

INTENSE MidTerm Review

Development of a data acquisition platform based on CAEN digital electronics

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About me

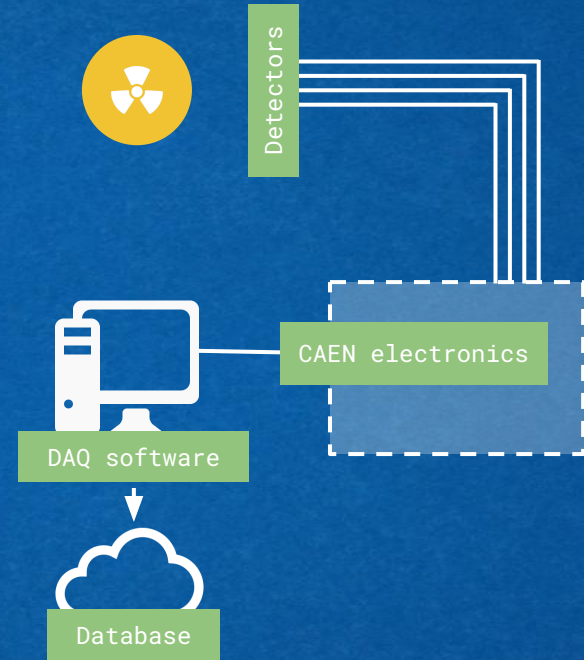
- Born in Santa Fe, **Argentina**.
- Bachelor degree in Physics (2018) and Master degree in Condensed Matter (2019) at the **Balseiro Institute** (Bariloche, Argentina).



- Started my ESR position in CAEN SpA in September 2022.
- Currently living in Lucca, Italy.

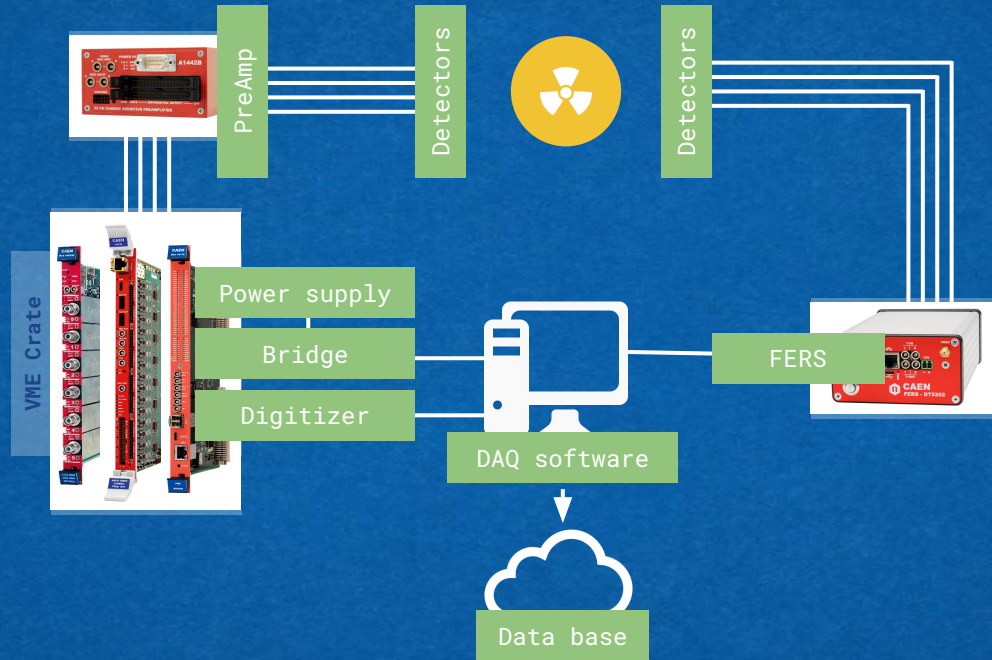
Data acquisition platform

- From the detectors to data storage.
- **CAEN electronics**
 - Signal conditioning.
 - Power supply.
 - Digitizer.
 - Communication.
- **DAQ software**
 - Integrated, versatile, high performance and easy-to-use.
 - Device configuration and control.
 - Data readout and storage (eventually in a cloud database).



< Digitizer-based ASIC-based >

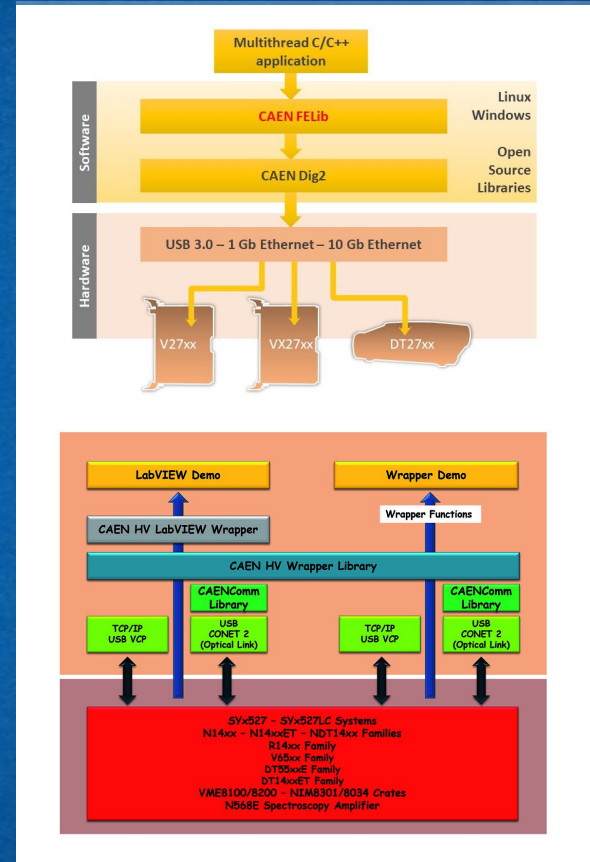
- *Signal conditioning*
CAEN A1442
16/32 Channel charge sensitive preamplifier.
- *Power supply*
CAEN V6519
6 Channel 500 V/3 mA VME
- *Communication*
CAEN V4718
VME to USB 3.0/Ethernet/Optical Link Bridge
- *Digitizer*
CAEN V2740
64 Channel 16 bit 125 MS/s.



- **CAEN FERS 5202: Front-End Readout System**
 - Citiroc 1A 32-channel front-end ASIC (x2).
 - Onboard power supply: CAEN A7585D +85 V/10 mA.
 - Several communication interfaces: USB, Ethernet and TDlink.

DAQ software

- Requirements
 - Integrated, versatile, high performance and easy-to-use.
 - Device configuration and control.
 - Data readout and storage (eventually in a cloud database).
- Current CAEN GUI softwares
 - Geco, Compass, WaveDump, Janus.
 - Communication (device control and data readout) in a simple and complete way with the *different* components of an acquisition system.
- CAEN intermediate level libraries
 - FELib library, HV Wrapper Library, FERSLib.
 - Easy development of application softwares.



New DAQ software

- C++.
- Qt Framework (GUI).
- Using CAEN intermediate level libraries.

The screenshot displays the 'tmp - Reyson' software interface, which is used for configuring and monitoring radiation detection systems. The interface is divided into several panels:

- Devices Manager:** Lists two mock devices: 'dev_0 Mock - PID: 0' and 'dev_1 Mock - PID: 1', both with 'No path'.
- Detectors Manager:** Shows configurations for four detectors: 'det_silif_0 SILf', 'det_silif_1 SILf', 'det_scifi_0 SciFi', and 'det_scifi_1 SciFi', with their respective device and PID settings.
- Configuration Panel (Bottom Left):**
 - dev_0 Mock - PID: 0:** Name: dev_0, Path: (empty), Acquisition mode: Spectroscopy, Count interval: 2000 10^-3 s, Min. spectrum: 0, Max. spectrum: 65535.
 - det_scifi_0 SciFi:** Name: det_scifi_0, Device PID: 1, Device channel A: 0, Device channel B: 1.
- Gamma view:** A line graph showing counts per second (CPS) over time. The y-axis ranges from 463.2 to 517.0 cps. Two data series are shown: 'det_sc...' (green) and 'det_si...' (purple). The legend indicates 'det_sc...' at 487.79 and 'det_si...' at 506.23.
- Neutron view:** A line graph showing counts per second (CPS) over time. The y-axis ranges from 468.3 to 522.1 cps. Two data series are shown: 'det_sc...' (green) and 'det_si...' (purple). The legend indicates 'det_sc...' at 517.89 and 'det_si...' at 482.60.
- Counts and Histogram:** A small 'Counts' plot and a 'Histogram' plot are visible at the bottom of the configuration panel, showing event counts and energy distribution.

New DAQ software

Modular design

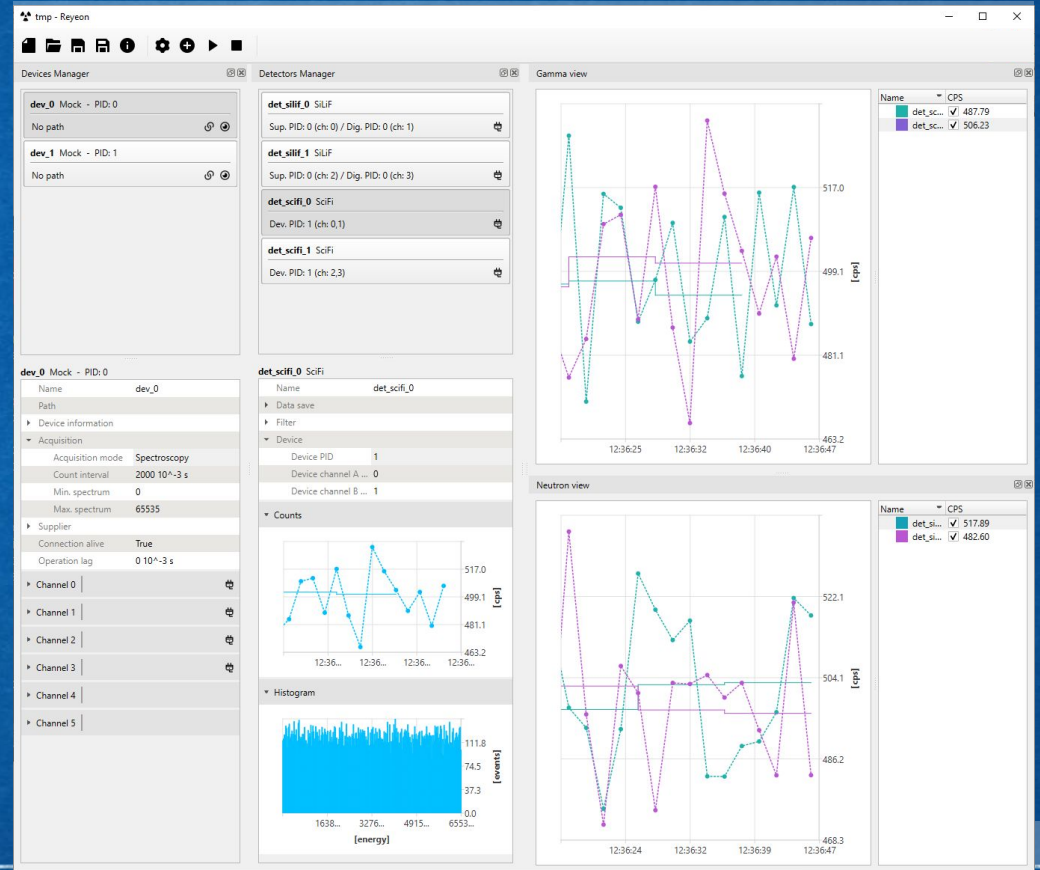
- Detectors and devices of different type can be easily added/removed.

Device management

- All devices can be set up from within the software. No need of additional programs.
- Configurations are saved. Device setup is done only once time and not every time the program is launched.

Detector management

- Simple and clear identification of the detectors and their relations with the devices.
- Straightforward visualization and saving of readed data.



Future work

- Bug fix
 - New DAQ software.
 - Underlying libraries.
- Finish implementations
 - Cloud database communication.
 - Alarms.
- Improve user experience.

