Status of the ISOLDE DAQ

Jan Kurcewicz

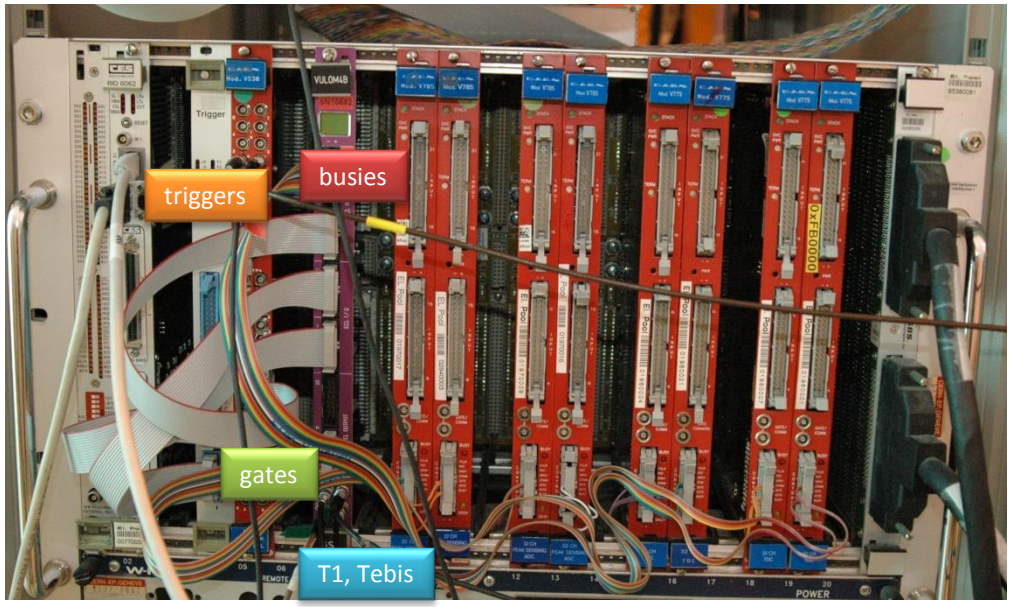
CERN PH-SME

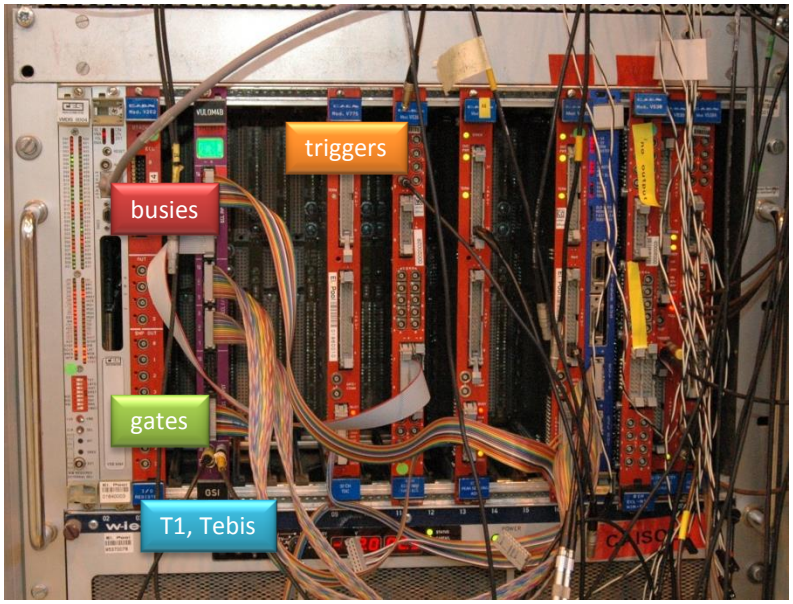
ISOLDE DAQ systems - MBS

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

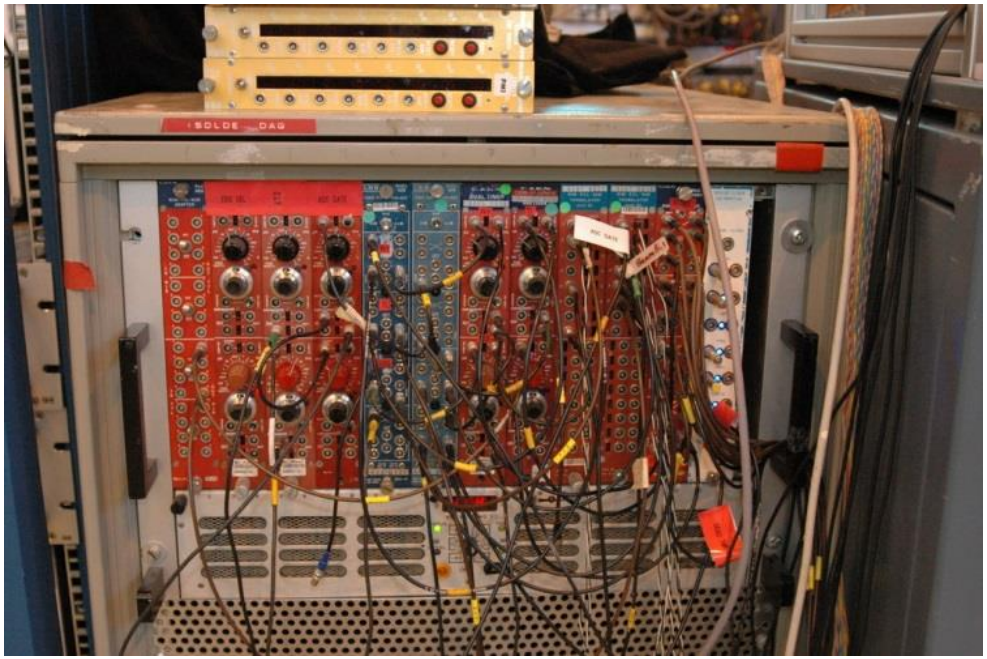
NEW!

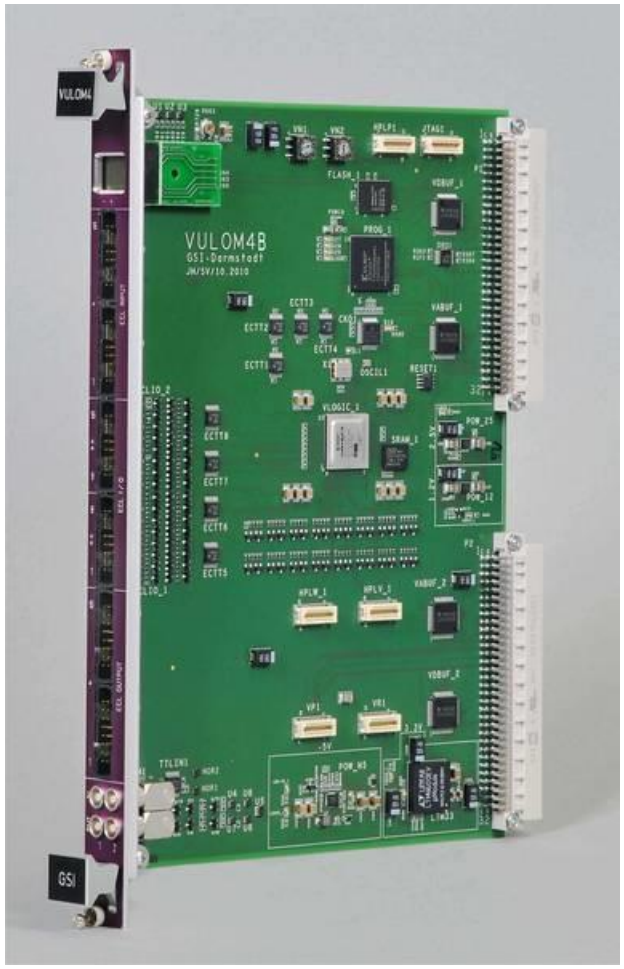




VULOM – VME Universal Logic Module

1NIM crate Trigger logic reduced to single VME board

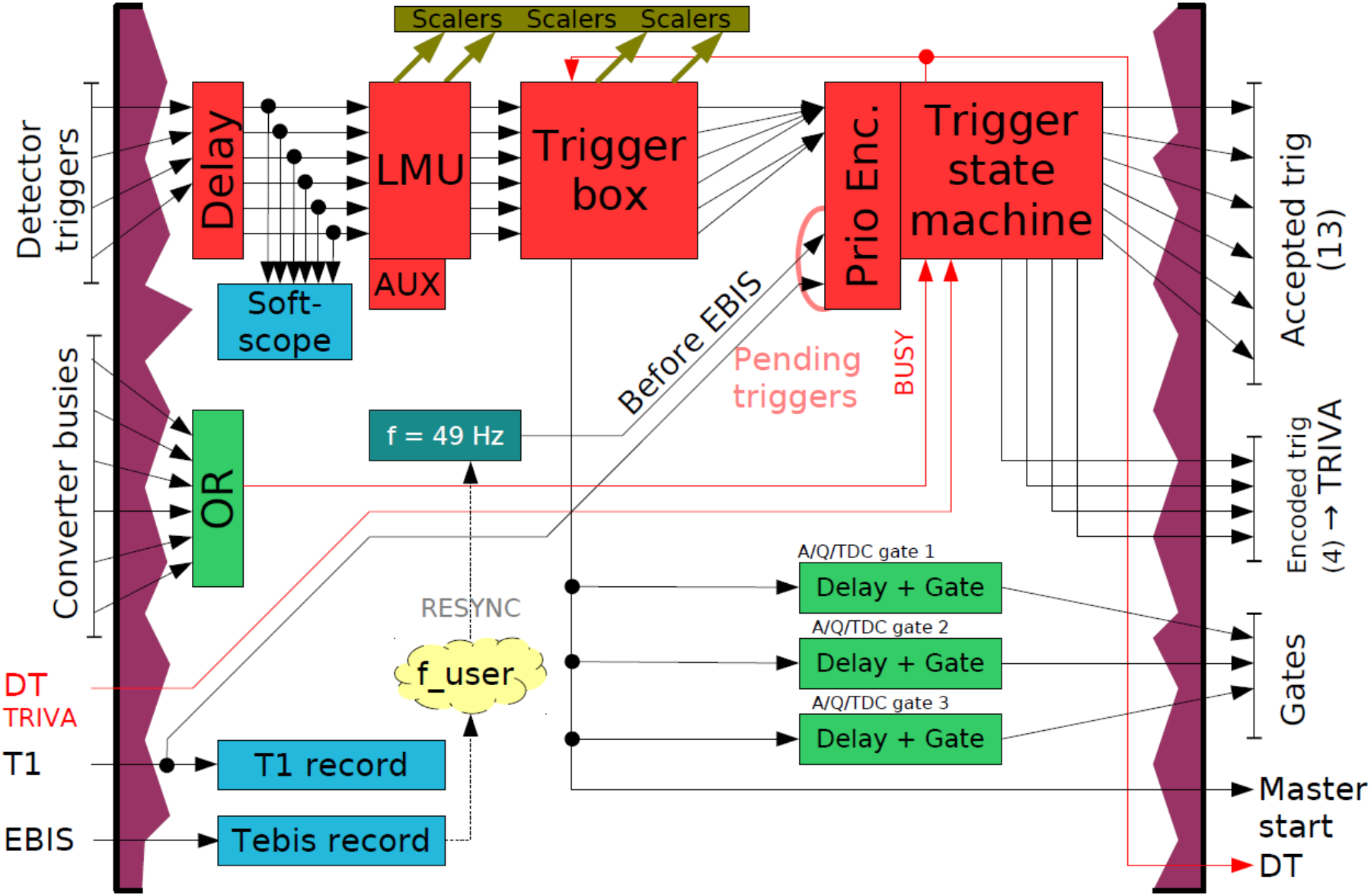




TRLO2 - trigger logic firmware (H. Johansson et al.)
VULOM - VME Universal Logic Module (J. Hoffman et al.)

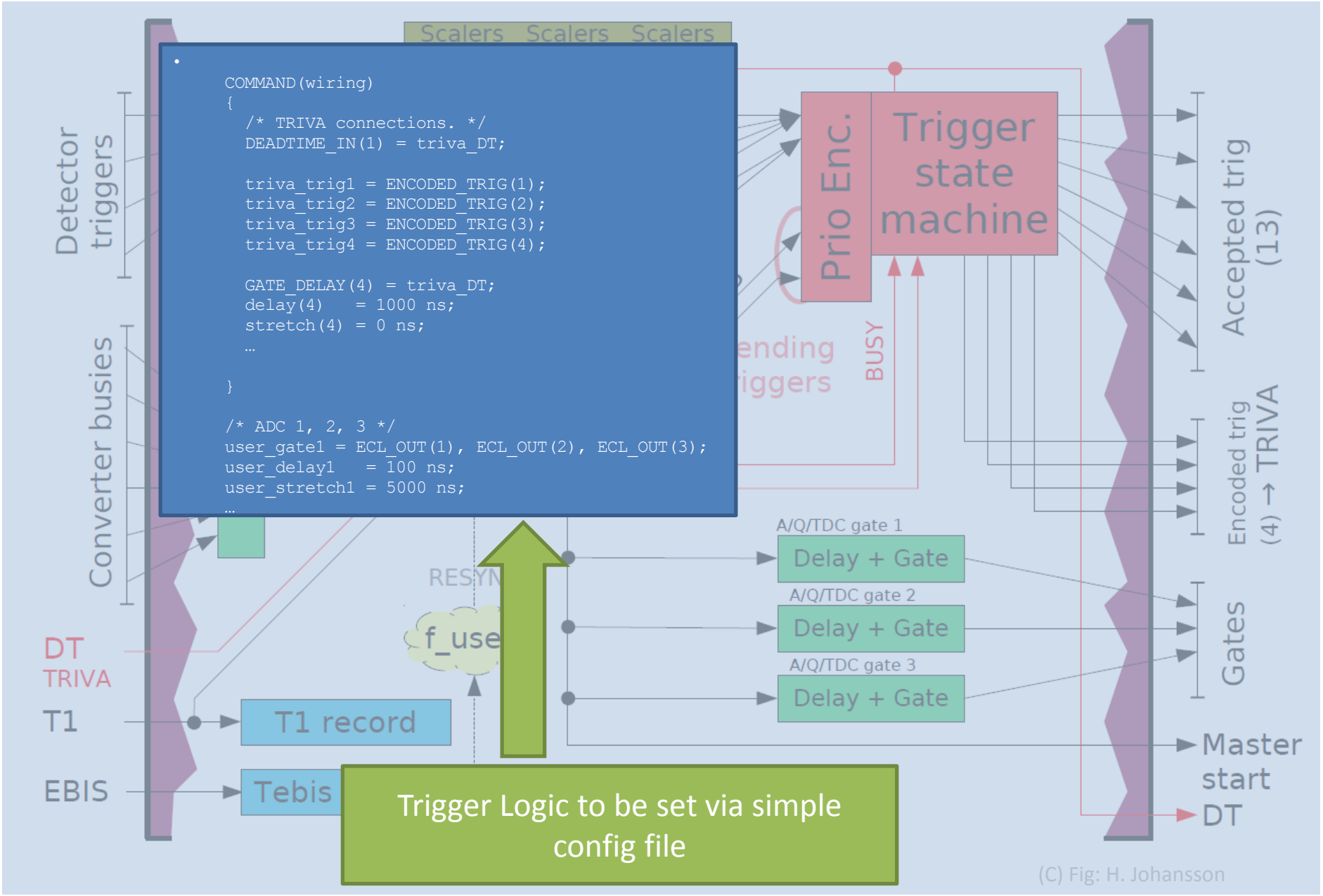
(C) Photo: GSI

VULOM – VME Universal Logic Module

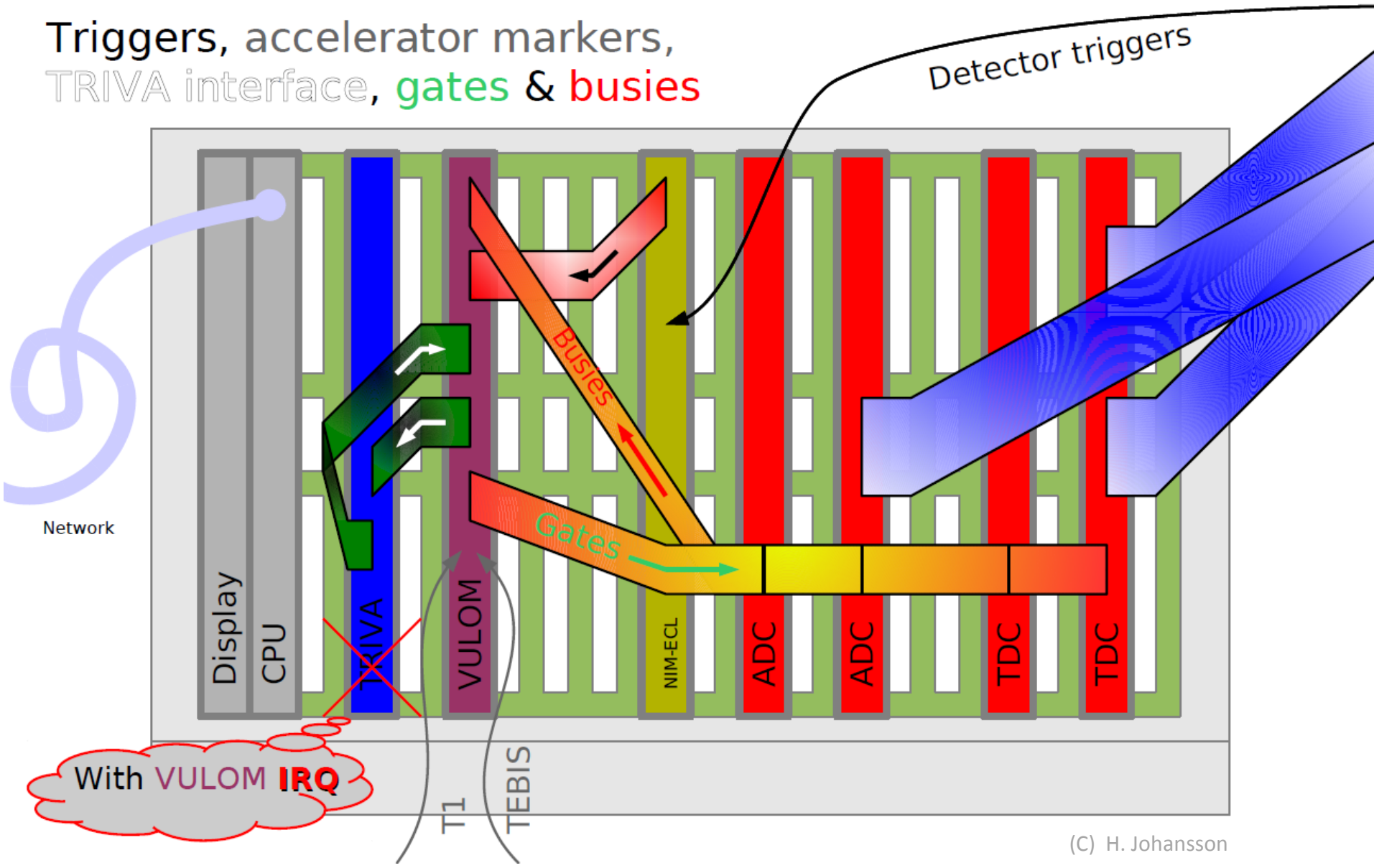


(C) Fig: H. Johansson

VULOM – VME Universal Logic Module



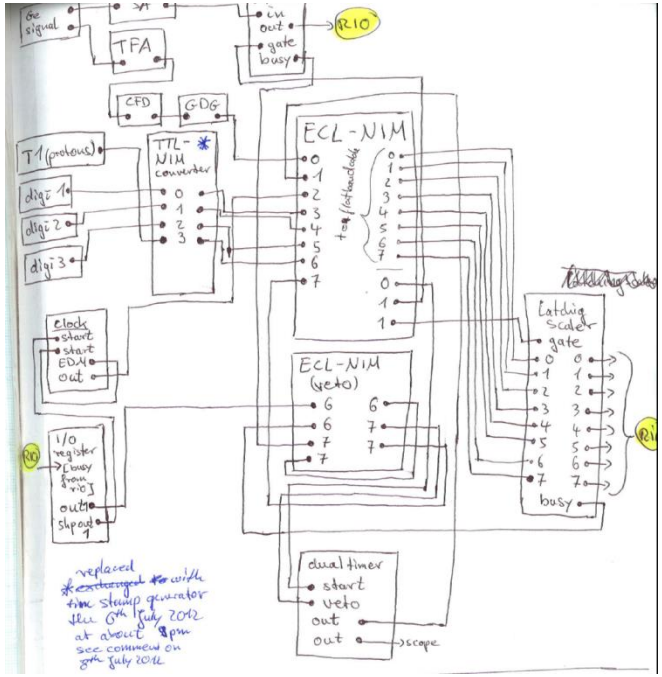
VULOM – VME Universal Logic Module

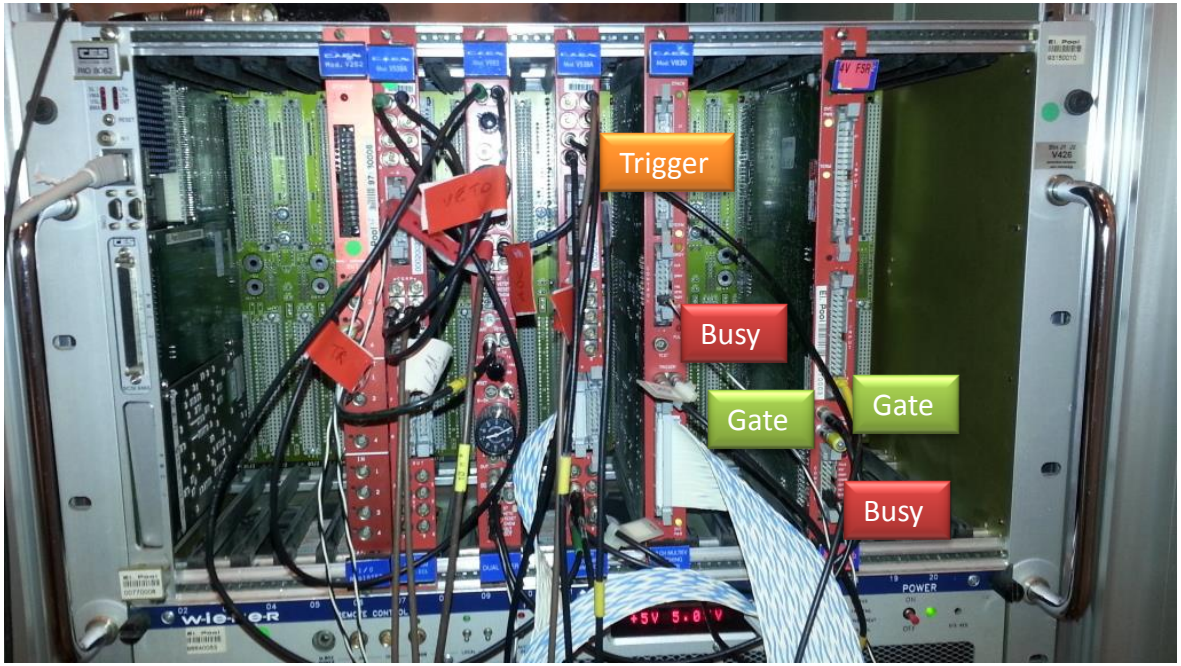


(C) H. Johansson

ISOLDE DAQ systems - minidaq

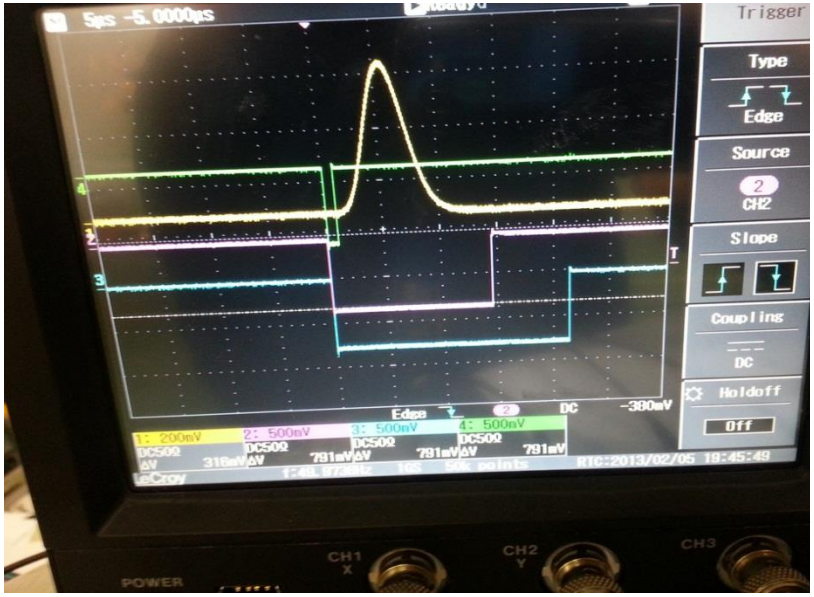
- mini VME DAQ, CES RIO2 processor + ADC + scaler, up to **32 ch**
- no TRIVA/VULOM
- only one trigger (veto by busy or I/O register during read-out)
- produces MBS-like data stream
- ADC and scaler operate in multi-event mode

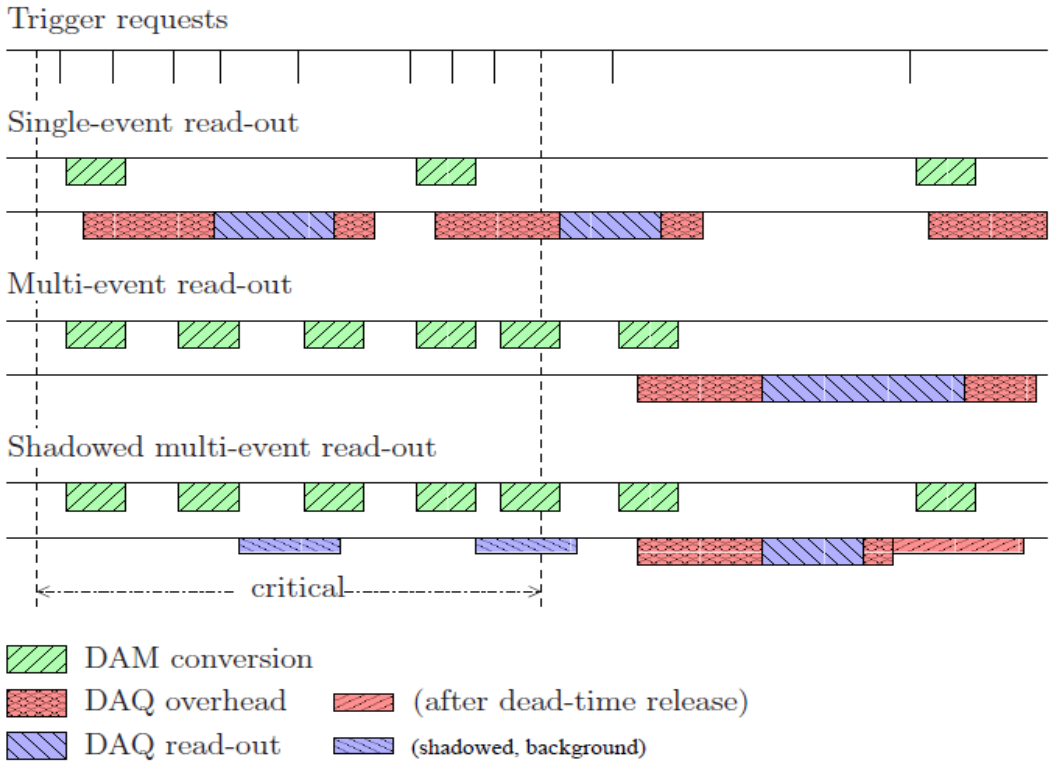




Multi-event read-out for MBS

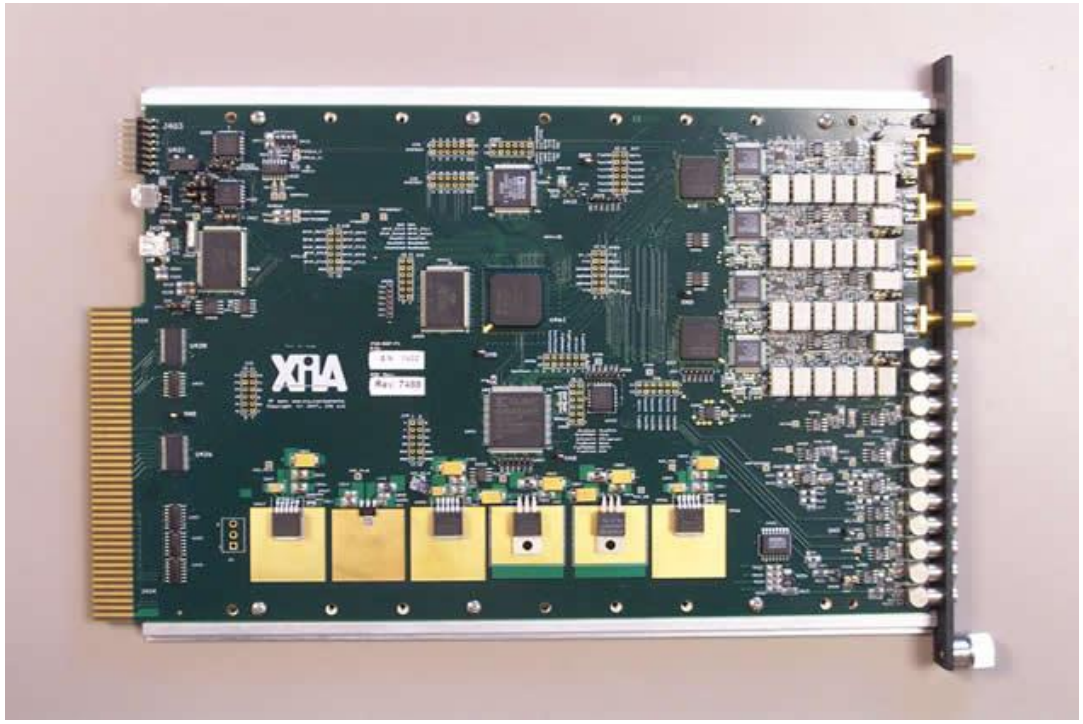
- Dead-time = conversion+read-out time
- ADC and scaler operate in multi-event mode (otherwise: ~1 event per EBIS pulse)
- Buffer size: 32 events (ADC/TDC), ~1000 (scaler)
- Both MBS and minidaq can be run in multi-event read-out mode
- (VME bus: 1us/word)





(C)Fig: H. Johansson

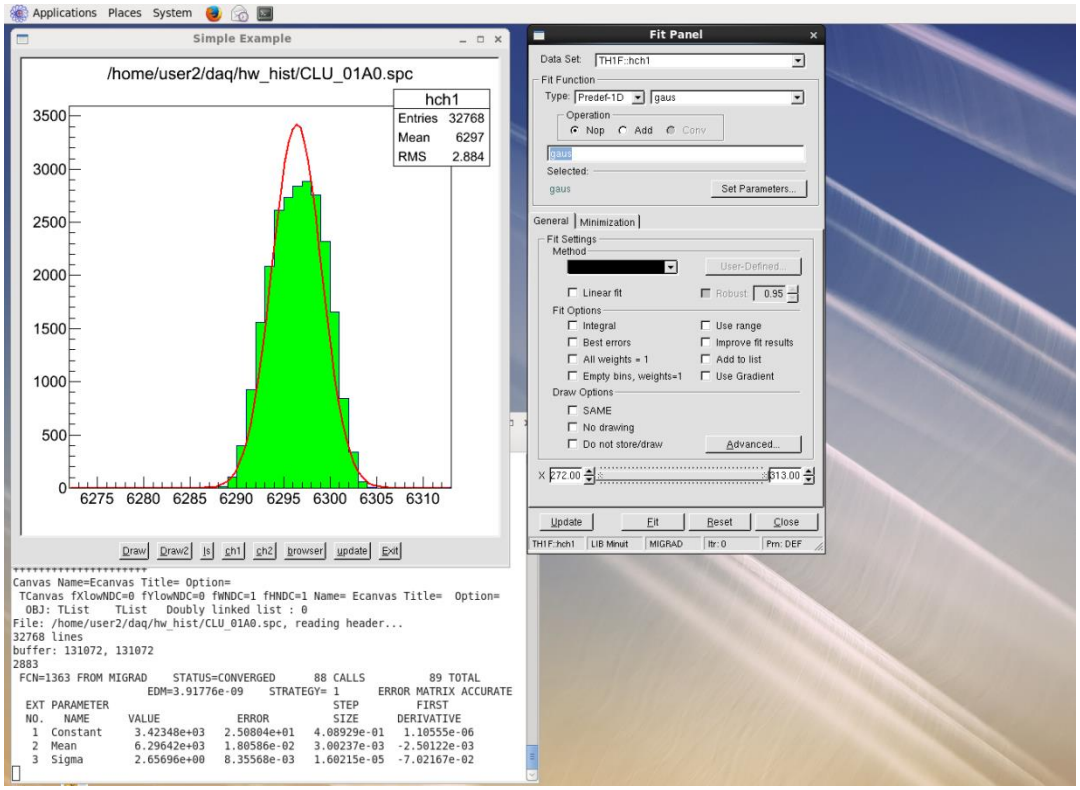
DGF4C – DAQ system (digiDAQ)

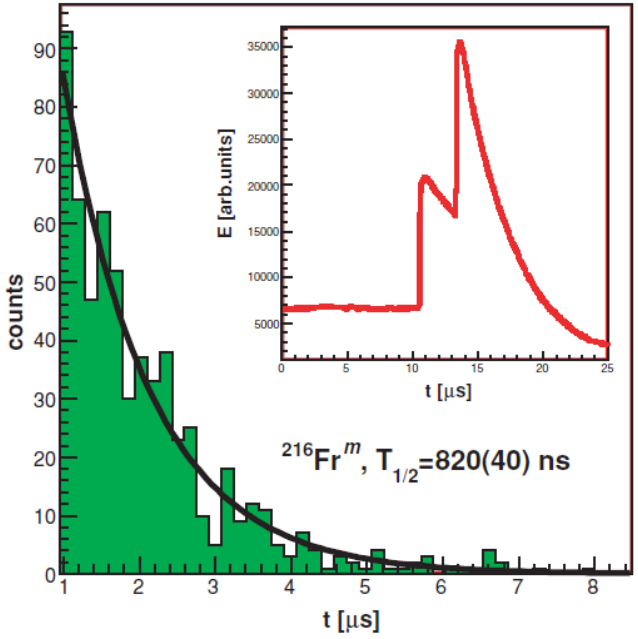


- Digital Gamma Finder (DGF) is a pulse processor with capabilities for measuring both energy and pulse shape
- Common clock distribution
- 40 MHz sampling rate (rev. D, E) → 80 MHz (rev. F). Upgrade presently being done.
- 12-bit (rev. D), 14-bit (rev. E) ADCs
- For >5 kHz significant dead-time in LMD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

Figs: xia.com

DGF4C - DAQ system (digiDAQ)



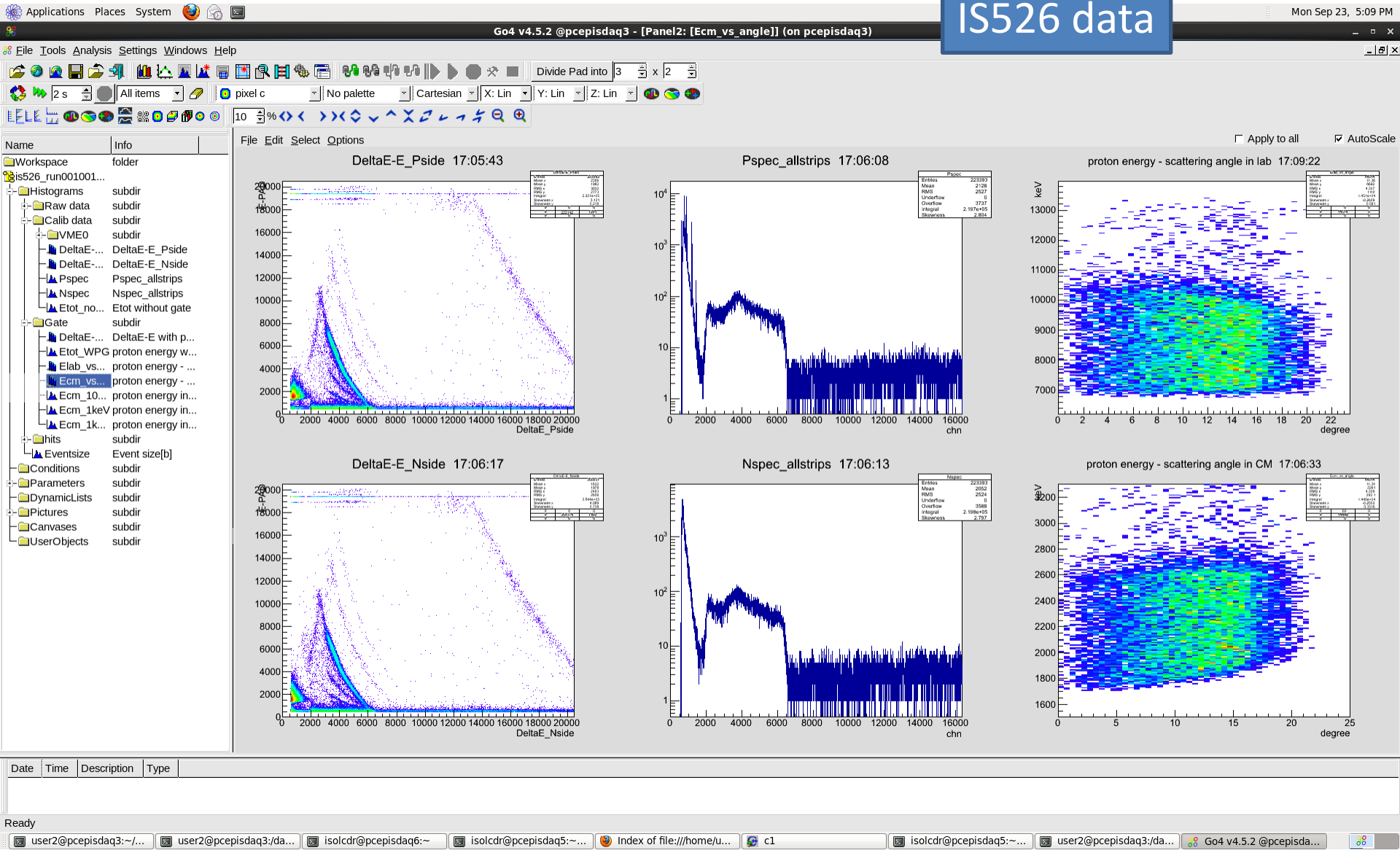


XIA DGF4c-based system (CRIS, ISOLTRAP, MB, NICOLE, others)

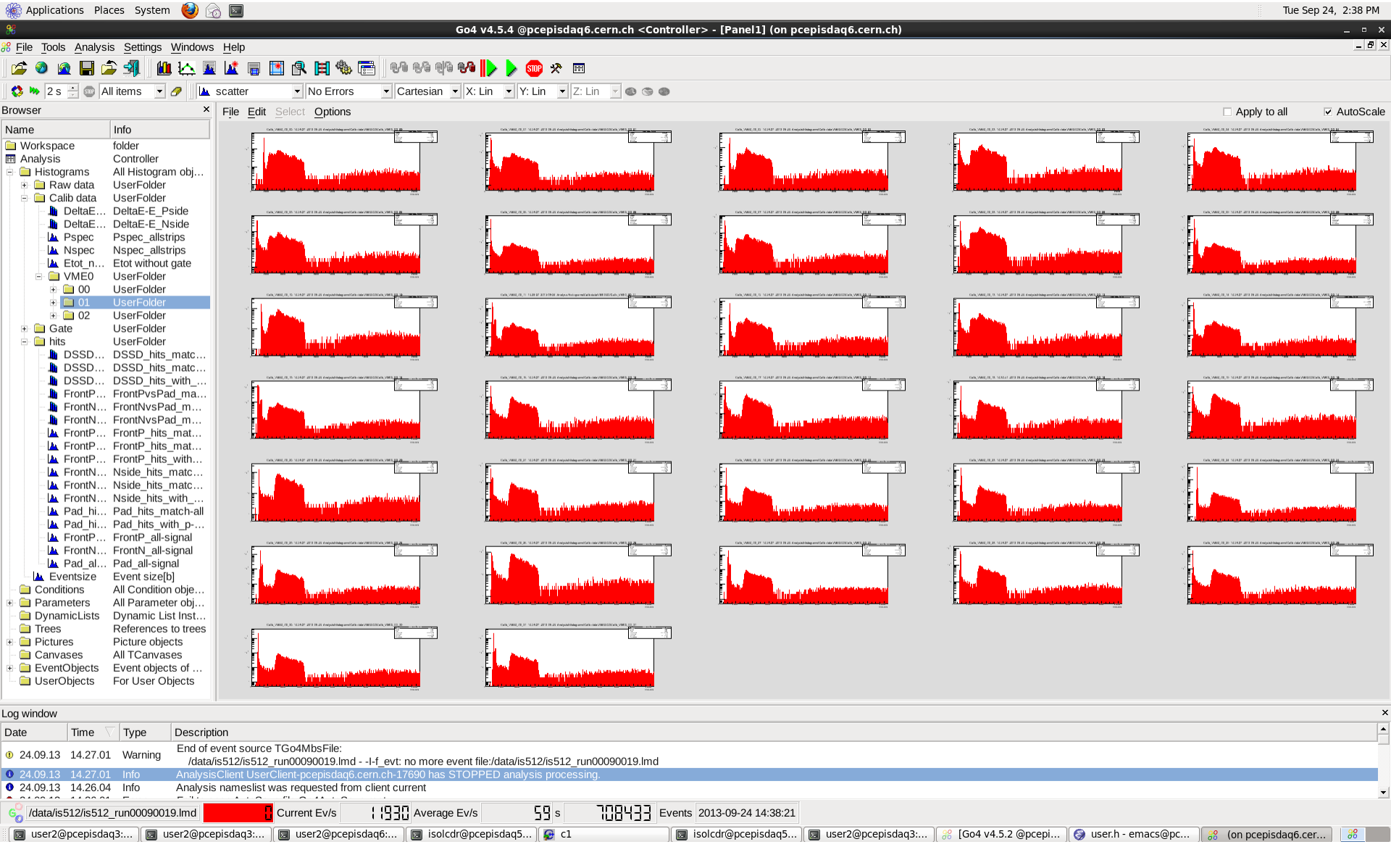
- DAQ based on MB collector code (N. Warr, G. Simpson), can also write MBS buffers (testing phase…)
- Online monitoring using cne/ROOT software,
- Offline analysis based on ROOT is also available (T. Cocolios, K. Lynch, G. Simpson)

MBS – online GUI GO4 (IS526)

IS526 data

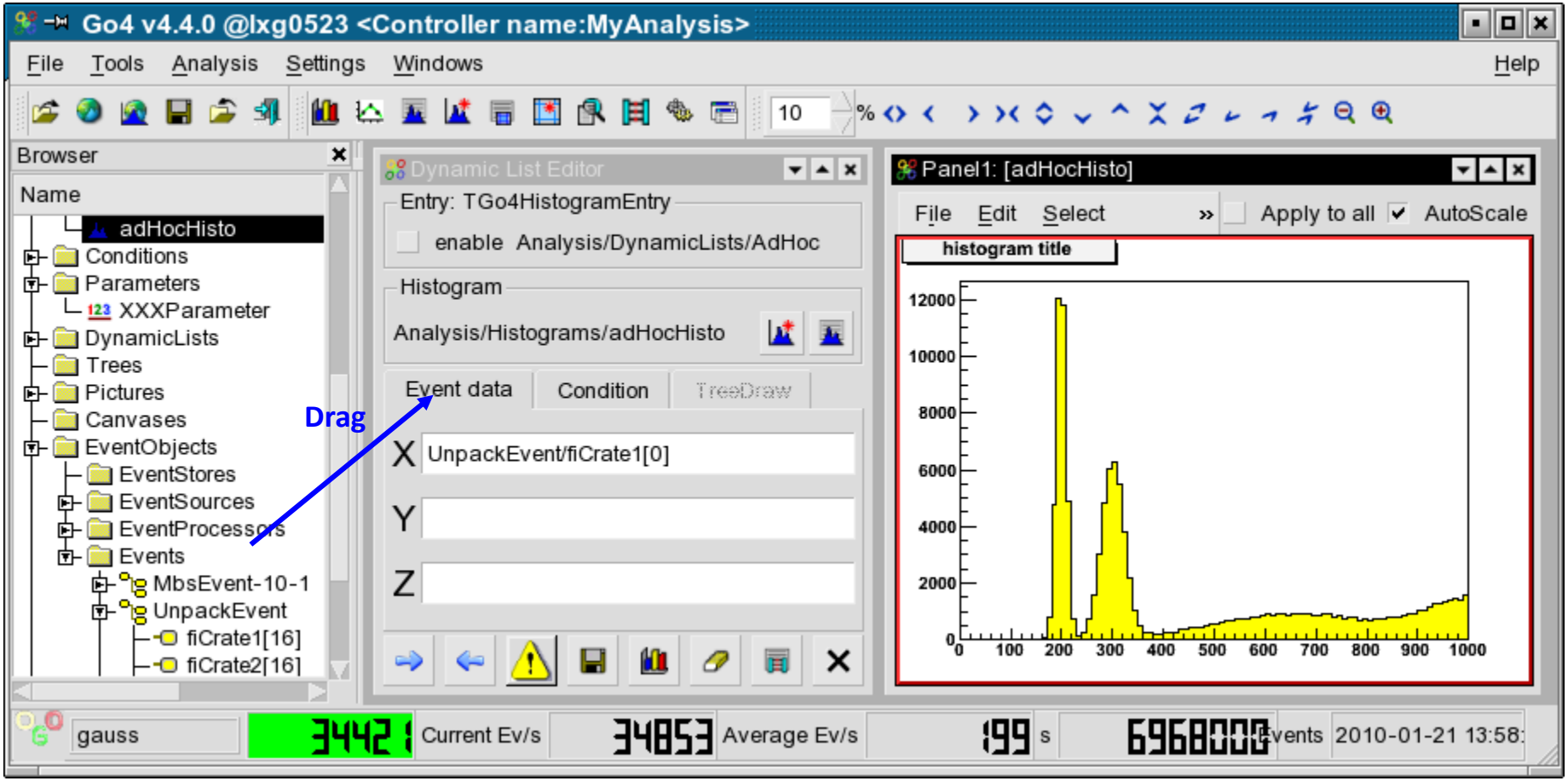


GO4 - View panel, IS526



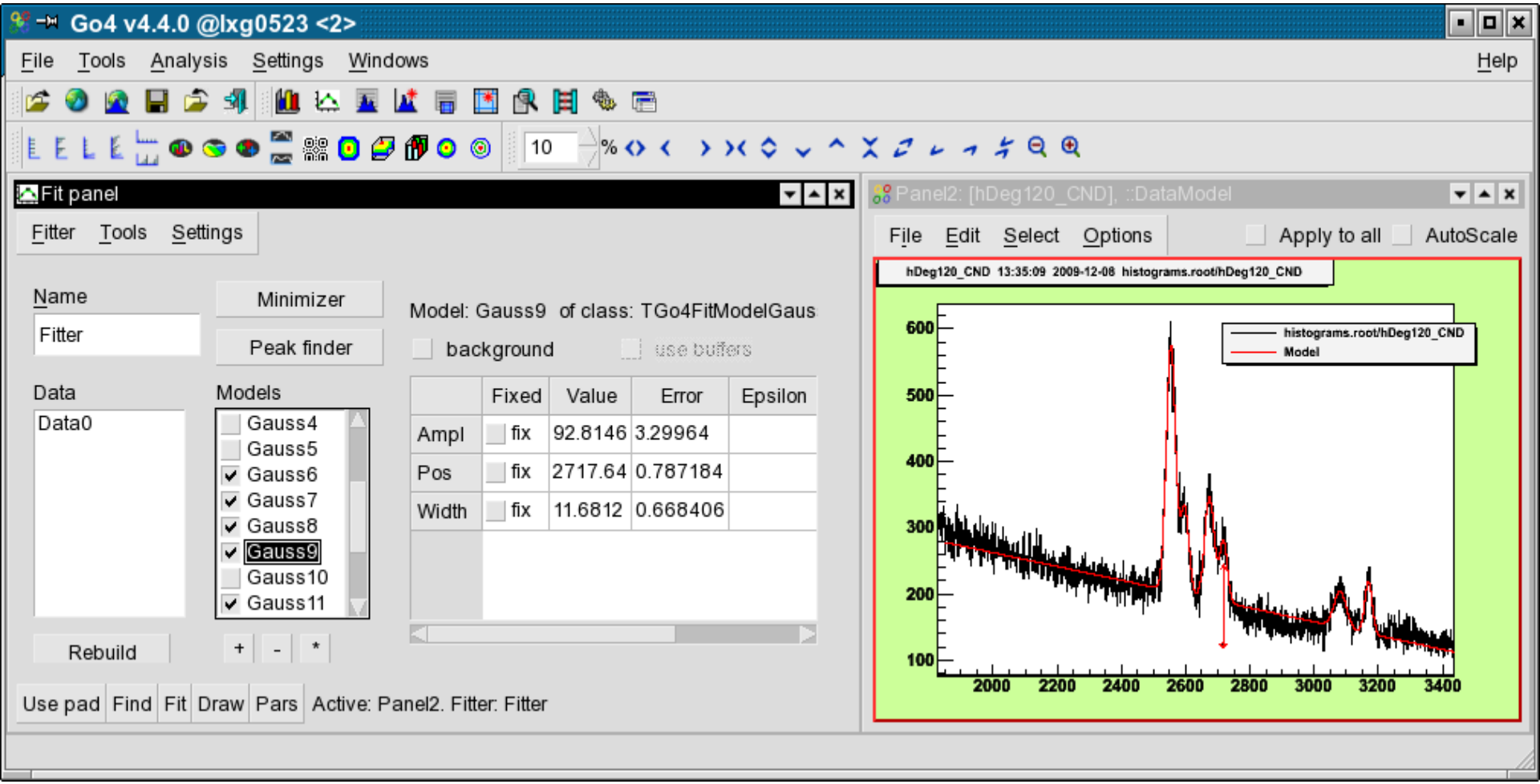
GO4 – Dynamic list editor

Adding histograms and conditions online from event data



GO4 – Fit panel

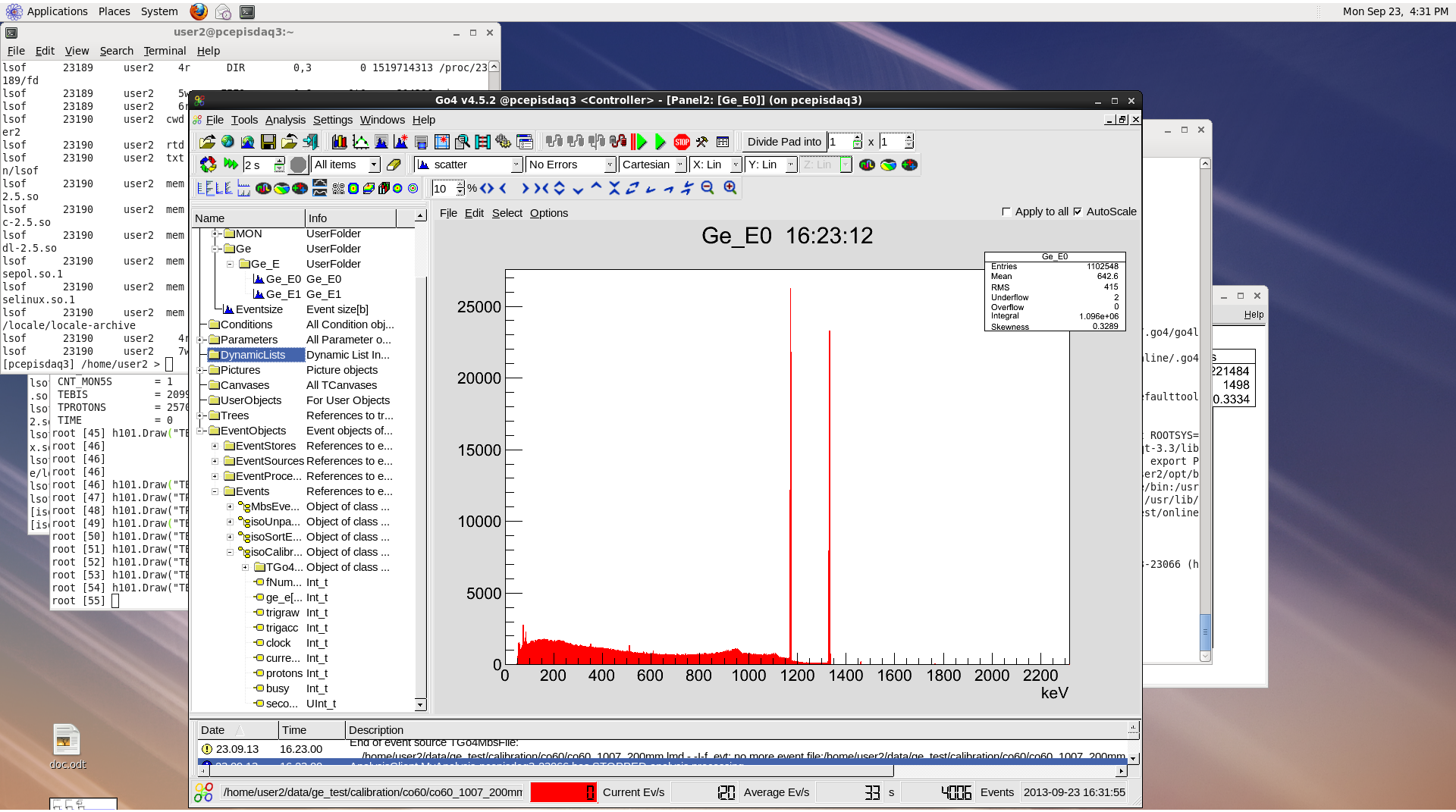
Interactive peak finding and fitting. Save fitter for use in macro



(C) Joern Adamczewski

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

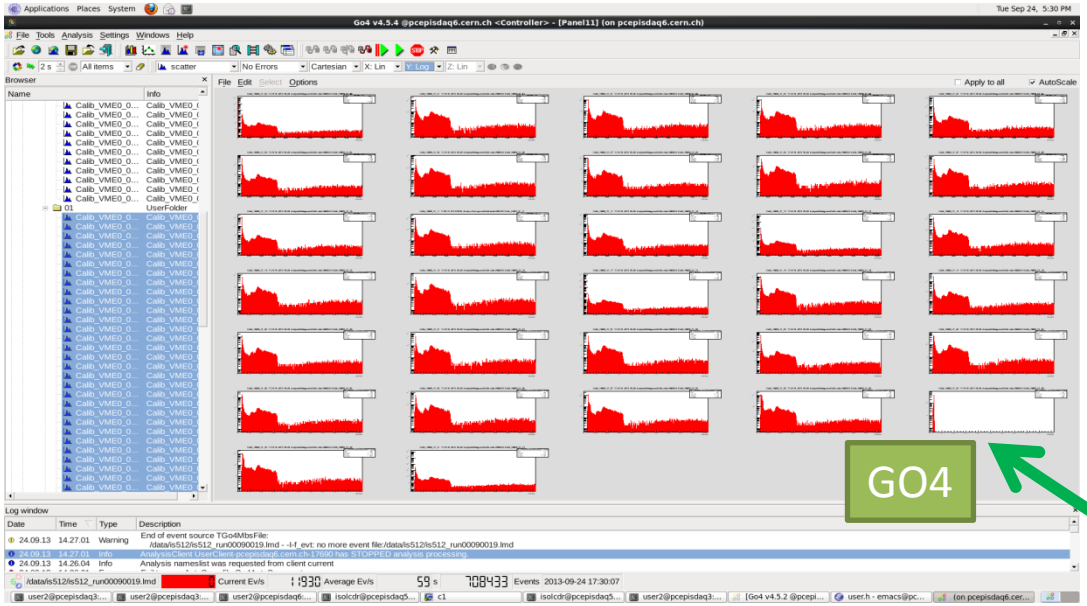
Minidaq – online GUI Go4

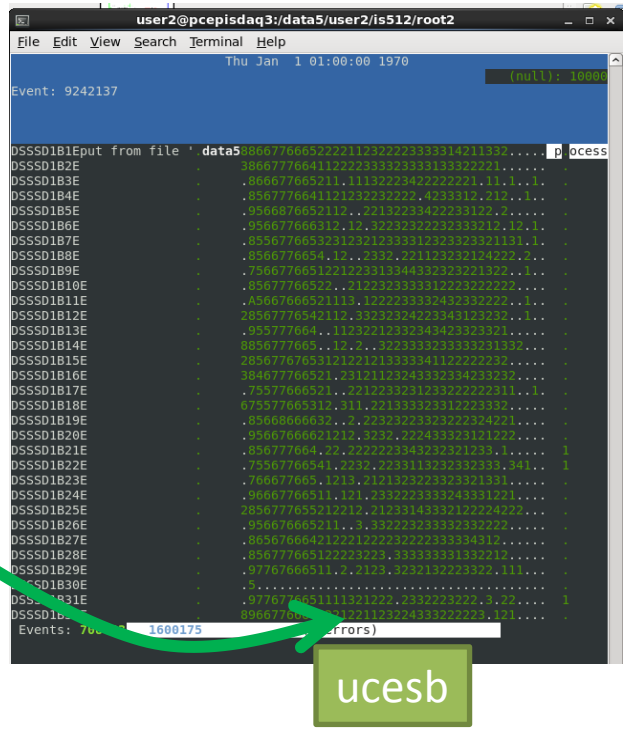


ucesb – unpack & check every single bit

- 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
```

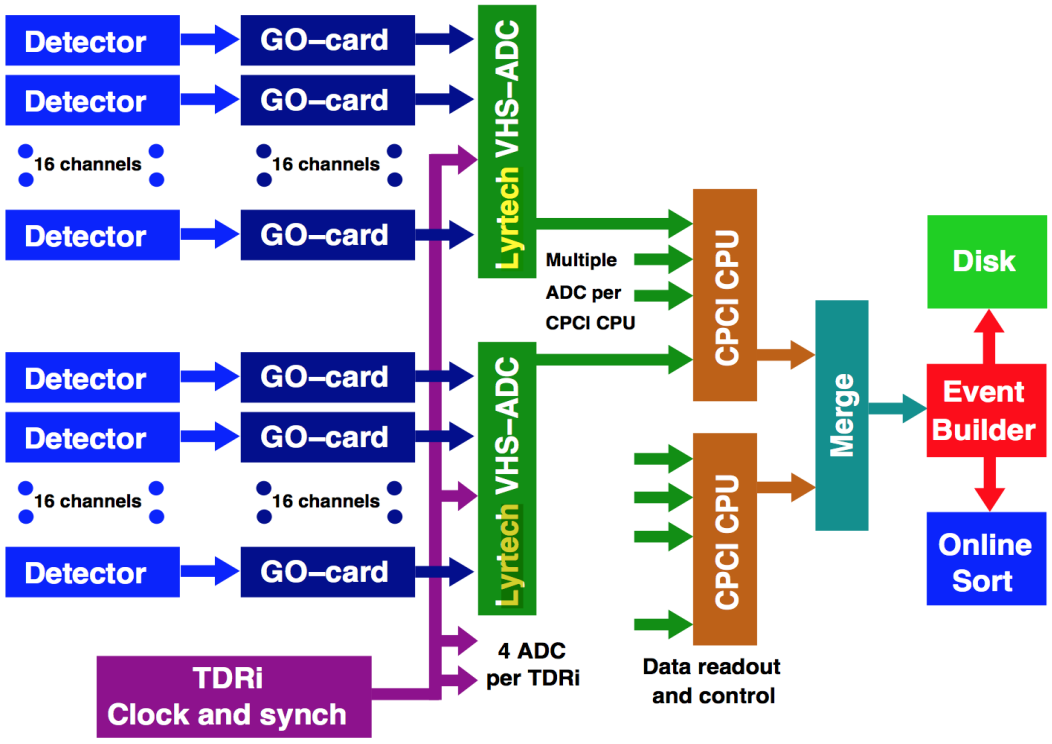




http://fy.chalmers.se/~f96hajo/ucesb/

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)

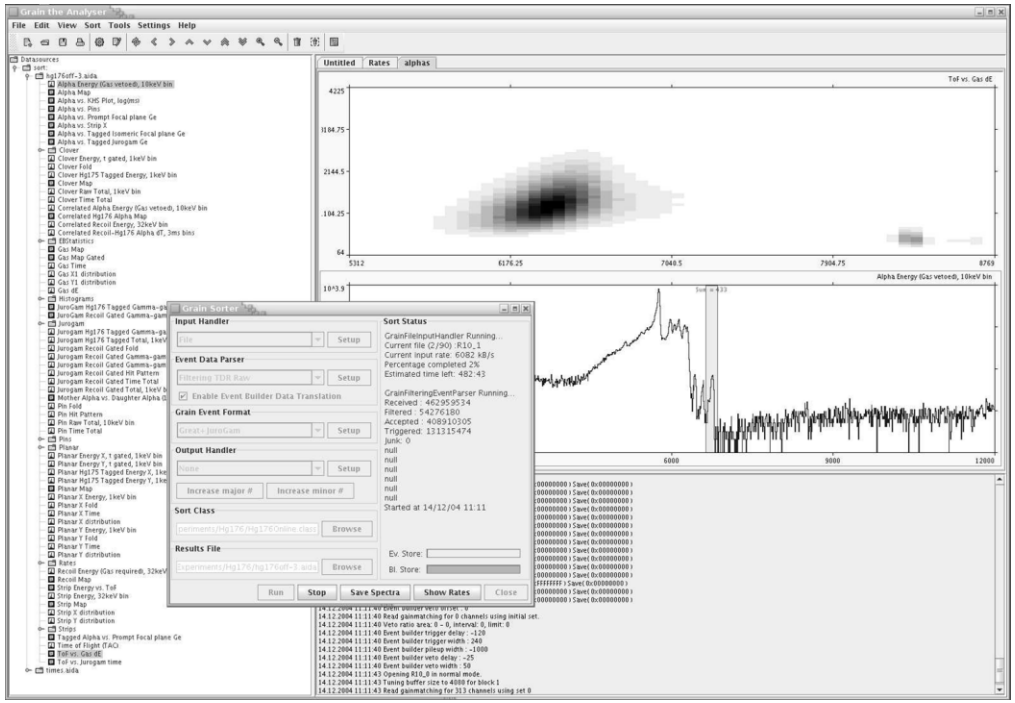


TDR - DAQ for IDS

HPGe: 19 ch (max 25, phase II)
LaBr3: 12 ch
Plastic: 3 ch
Si: 64 ch
Total: 98 ch (112 ch available)

+ ISOLDE status (T1, T2, tape, laser…)

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)

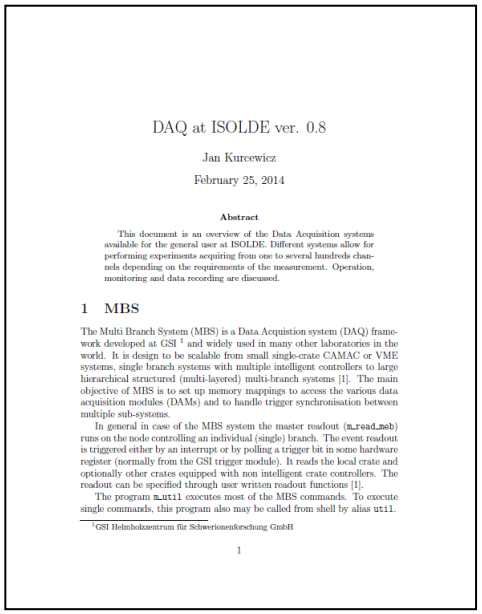
Grain

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 (112/n8ch)



DAQ at ISOLDE ver. 0.8

Jan Kurcewicz

February 25, 2014

Abstract

This document is an overview of the Data Acquisition systems available for the general user at ISOLDE. Different systems allow for performing experiments acquiring from one to several hundreds channels depending on the requirements of the measurement. Operation, monitoring and data recording are discussed.

1 MBS

The Multi Branch System (MBS) is a Data Acquistion system (DAQ) framework developed at GSI [1] and widely used in many other laboratories in the world. It is design to be scalable from small single-crate CAMAC or VME systems, single branch systems with multiple intelligent controllers to large hierarchical structured (multi-layered) multi-branch systems [1]. The main objective of MBS is to set up memory mappings to access the various data acquisition modules (DAMs) and to handle trigger synchronisation between multiple sub-systems.

In general in case of the MBS system the master readout (`m_read_mob`) runs on the node controlling an individual (single) branch. The event readout is triggered either by an interrupt or by polling a trigger bit in some hardware register (normally from the GSI trigger module). It reads the local crate and optionally other crates equipped with non intelligent crate controllers. The readout can be specified through user written readout functions [1].

The program `m_util` executes most of the MBS commands. To execute single commands, this program also may be called from shell by alias `util`.

[1] GSI Helmholzzentrum für Schwerionenforschung GmbH

1

/afs/cern.ch/user/j/jkurcewi/public/doc/daq_isolde.pdf

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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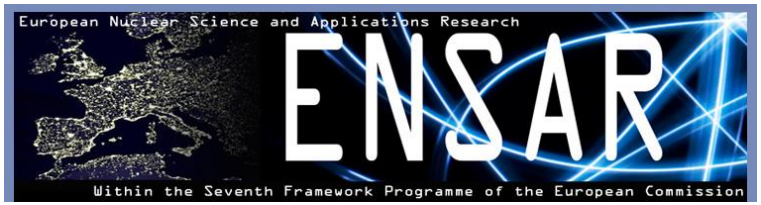
- Momo Mukai (University of Tsukuba, Japan)
- Nobuaki Imai (KEK, Japan)
- IS512/526 teams

This work is supported by ENSAR



Template