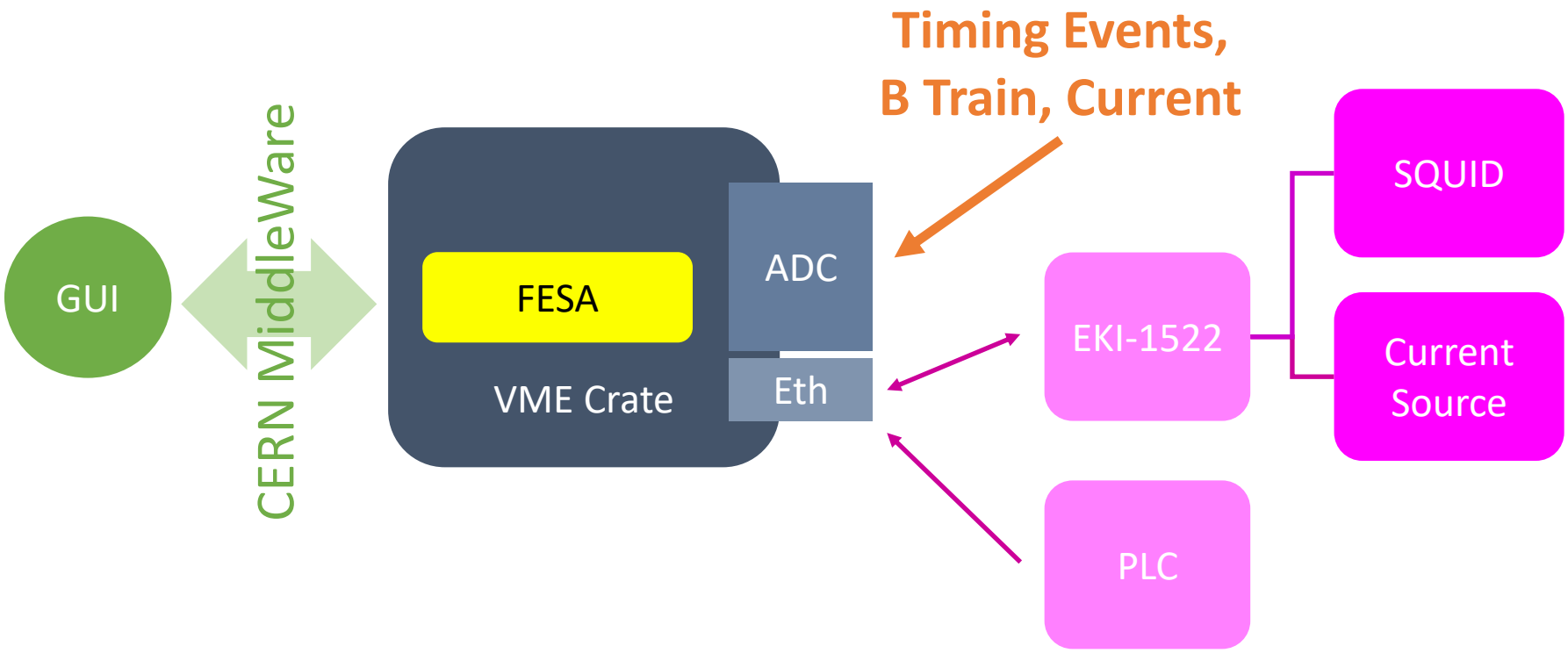
System Overview – HW and SW



- **ADC card on VME crate** : 16ch, 16bits, 200kS/s, +/-10V differential input (SQUID signal, B train and timing events).
- **SQUID** : controlled by the Magnicon connector box.
- **Calibration** : Keithley 6221 current source.
- **Advantek EKI-1522** : communication interface between the [connector box + current source] and the FESA server.
- **PLC modules** : Reading cryogenic parameters, electro-valves, heaters and vacuum pumps.

Software Architecture - FESA

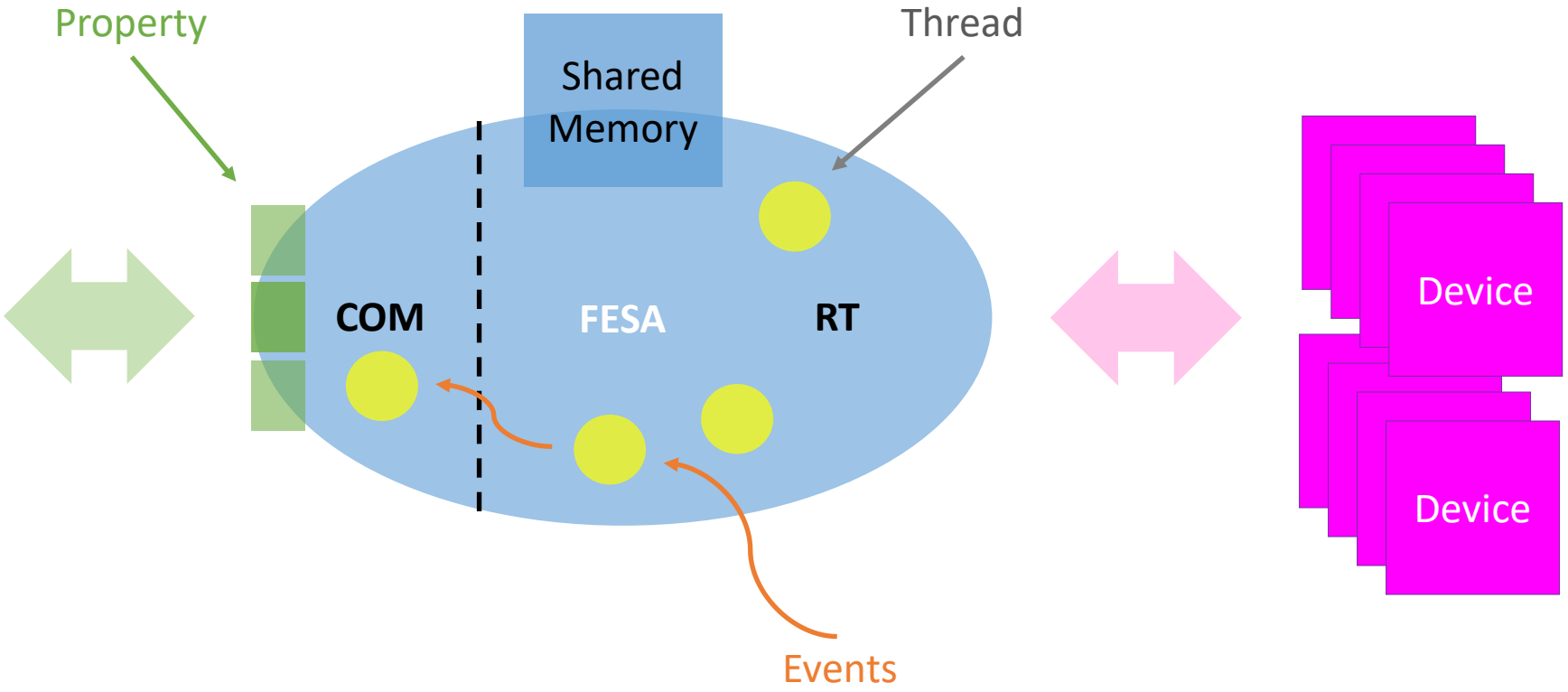
FESA : Front-End Software Architecture

C++ server compatible with Linux PC and VME Crate CPU (L867).

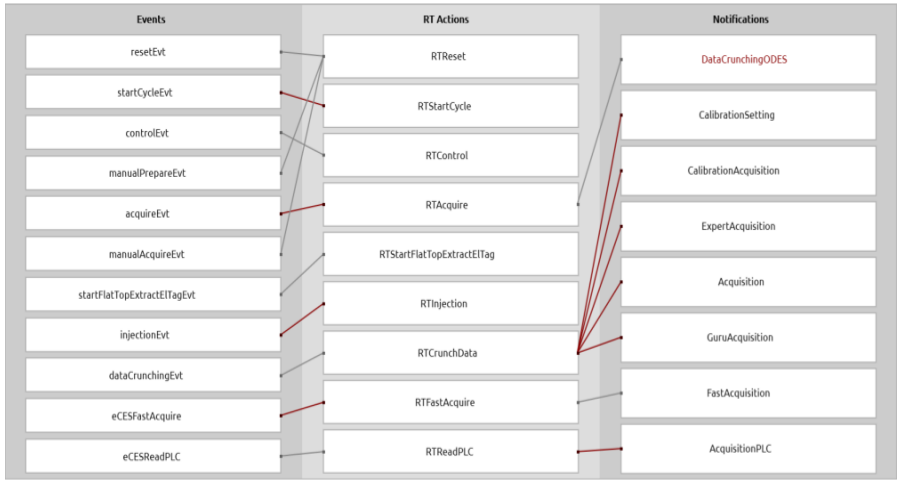
Realtime processes organized under a multi-threading mechanism.

Single thread communication process giving access to several properties.

Developed by BE-CSS group.



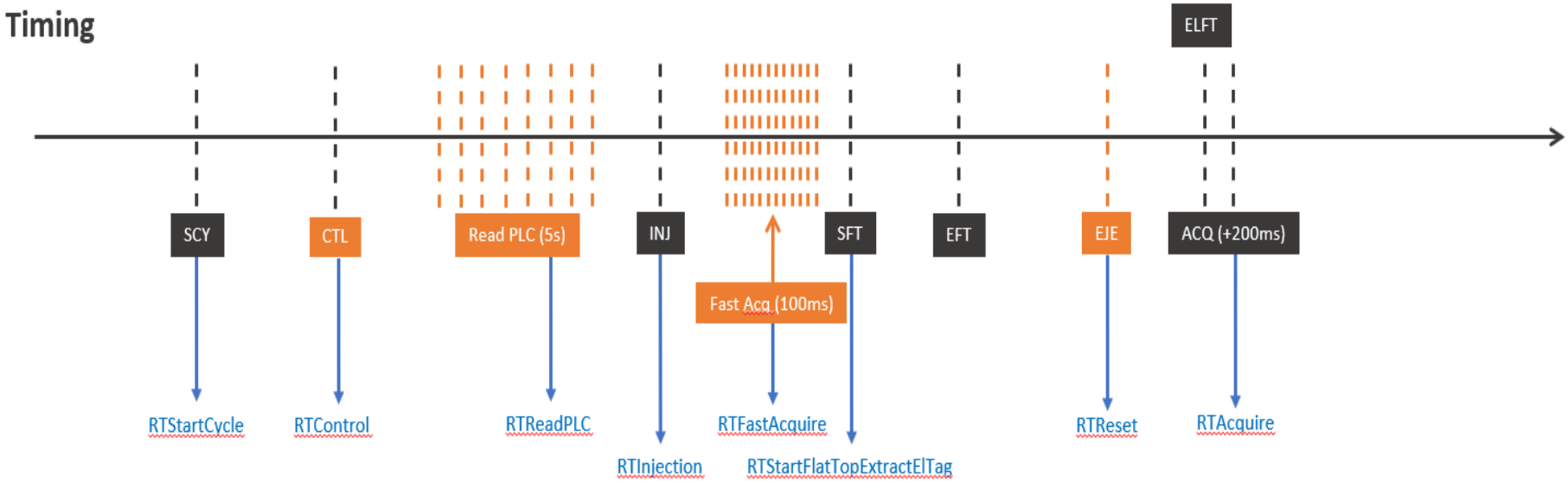
Real-time Processes



startCycleEvt	timing	DX.SCY-CT
controlEvt	timing	DX.CTL-BCTDC
acquireEvt	timing	DX.ACQ-BCTDC
resetEvt	timing	DX.EJE-BCTDC
injectionEvt	timing	DX.INJ-BCTDC
startFlatTopExtractElTagEvt	timing	DAX.SFT-CT
dataCrunchingEvt	on-demand	DataCrunchingODES
manualPrepareEvt	on-demand	ManualPrepareODES
manualAcquireEvt	on-demand	ManualAcquireODES
eCESFastAcquire	custom	defaultEvent
eCESReadPLC	custom	defaultEvent

- **RTControl**
  - Set ADC sampling rate
  - Restart/Arm ADC
  - Setup CAL sequence
  - Test SQUID
- **RTInjection**
  - Reset Integrator on SQUID
  - Calibration OFF
- **RTFastAcquire**
  - Read ADC and notify
- **RTAcquire**
  - Stop and read ADC
  - Read SQUID param
  - Set bias for calibrator
  - Reset SQUID integrator
  - Start data crunch
- **RTCrunchData**
  - Get INJ markers
  - Calculate calib. offset and factors
  - Calculate intensities and current

Timing Events



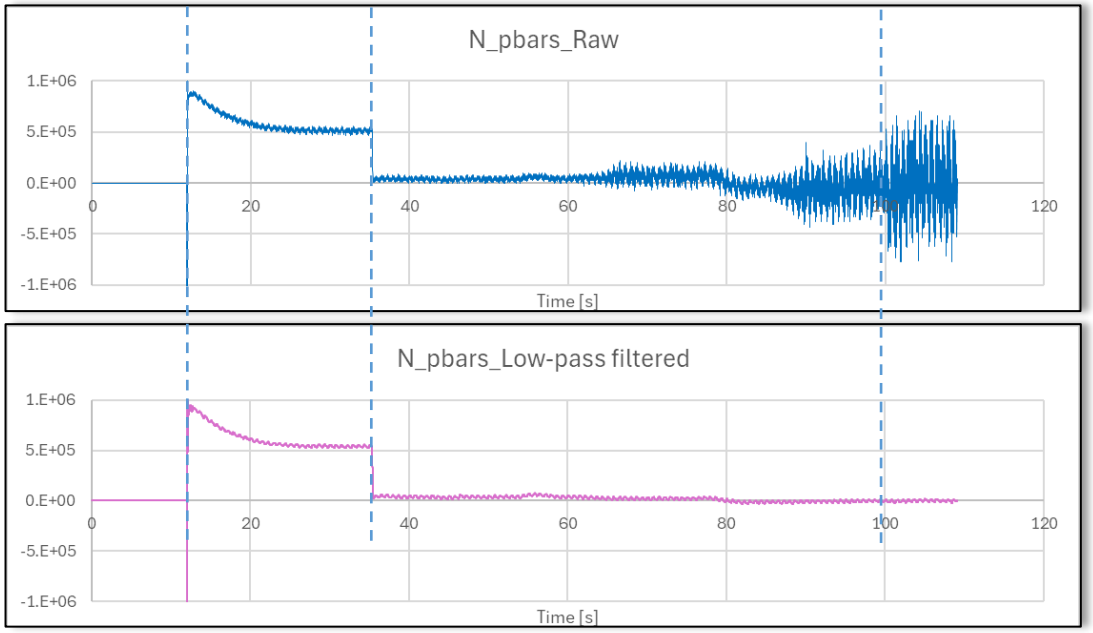
- Prepare and configure the instrument then calibration
- Fast acquisition (10Hz)
- Normalized, convert and publish data (250Hz ~108s) at the end of the cycle.
- PLC reading (1Hz continuously)

Data Filtering

- Butterworth algorithm (low-pass filter, order 3) from FESA (on-demand).
- FIR (Finite Input Response, low-pass filter) from the GUI.
- **Used only by the hardware expert.**
- Artefacts (increasing intensity) to be reduced by the new B Direct signal.
- Acoustic noise can be reduced with simple FIR.

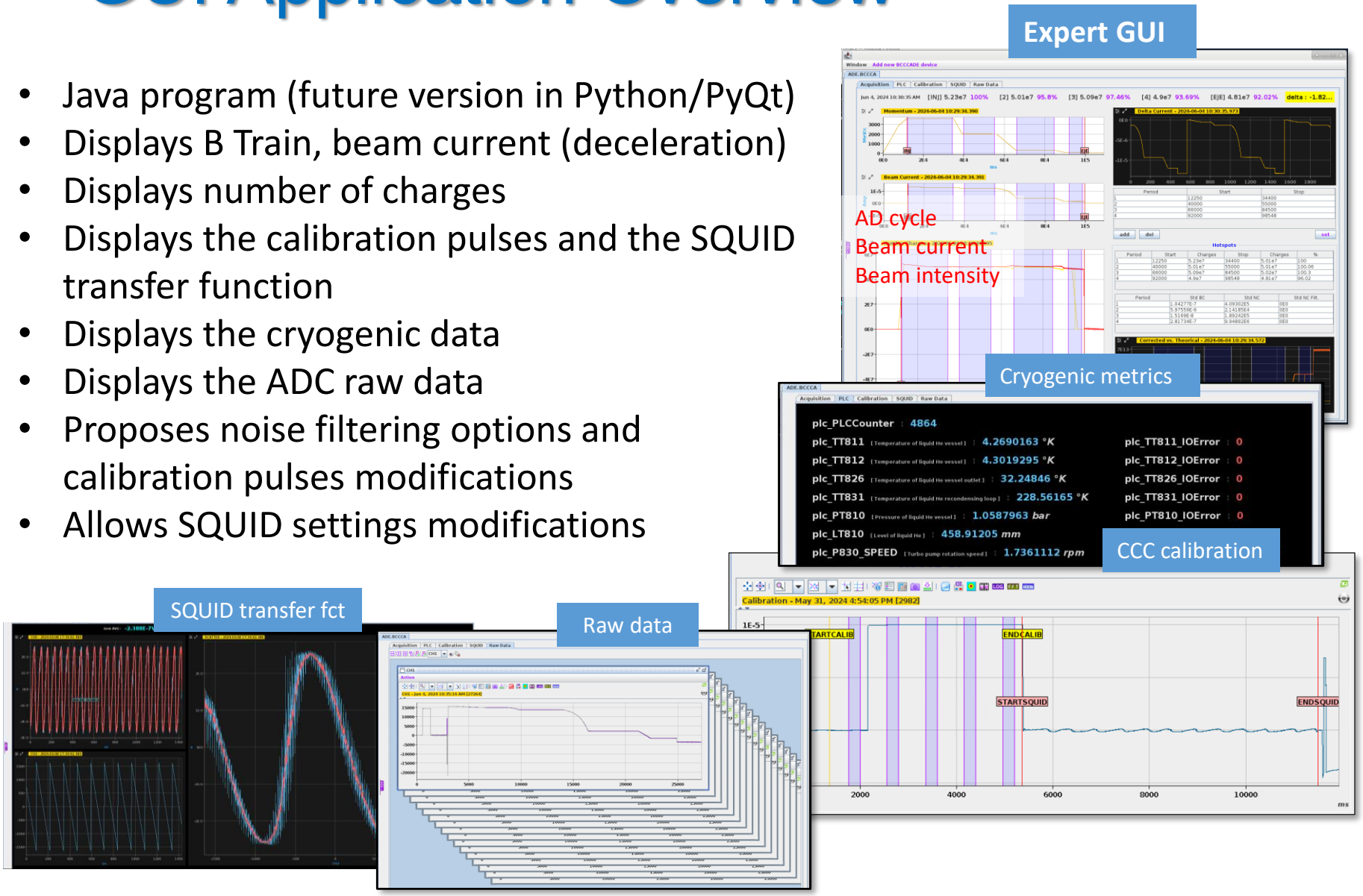
Normalized Raw data

Normalized & Filtered data



GUI Application Overview

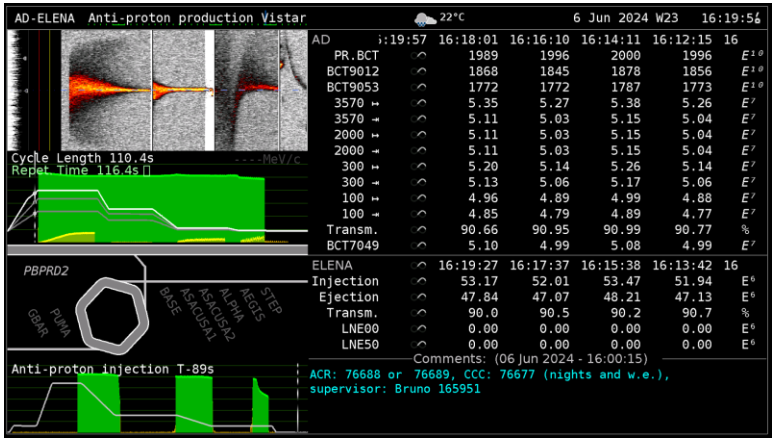
- Java program (future version in Python/PyQt)
- Displays B Train, beam current (deceleration)
- Displays number of charges
- Displays the calibration pulses and the SQUID transfer function
- Displays the cryogenic data
- Displays the ADC raw data
- Proposes noise filtering options and calibration pulses modifications
- Allows SQUID settings modifications



Conclusion

- Simple and reliable FESA server.
- Expert GUI available for diagnostic and data filtering.
- Complex and robust hardware :
  - Many thanks to SY-BI-XEI, Mark, Gunn and Miguel.
  - **Special thanks to Jocelyn for his support, responsiveness and precision.**

Key instrument for the ADE operators.



- FESA/GUI for a new BCCC instrument means :
  - New mapping of new timing events.
  - Minor modifications to be done.

Thank you for your attention