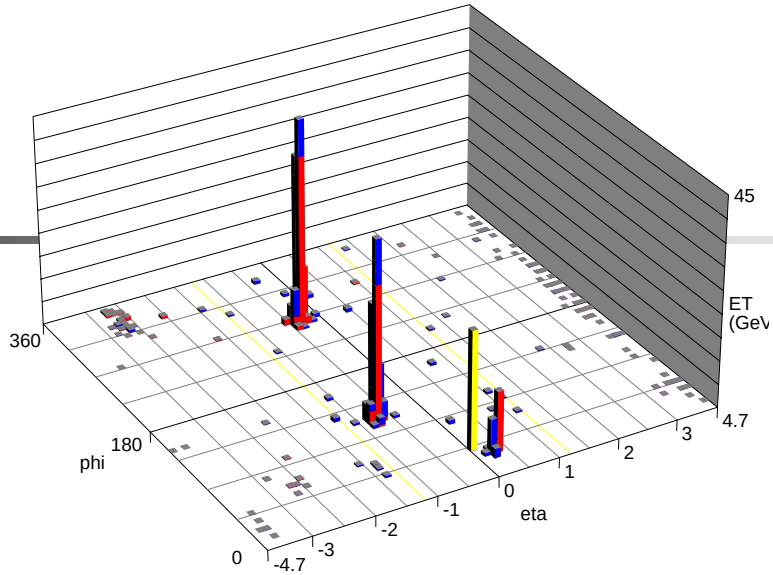


DAQ Tutorial (Calorimeter)

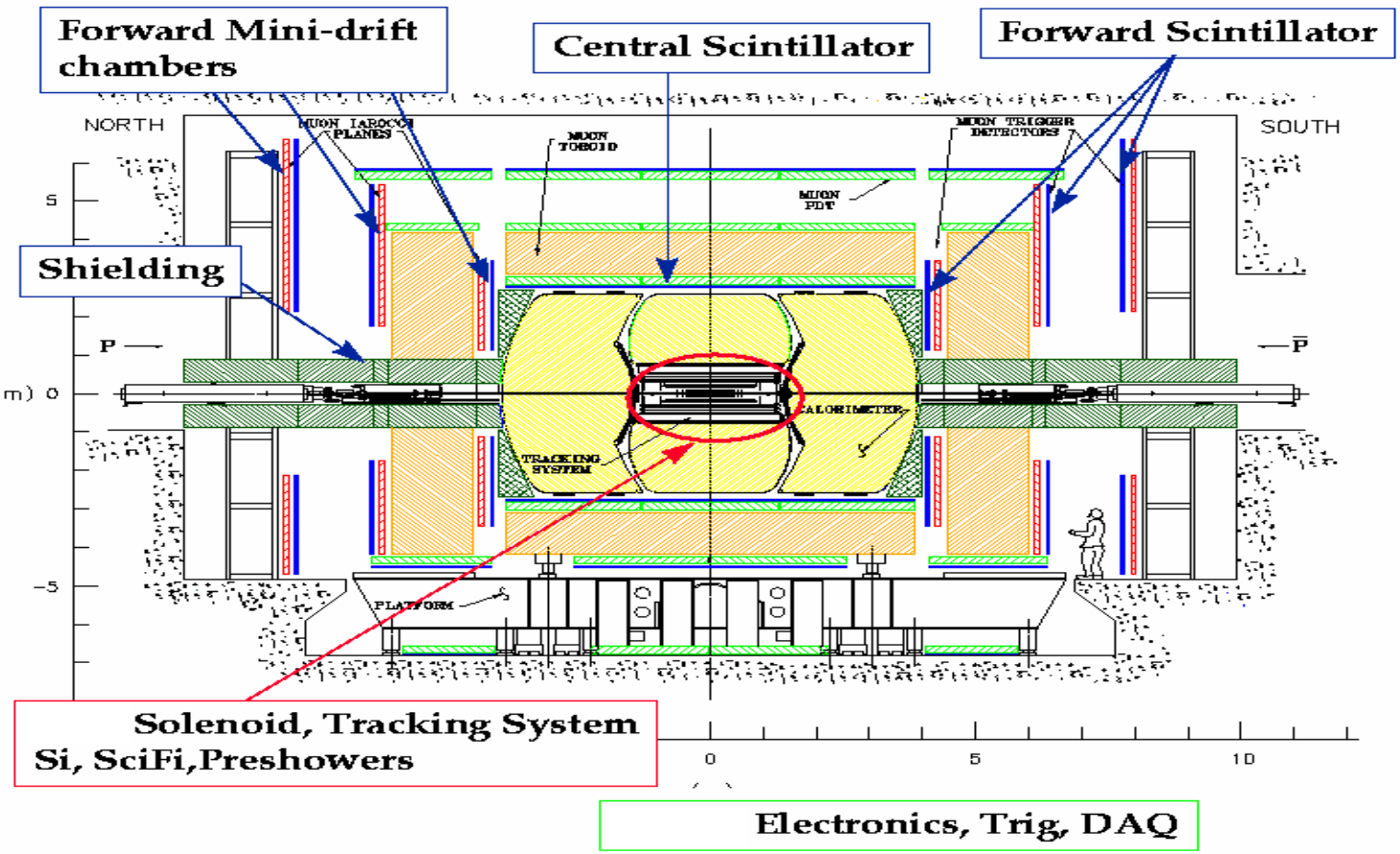
Norm Buchanan

May 17, 2005

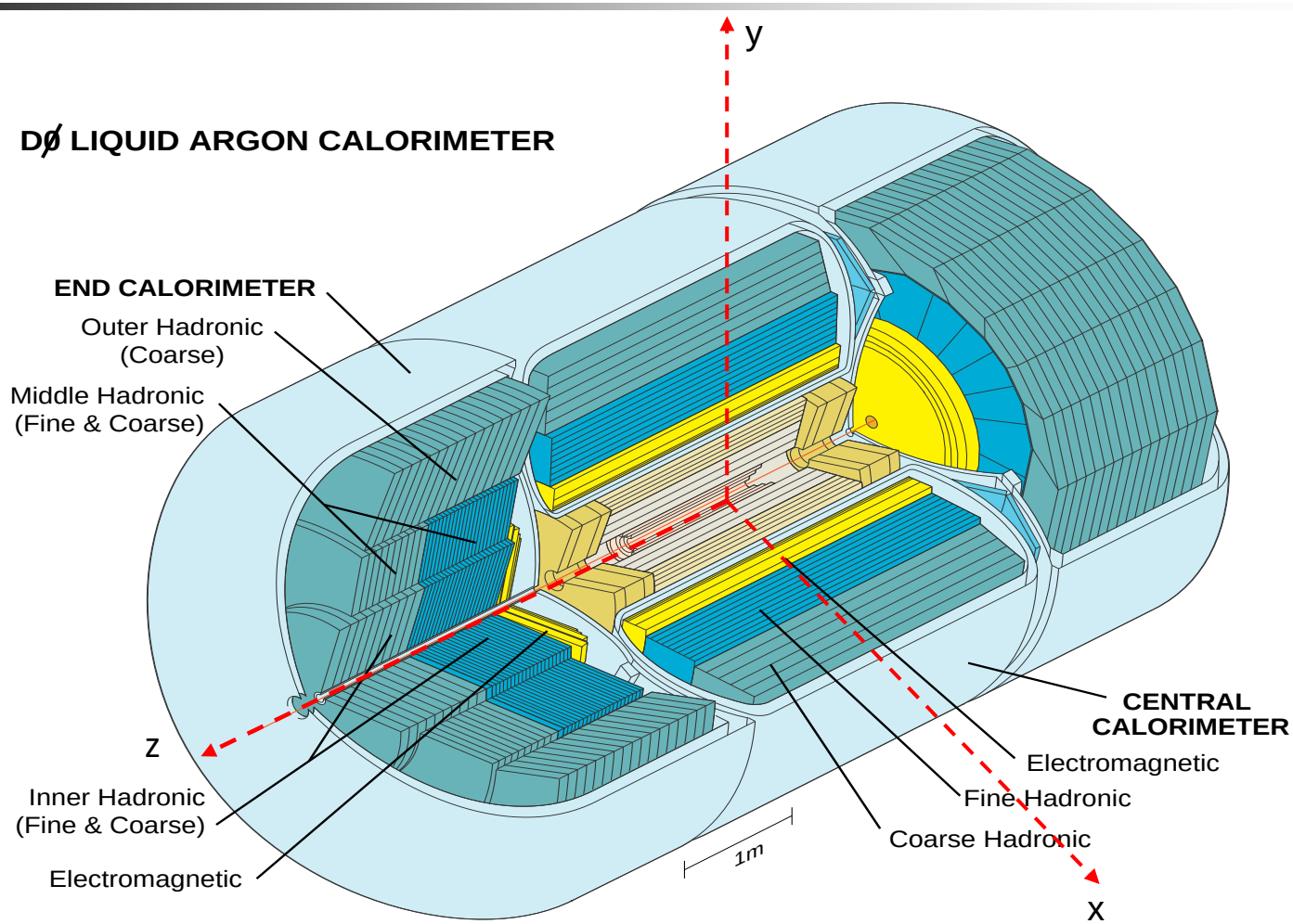
Outline

- Calorimeter Overview
- Shifter Tasks
- GUI Descriptions
- To do during store
- To do between stores

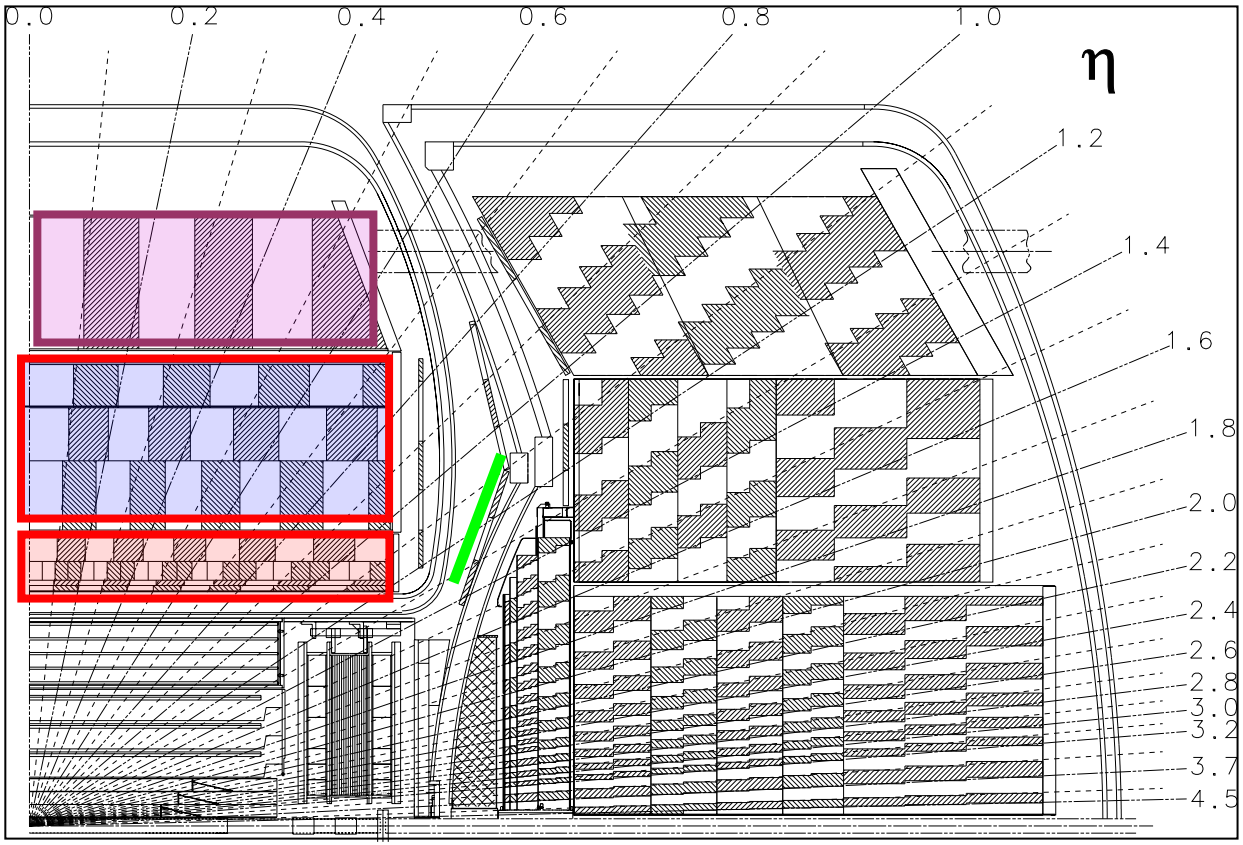
D0 Detector


Forward Mini-drift chambers
Central Scintillator
Forward Scintillator
Shielding
Solenoid, Tracking System
Si, SciFi,Preshowers
Electronics, Trig, DAQ
NORTH
SOUTH
MUON IARocci PLANES
MUON TOROID
MUON PDT
MUON TRIGGER DETECTORS
CALORIMETER
TRACKING SYSTEM
PLATFORM
P
$\bar{P}$
5
0
-5
0
5
10

Calorimeter Overview



Overview cont...



Liquid Argon

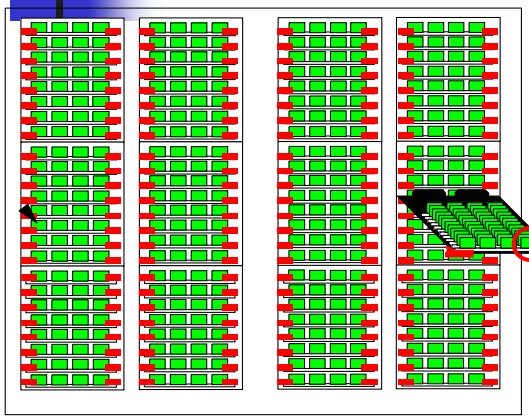
- Electromagnetic
- Fine hadronic
- Coarse hadronic

Scintillating

- Inter-cryostat detector

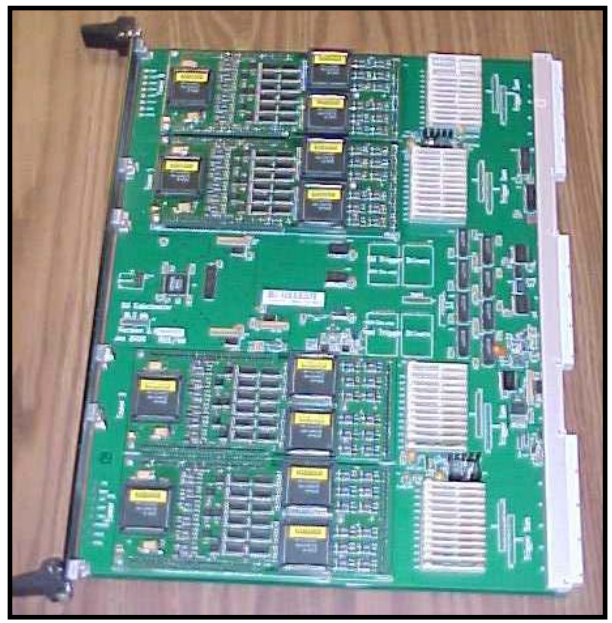
~55,000 readout channels

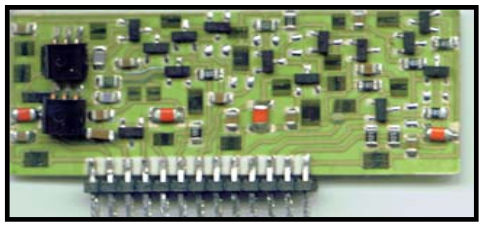
Precision Readout



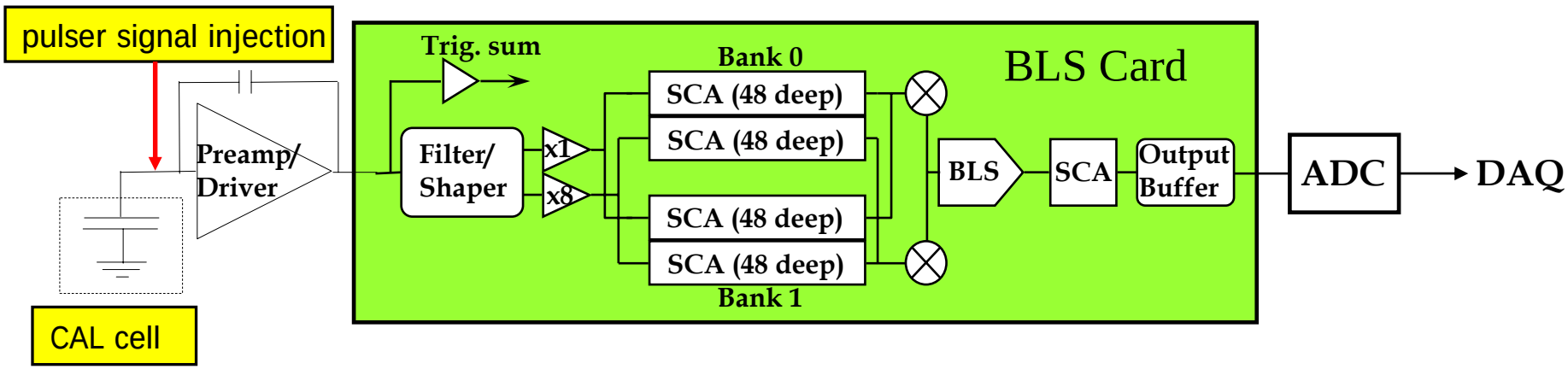
preamp crates

BLS card

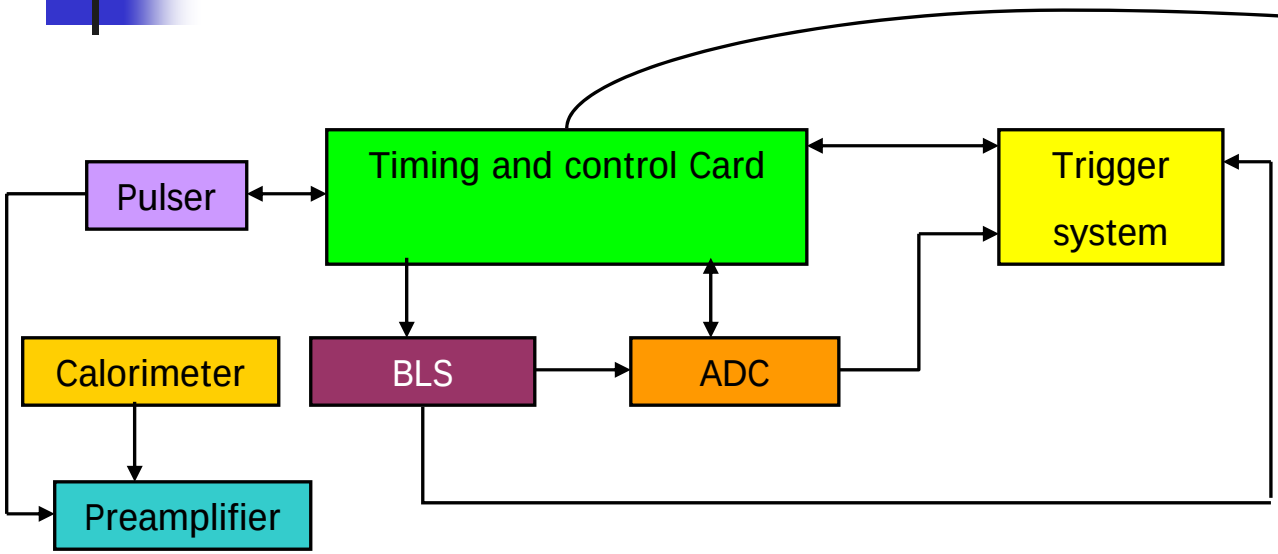


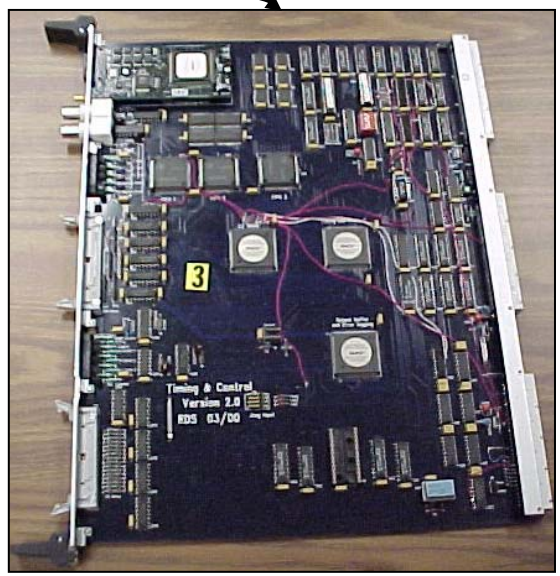


preamp



Control of System





12 T&C boards and 1 controller board is used

Receives trigger, accelerator, clock information

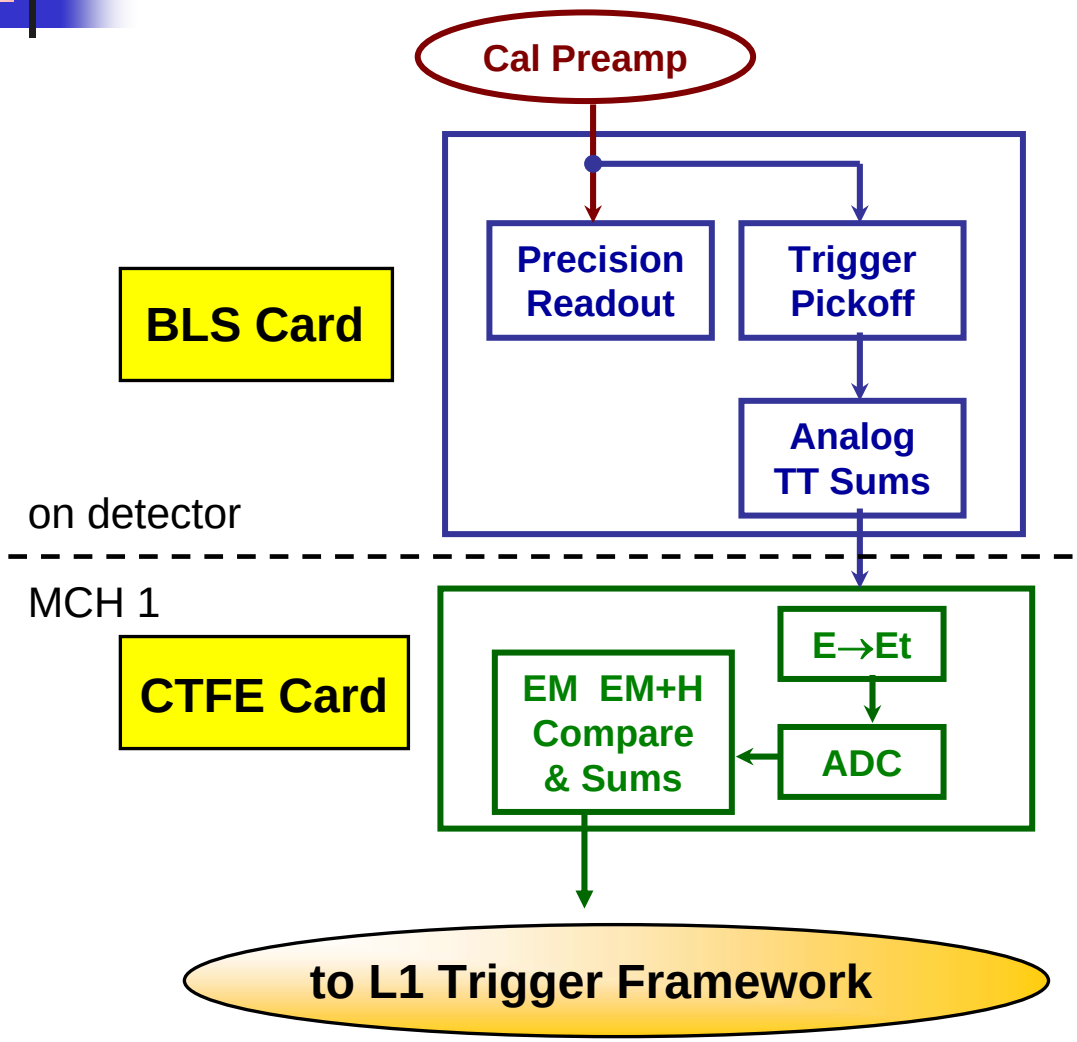
Samples BLS shapers at the signal peak and base.

Keeps track of the memory location of crossings.

Generates busy signal when system is not ready.

Coordinates pulser calibration.

L1 Calorimeter Trigger

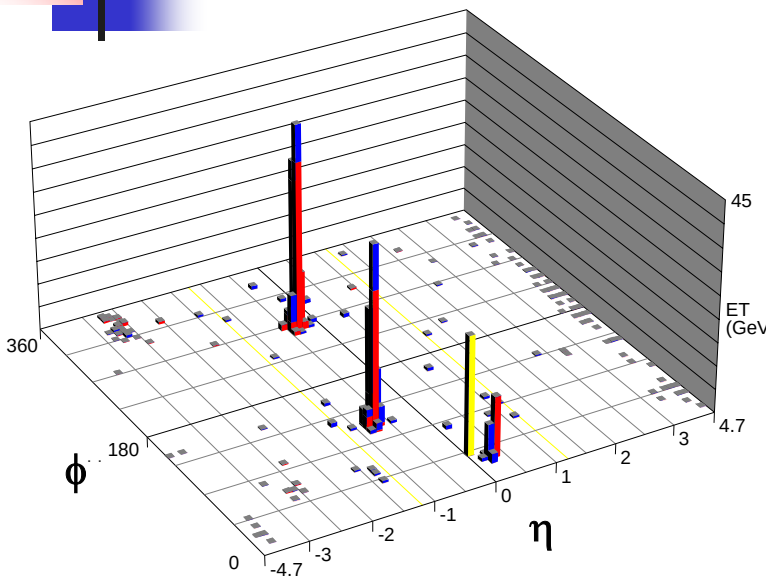


40 x 32 Trigger Towers
0.2 x 0.2 in $\Delta\eta$ x $\Delta\phi$

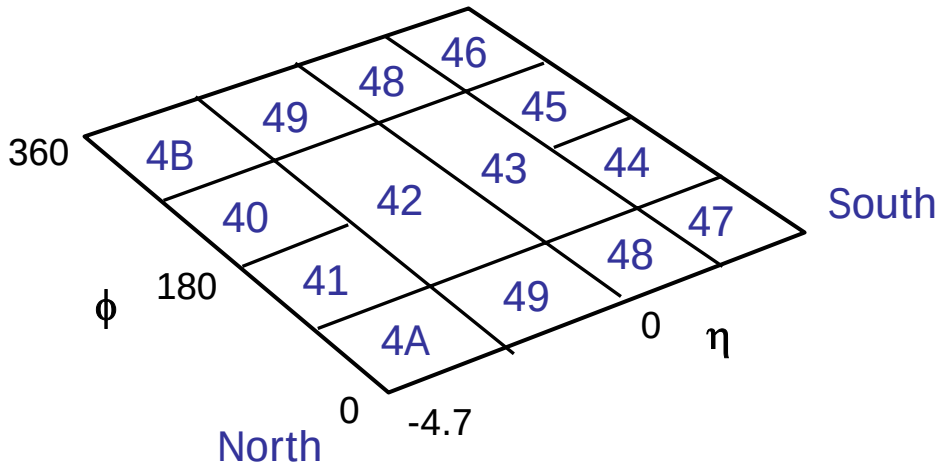
2560 differential analog Trigger pickoff signals

1280 EM samples
1280 HD samples

How is it all related?



Physics display



Level 3 readout crate

Cathedral

Preamps (and PSs)

1 Crate per ADC crate

2 PS per crate (1 + backup)

Platform

BLS cards (and PSs)

6 Crates per ADC crate

1 PS per 2 BLS crates

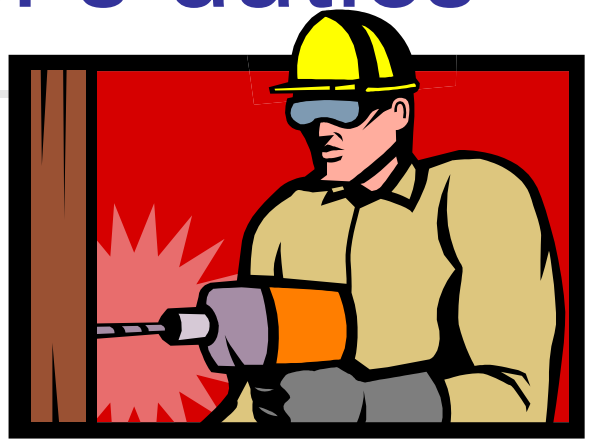
MCH 3

ADC cards (and PSs)

12 Crates

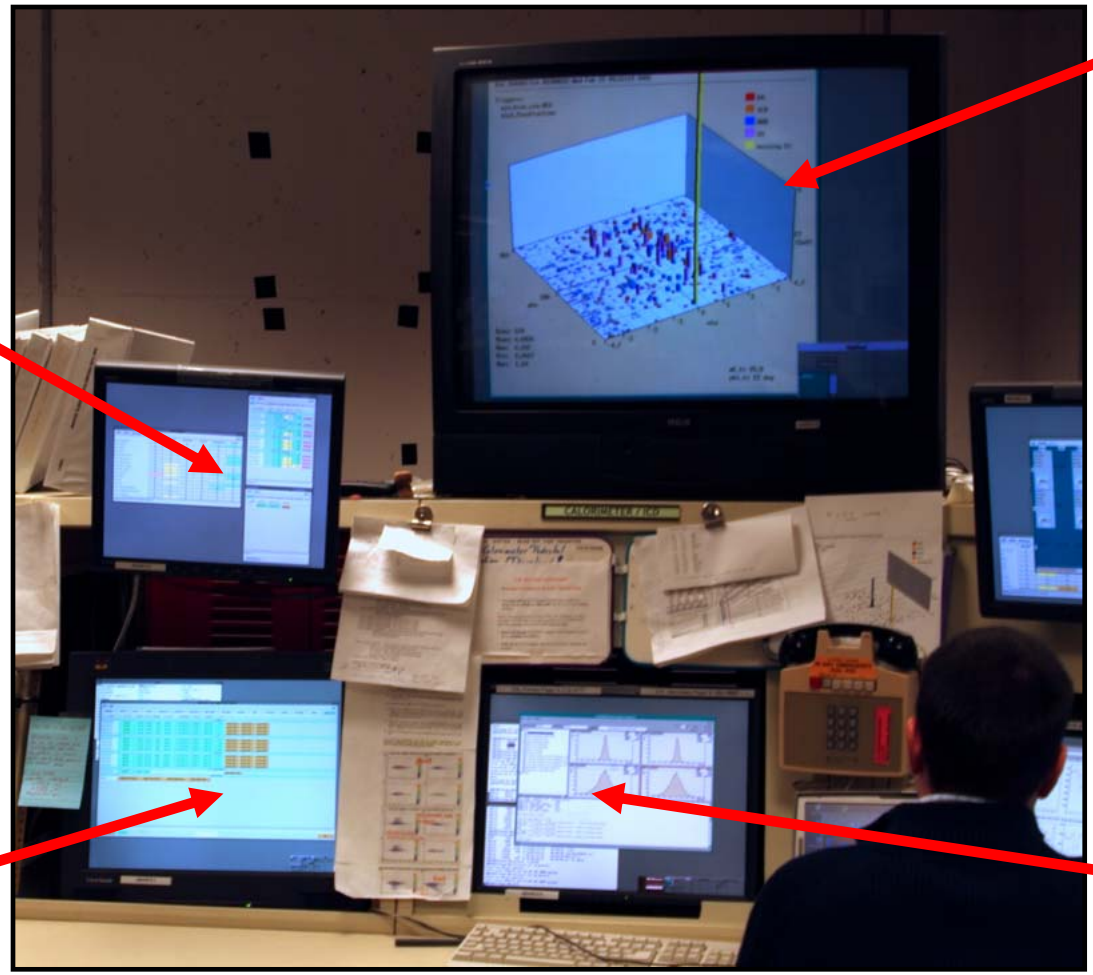
1 PS per 2 ADC crates

CALMUO Shifter's duties



- Be familiar with the console
- Run and watch the examines
  - Cal data quality
  - L1 CAL examine
- Make sure all GUIs are opened
  - Supply GUI, alarm display, taker, logbook etc…
- Look for alarms or unusual conditions (pink=trouble)
- Use the logbook
  - fill out the end of run summary and paste plots
  - note anything out of the ordinary (such as calling expert)
- Take pedestal calibration runs between stores
- Assist expert with taking NLC calibrations

Calorimeter Console



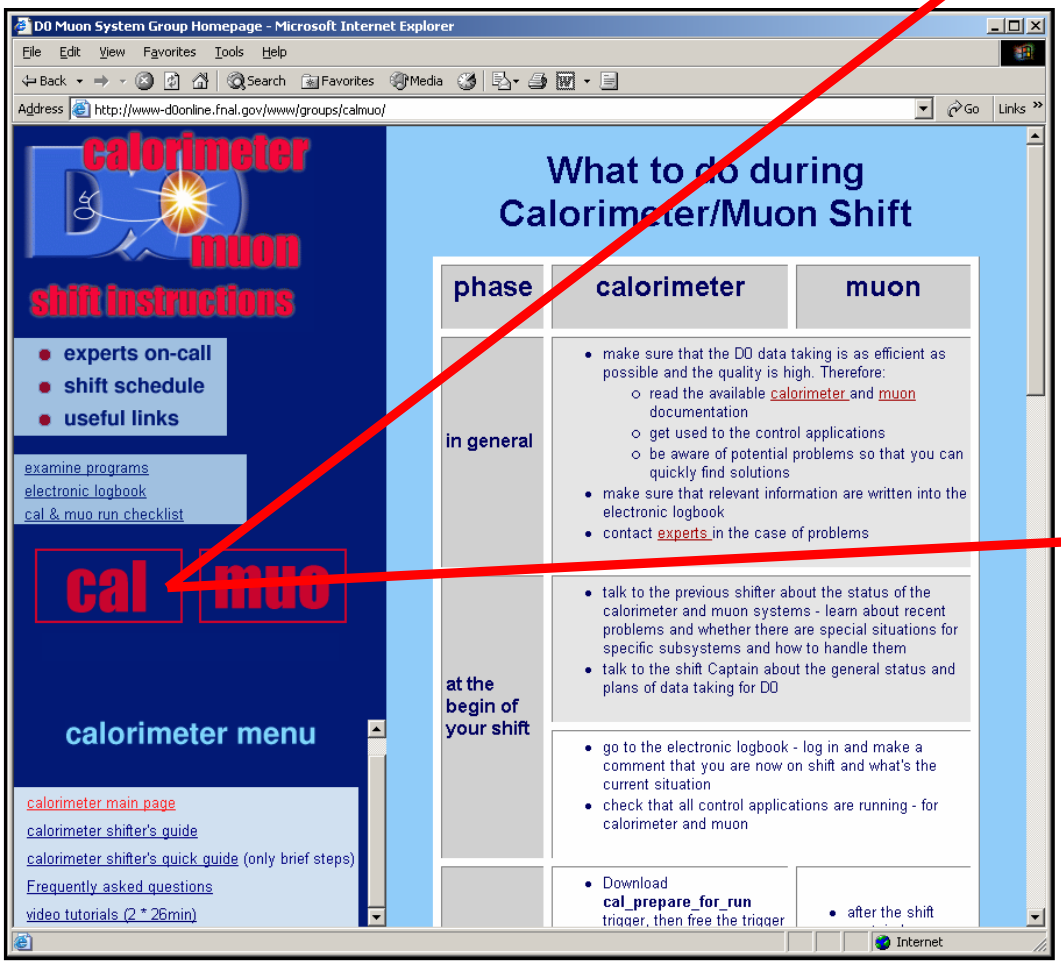
Lego plot
$E_T(\eta,\phi)$

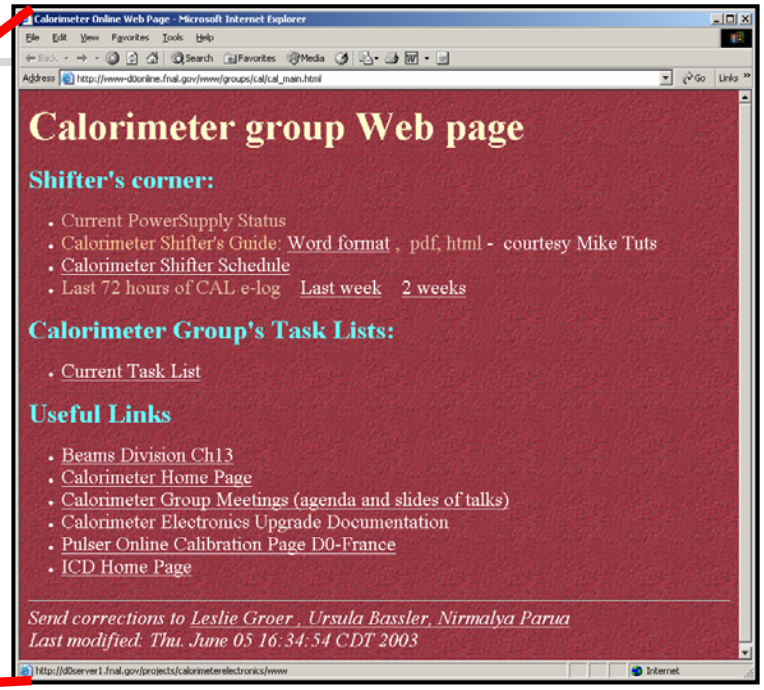
Alarms/Status

Cal utilities

Examines
and taker

CALMUO Web Page





- **Shifter's guide**
- **On-call contacts**
- **Shift schedule**
- **Useful links**

start_cal

A script that properly starts cal utilities

What you need to know

- start_cal all (starts all standard GUIs)
- start_cal (lists all possible arguments, when in doubt use this)

Some useful commands

- start_cal supply (starts Supply GUI)
- start_cal alarm (starts alarm watcher)
- start_cal hv (starts high voltage GUI)
- start_cal D0run (change to d0run user)
- start_cal rmi (starts rack monitor GUI)
- start_cal ioc (starts IOC monitoring)
- start_cal dq_calo
- start_cal dq_monitor (cal examine)
- start_cal l1examine_d0ol23
- start_cal l1examine (l1cal examine)
- start_cal calib (calibration GUI)

GUIs – Alarms

"start_cal alarm"

File View Settings Help

	MAJOR	MINOR	INVALID	ACKED	DISABLED	GOOD
CAL Preamp	0	4	0	0	0	8
CAL BLS N	0	0	0	0	0	0
CAL BLS C	0	0	0	0	0	0
CAL BLS S	0	0	0	0	0	1
CAL BLS BCK N	0	0	0	0	0	1
CAL BLS BCK C	0	0	0	0	0	0
CAL BLS BCK S	0	1	0	0	0	0
CAL ADC Temp	0	4	0	0	1	0
CAL PA Temp	0	4	0	0	8	1
CAL Fanout	0	0	0	0	0	19
CAL ADC	0	0	0	0	0	0
Pulser	0	1	0	0	1	3
CAL HV	0	2	0	0	50	0
CAL MCH Protection	0	0	0	0	0	0
CAL Platform Protection	0	0	0	0	0	0
CAL Controls	0	9	0	0	0	0

Status: Connection to server opened

CAL HV :Disabled Alarms

CALC_HVC_17C/VOLT
CALC_HVC_45C/VOLT
CALC_HVC_LAR0/STATE
CALC_HVC_LAR0/VOLT
CALC_HVC_LAR1/STATE
CALC_HVC_LAR1/VOLT
CALC_HVC_LAR2/STATE
CALC_HVC_LAR2/VOLT
CALC_HVC_LAR3/STATE
CALC_HVC_LAR3/VOLT
CALC_HVC_LAR4/STATE
CALC_HVC_LAR4/VOLT
CALC_HVC_LAR5/STATE
CALC_HVC_LAR5/VOLT
CALC_HVC_LAR6/STATE
CALC_HVC_LAR6/VOLT
CALC_HVC_LAR7/STATE
CALC_HVC_LAR7/VOLT
CALN_HVC_LAR0/STATE
CALN_HVC_LAR0/VOLT
CALN_HVC_LAR1/STATE
CALN_HVC_LAR1/VOLT
CALN_HVC_LAR2/STATE
CALN_HVC_LAR2/VOLT

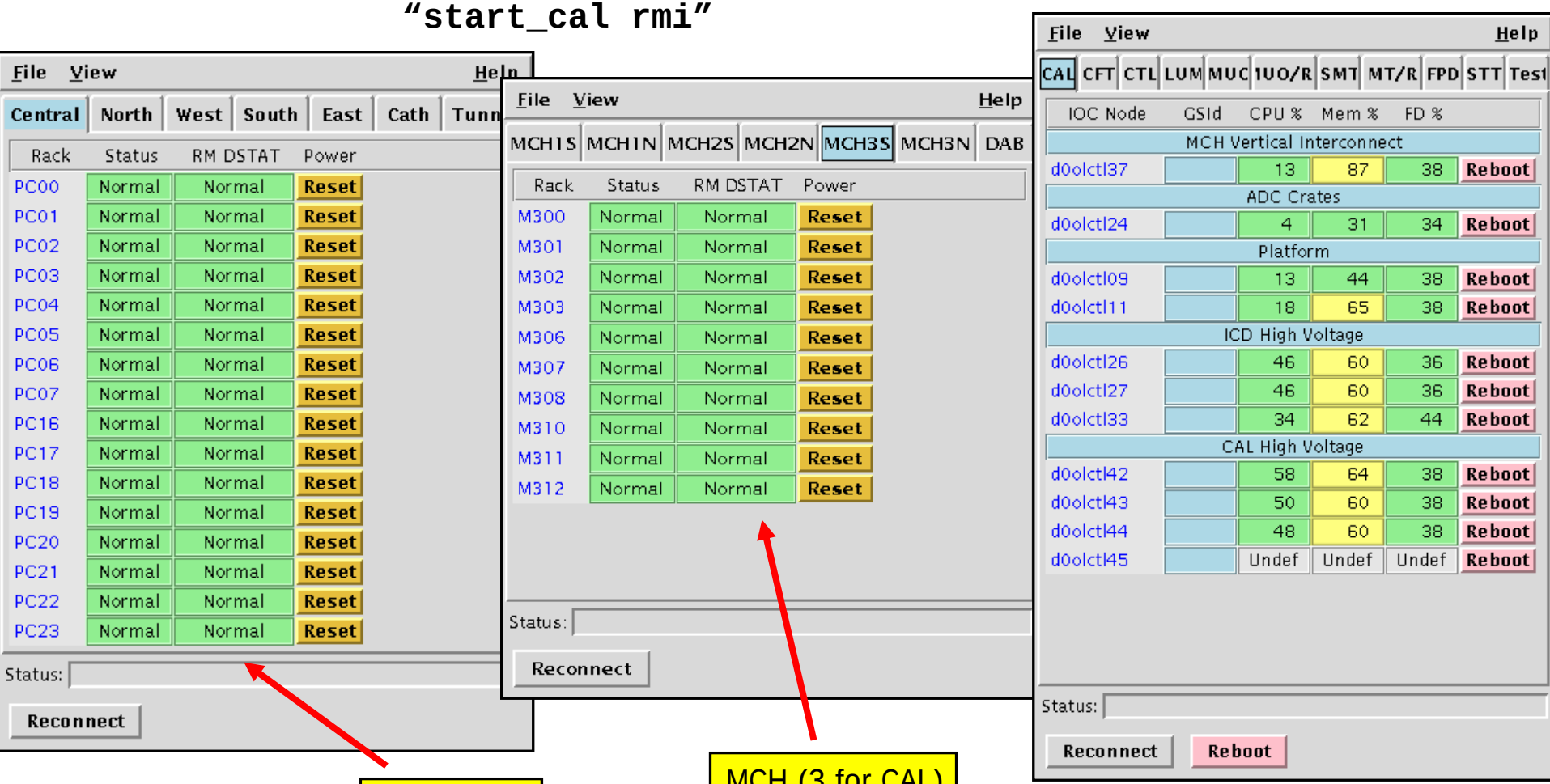
SHOW
GUIDANCE
CONTROL
ENABLE
ENABLE ALL
CLOSE

- Watch out for pink (major) alarms
- Check that disabled are "known" – disabled list

General Monitoring

"start_cal rmi"

"start_cal ioc"



Supply GUI

"start_cal supply"

File View Help

Preamp | BLS N | BLS C | BLS S | BLS BCK N | BLS BCK C | BLS BCK S | ADC Temp | PA Temp | Fanout | ADC | LAr Temp | Pulser | PLS Mode | Mode | Mode Shift

Device	+12VA V	+12VA I	+12VB V	+12VB I	+8VC V	+8VC I	+8VD V	+8VD I	+8VE V	+8VE I	+8VF V	+8VF I	-6VG V	-6VG I	-6VH V	-6VH I	Vic Tmp	Shn Tmp	Mag F	D1 Tmp	D2 Tmp	STAT	RM			
EC North																										
CALN_LVCP_PA00P	12.37	16.37	12.37	16.10	8.36	17.86	8.35	17.69	8.34	15.83	8.39	16.03	-6.28	23.52	-6.25	23.67	29.74	31.40	-10.01	38.57	29.79	0x3	0x0	On	Off	Reset
CALN_LVCP_PA00S	12.34	-0.48	12.35	0.33	8.30	0.18	8.29	0.48	8.30	-0.23	8.33	0.06	-6.19	0.16	-6.15	-0.16	17.92	13.43	1.71	9.28	15.14	0x2	0x0	On	Off	Reset
CALN_LVCP_PA01P	12.40	15.98	12.39	16.69	8.38	17.74	8.19	17.25	8.21	15.59	8.34	15.82	-6.23	23.47	-6.24	23.16	31.69	35.11	-9.03	30.76	33.69	0x3	0x0	On	Off	Reset
CALN_LVCP_PA01S	12.30	0.11	12.35	0.13	8.33	0.31	8.10	0.40	8.13	0.38	8.30	-0.06	-6.13	0.18	-6.13	0.10	18.31	16.06	-6.10	11.23	7.32	0x2	0x0	On	Off	Reset
CALN_LVCP_PA10P	12.59	16.33	12.44	16.43	8.39	17.75	8.43	17.75	8.47	16.38	8.32	16.11	-6.27	23.61	-6.28	23.28	34.38	39.16	-20.02	42.97	36.13	0x3	0x0	On	Off	Reset
CALN_LVCP_PA10S	12.48	0.28	12.28	-0.04	8.22	-0.13	8.31	-0.23	8.33	-0.11	8.23	0.40	-6.18	-0.09	-6.14	-0.43	18.60	18.21	-1.22	10.25	12.21	0x2	0x0	On	Off	Reset
CALN_LVCP_PA11P	12.31	16.50	12.49	16.35	8.45	17.85	8.44	18.09	8.49	16.33	8.37	16.06	-6.26	23.49	-6.26	23.46	33.69	33.69	-4.39	38.09	34.18	0x3	0x0	On	Off	Reset
CALN_LVCP_PA11S	12.17	0.04	12.57	0.21	8.27	-0.23	8.30	-0.06	8.34	0.28	8.24	-0.01	-6.12	-0.18	-6.13	0.16	17.53	18.70	-0.24	8.30	10.25	0x2	0x0	On	Off	Reset
CC																										
CALC_LVCP_PA02P	12.35	16.49	12.36	16.63	8.25	17.21	8.18	16.54	8.29	17.02	8.12	17.07	-6.24	23.12	-6.14	23.38	34.47	36.43	-11.23	34.18	38.09	0x3	0x0	On	Off	Reset
CALC_LVCP_PA02S	12.23	0.31	12.51	-0.09	8.18	0.21	8.11	-0.01	8.19	0.06	8.05	-0.33	-6.06	0.11	-6.00	-0.18	18.31	17.43	-0.24	15.14	14.16	0x2	0x0	On	Off	Reset
CALC_LVCP_PA03P	12.42	16.20	12.41	16.33	8.39	17.50	8.39	17.36	8.39	17.42	8.35	17.08	-6.26	23.82	-6.28	23.47	33.11	34.33	9.28	46.39	38.09	0x3	0x0	On	Off	Reset
CALC_LVCP_PA03S	12.32	0.28	12.31	-0.23	8.32	-0.01	8.31	-0.01	8.30	0.48	8.26	-0.21	-6.10	-0.38	-6.18	-0.70	18.70	15.58	14.40	8.79	10.74	0x2	0x0	On	Off	Reset
CALC_LVCP_PA08P	12.39	16.69	12.43	15.78	8.36	17.76	8.38	17.37	8.40	17.44	8.33	17.27	-6.31	23.38	-6.24	24.06	31.59	32.76	6.59	35.64	36.62	0x3	0x0	On	Off	Reset
CALC_LVCP_PA08S	12.33	-0.11	12.39	0.06	8.30	-0.13	8.31	-0.11	8.30	-0.18	8.30	0.13	-6.18	0.21	-6.18	-0.01	18.80	18.21	8.54	15.14	13.18	0x2	0x0	On	Off	Reset
CALC_LVCP_PA09P	12.40	16.59	12.33	16.37	8.37	17.71	8.36	17.18	8.37	17.49	8.34	17.35	-6.32	23.52	-6.34	23.94	32.86	34.03	0.24	25.88	35.64	0x3	0x0	On	Off	Reset
CALC_LVCP_PA09S	12.37	-0.01	12.36	0.12	8.29	-0.12	8.29	0.02	8.30	0.04	8.27	-0.27	-6.20	0.42	-6.22	0.12	18.75	17.68	-5.37	8.79	12.70	0x2	0x0	On	Off	Reset
EC South																										
CALS_LVCP_PA04P	12.39	16.44	12.40	16.93	8.39	17.53	8.40	17.31	8.43	15.99	8.41	16.04	-6.32	24.00	-6.24	23.68	30.57	36.82	1.46	38.09	30.27	0x3	0x0	On	Off	Reset
CALS_LVCP_PA04S	12.32	0.28	12.37	0.29	8.29	-0.31	8.30	0.40	8.32	0.00	8.33	0.26	-6.23	0.04	-6.14	0.16	18.12	18.80	16.85	17.09	16.11	0x2	0x0	On	Off	Reset
CALS_LVCP_PA05P	12.67	16.59	12.65	16.87	8.43	18.48	8.41	18.38	8.43	16.44	8.45	16.70	-6.30	23.44	-6.26	23.46	31.35	33.69	15.14	30.76	26.37	0x3	0x0	On	Off	Reset
CALS_LVCP_PA05S	12.71	-0.06	12.69	0.57	8.33	0.00	8.33	0.11	8.37	-0.07	8.36	-0.28	-6.18	-0.31	-6.16	0.23	17.82	17.72	13.92	10.25	13.18	0x2	0x0	On	Off	Reset
CALS_LVCP_PA06P	12.51	16.64	12.51	16.59	8.34	18.08	8.34	17.59	8.37	16.49	8.37	16.44	-6.25	23.62	-6.28	23.69	31.98	36.57	10.01	39.55	37.60	0x3	0x0	On	Off	Reset
CALS_LVCP_PA06S	12.34	0.46	12.30	-0.46	8.19	-0.27	8.22	0.37	8.25	-0.01	8.25	0.27	-5.94	-0.61	-5.93	0.10	18.55	15.92	-2.44	15.14	12.70	0x2	0x0	On	Off	Reset
CALS_LVCP_PA07P	12.68	16.42	12.69	17.18	8.55	18.44	8.52	18.79	8.61	17.13	8.53	16.74	-6.41	23.52	-6.39	23.96	32.96	31.40	21.24	38.57	36.62	0x3	0x0	On	Off	Reset
CALS_LVCP_PA07S	12.34	0.27	12.40	-0.17	8.31	-0.06	8.33	0.52	8.37	0.27	8.32	0.46	-6.19	-0.06	-6.14	-0.60	17.19	16.06	9.52	7.32	13.18	0x2	0x0	On	Off	Reset
ICD																										
ICD_LVCP_PW09	12.77	2.48									8.70	5.80	-6.36	3.67			25.05	36.87				0x3	0x0	On	Off	Reset

Global Buttons

Global | Turn ON Primary | Turn ON Second | Turn OFF All | Reset All

Status:

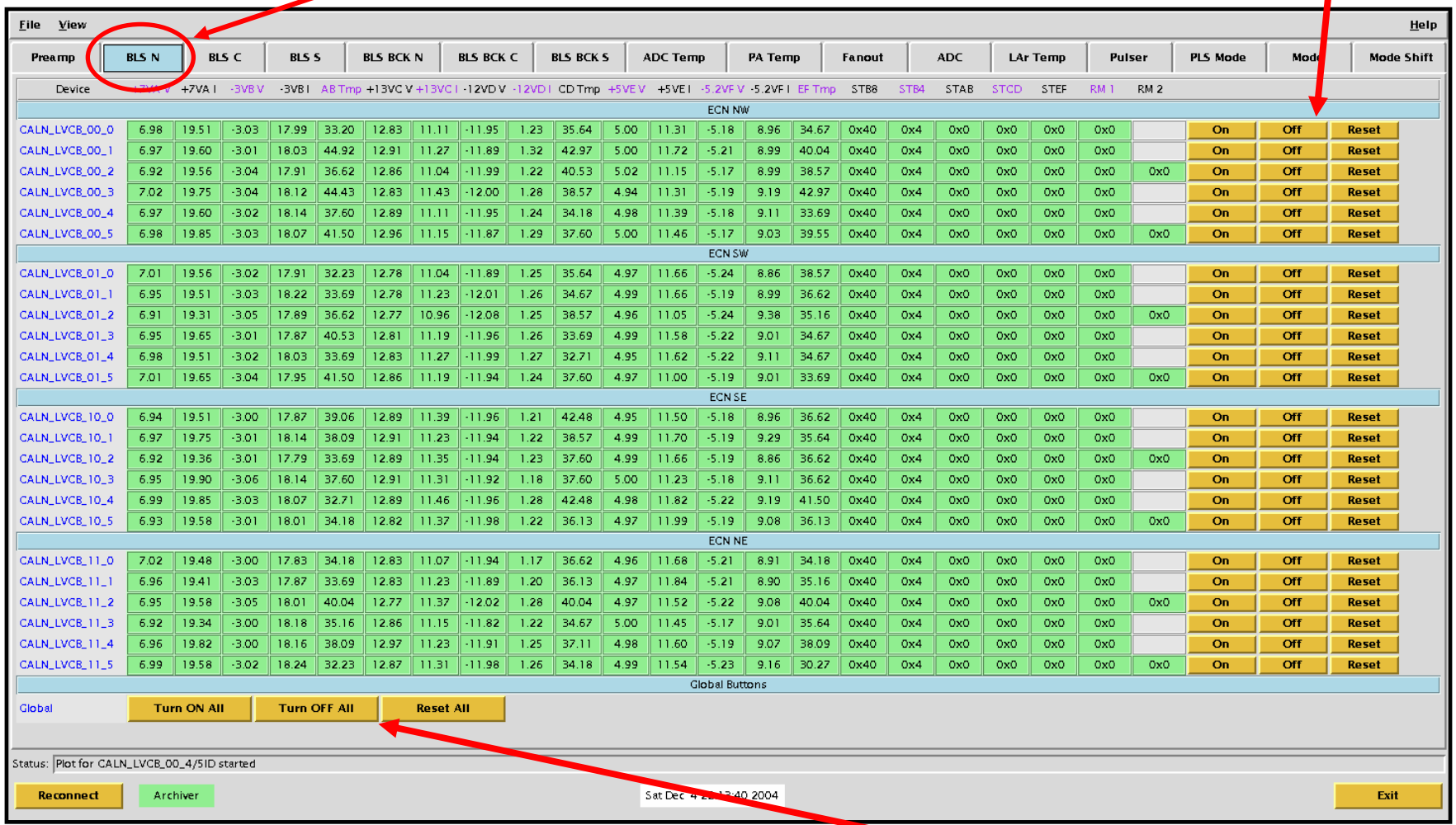
Reconnect | Archiver | Sat Dec 4 22:03:23 2004 | Exit

Keep an eye on the archiver status!

Supply GUI cont...

16 pages (TABS) of information

Individual channel



File View Help

Preamp | BLS N | BLS C | BLS S | BLS BCK N | BLS BCK C | BLS BCK S | ADC Temp | PA Temp | Fanout | ADC | LAr Temp | Pulser | PLS Mode | Mode | Mode Shift

Device	-13VA V	+7VA I	-3VB V	-3VB I	AB Tmp	+13VC V	+13VC I	-12VD V	-12VD I	CD Tmp	+5VE V	+5VE I	-5.2VF V	-5.2VF I	EF Tmp	STB8	STB4	STAB	STCD	STEF	RM 1	RM 2			
ECN NW																									
CALN_LVCB_00_0	6.98	19.51	-3.03	17.99	33.20	12.83	11.11	-11.95	1.23	35.64	5.00	11.31	-5.18	8.96	34.67	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_00_1	6.97	19.60	-3.01	18.03	44.92	12.91	11.27	-11.89	1.32	42.97	5.00	11.72	-5.21	8.99	40.04	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_00_2	6.92	19.56	-3.04	17.91	36.62	12.86	11.04	-11.99	1.22	40.53	5.02	11.15	-5.17	8.99	38.57	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
CALN_LVCB_00_3	7.02	19.75	-3.04	18.12	44.43	12.83	11.43	-12.00	1.28	38.57	4.94	11.31	-5.19	9.19	42.97	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_00_4	6.97	19.60	-3.02	18.14	37.60	12.89	11.11	-11.95	1.24	34.18	4.98	11.39	-5.18	9.11	33.69	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_00_5	6.98	19.85	-3.03	18.07	41.50	12.96	11.15	-11.87	1.29	37.60	5.00	11.46	-5.17	9.03	39.55	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
ECN SW																									
CALN_LVCB_01_0	7.01	19.56	-3.02	17.91	32.23	12.78	11.04	-11.89	1.25	35.64	4.97	11.66	-5.24	8.86	38.57	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_01_1	6.95	19.51	-3.03	18.22	33.69	12.78	11.23	-12.01	1.26	34.67	4.99	11.66	-5.19	8.99	36.62	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_01_2	6.91	19.31	-3.05	17.89	36.62	12.77	10.96	-12.08	1.25	38.57	4.96	11.05	-5.24	9.38	35.16	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
CALN_LVCB_01_3	6.95	19.65	-3.01	17.87	40.53	12.81	11.19	-11.96	1.26	33.69	4.99	11.58	-5.22	9.01	34.67	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_01_4	6.98	19.51	-3.02	18.03	33.69	12.83	11.27	-11.99	1.27	32.71	4.95	11.62	-5.22	9.11	34.67	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_01_5	7.01	19.65	-3.04	17.95	41.50	12.86	11.19	-11.94	1.24	37.60	4.97	11.00	-5.19	9.01	33.69	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
ECN SE																									
CALN_LVCB_10_0	6.94	19.51	-3.00	17.87	39.06	12.89	11.39	-11.96	1.21	42.48	4.95	11.50	-5.18	8.96	36.62	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_10_1	6.97	19.75	-3.01	18.14	38.09	12.91	11.23	-11.94	1.22	38.57	4.99	11.70	-5.19	9.29	35.64	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_10_2	6.92	19.36	-3.01	17.79	33.69	12.89	11.35	-11.94	1.23	37.60	4.99	11.66	-5.19	8.86	36.62	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
CALN_LVCB_10_3	6.95	19.90	-3.06	18.14	37.60	12.91	11.31	-11.92	1.18	37.60	5.00	11.23	-5.18	9.11	36.62	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_10_4	6.99	19.85	-3.03	18.07	32.71	12.89	11.46	-11.96	1.28	42.48	4.98	11.82	-5.22	9.19	41.50	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_10_5	6.93	19.58	-3.01	18.01	34.18	12.82	11.37	-11.98	1.22	36.13	4.97	11.99	-5.19	9.08	36.13	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
ECN NE																									
CALN_LVCB_11_0	7.02	19.48	-3.00	17.83	34.18	12.83	11.07	-11.94	1.17	36.62	4.96	11.68	-5.21	8.91	34.18	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_11_1	6.96	19.41	-3.03	17.87	33.69	12.83	11.23	-11.89	1.20	36.13	4.97	11.84	-5.21	8.90	35.16	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_11_2	6.95	19.58	-3.05	18.01	40.04	12.77	11.37	-12.02	1.28	40.04	4.97	11.52	-5.22	9.08	40.04	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
CALN_LVCB_11_3	6.92	19.34	-3.00	18.18	35.16	12.86	11.15	-11.82	1.22	34.67	5.00	11.45	-5.17	9.01	35.64	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_11_4	6.96	19.82	-3.00	18.16	38.09	12.97	11.23	-11.91	1.25	37.11	4.98	11.60	-5.19	9.07	38.09	0x40	0x4	0x0	0x0	0x0	0x0		On	Off	Reset
CALN_LVCB_11_5	6.99	19.58	-3.02	18.24	32.23	12.87	11.31	-11.98	1.26	34.18	4.99	11.54	-5.23	9.16	30.27	0x40	0x4	0x0	0x0	0x0	0x0	0x0	On	Off	Reset
Global Buttons																									
Global	Turn ON All			Turn OFF All			Reset All																		

Status: Plot for CALN_LVCB_00_4/5ID started

Reconnect | Archiver | Sat Dec 4 2004 | Exit

All channels

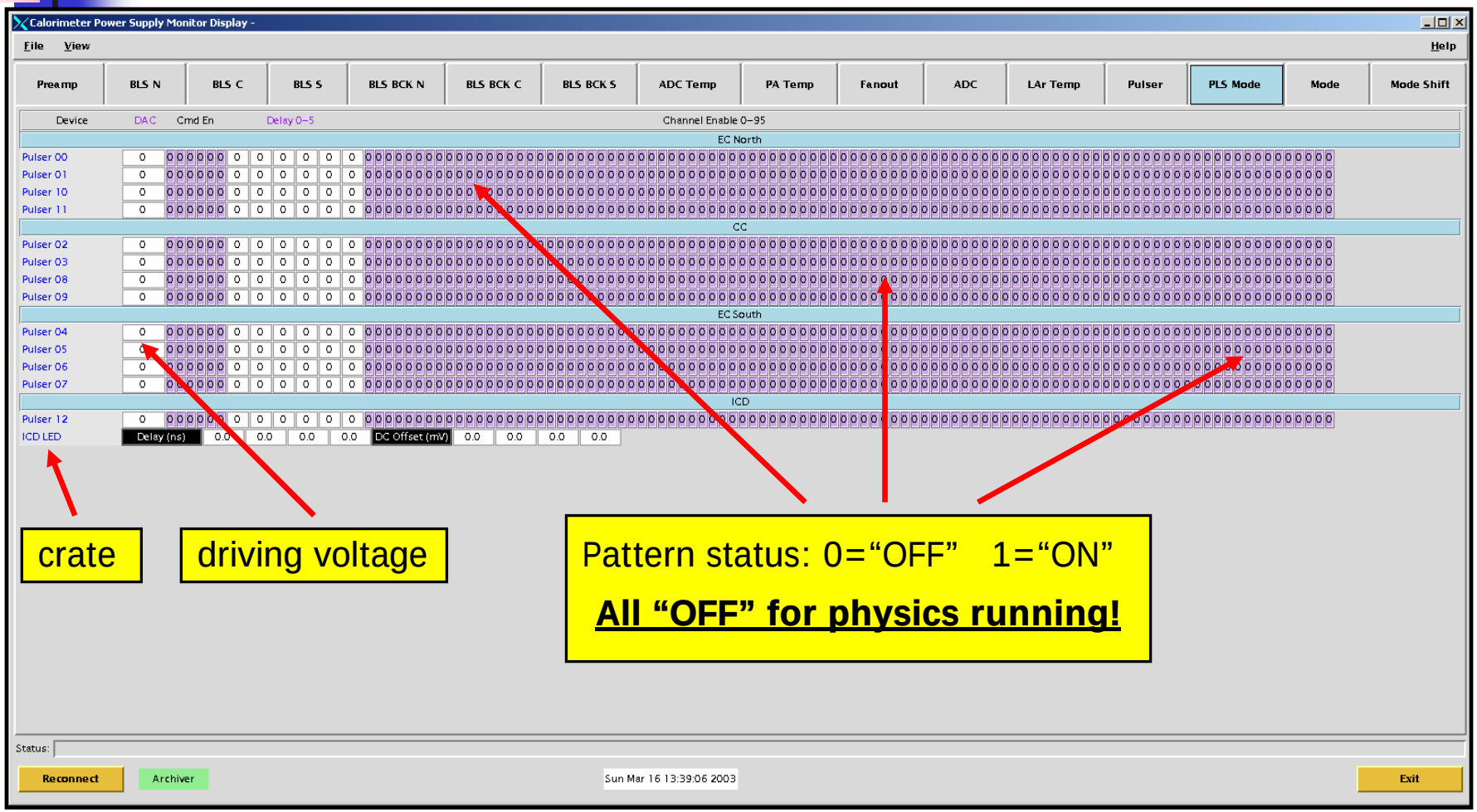
Supply GUI cont...

It's important to be able to give details to expert

attribute

channel

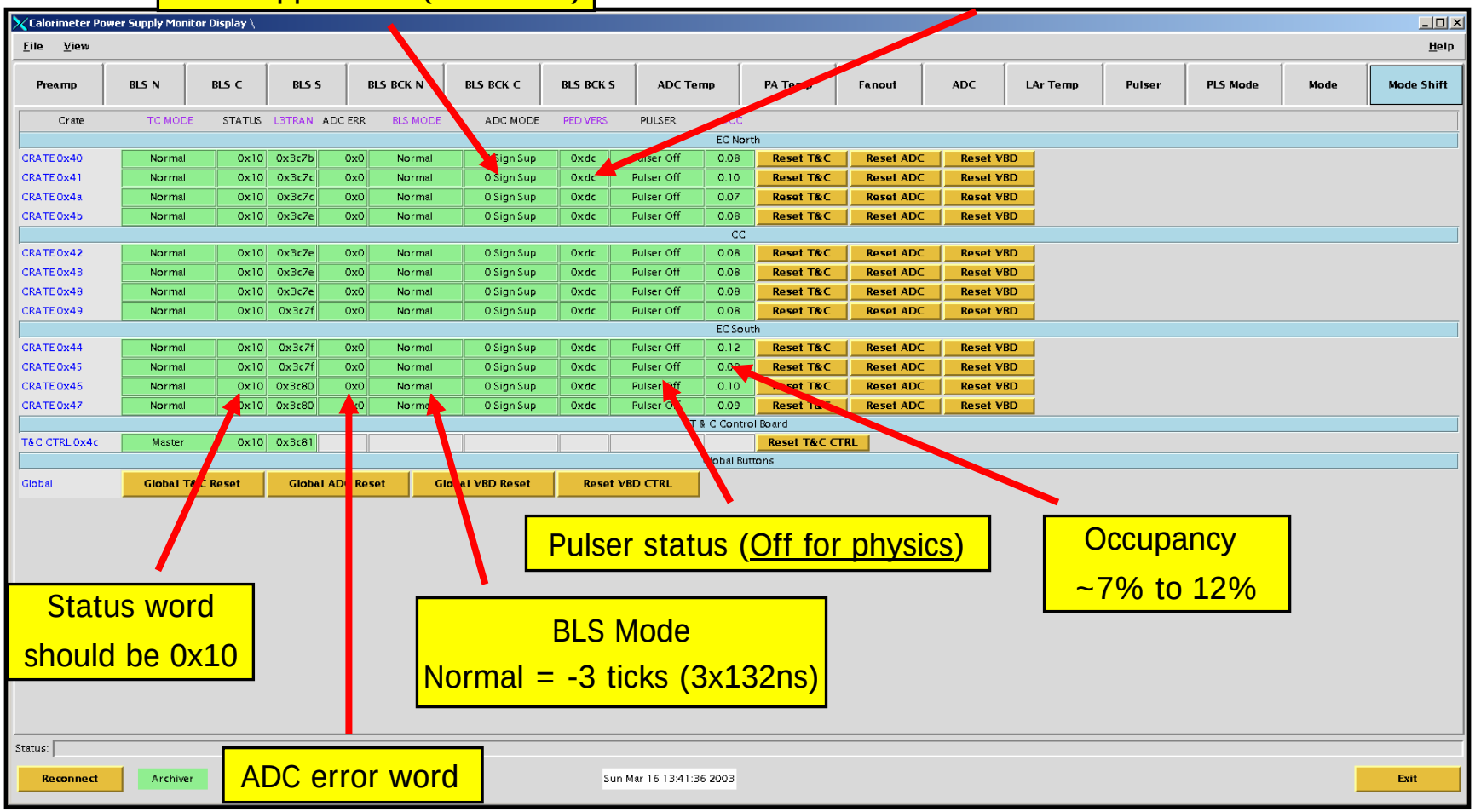
Supply GUI – pulser



Supply GUI – Shifter Mode

Pedestal subtracted
zero suppression (cut: 1.5 σ)

Pedestal version



Pulser status (Off for physics)

Occupancy
~7% to 12%

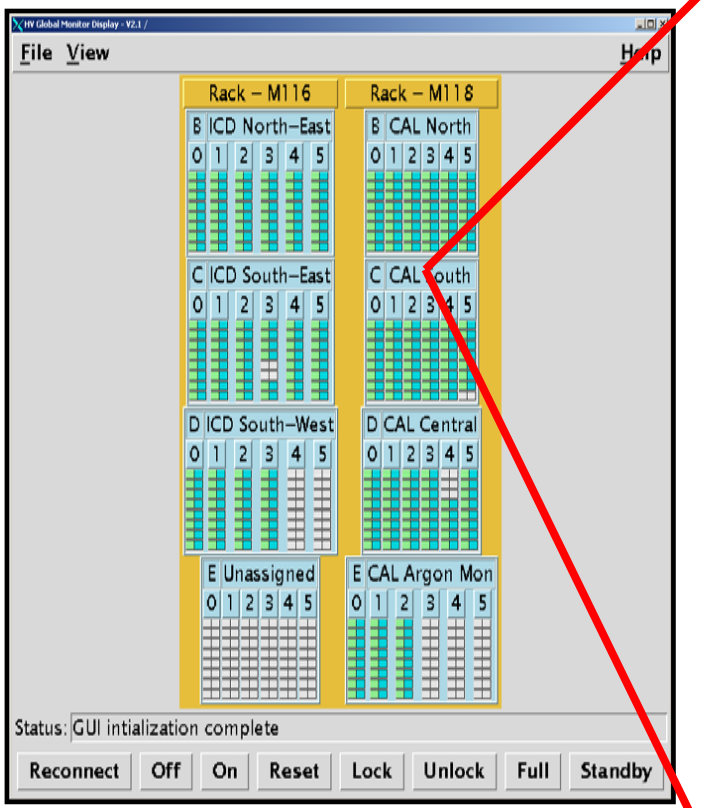
Status word
should be 0x10

BLS Mode
Normal = -3 ticks (3x132ns)

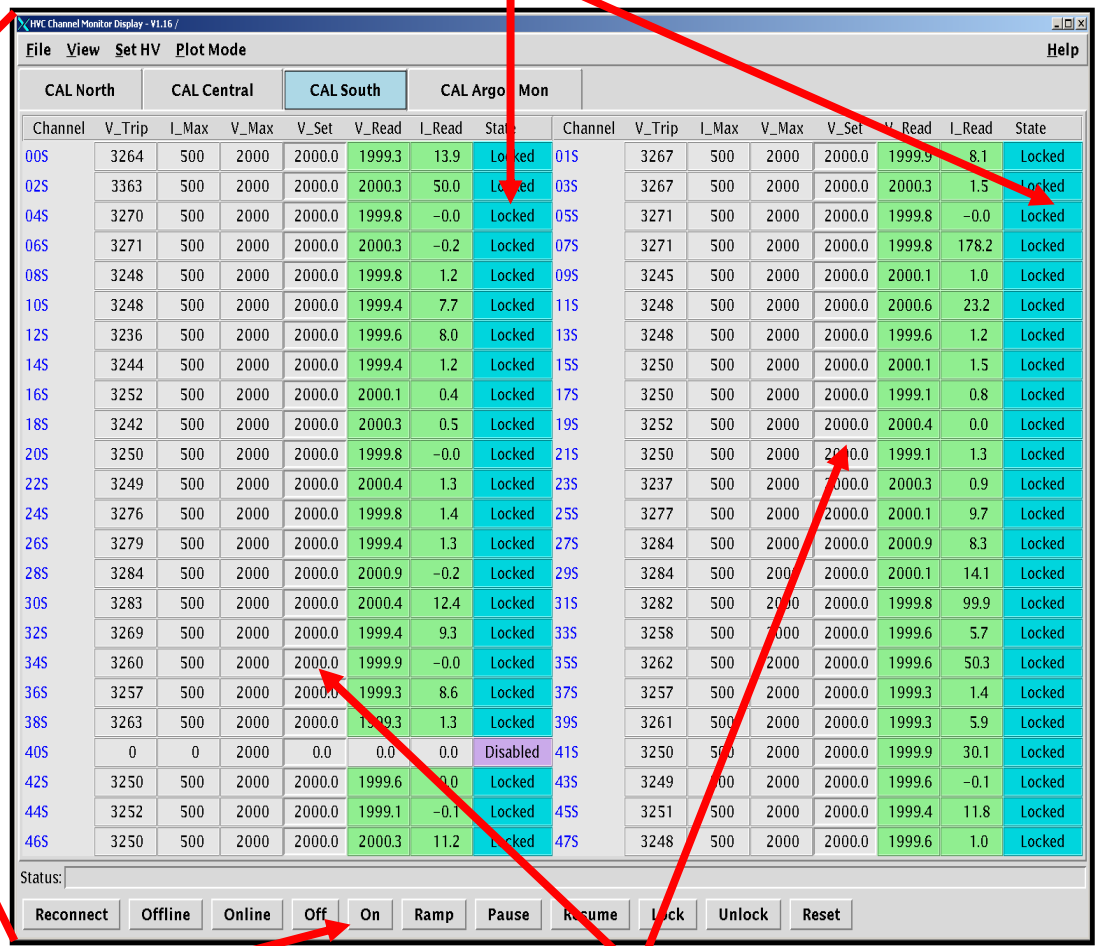
ADC error word

HV GUI

"start_cal hv"



Change individual channel

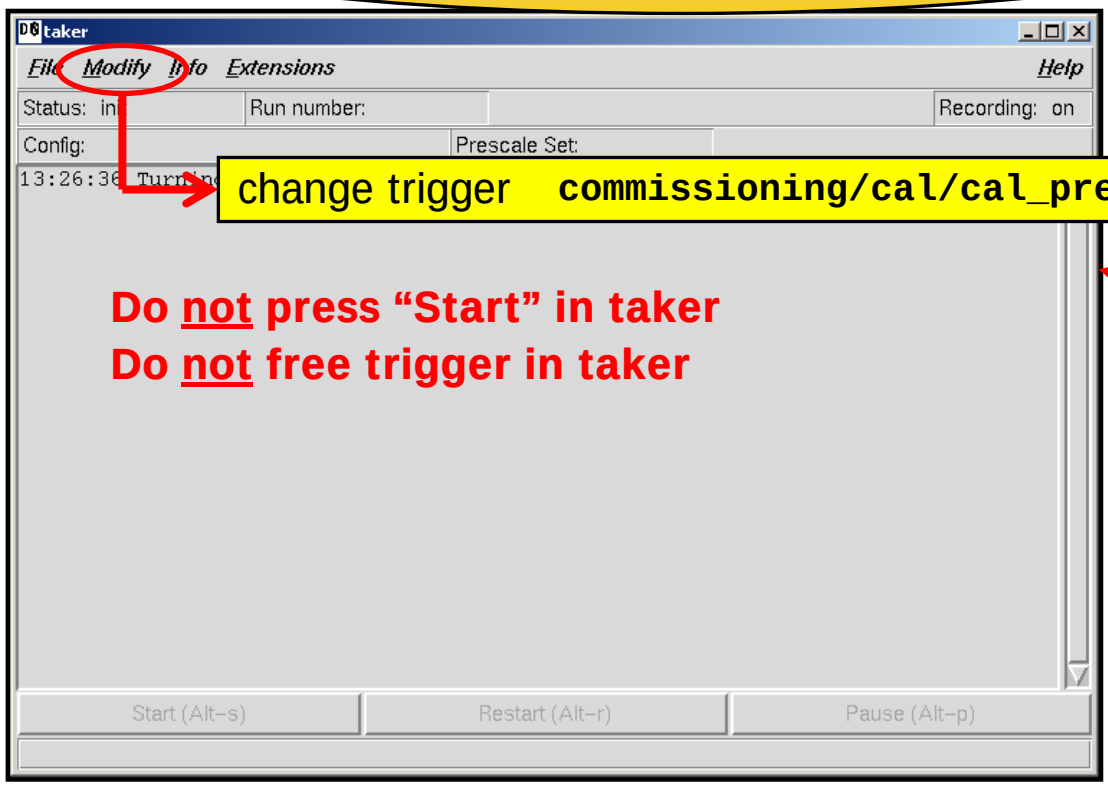


Change all channels

Can enter voltage by hand

Before Store

cal_prepare_for_run is a special configuration file that sets up the calorimeter for the coming store.



change trigger **`commissioning/cal/cal_prepare_for_run-2.4`**

Do <u>not</u> press "Start" in taker

Do <u>not</u> free trigger in taker

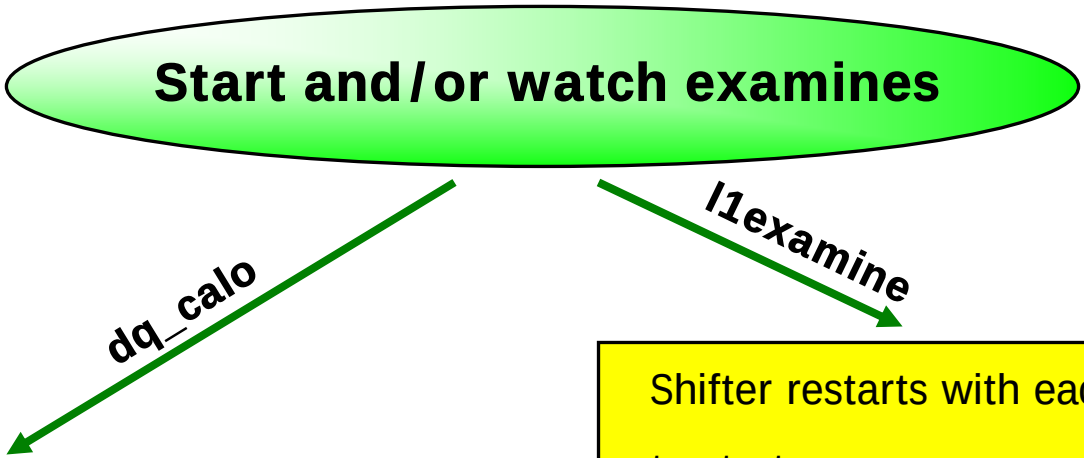
taker

`"start_daq taker"`

Also: - check for major alarms

- check pulsers are OFF

During Store



Automatically starts with new run

(...still keep an eye on it)

to start/restart:

```
start_cal dq_calo
start_cal
dq_monitor
```

Shifter restarts with each new run

to start:

```
start_cal
start_cal l1examine
    init
    start
```

to stop:

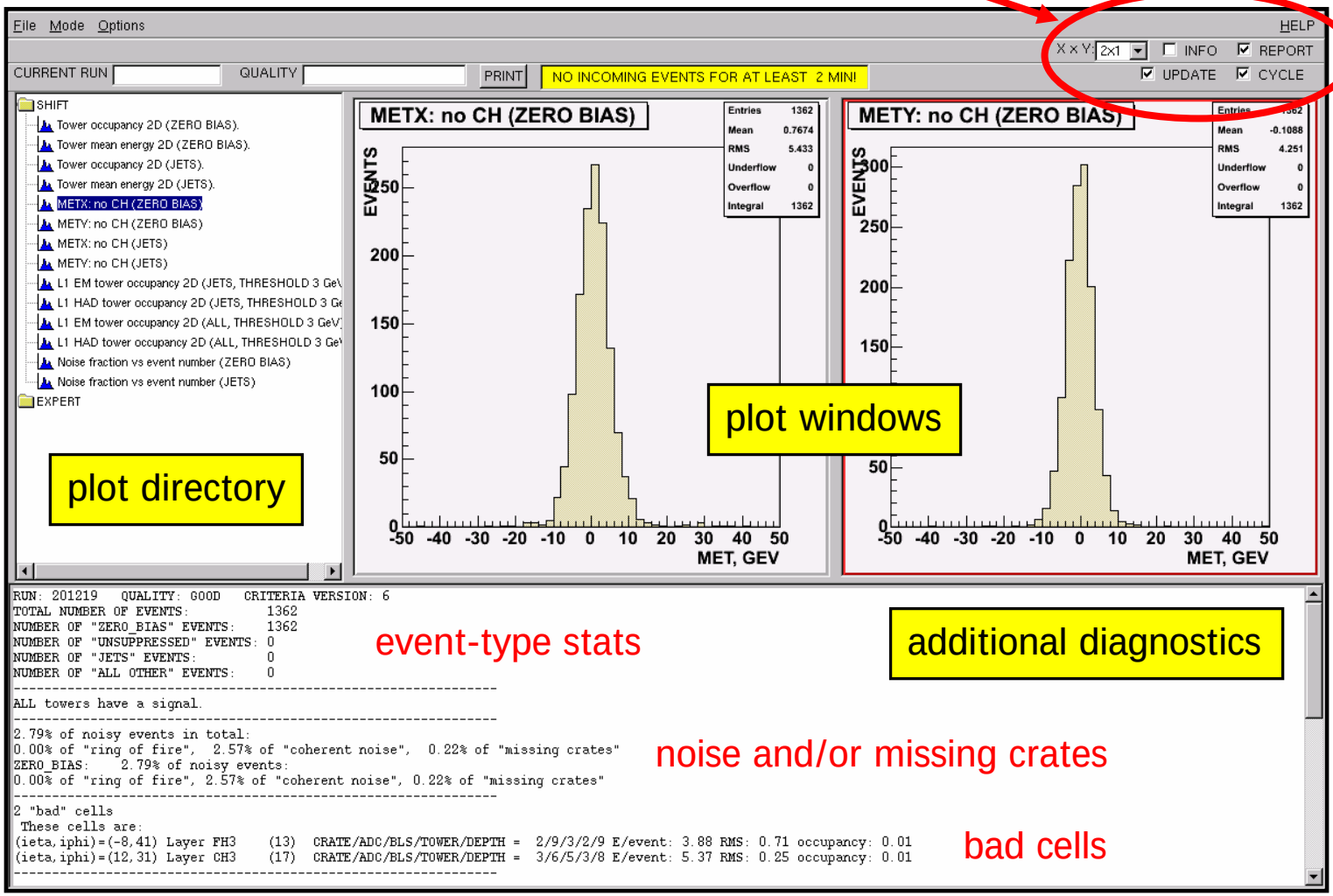
```
    stop
    quit
```

Calorimeter

L1 Cal trigger

DQ_calo – Overview

examine behaviour settings

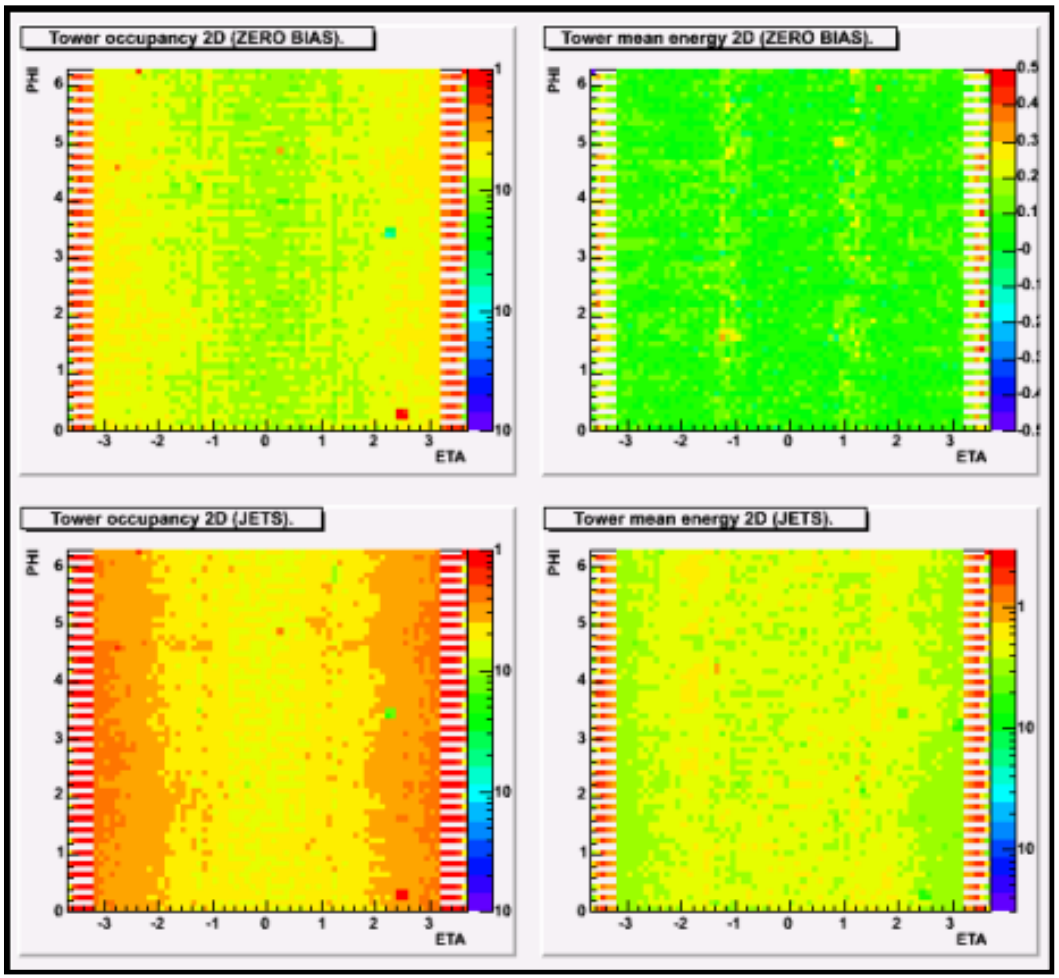


dq_calo (healthy example)

Occupancy <Energy>

Zero bias

Jets

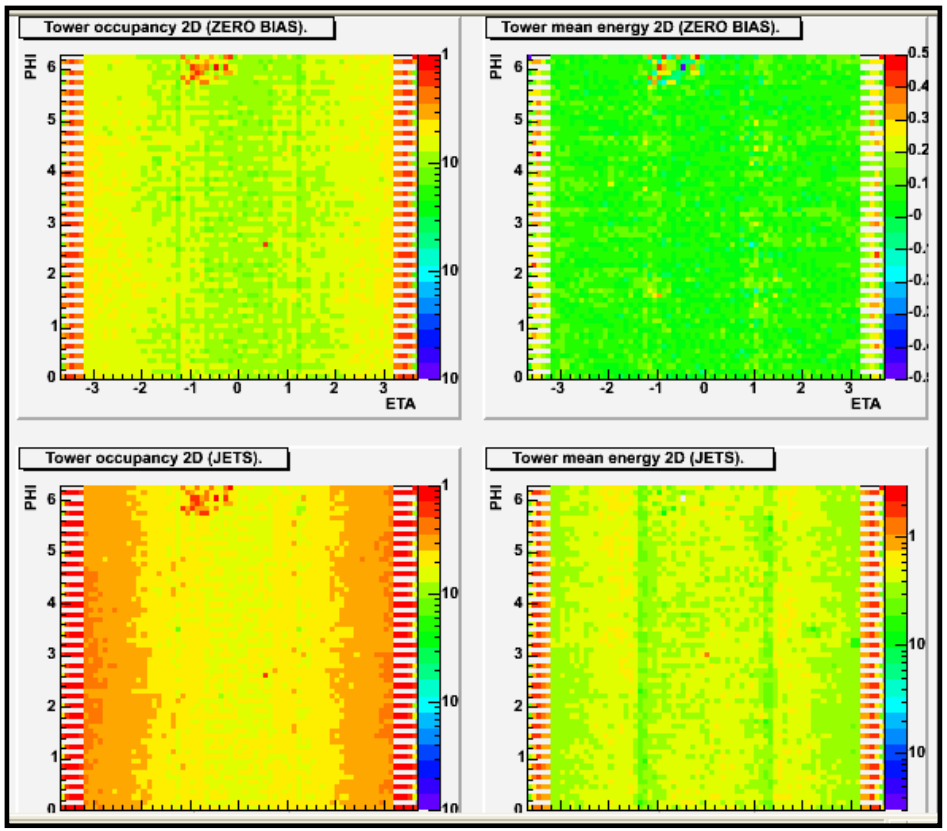


Powerful tool for shifter … and experts!

Be familiar with the plots
Be alert – look for changes
Paste anomalies in logbook
Compare various plots
Communicate with GM shifter

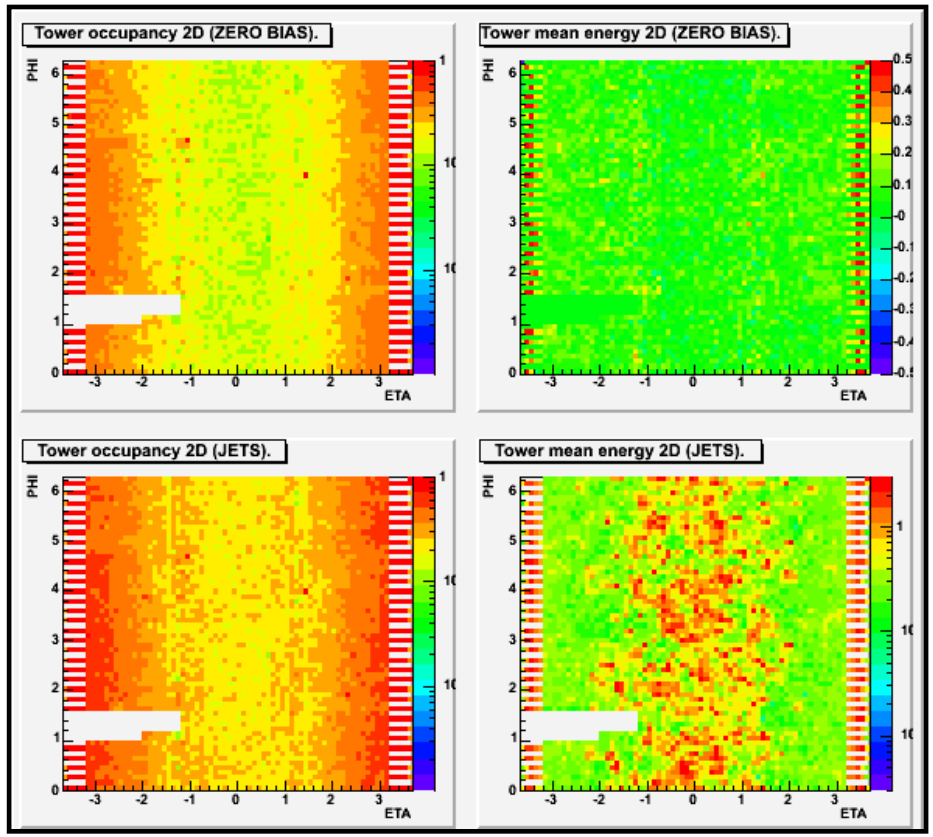
dq_calo (problem examples)

Bad



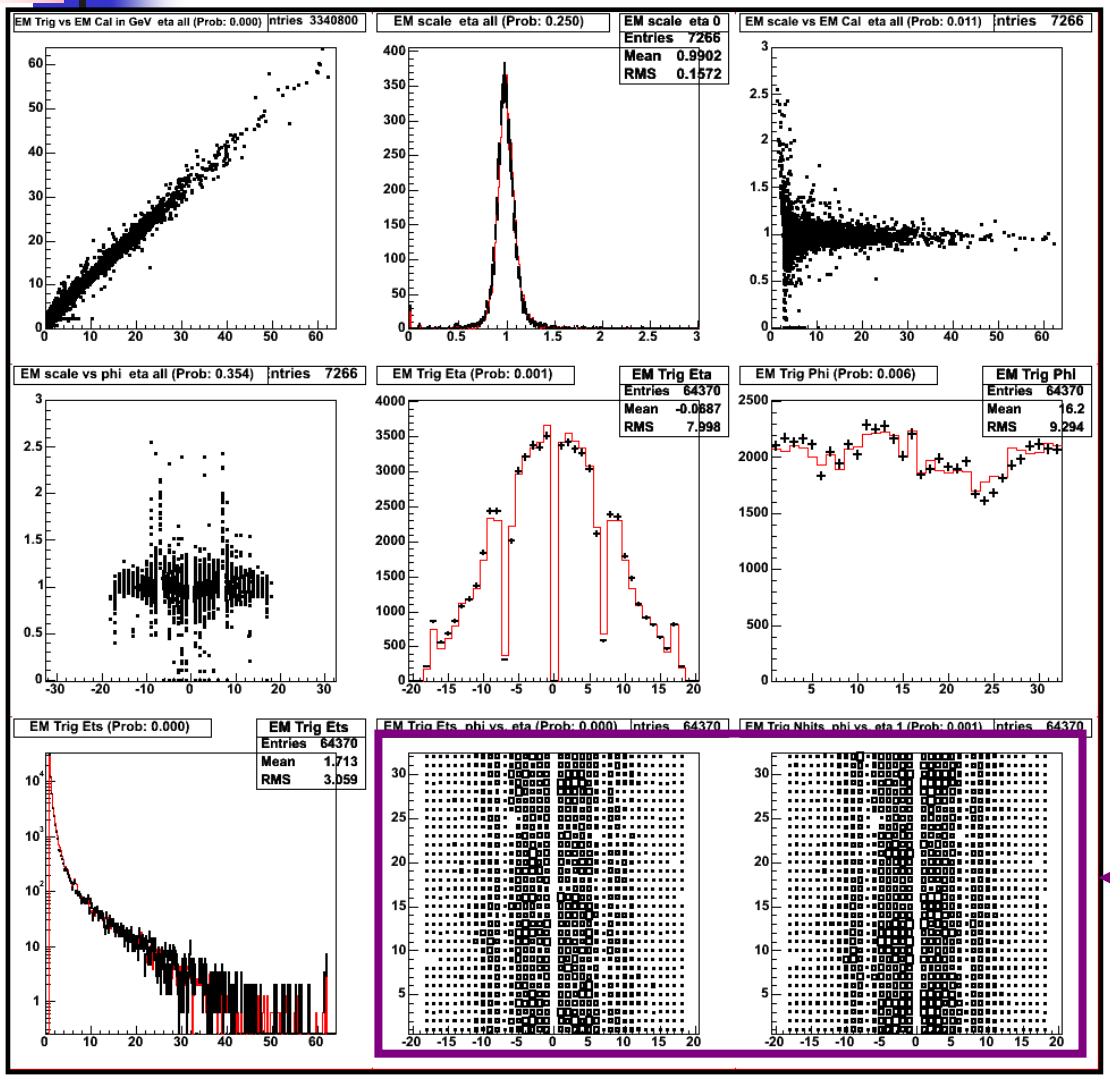
BLS cable harness problem

REALLY Bad!



Problem with pedestals

L1CalExamine



Sorry to be repetitive,

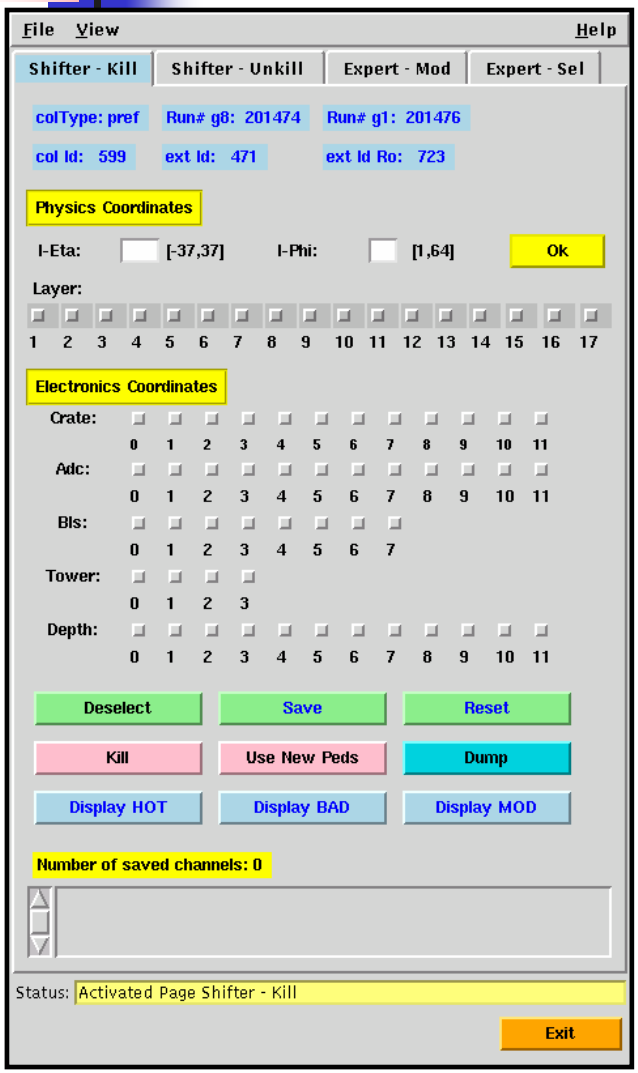
but...

Be familiar with the plots
Be alert – look for changes
Paste anomalies in logbook
Compare various plots
Communicate with GM shifter

One page for EM, one for HAD

← Trigger E_T and hits in (η,ϕ)

Killing Hot Cells (with expert)



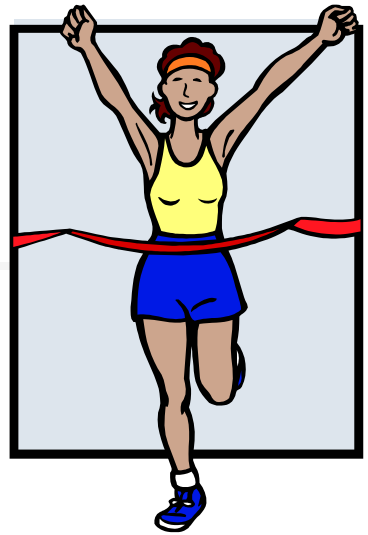
If a CAL cell is causing problems with L3 rates, it may have to be killed.

- Discuss with captain
- Page expert
- Have coordinates of cell ready (phys. or elec.)
- In coordination with expert:

```
start_cal D0run
start_cal
HCkiller
```

- Ask for run to be stopped and trigger freed
- Enter coords –> Kill –> Save
- Download cal_prepare_for_run
- Resume running and make sure problem fixed!

End of Run



- Save histograms and paste in logbook
- Complete CALMUO checklist
- Get ready to restart l1examine

- If store ends, set MUON HV to STANDBY
- CAL HV stays up always

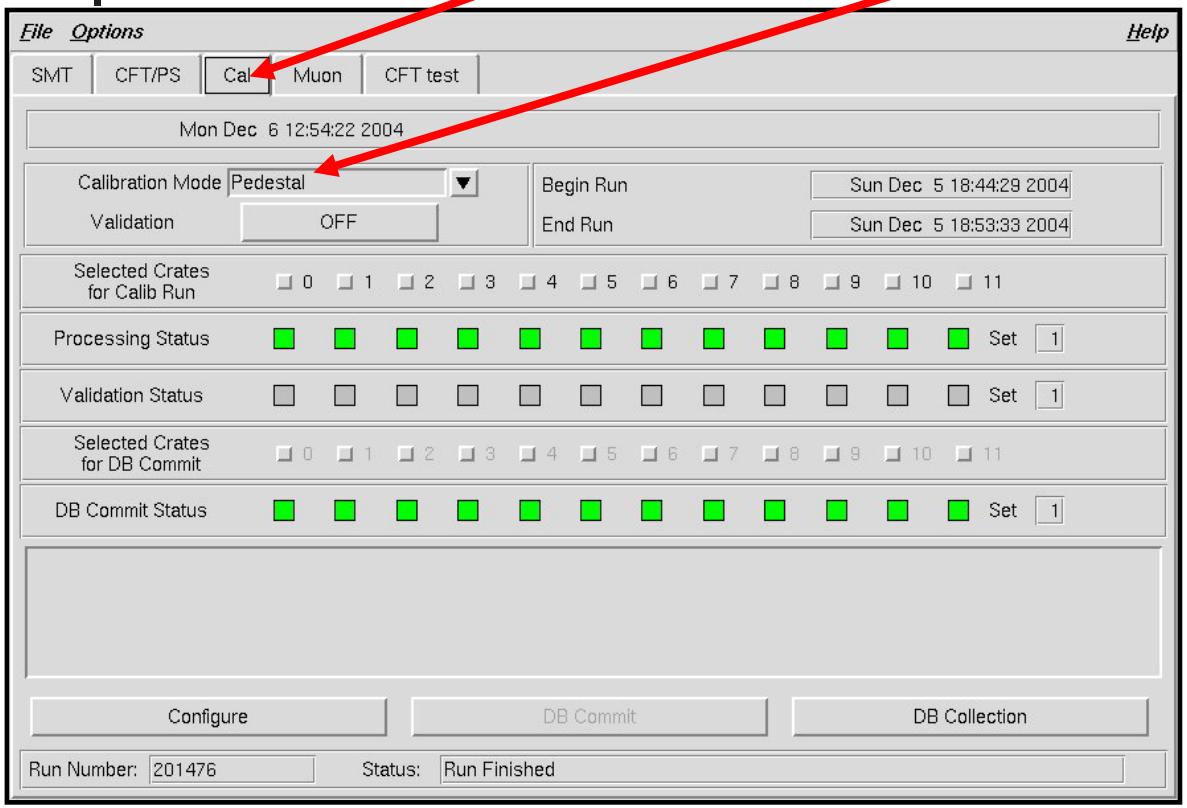
Between Stores

- Perform pedestal calibration
  - No beam in machine (ask Captain)
  - If time is short take gain 8 only – otherwise take gain 1 as well
- Keep system running, monitor examines
- Help out experts
  - Assist with NLC “ramp runs”
  - During access assist with running diagnostics
  - Make entries in logbook
  - After any changes be sure pedestals are taken
- Shift cancellation
  - During extended Tevatron downtime shifts may be cancelled
  - Check with Captain, CAL expert, and MUON expert first

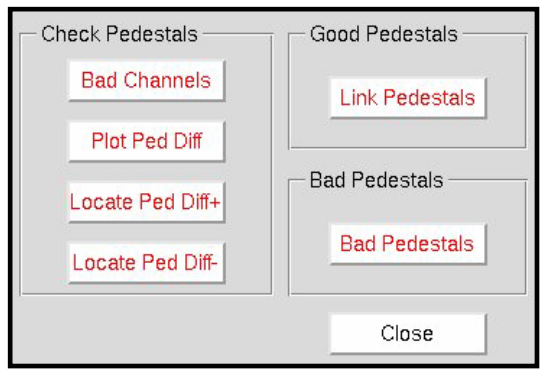
Pedestal Calibration

Select “Cal”

Select “Pedestal”



Ask for CAL <u>and</u> SMT crates
Use taker to start each run
<u>Never</u> stop calib run with taker!
After runs taken, give back SMT
Record run #’s in logbook
If Ped Diff plot looks bad, page expert
Link pedestals
Paste Ped Diff plots in logbook

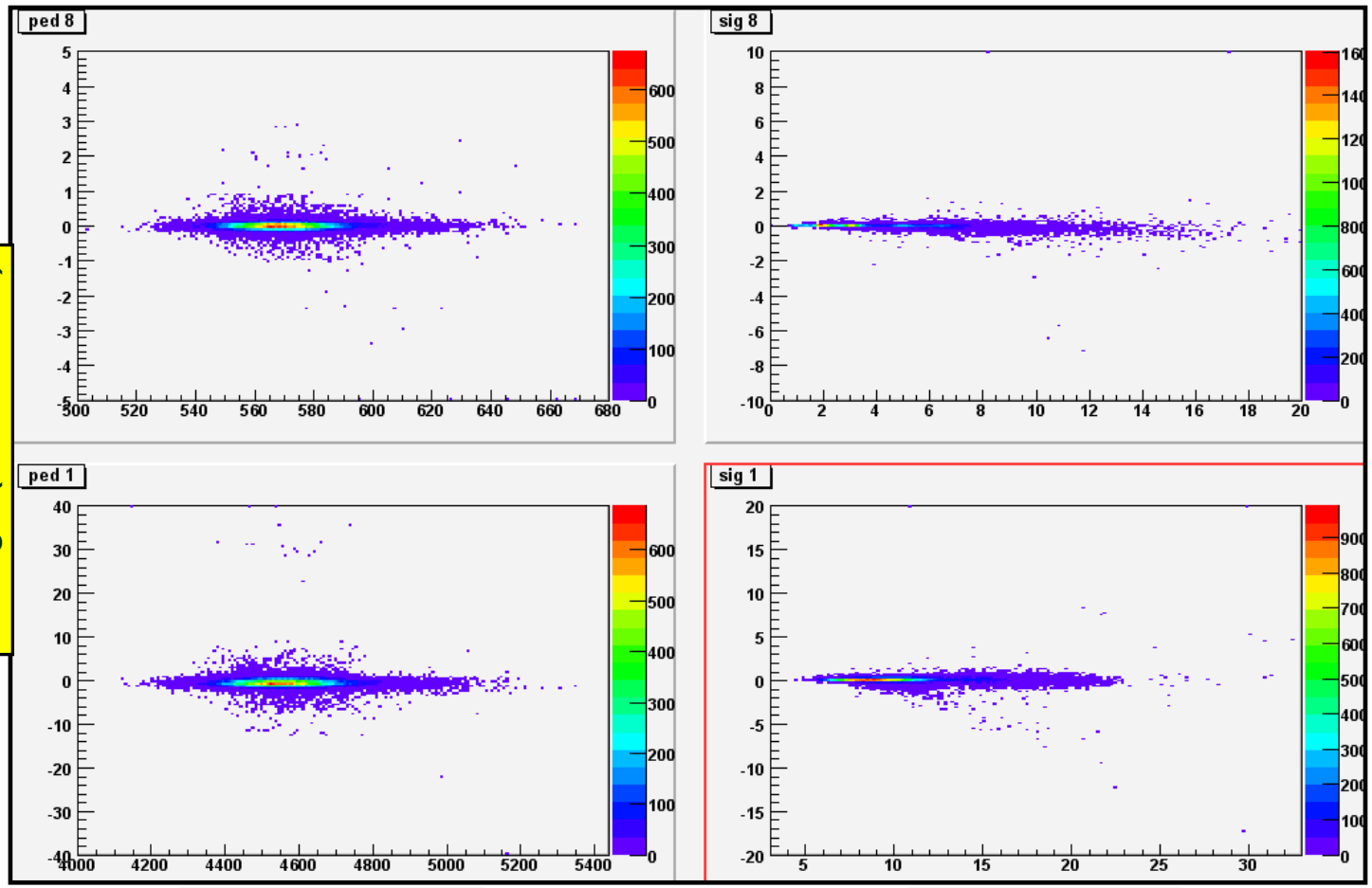


<u>How to run GUIs</u>

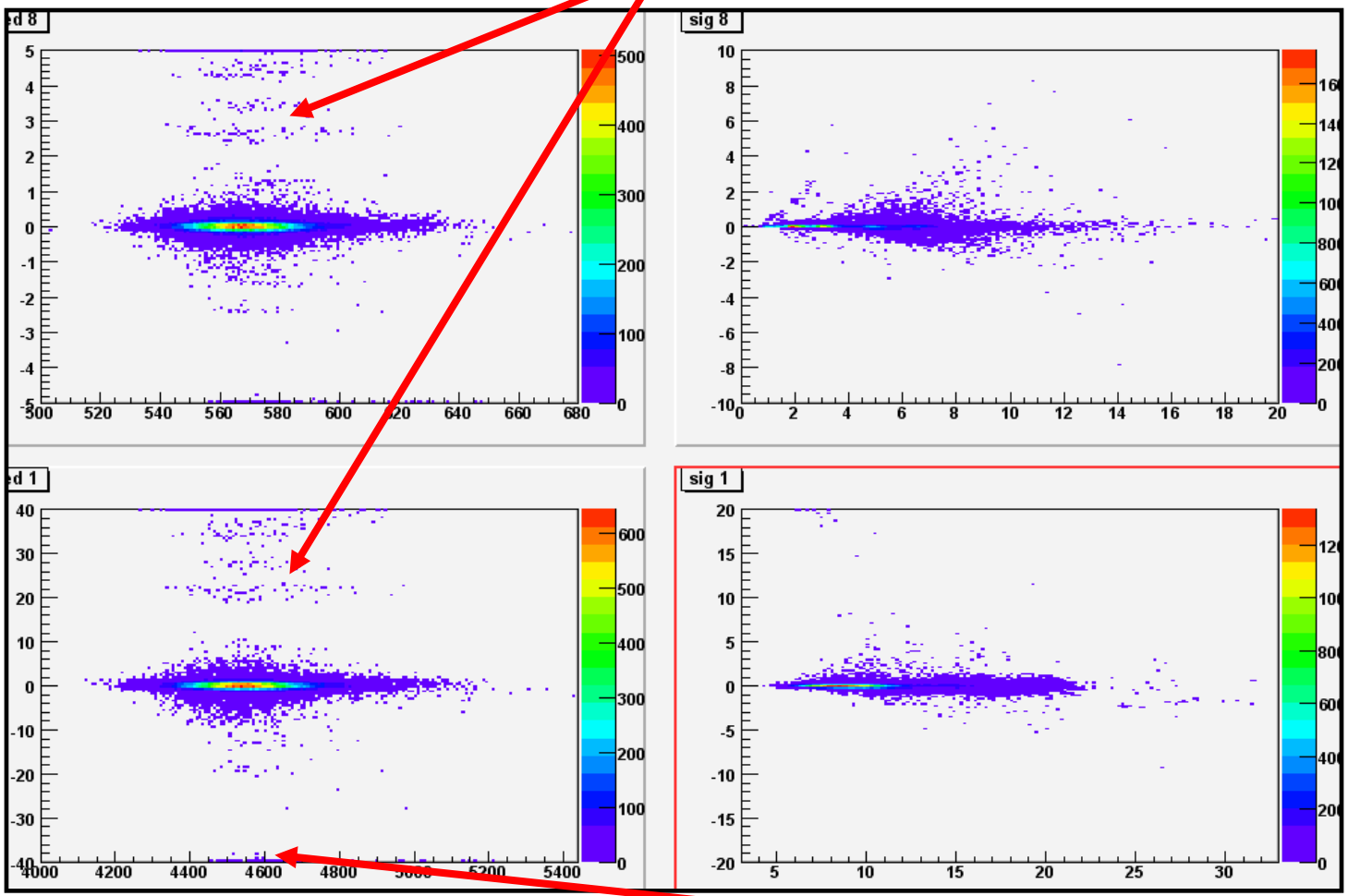
```
start_cal
Start_cal
Start_cal
calib
```

Follow instructions in manual

Good Pedestals



Post-repair Pedestals

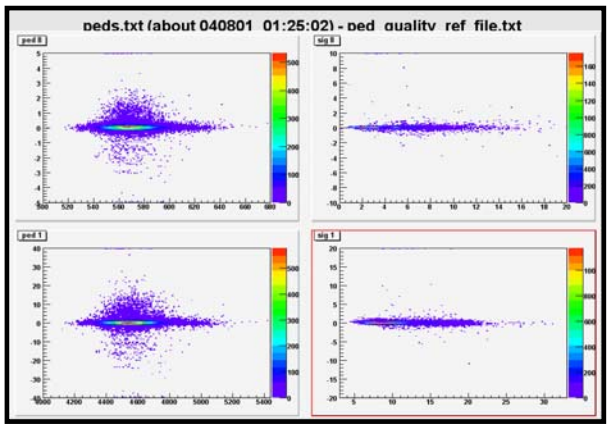


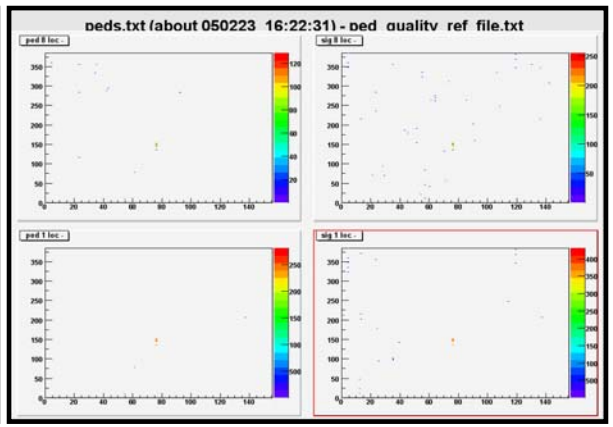
Example Log Entry

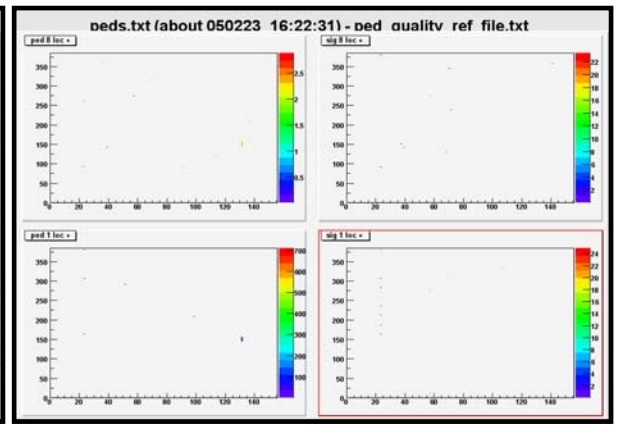
Starting calorimeter pedestal calibration run.

SMT is off.

Run 195816 x8, run 195817 x1. These two runs went OK.







Bad Channels:

3 1 3 0 6 578.11 63.37 576.80 55.25 4567.73 18.30 4 E-ped8
4 9 5 2 11 579.97 99.99 575.42 50.72 4586.80 66.11 4 E-ped8
Calibration looks OK to me so I linked the pedestals.

Summary

- All details of shifter duties and troubleshooting can be found in the CAL shifter's guide (white binder or web)
- If in doubt... page expert!