

# Status of the ISOLDE DAQ

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CERN PH-SME

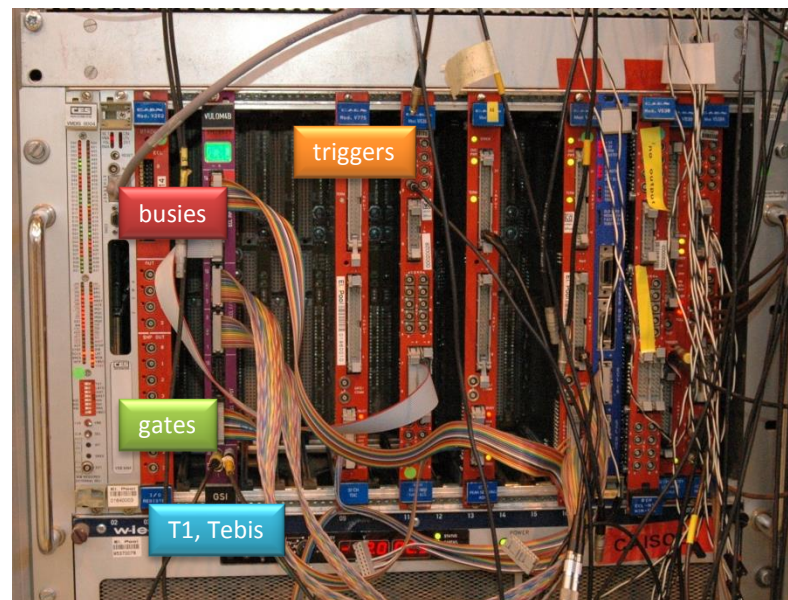
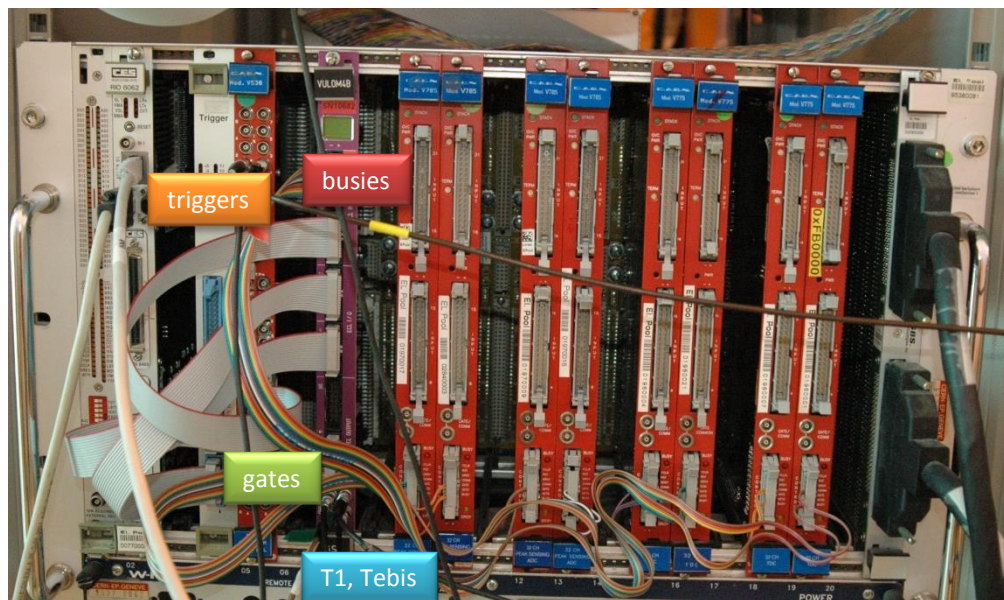


# ISOLDE DAQ systems - MBS

Standard ISOLDE VME-based system

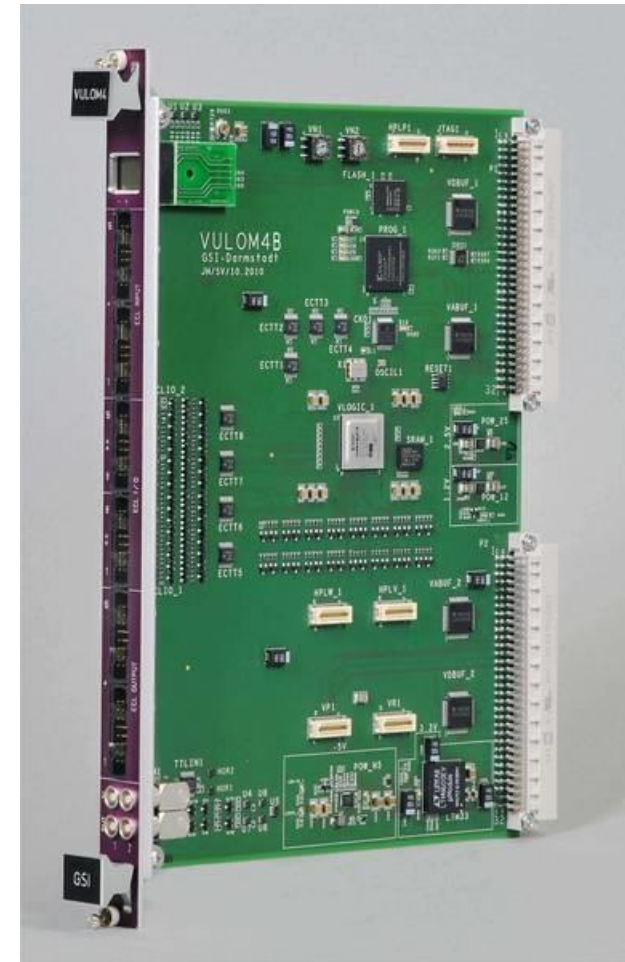
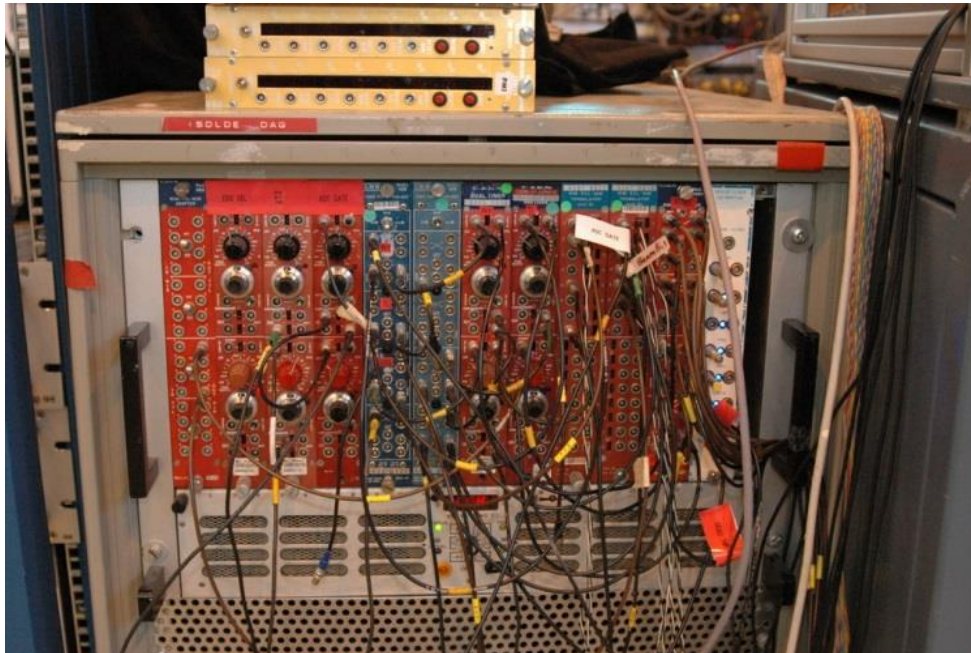
- **MBS** DAQ system from GSI (N. Kurz et al.).
- CES RIO2 processor
- CAEN v775 TDCs and v785 peak sensing ADCs
- **TRIVA** trigger synchronization module, **VULOM+TRLO2** firmware for trigger logics.
- Well established within collaboration

**NEW!**



# VULOM – VME Universal Logic Module

1NIM crate Trigger logic reduced to single VME board

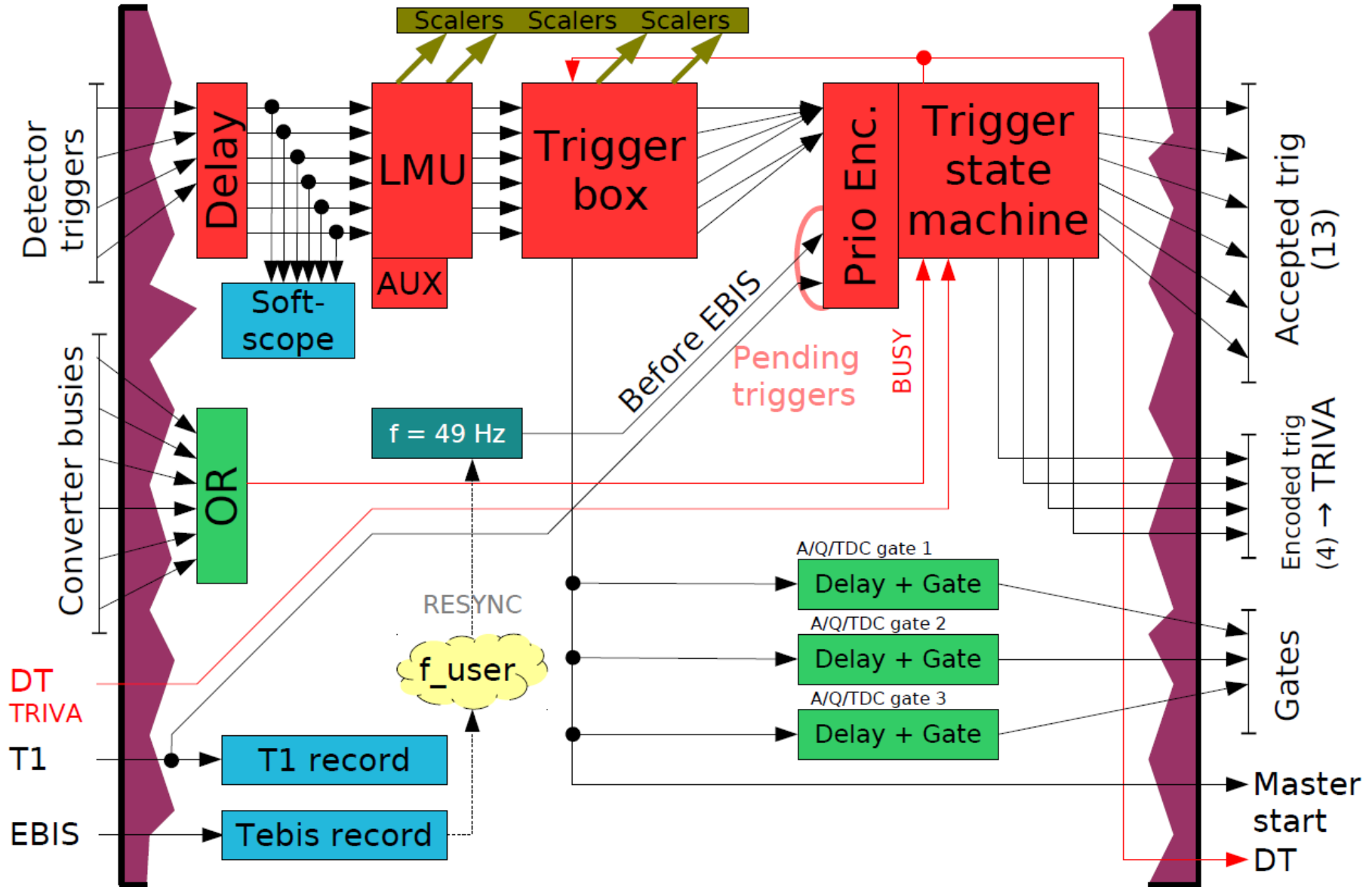


**TRLO2** - trigger logic firmware (H. Johansson et al.)

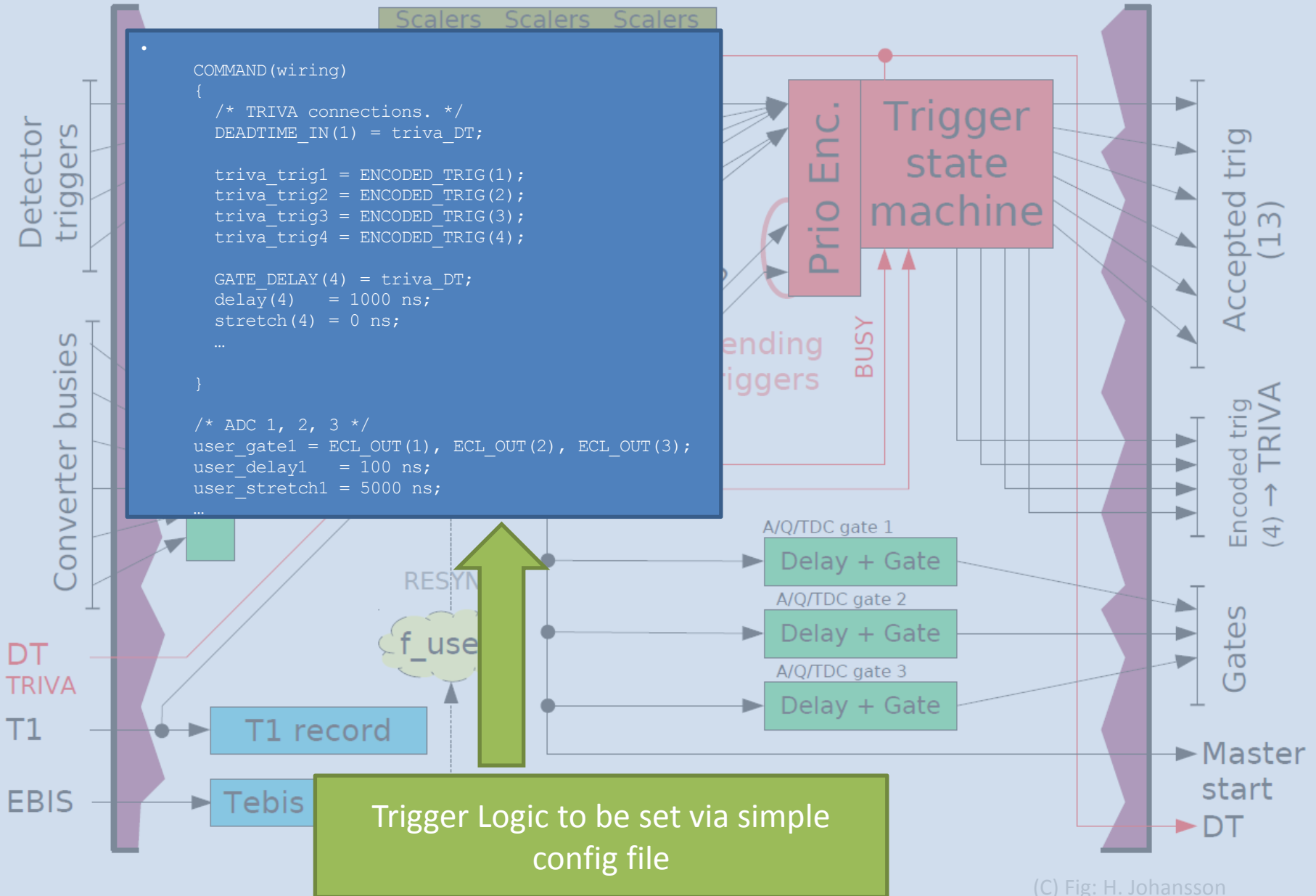
**VULOM** - VME Universal Logic Module (J. Hoffman et al.)

(C) Photo: GSI

# VULOM – VME Universal Logic Module



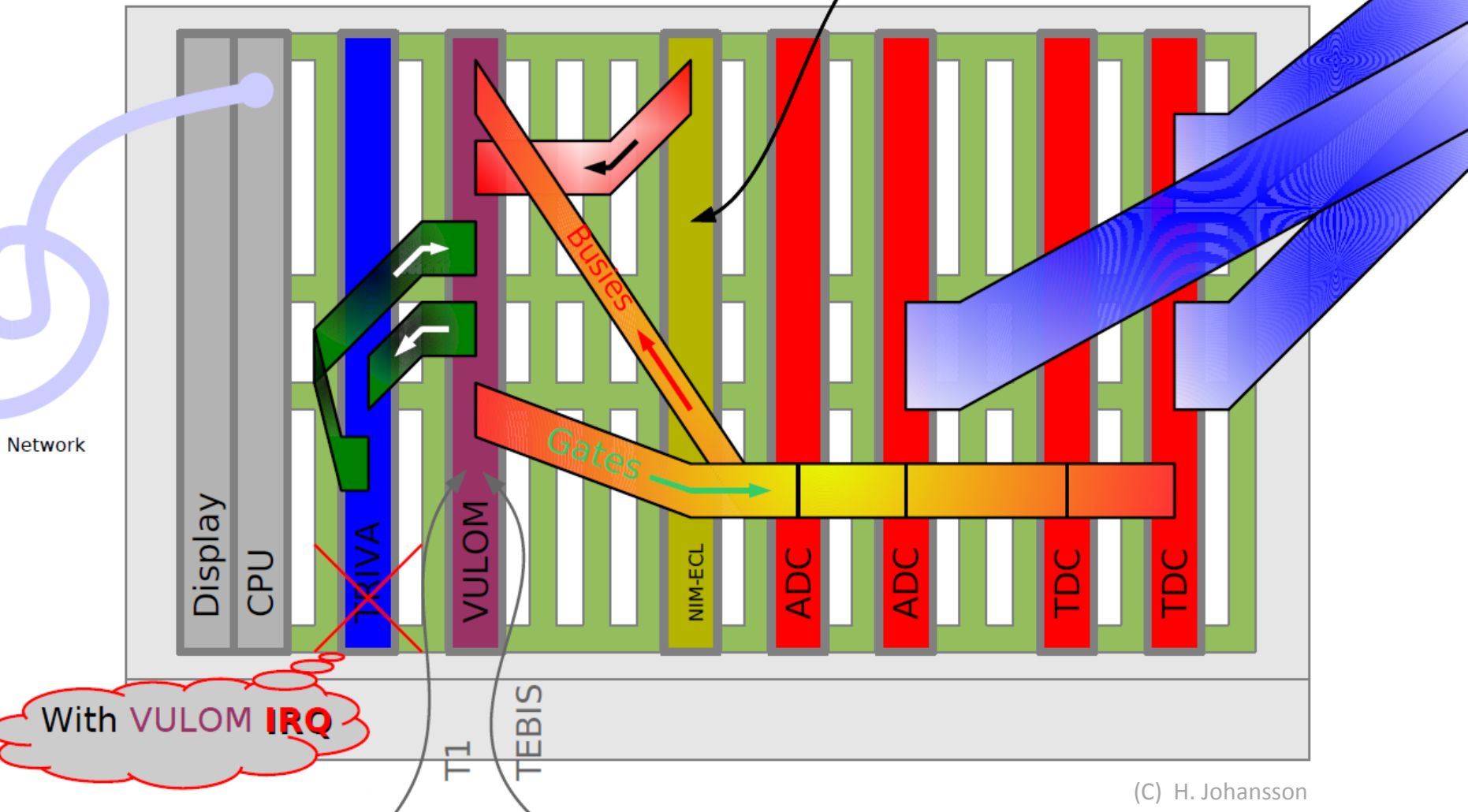
# VULOM – VME Universal Logic Module



# VULOM – VME Universal Logic Module

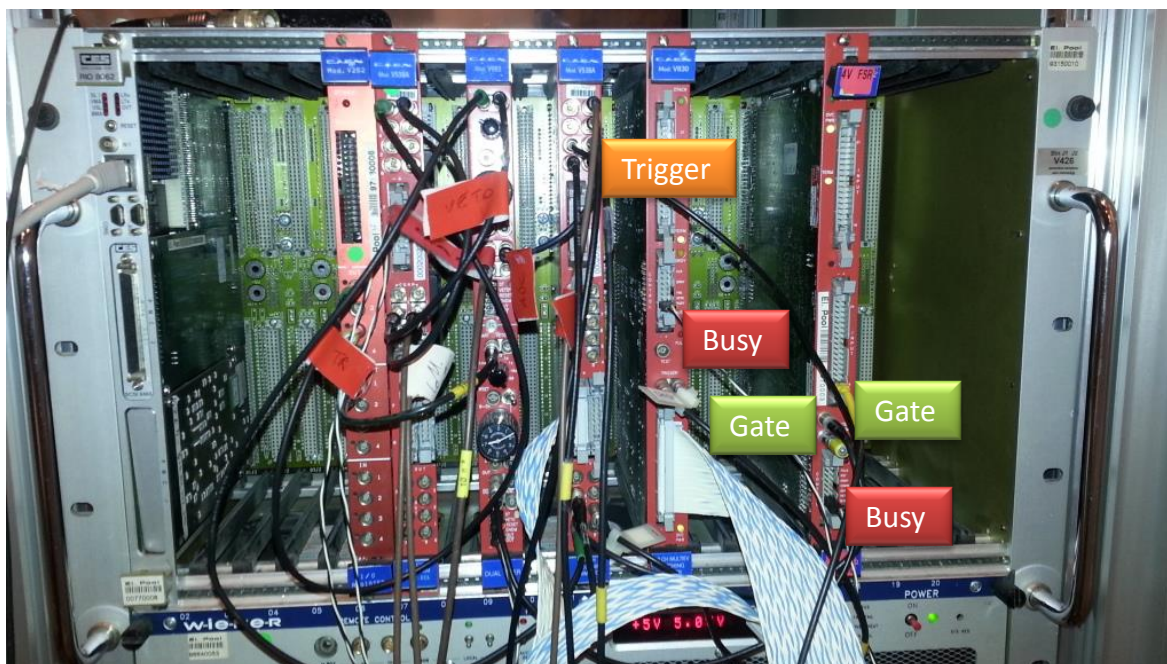
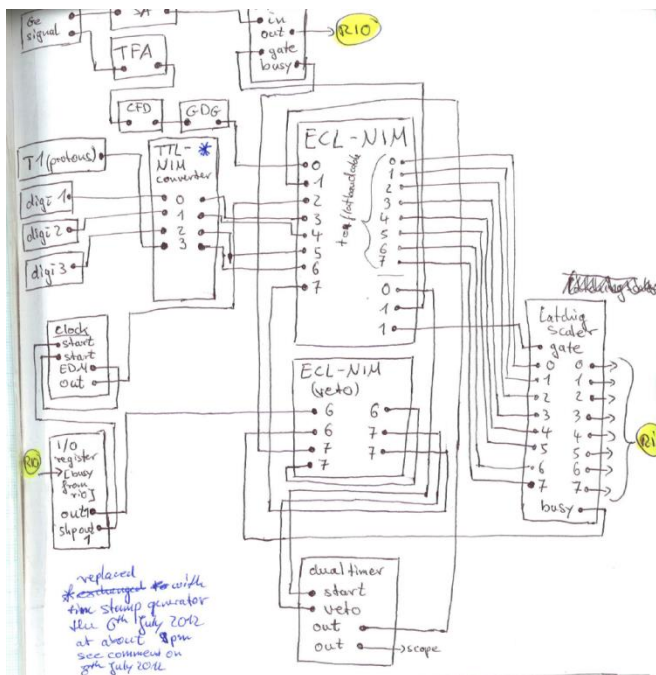
Triggers, accelerator markers,  
TRIVA interface, **gates** & **busies**

Detector triggers



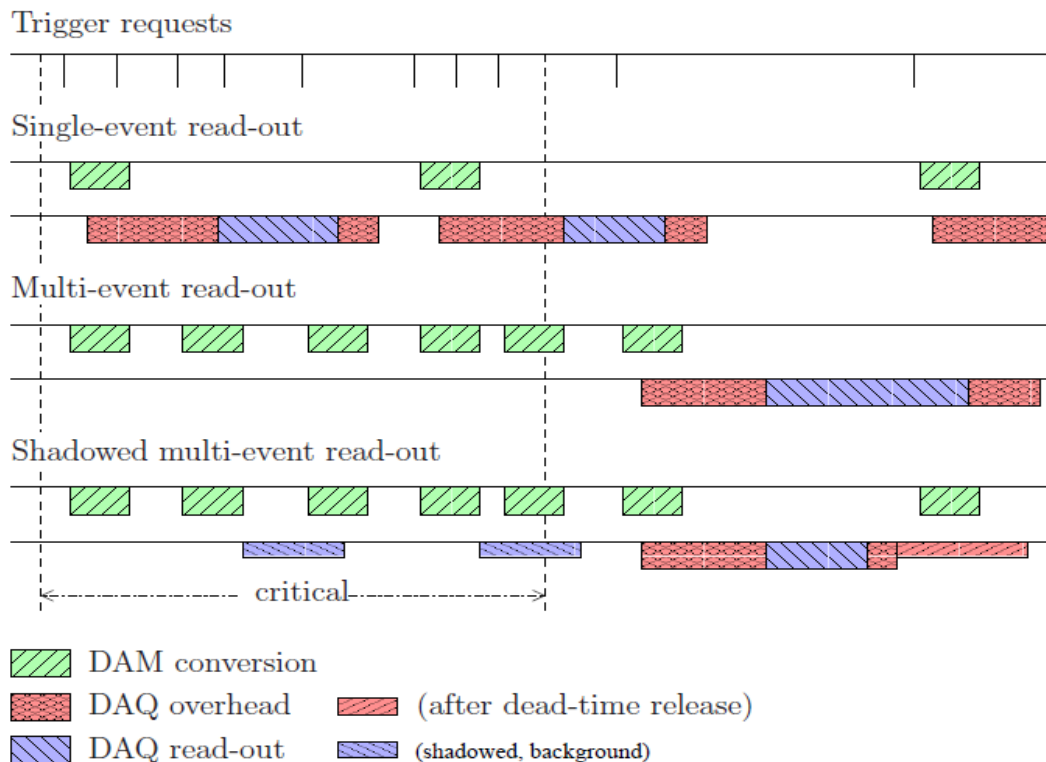
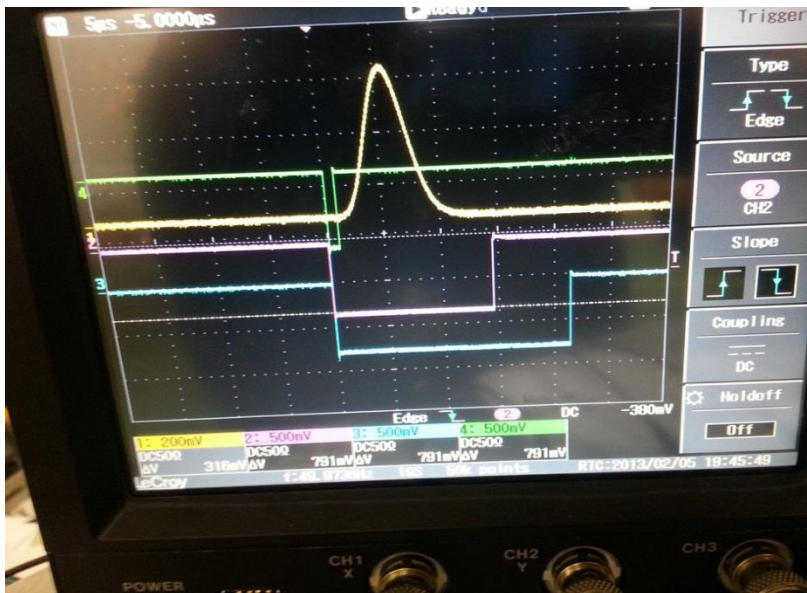
# ISOLDE DAQ systems - minidaq

- 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



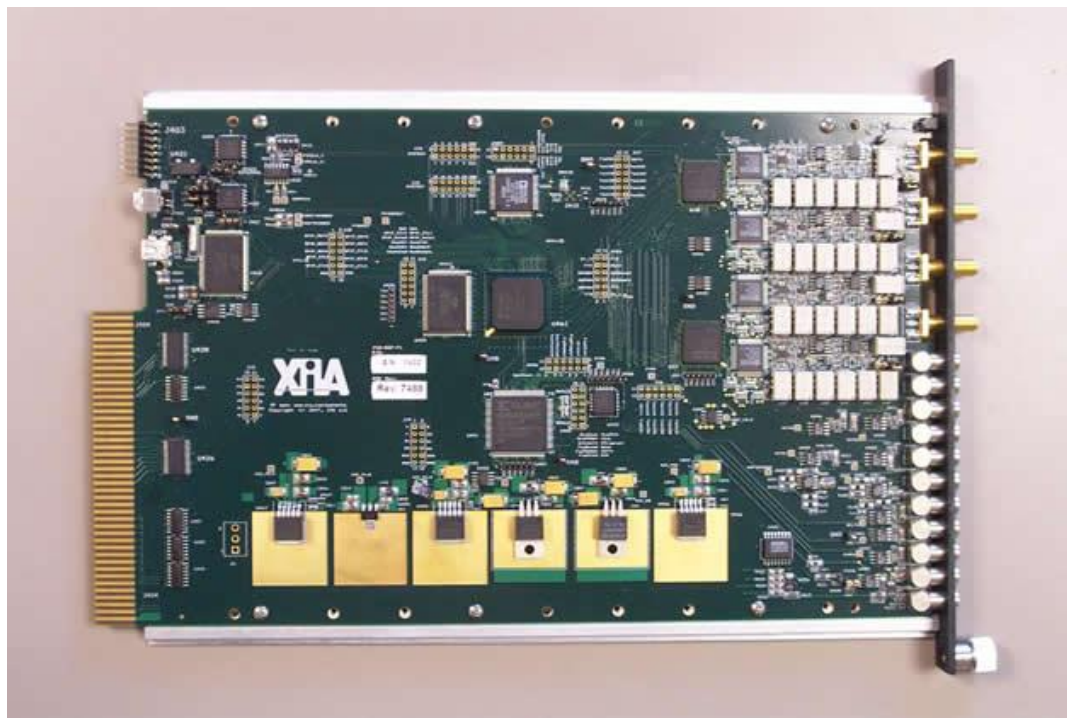
# Multi-event read-out for MBS

- 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 minidag can be run in multi-event read-out mode
- (VME bus: 1us/word)



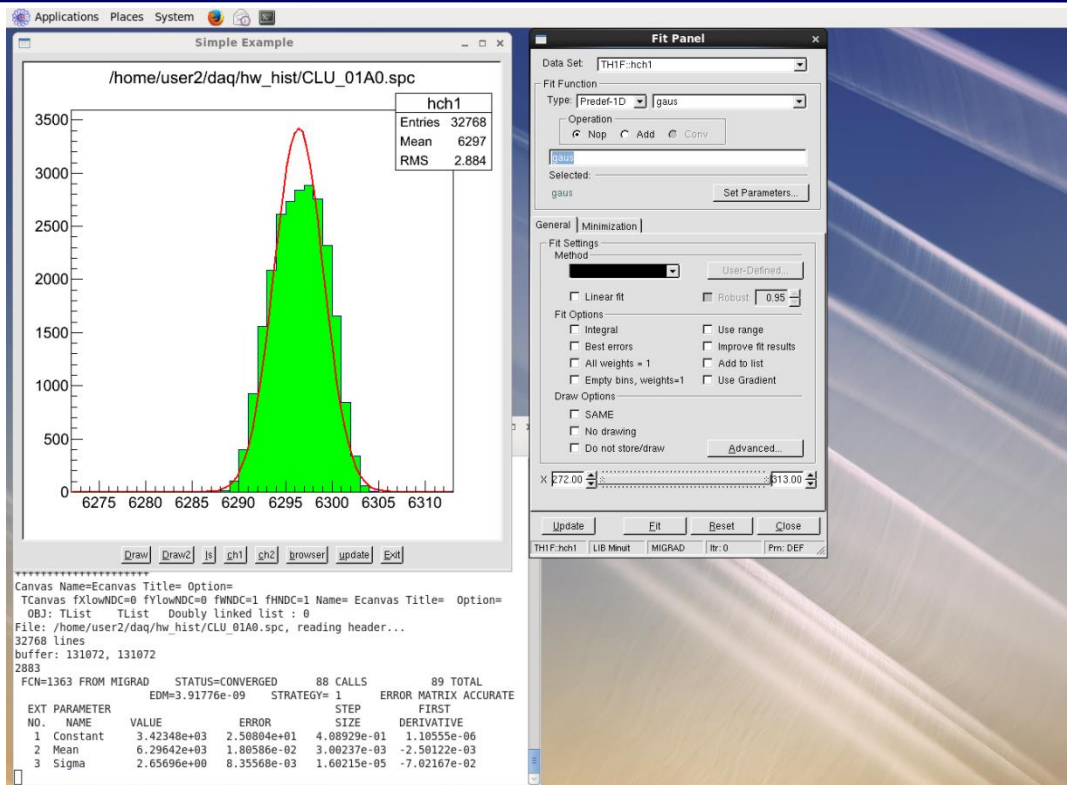


# DGF4C – DAQ system (digiDAQ)



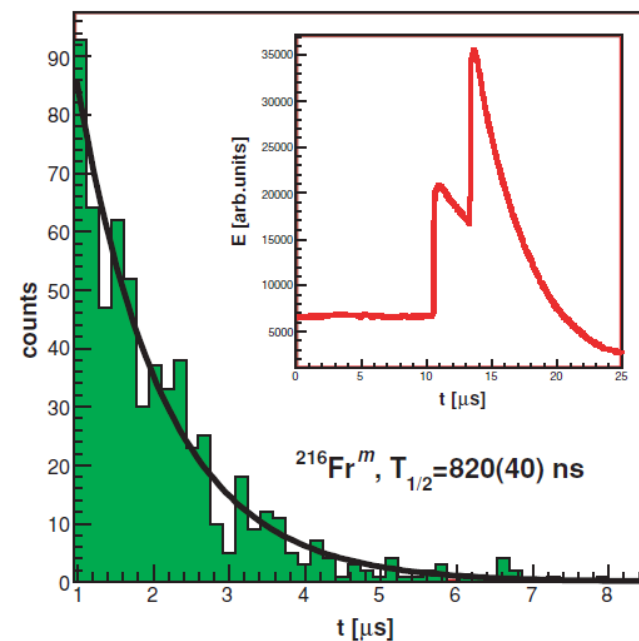
- Digital Gamma Finder (DGF) is a pulse processor with capabilities for measuring both energy and pulse shape
- Common clock distribution
- 40 MHz sampling rate (rev. D, E) → 80 MHz (rev. F). Upgrade presently being done.
- 12-bit (rev. D), 14-bit (rev. E) ADCs
- For >5 kHz significant dead-time in LMD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

# 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

Mon Sep 23, 5:09 PM

Go4 v4.5.2 @pcepisdaq3 - [Panel2: [Ecm\_vs\_angle]] (on pcepisdaq3)

File Edit Select Options

Apply to all  AutoScale

Name Info

- Workspace folder
- is526\_run001001... folder
- Histograms subdir
  - Raw data subdir
  - Calib data subdir
  - VME0 subdir
    - DeltaE... DeltaE-E\_Pside
    - DeltaE... DeltaE-E\_Nside
    - Pspec Pspec\_allstrips
    - Nspec Nspec\_allstrips
    - Etot\_no... Etot without gate
  - Gate subdir
    - DeltaE... DeltaE-E with p...
    - Etot\_WPG proton energy w...
    - Elab\_vs... proton energy - ...
    - Ecm\_vs... proton energy - ...
    - Ecm\_10... proton energy in...
    - Ecm\_1keV proton energy in...
  - hits subdir
    - Eventsize Event size[b]
  - Conditions subdir
  - Parameters subdir
  - DynamicLists subdir
  - Pictures subdir
  - Canvases subdir
  - UserObjects subdir

DeltaE-E\_Pside 17:05:43

DeltaE-E\_Nside 17:06:17

Pspec\_allstrips 17:06:08

Nspec\_allstrips 17:06:13

proton energy - scattering angle in lab 17:09:22

proton energy - scattering angle in CM 17:06:33

Date Time Description Type

Ready

# GO4 - View panel, IS526

Applications Places System Tue Sep 24, 2:38 PM

Go4 v4.5.4 @pcepisdaq6.cern.ch <Controller> - [Panel1] (on pcepisdaq6.cern.ch)

File Tools Analysis Settings Windows Help

2 s All items scatter No Errors Cartesian X: Lin Y: Lin Z: Lin

Browser

- Workspace folder
- Analysis Controller
- Histograms All Histogram obj...
- Raw data UserFolder
- Calib data UserFolder
- DeltaE... DeltaE-E\_Pside
- DeltaE... DeltaE-E\_Nside
- Pspec Pspec\_allstrips
- Nspec Nspec\_allstrips
- Etot\_n... Etot without gate
- VME0 UserFolder
- 00 UserFolder
- 01 UserFolder
- 02 UserFolder
- Gate UserFolder
- hits UserFolder
- DSSD... DSSD\_hits\_mat...
- DSSD... DSSD\_hits\_mat...
- DSSD... DSSD\_hits\_with...
- FrontP... FrontPvsPad\_ma...
- FrontN... FrontNvsPad\_m...
- FrontN... FrontNvsPad\_m...
- FrontP... FrontP\_hits\_mat...
- FrontP... FrontP\_hits\_with...
- FrontN... FrontN\_hits\_mat...
- FrontN... FrontN\_hits\_with...
- FrontN... Nside\_hits\_mat...
- FrontN... Nside\_hits\_with...
- Pad\_hi... Pad\_hits\_match-all
- Pad\_hi... Pad\_hits\_with\_p...
- FrontP... FrontP\_all-signal
- FrontN... FrontN\_all-signal
- Pad\_al... Pad\_all-signal
- Eventsize Event size[b]
- Conditions All Condition obje...
- Parameters All Parameter obje...
- DynamicLists Dynamic List Inst...
- Trees References to trees
- Pictures Picture objects
- Canvases All TCanvases
- EventObjects Event objects of ...
- UserObjects For User Objects

File Edit Select Options  Apply to all  AutoScale

Log window

Date	Time	Type	Description
24.09.13	14.27.01	Warning	End of event source TGo4MbsFile: /data/is512/is512_run00090019.lmd - -f evt: no more event file:/data/is512/is512_run00090019.lmd
24.09.13	14.27.01	Info	AnalysisClient UserClient-pcepisdaq6.cern.ch-17690 has STOPPED analysis processing.
24.09.13	14.26.04	Info	Analysis nameslist was requested from client current

/data/is512/is512\_run00090019.lmd ██████████ Current Ev/s: 11930 Average Ev/s: 59 s 708433 Events 2013-09-24 14:38:21

user2@pcepisdaq3... user2@pcepisdaq3... user2@pcepisdaq6... isolcdr@pcepisdaq5... c1 isolcdr@pcepisdaq5... user2@pcepisdaq3... [Go4 v4.5.2 @pcepi... user.h - emacs@pc... (on pcepisdaq6.cer...]

# GO4 – Dynamic list editor

## Adding histograms and conditions online from event data

The screenshot displays the Go4 v4.4.0 software interface. The main window is titled "Go4 v4.4.0 @lxg0523 <Controller name:MyAnalysis>". The interface is divided into several panels:

- Browser:** A tree view on the left showing the project structure. The "adHocHisto" folder is selected. A blue arrow labeled "Drag" points from the "fiCrate1[16]" object in the "EventSources" folder to the "Event data" tab in the Dynamic List Editor.
- Dynamic List Editor:** A central panel with the following settings:
  - Entry: TGo4HistogramEntry
  - enable Analysis/DynamicLists/AdHoc
  - Histogram: Analysis/Histograms/adHocHisto
  - Event data tab is active.
  - X-axis: UnpackEvent/fiCrate1[0]
  - Y-axis: (empty)
  - Z-axis: (empty)
- Panel1: [adHocHisto]:** A histogram plot on the right with the title "adHocHisto". The plot shows a distribution of event counts. The x-axis ranges from 0 to 1000, and the y-axis ranges from 0 to 12000. The histogram is filled with yellow.

The status bar at the bottom displays the following information:

- gauss
- 3442 (Current Ev/s)
- 34853 (Average Ev/s)
- 199 s
- 6968000 (Events)
- 2010-01-21 13:58

# GO4 – Fit panel

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

The screenshot displays the Go4 v4.4.0 software interface. The main window is titled "Go4 v4.4.0 @lxg0523 <2>". The menu bar includes "File", "Tools", "Analysis", "Settings", "Windows", and "Help". The toolbar contains various icons for file operations and analysis. The "Fit panel" is active, showing the "Fitter" tab. The "Name" field is "Fitter", and the "Minimizer" is set to "Peak finder". The "Model" is "Gauss9 of class: TGo4FitModelGaus". The "Data" field is "Data0". The "Models" list includes Gauss4 through Gauss11, with Gauss9 selected. The "Rebuild" button is visible. The "Table" shows the following parameters:

	Fixed	Value	Error	Epsilon
Ampl	<input type="checkbox"/> fix	92.8146	3.29964	
Pos	<input type="checkbox"/> fix	2717.64	0.787184	
Width	<input type="checkbox"/> fix	11.6812	0.668406	

The "Panel2: [hDeg120\_CND]. :DataModel" window shows a histogram plot of "hDeg120\_CND" with a red fit line. The plot title is "hDeg120\_CND 13:35:09 2009-12-08 histograms.root/hDeg120\_CND". The y-axis ranges from 100 to 600, and the x-axis ranges from 2000 to 3400. The plot shows a black histogram and a red fit line. A legend in the top right corner identifies the black line as "histograms.root/hDeg120\_CND" and the red line as "Model".

(C) Joern Adamczewski

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

# Minidaq – online GUI Go4

The screenshot displays the Minidaq online GUI Go4 interface. The main window, titled "Go4 v4.5.2 @pcepisdaq3 <Controller> - [Panel2: [Ge\_E0]] (on pcepisdaq3)", shows a histogram of Ge\_E0 data. The x-axis is labeled "keV" and ranges from 0 to 2200. The y-axis ranges from 0 to 25000. Two prominent peaks are visible at approximately 1200 keV and 1400 keV. A statistics table for Ge\_E0 is shown in the top right corner of the plot area:

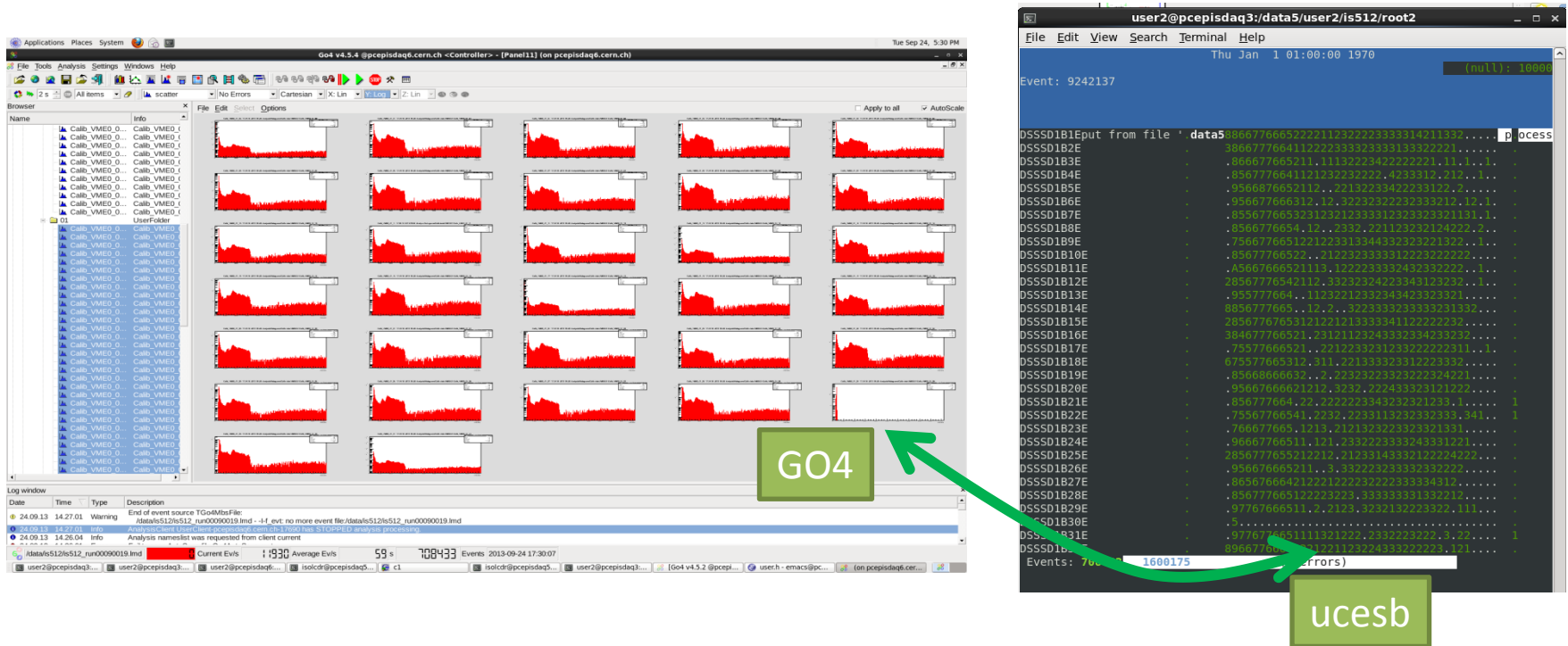
Ge_E0	
Entries	1102548
Mean	642.6
RMS	415
Underflow	2
Overflow	0
Integral	1.096e+06
Skewness	0.3289

The interface includes a file browser on the left showing a directory tree with folders like MON, Ge, Ge\_E, Ge\_E0, Ge\_E1, Events, Conditions, Parameters, DynamicLists, Pictures, Canvases, UserObjects, Trees, EventObjects, EventStores, EventSources, EventProce..., and Events. The status bar at the bottom shows the current event rate: "Current Ev/s: 20, Average Ev/s: 33, 4006 Events, 2013-09-23 16:31:55".

# 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), EBYPDATA (Daresbury MIDAS), PAX(KVI), HADES...
- Data structures → (parser) → C++ code (can handle any type of data)
- Simple but effective on-line data monitoring

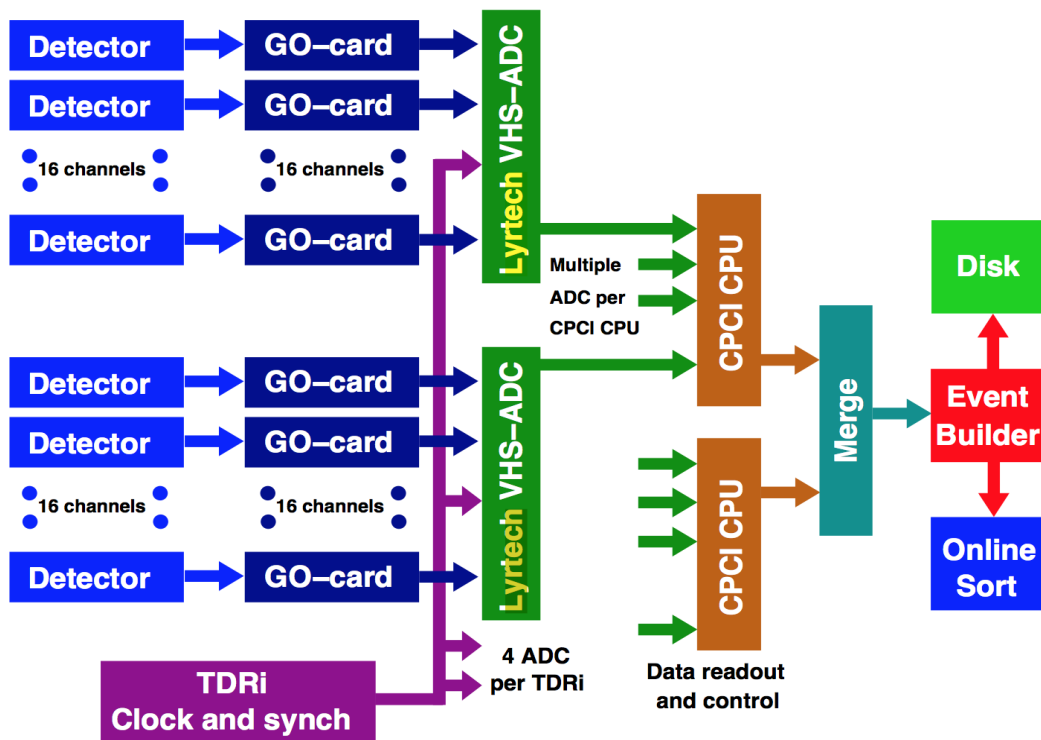
```
[pcepisdaq3] /data5/user2/is512/root2 > ~/is512_unp/is512 is512_run00090019.lmd --watcher=DSSSD1B*E
```





# 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  $\sim 30\text{kHz/ch}$  (DC beam)



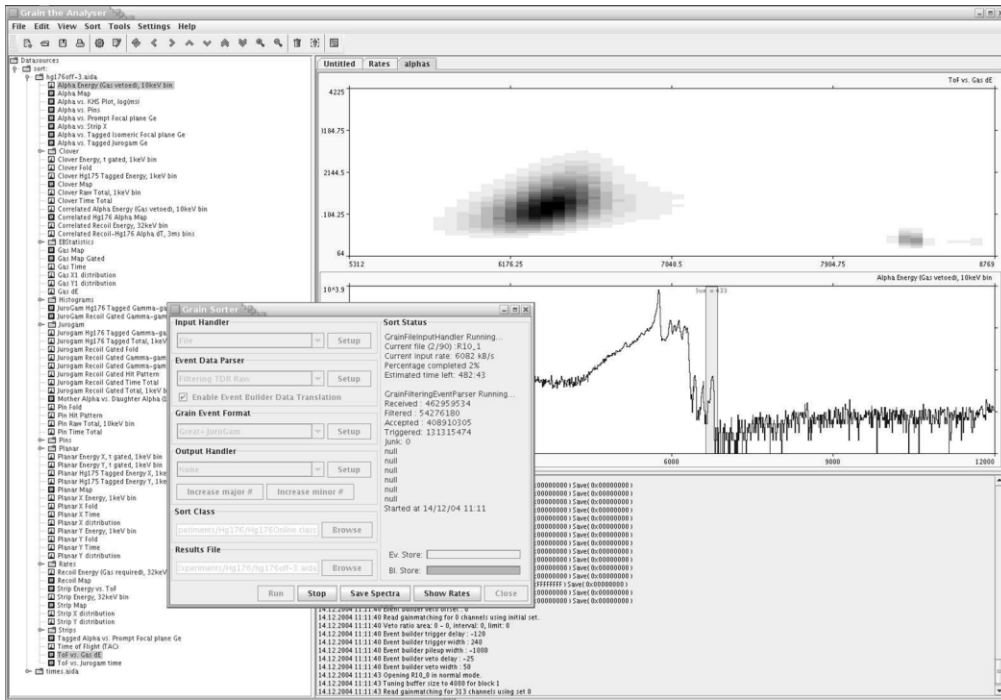
# TDR - DAQ for IDS



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



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

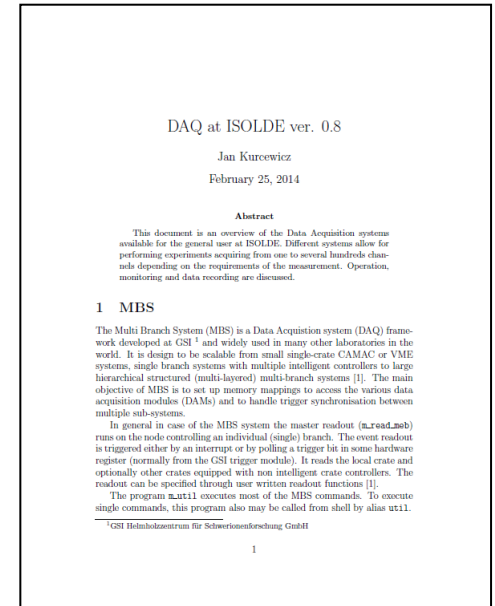
# Summary

## 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)

## Statistics for 2012:

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



[/afs/cern.ch/user/j/jkurewicz/public/doc/daq\\_isolde.pdf](/afs/cern.ch/user/j/jkurewicz/public/doc/daq_isolde.pdf)

# Acknowledgment

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