Update of the ISOLDE DAQ

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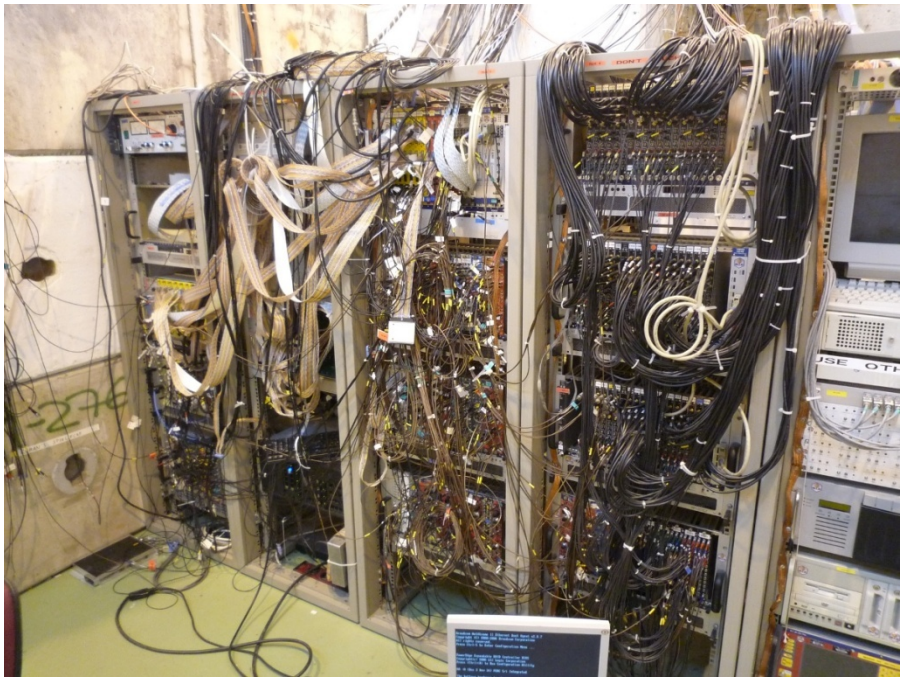
CERN PH-SME

ISOLDE DAQ systems - overview

Different DAQ solutions available for ISOLDE experiments:

- Modular electronics: VME, CAMAC, PCIe, uTCA-based systems
- Other (Digital oscilloscope, MCA…)
- Traditional analogue chain approach
- Digital pulse processing

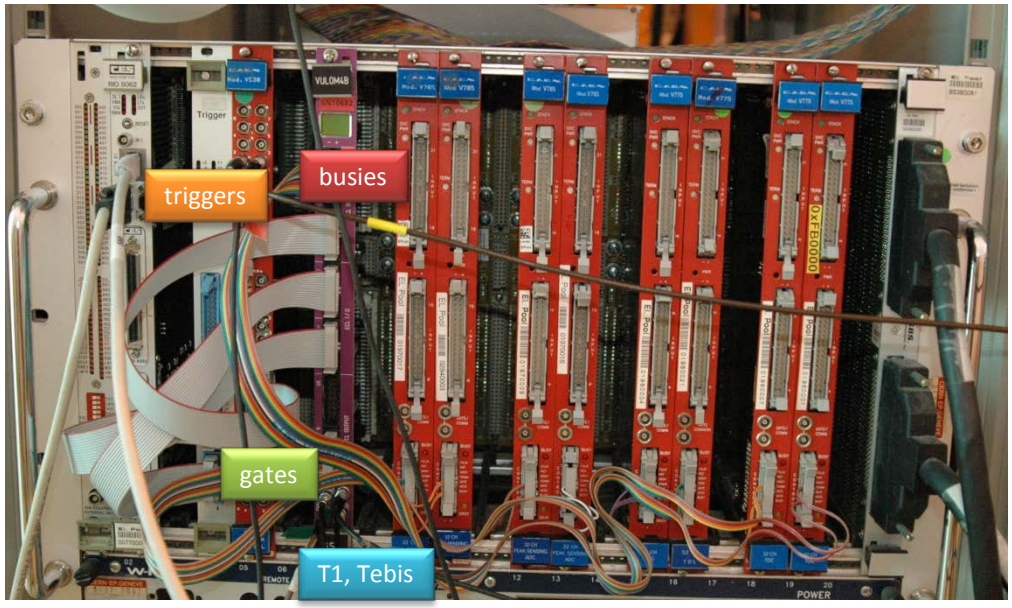


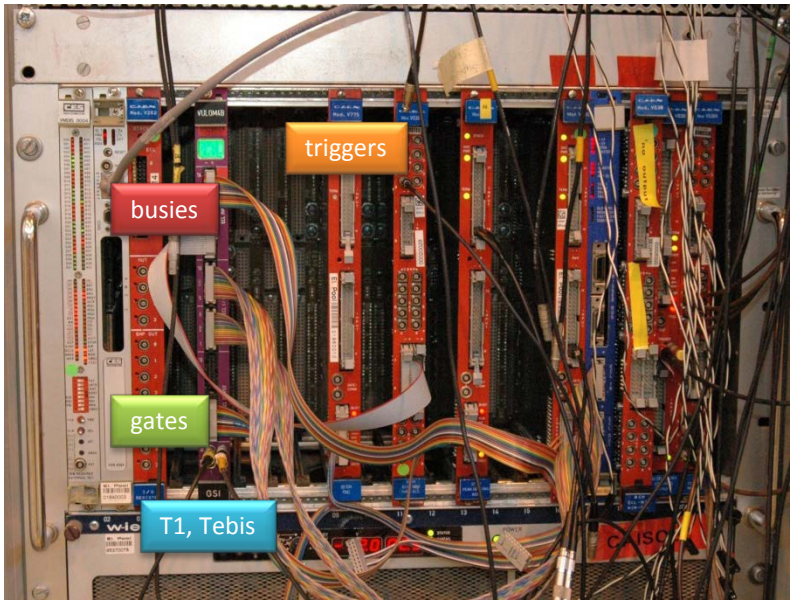
ISOLDE DAQ systems - MBS

Standard ISOLDE VME-based system

- **MBS** DAQ system from GSI (N. Kurz et al.).
- CES RIO2 processor
- CAEN v775 TDCs and v785 peak sensing ADCs
- **TRIVA** trigger synchronization module, **VULOM+TRLO2** firmware for trigger logics.
- Well established within collaboration

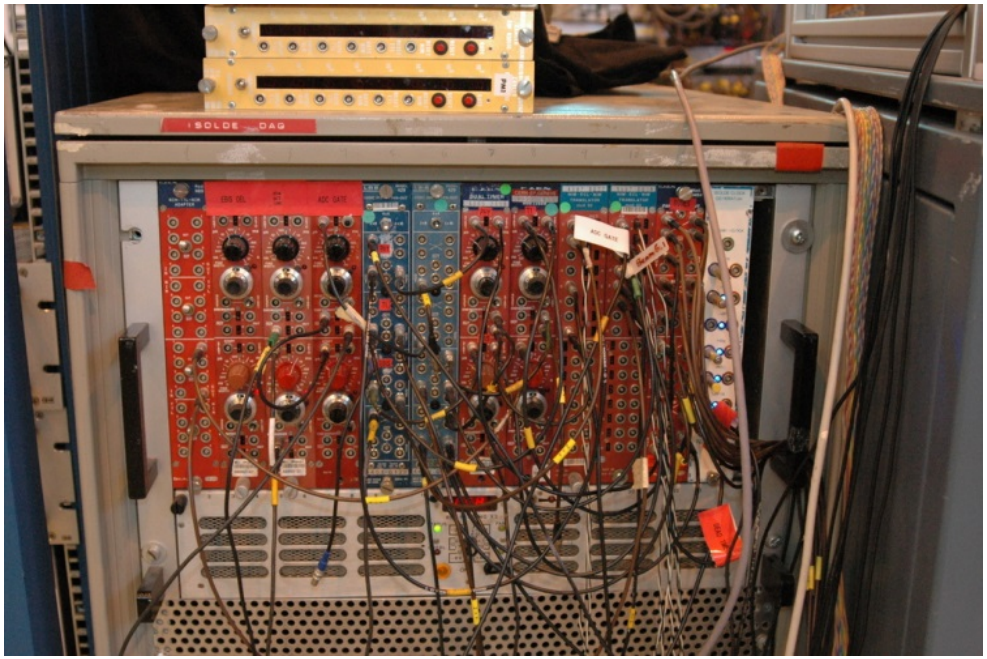
NEW!

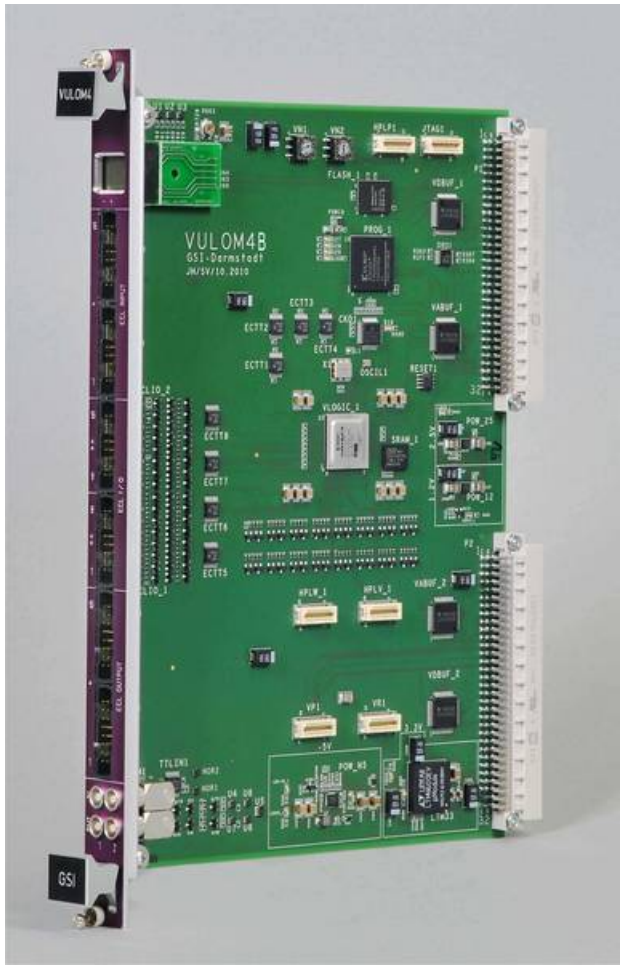




VULOM – VME Universal Logic Module

1NIM crate Trigger logic reduced to single VME board

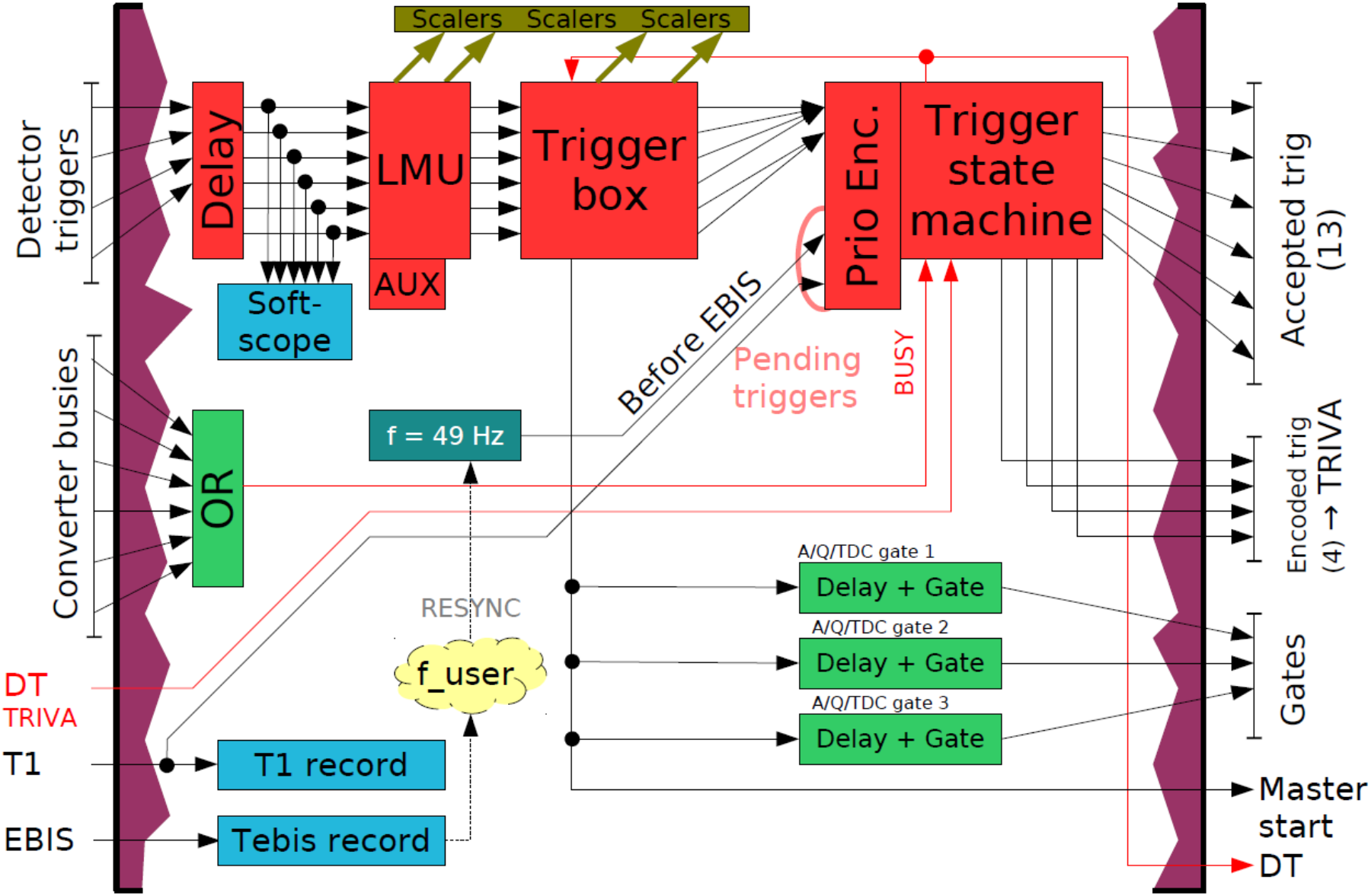




TRLO2 - trigger logic firmware (H. Johansson et al.)
VULOM - VME Universal Logic Module (J. Hoffman et al.)

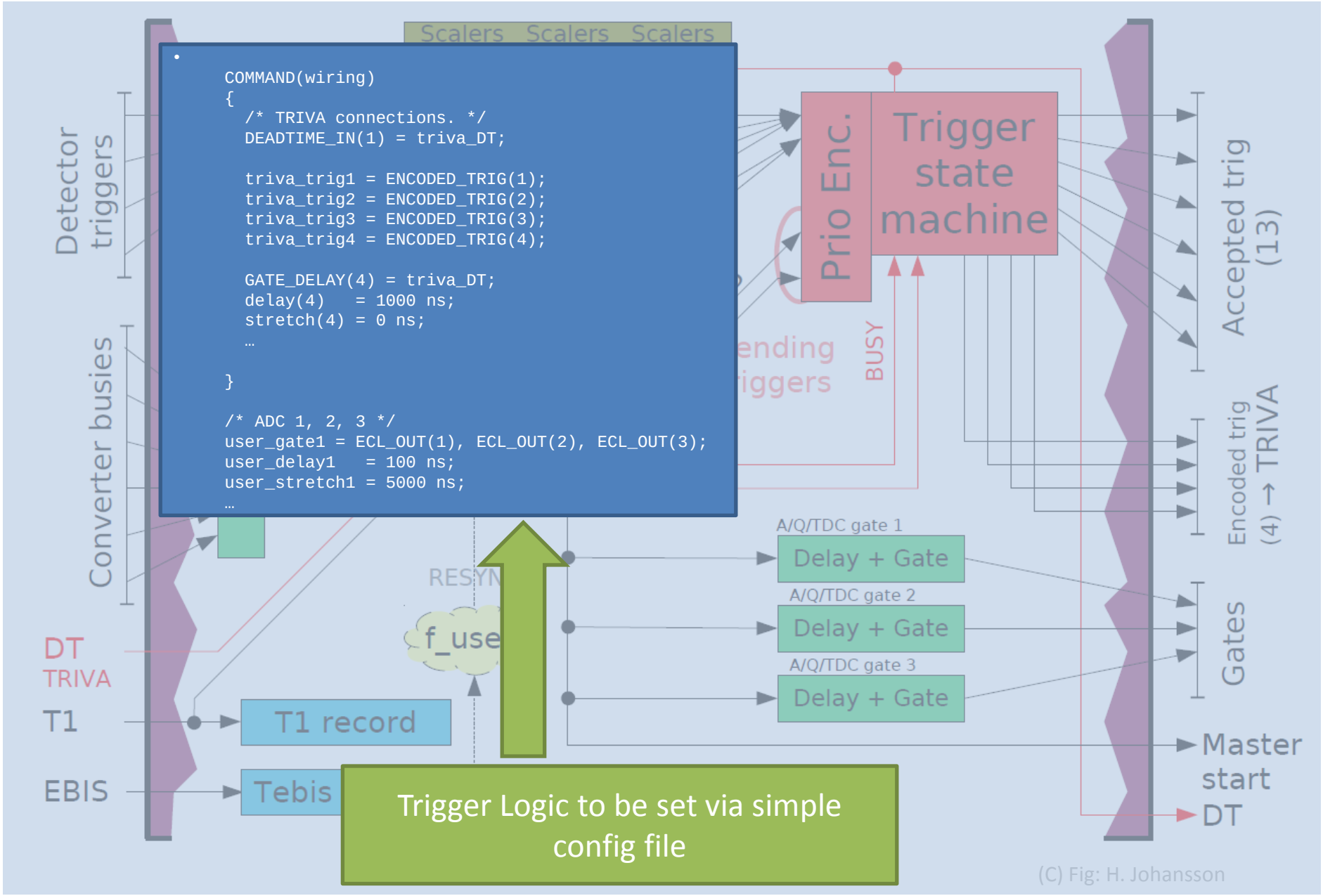
(C) Photo: GSI

VULOM – VME Universal Logic Module

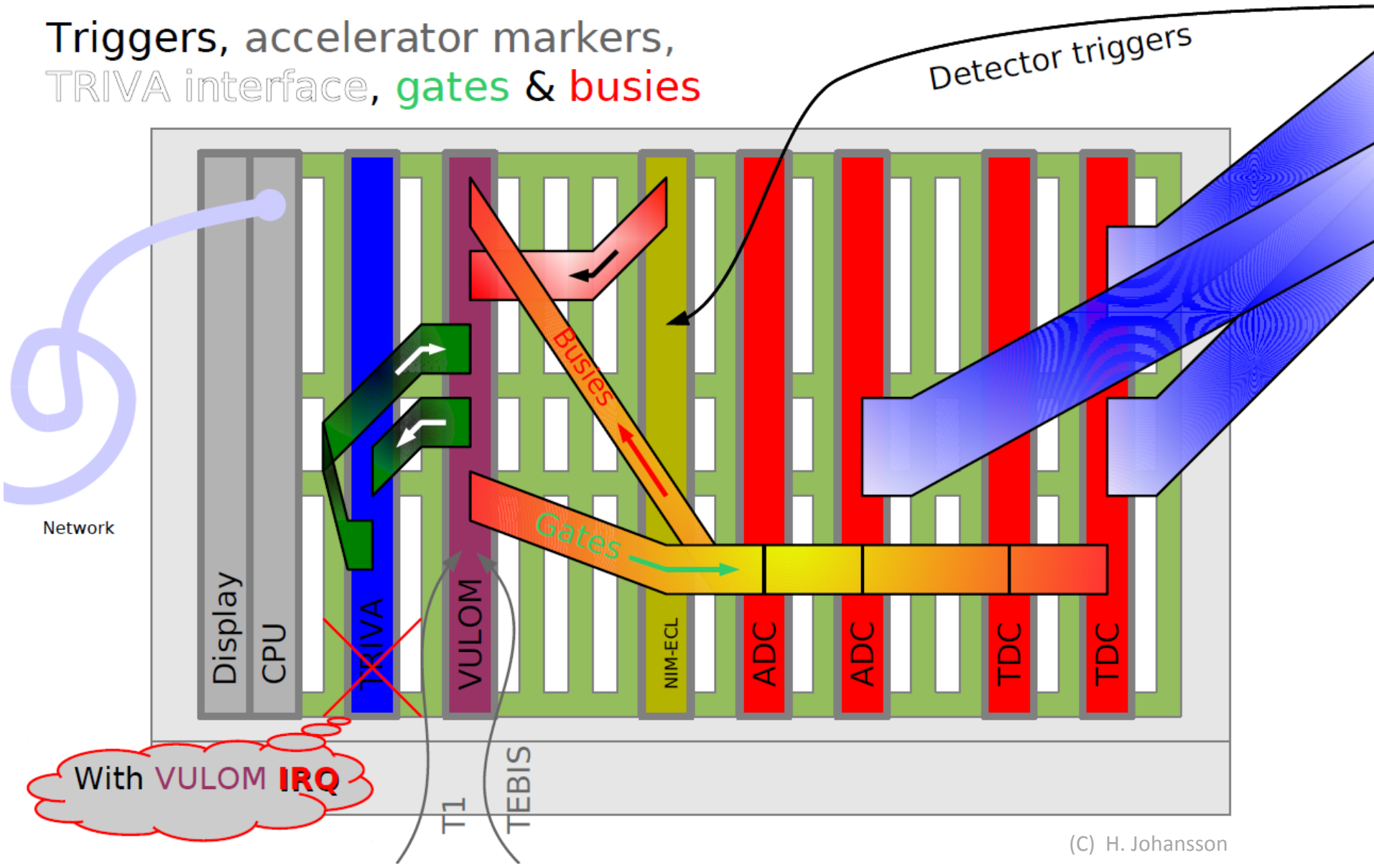


(C) Fig: H. Johansson

VULOM – VME Universal Logic Module



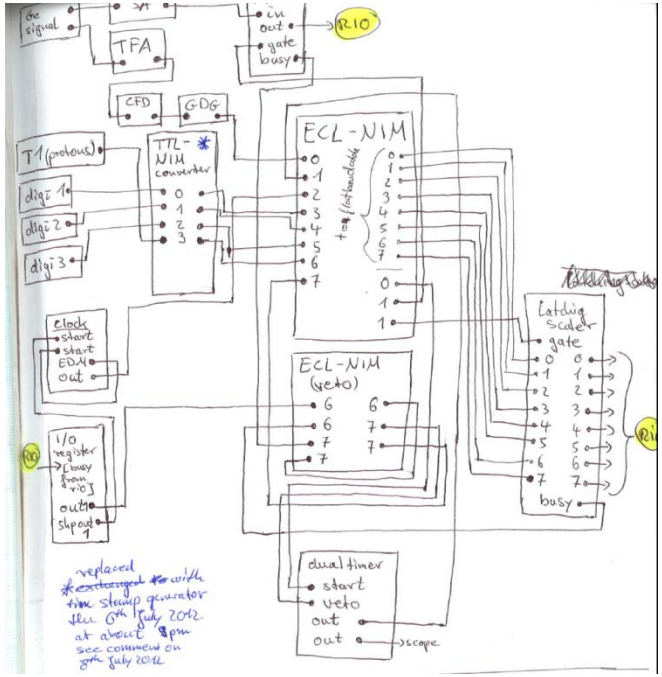
VULOM – VME Universal Logic Module

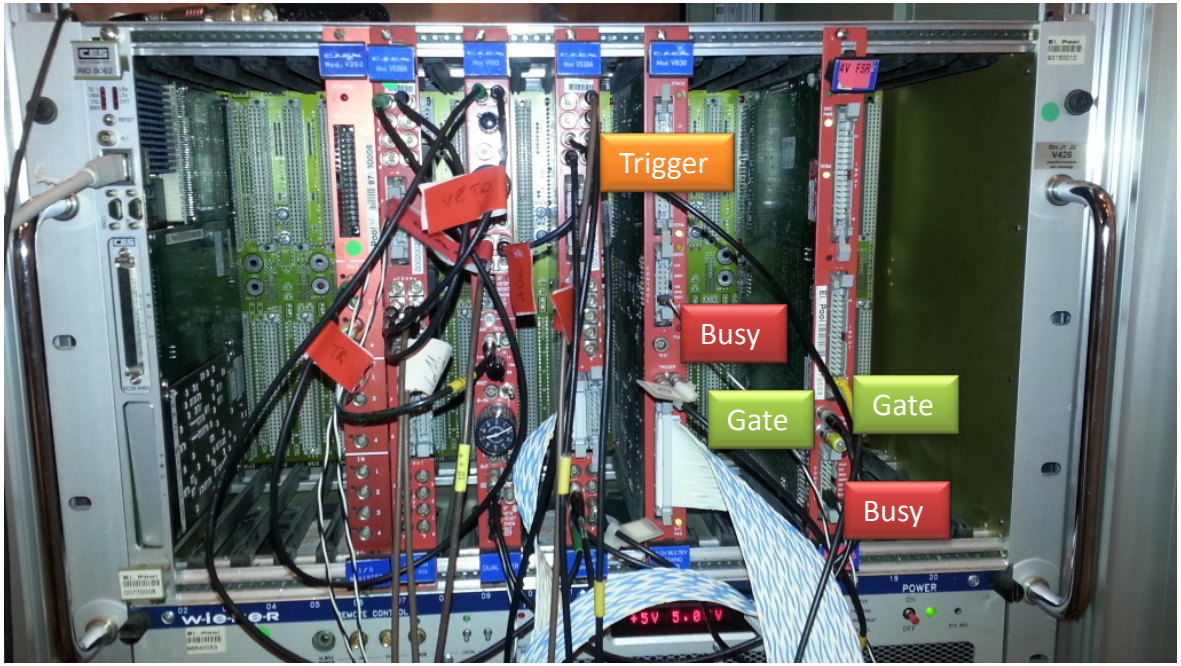


(C) H. Johansson

ISOLDE DAQ systems - minidaq

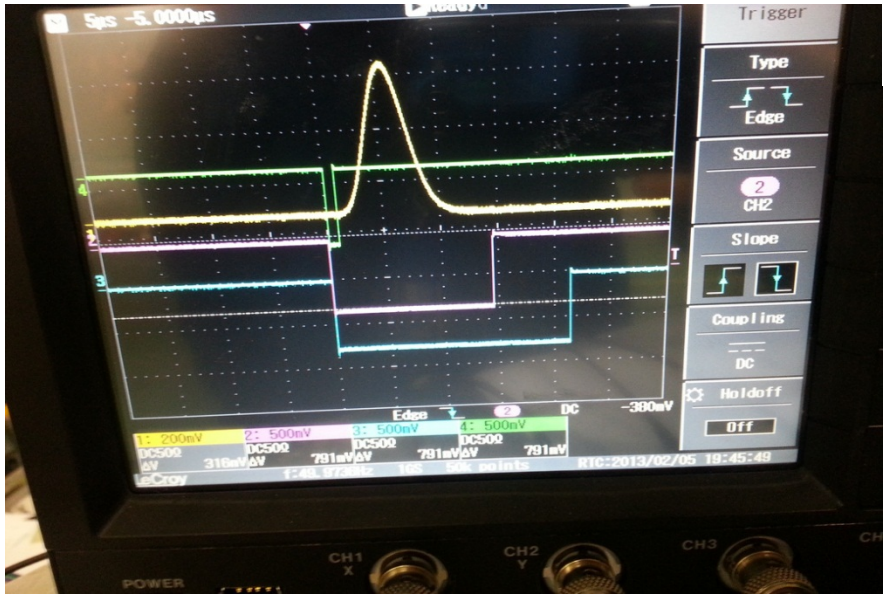
- mini VME DAQ, CES RIO2 processor + ADC + scaler
- no TRIVA/VULOM
- only one trigger (veto by busy or I/O register during read-out)
- produces MBS-like data stream
- ADC and scaler operate in multi-event mode

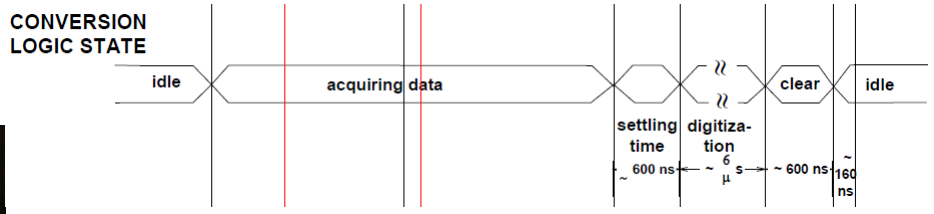




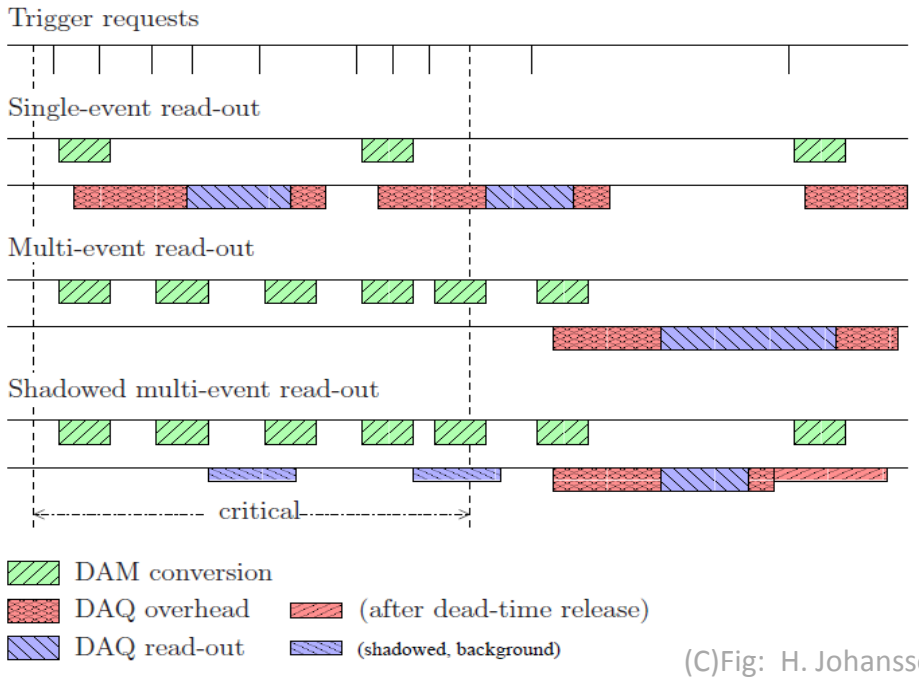
Multi-event read-out for MBS

- Dead-time = conversion+read-out time
- ADC and scaler operate in multi-event mode (otherwise: ~1 event per EBIS pulse)
- Buffer size: 32 events (ADC/TDC), ~1000 (scaler)
- Both MBS and minidaq can be run in multi-event read-out mode
- (VME bus: 1us/word)



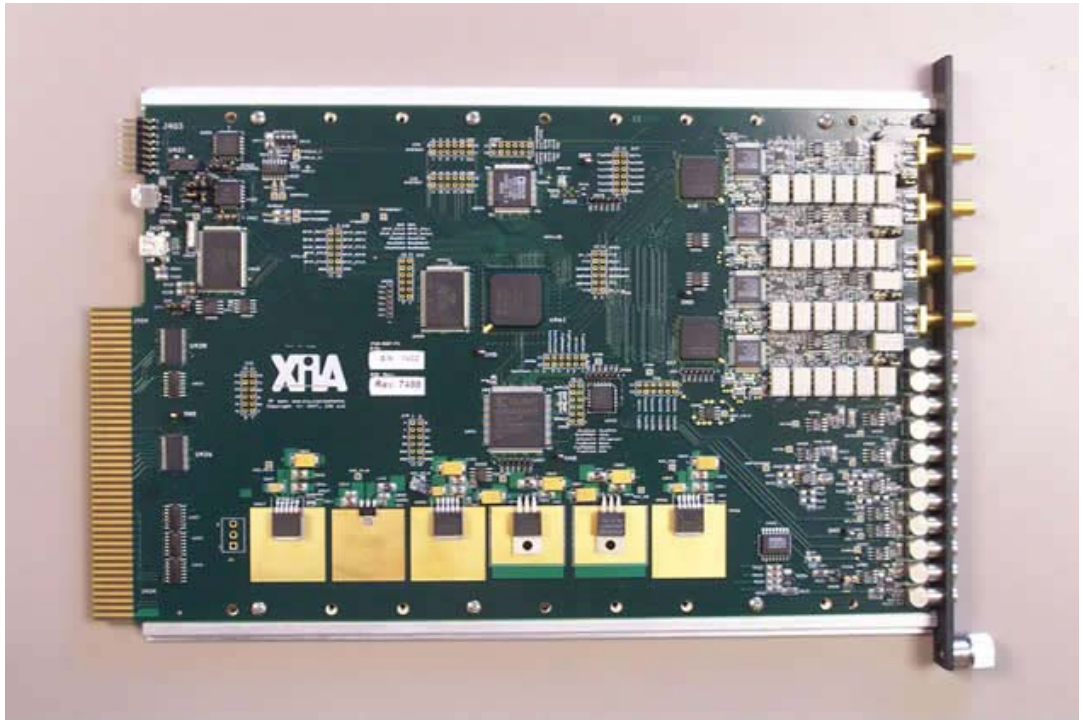


(C) Fig: caen



(C)Fig: H. Johansson

DGF4C – DAQ system (digiDAQ)



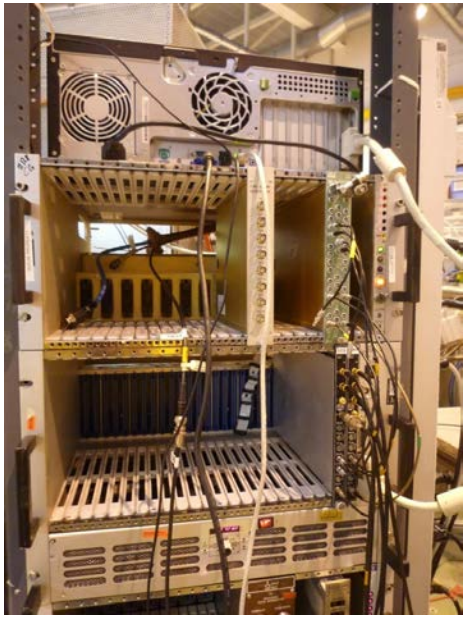
- Digital Gamma Finder (DGF) is a pulse processor with capabilities for measuring both energy and pulse shape
- Common clock distribution
- 40 MHz sampling rate (rev. D, E) → 80 MHz (rev. F). Upgrade presently being done.
- 12-bit (rev. D), 14-bit (rev. E) ADCs
- For >5 kHz significant dead-time in LMD mode (long read-out)

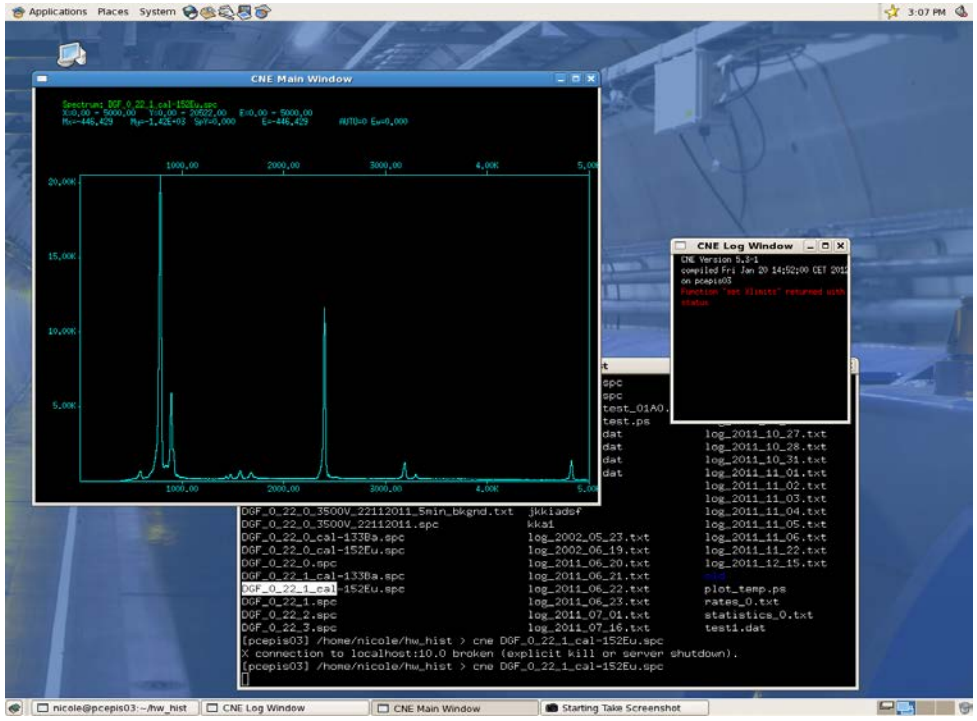
Figs: xia.com

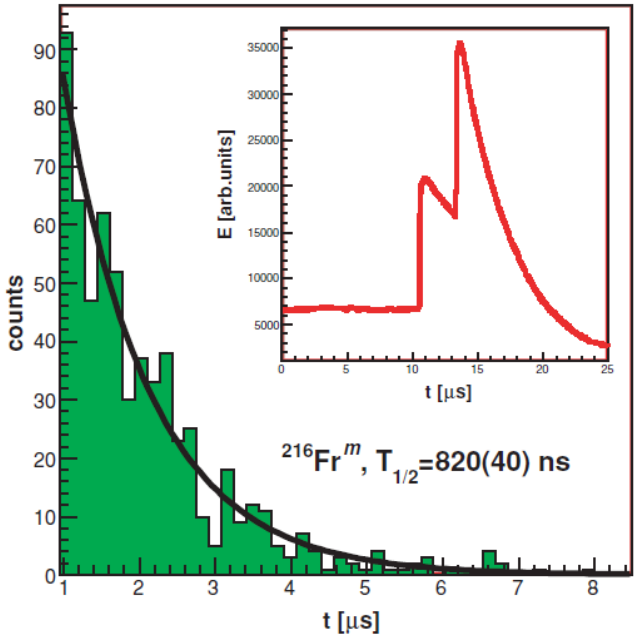
DGF4C - DAQ system (digiDAQ)

XIA DGF4c-based system (CRIS, ISOLTRAP, MB, NICOLE, others)

- DAQ based on MB collector code (N. Warr, G. Simpson), can also write MBS buffers (testing phase…)
- Online monitoring using cne/ROOT software,
- Offline analysis based on ROOT is also available (T. Cocolios, K. Lynch, G. Simpson)

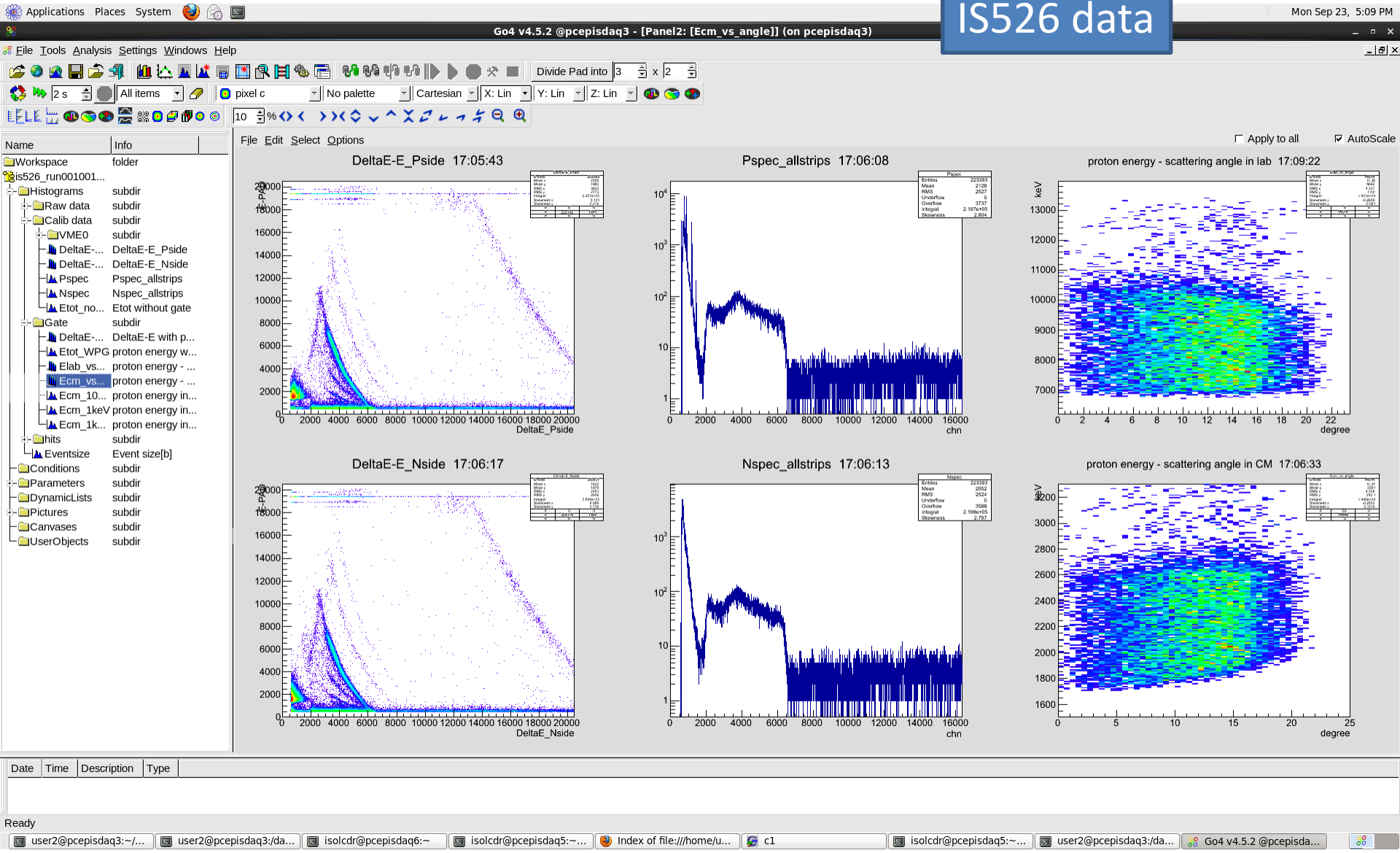




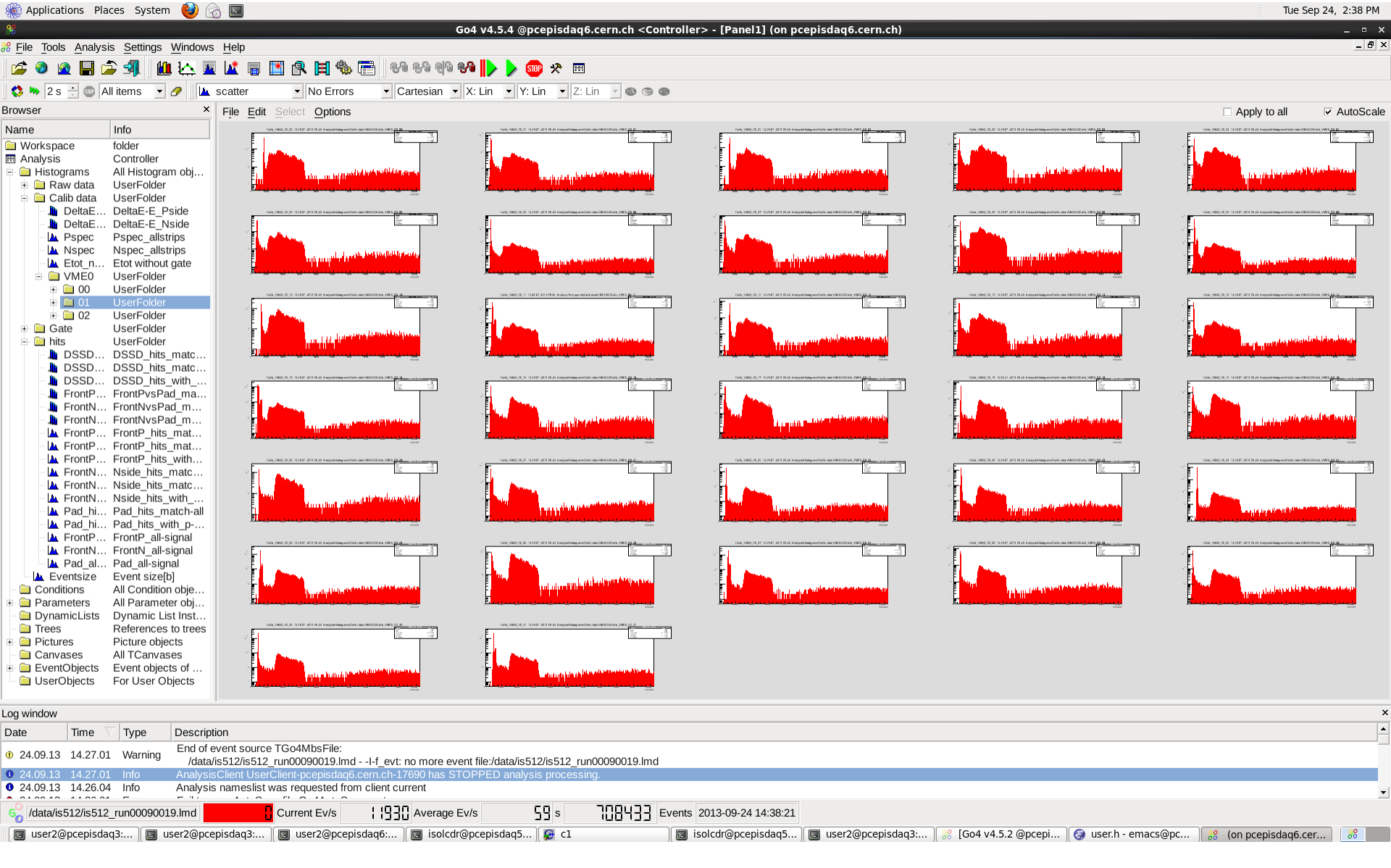


MBS – online GUI GO4 (IS526)

IS526 data

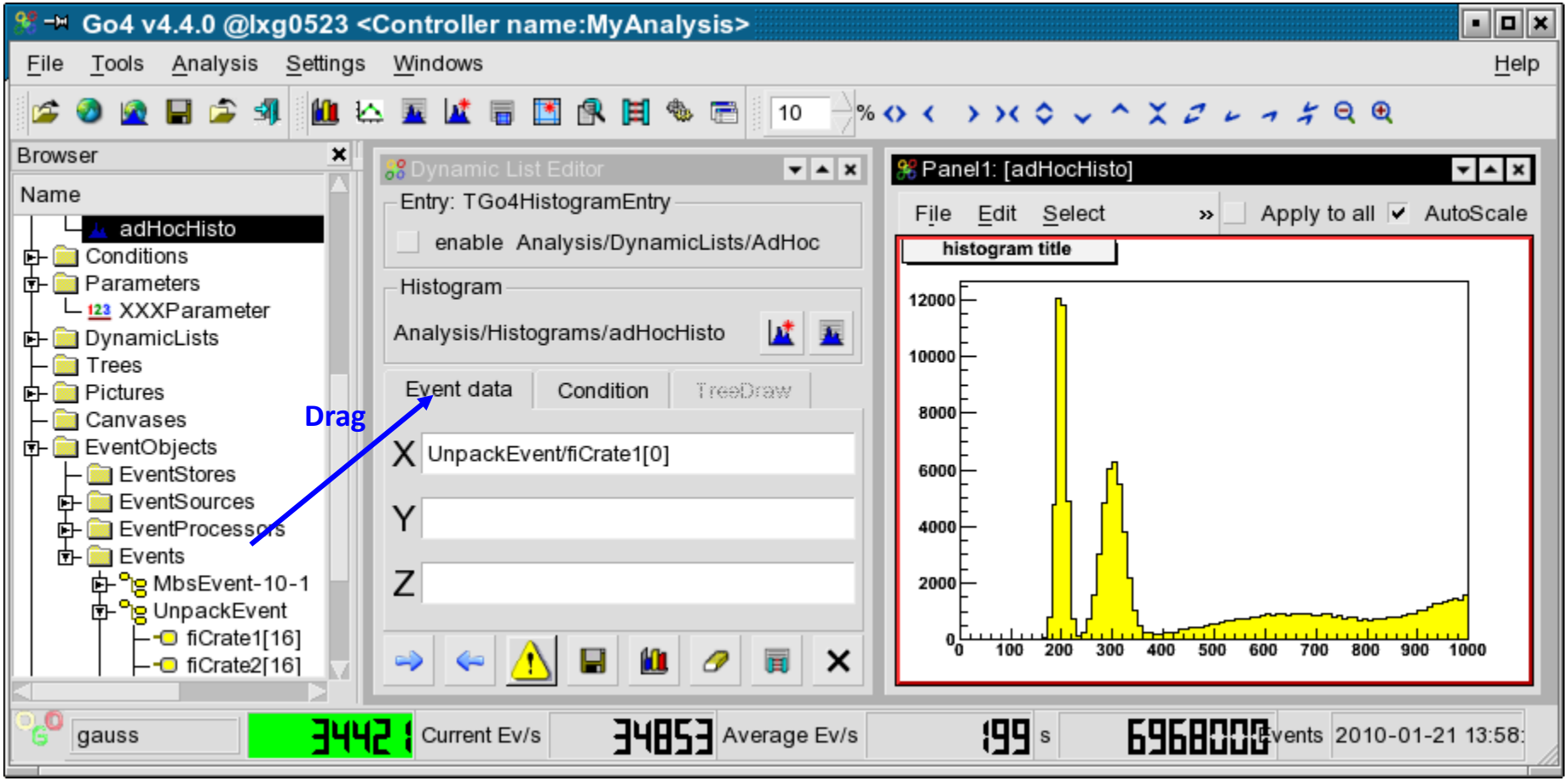


GO4 - View panel, IS526



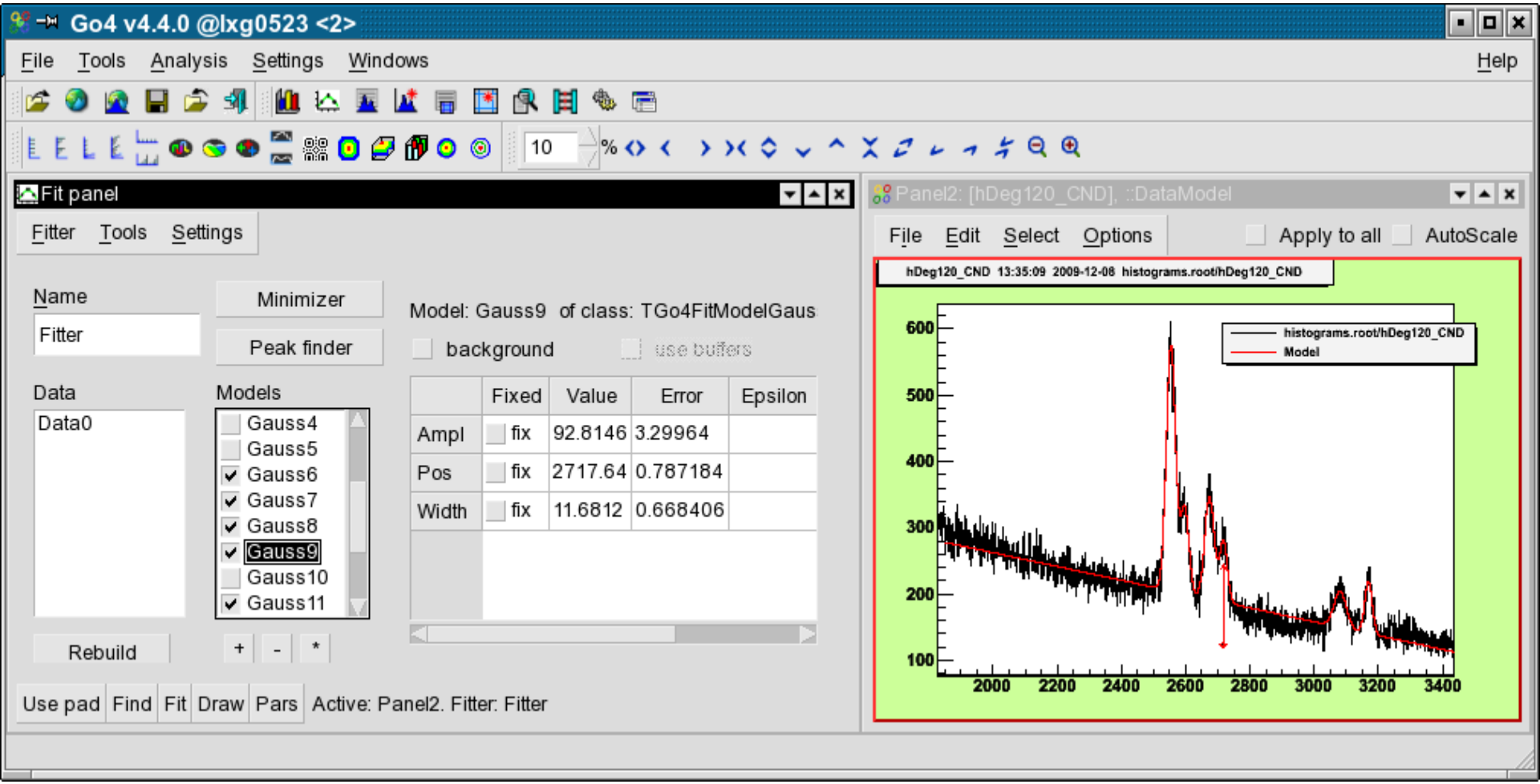
GO4 – Dynamic list editor

Adding histograms and conditions online from event data



GO4 – Fit panel

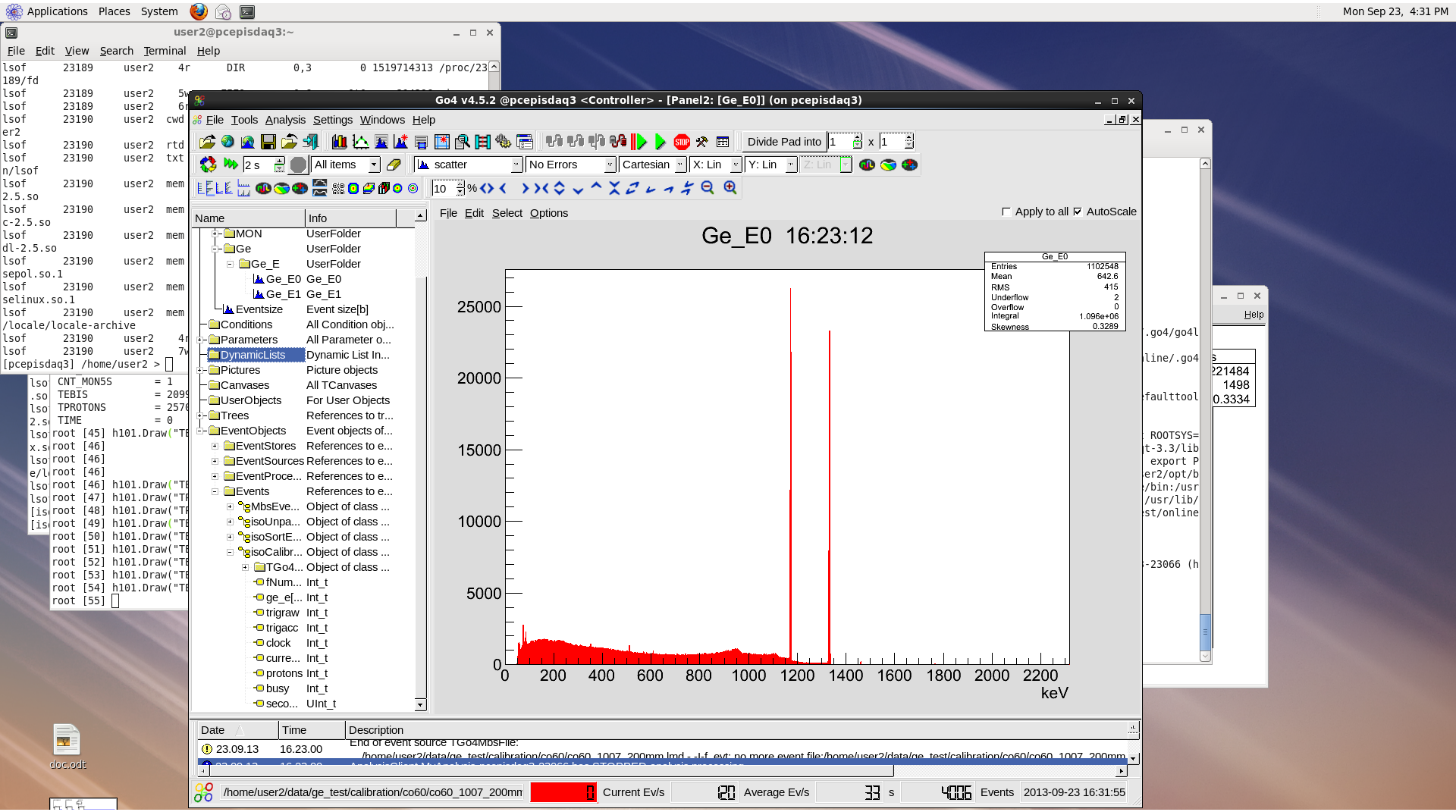
Interactive peak finding and fitting. Save fitter for use in macro



(C) Joern Adamczewski

Can handle any TH1 objects (from files NOT necessarily created with Go4)

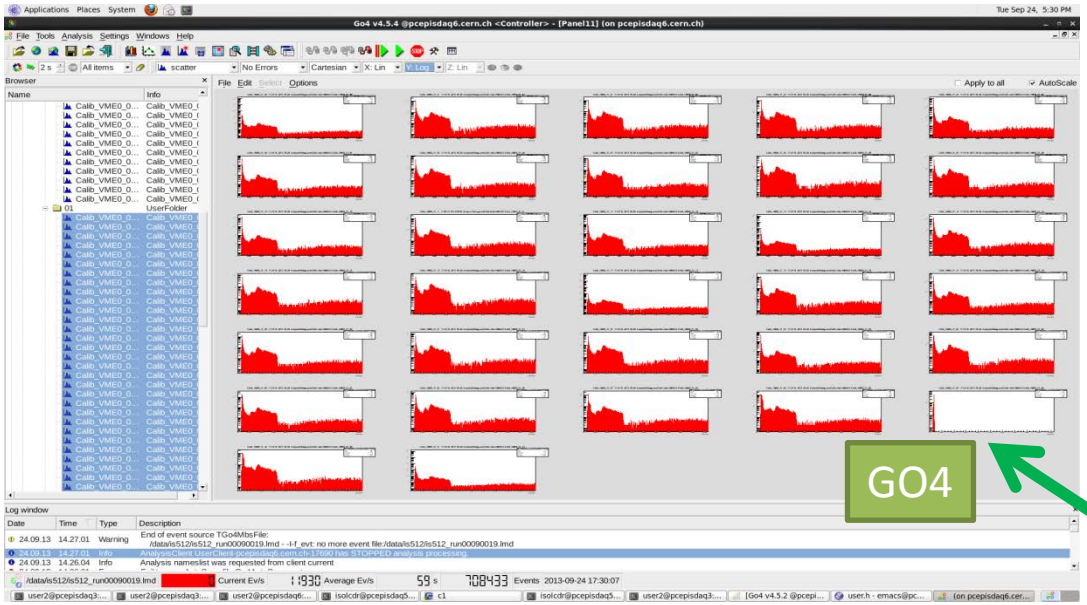
Minidaq – online GUI Go4

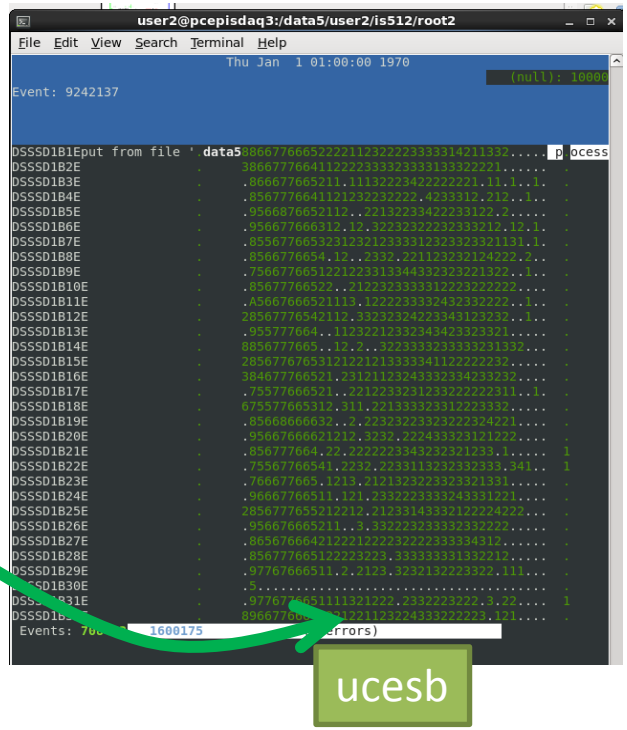


ucesb - unpack & check every single bit

- Tool to do rather quick checks of event-based data produced in e.g. nuclear physics experiments, installed on ISOLDE DAQ computers
- Built-in data formats: LMD (MBS), EBYEDATA (Daresbury MIDAS), PAX(KVI), HADES…
- Data structures → (parser) → C++ code (can handle any type of data)
- Simple but effective on-line data monitoring

```
[pcepisdaq3] /data5/user2/is512/root2 > ~/is512_unp/is512 is512_run00090019.lmd --watcher=DSSSD1B*E
```

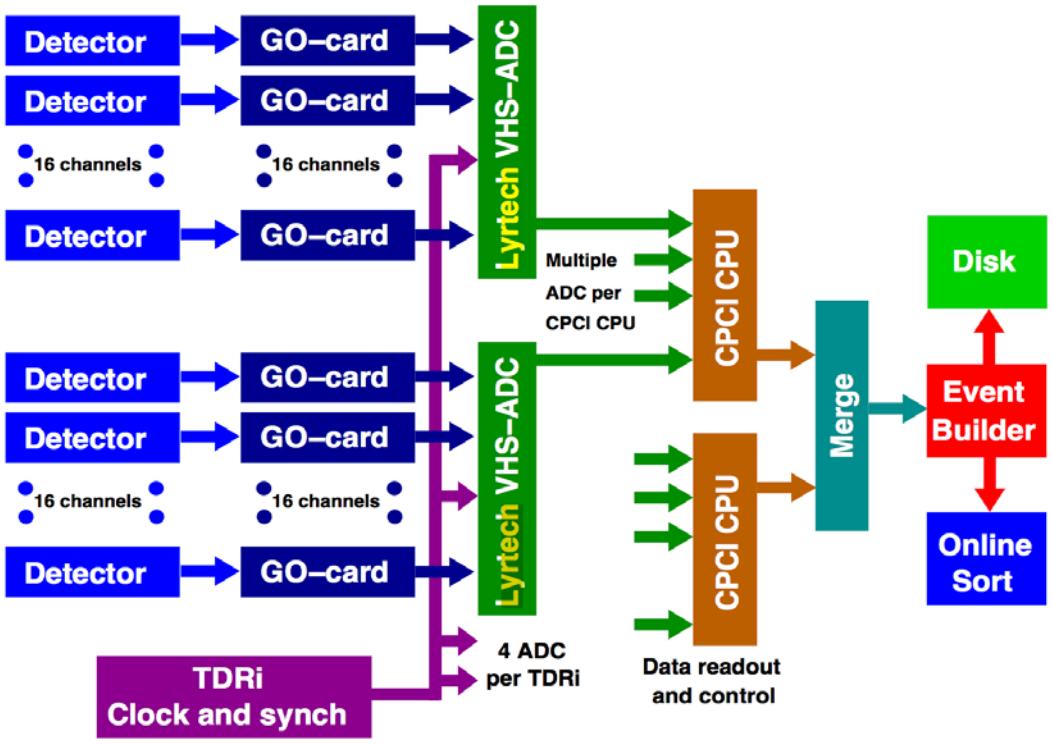




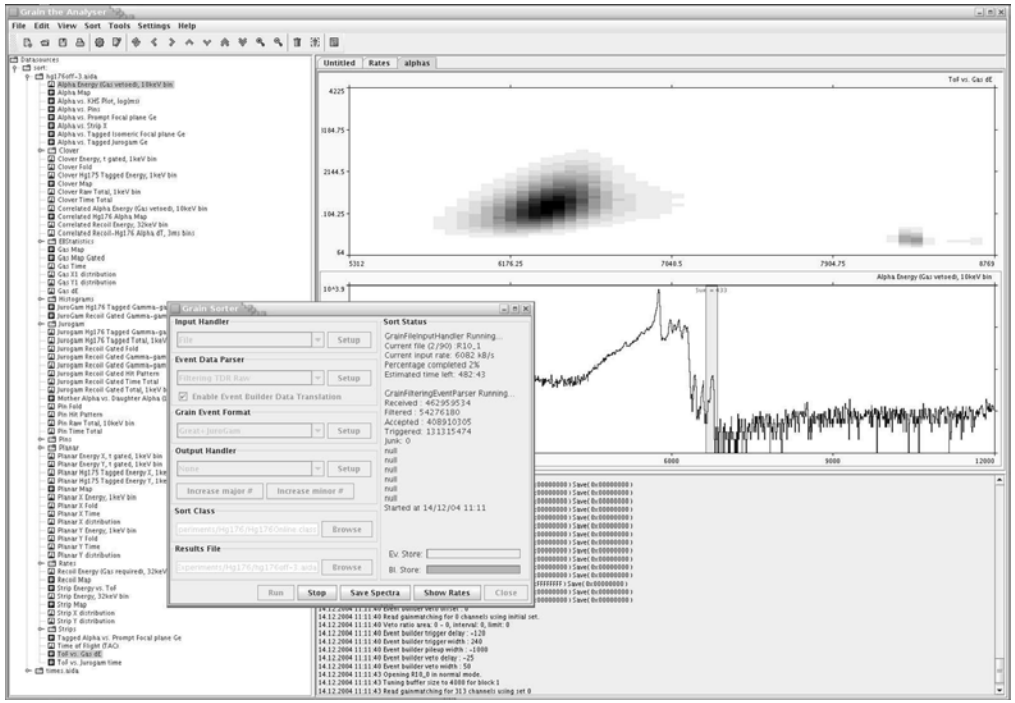
http://fy.chalmers.se/~f96hajo/ucesb/

TDR - DAQ for IDS

- TDR – Total Data Readout (Daresbury, UK), widely used at JYFL, chosen for ISOLDE IDS - phase I.
- Channels are read out asynchronously in singles mode and each data item is time-stamped with an external clock .
- Event building and analysis has to be done entirely in the software post-processing the data stream.
- VHS-ADC : 8 ch, 105 MSPS, 14-bit ADC (virtex4 FPGA) - could be available on loan from JYFL
- Capable to handle rates ~30kHz/ch (DC beam)



GRAIN – data analysis software



- GRAIN - data analysis framework developed at JYU to be used with the novel Total Data Readout (TDR) data acquisition system.
- A flexible and efficient event parser and the accompanying software framework written entirely in Java.

P. Rahkila, Grain - A Java Data Analysis System for Total Data Readout Nucl. Instr. and Meth. A 595, 637 (2008)

Grain

https://trac.cc.jyu.fi/projects/grain

Summary

Available systems:

- MBS: 2 nodes (up to 128ch)
- Minidaq: 1 node (up to 32ch)
- Digidaq: 1 node (up to 8ch)
- TDR (future): 1 node (n8ch)

Statistics for 2012:

- MBS: i83, is476, is512, is526, is545 [total: 220GB]
- Minidaq: is541 [total 20GB]
- Digidaq: is537, is471, CRIS development [total: 30GB]

Acknowlegment

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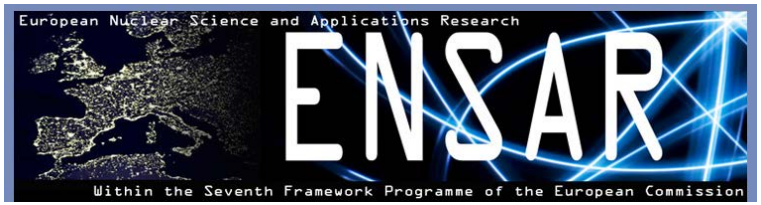
- Hossein Khozani (CERN-PH, Switzerland)
- Momo Mukai (University of Tsukuba, Japan)
- Nobuaki Imai (KEK, Japan)
- IS512/526 teams

This work is supported by ENSAR