Linac4 source Control system

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Outline

- Status
  - Control architecture (INCA)
  - WorkingSet (Knobs, Function Editor, Trim History)
  - OASIS
  - Logging Service
  - Specific Application
    - Logging Display
    - Timing editor
    - Synoptic : Vacuum and Gas delivery System
    - General Source control
- Resources needed to implement a magnetron source
- Conclusion/outlook

INjector Control Architechture

Based on 3-tier architecture

Top Tier

Control room

- WorkingSet
  Knobs, Function Editor, Trim History
- OASIS
  Viewer
- Specific JAVA
  Applications

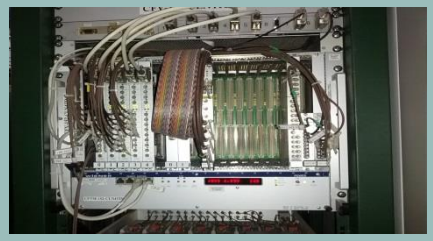
Middle Tier

INCA (Applications Servers)

- CONTROL CORE
  LSA
- AcqCore
- Configuration
  Service
- Logging
  Service

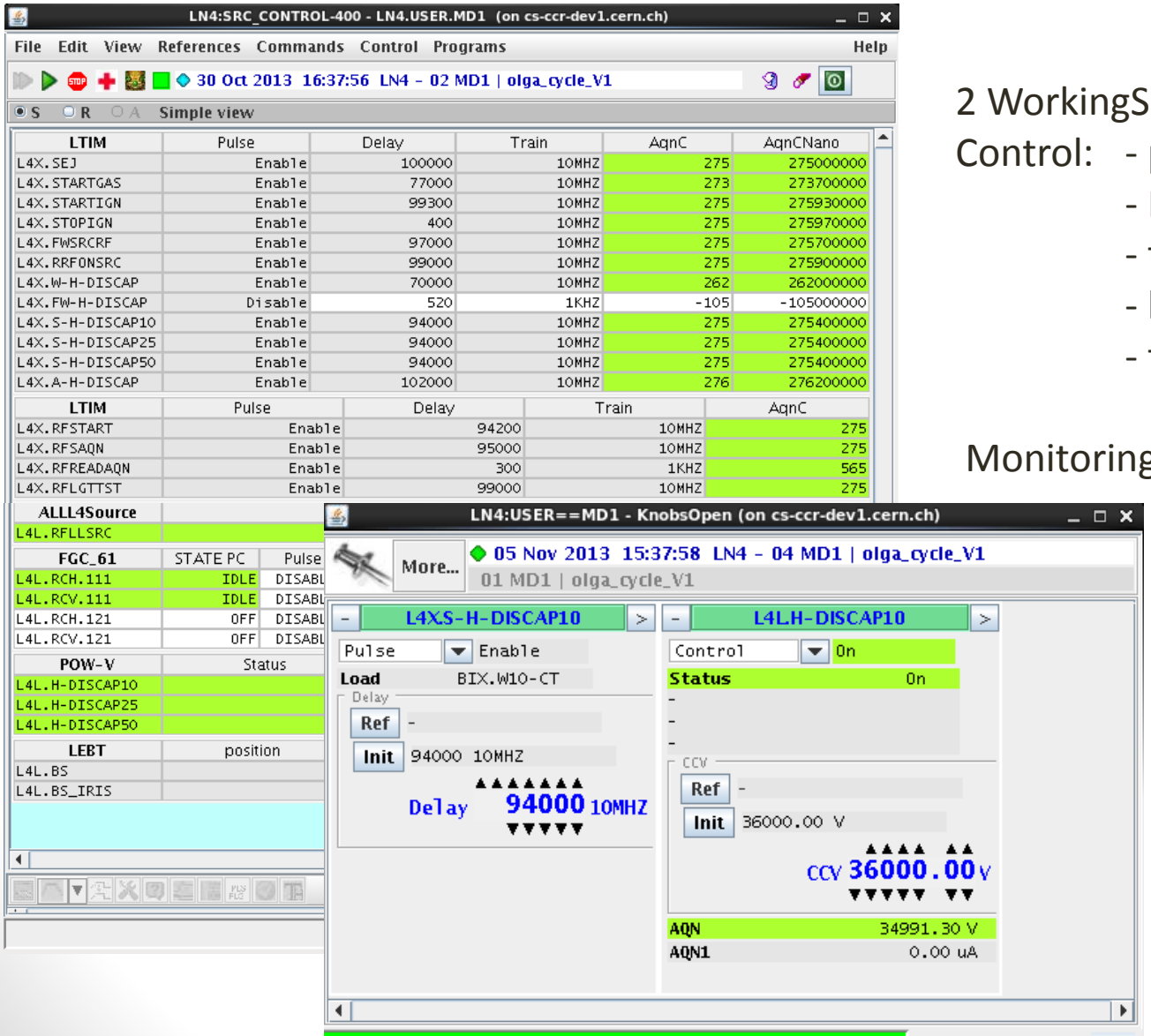
Lower Tier

Front-End Computers



FESA

WorkingSet & Knobs



2 WorkingSets:

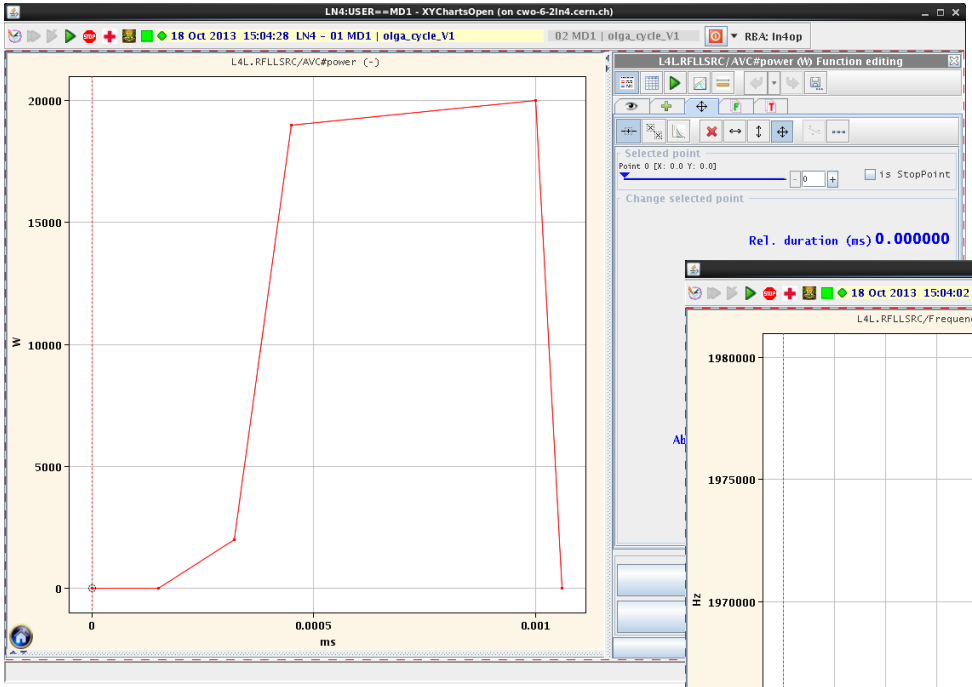
Control:
- power supplies
- RF
- timings
- beam stopper
- faraday-cup

Monitoring:
- pressures
- temperatures
- Waveforms

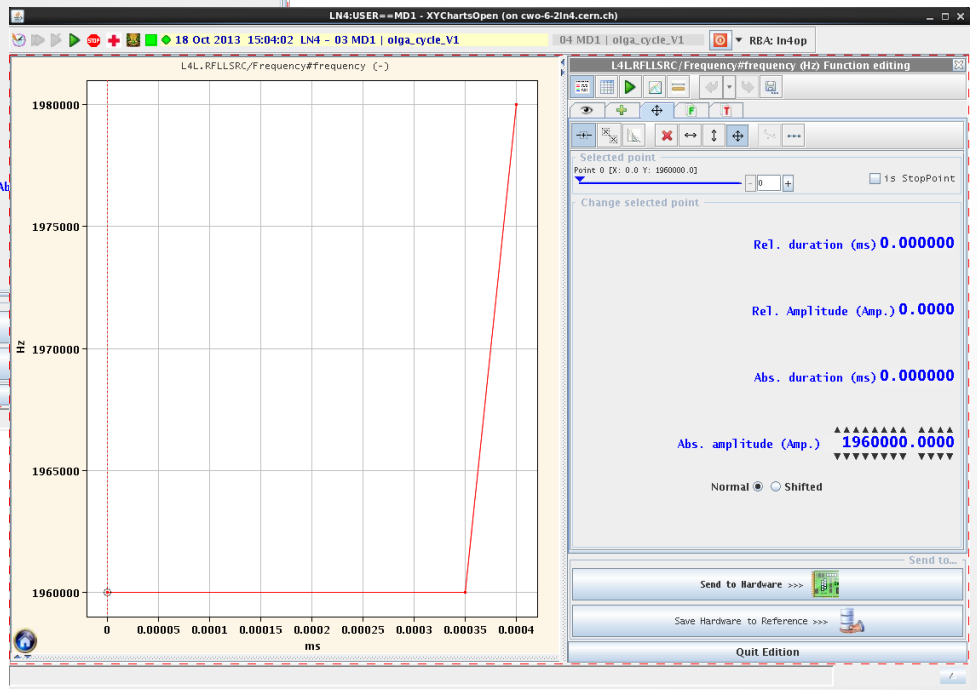
Function Editor

RF parameters

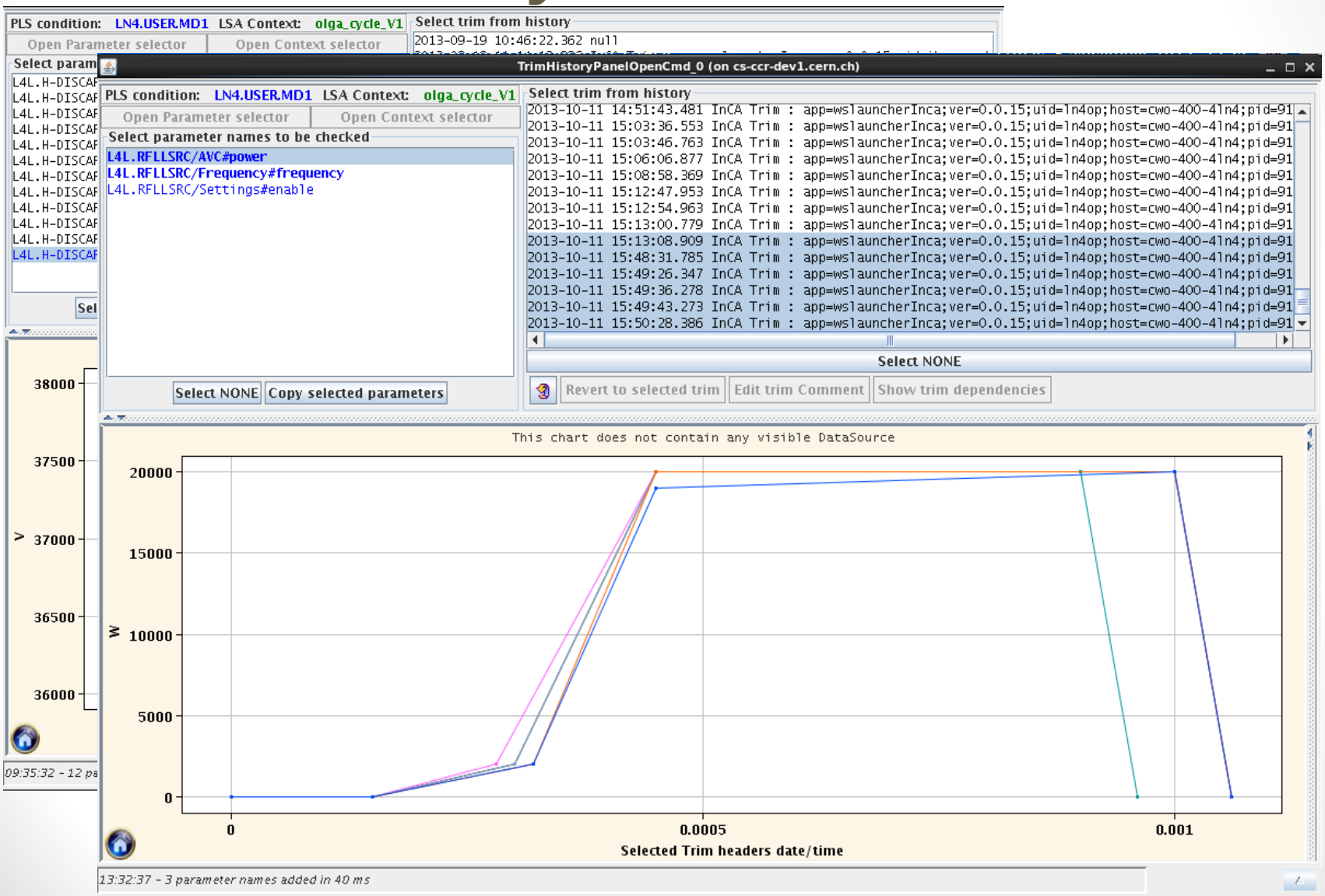
Power function



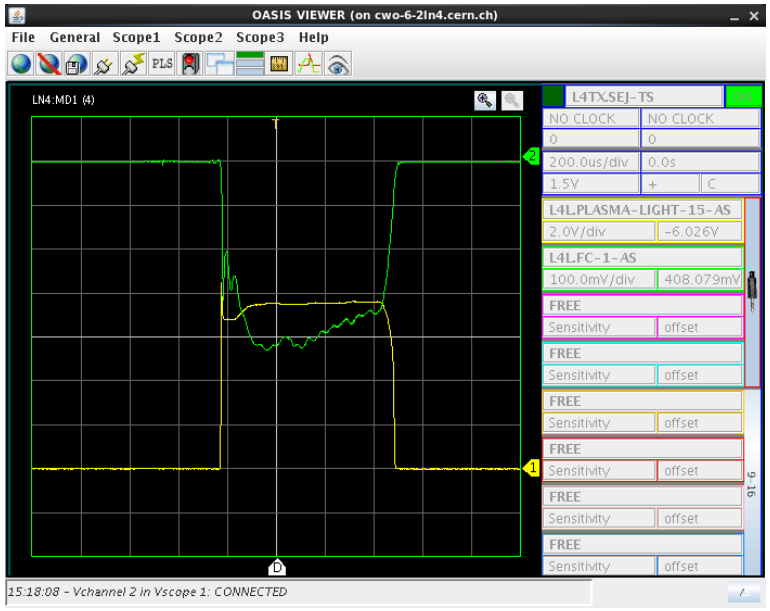
Frequency function

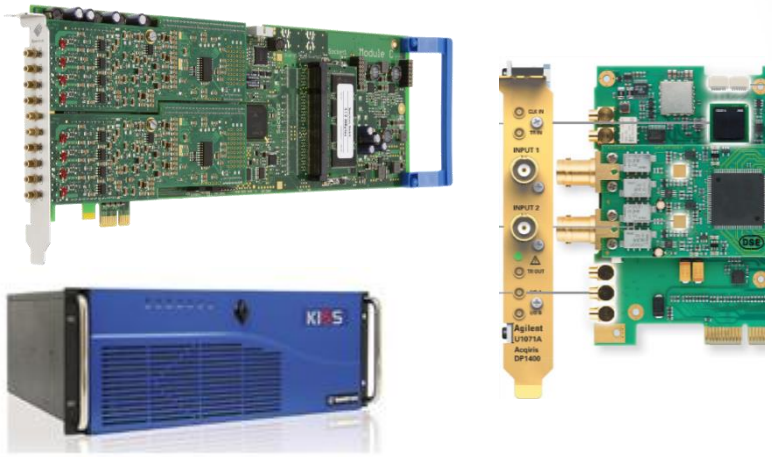


Trim History



Open Analogue Signal Information System





- System to acquire analogue signal from devices and display them in a graphical application. The signals are digitalized by oscilloscopes located in the front-end computers(FEC). The acquired data are sent through the Ethernet network , displayed on workstations running dedicated application and logged by the logging service

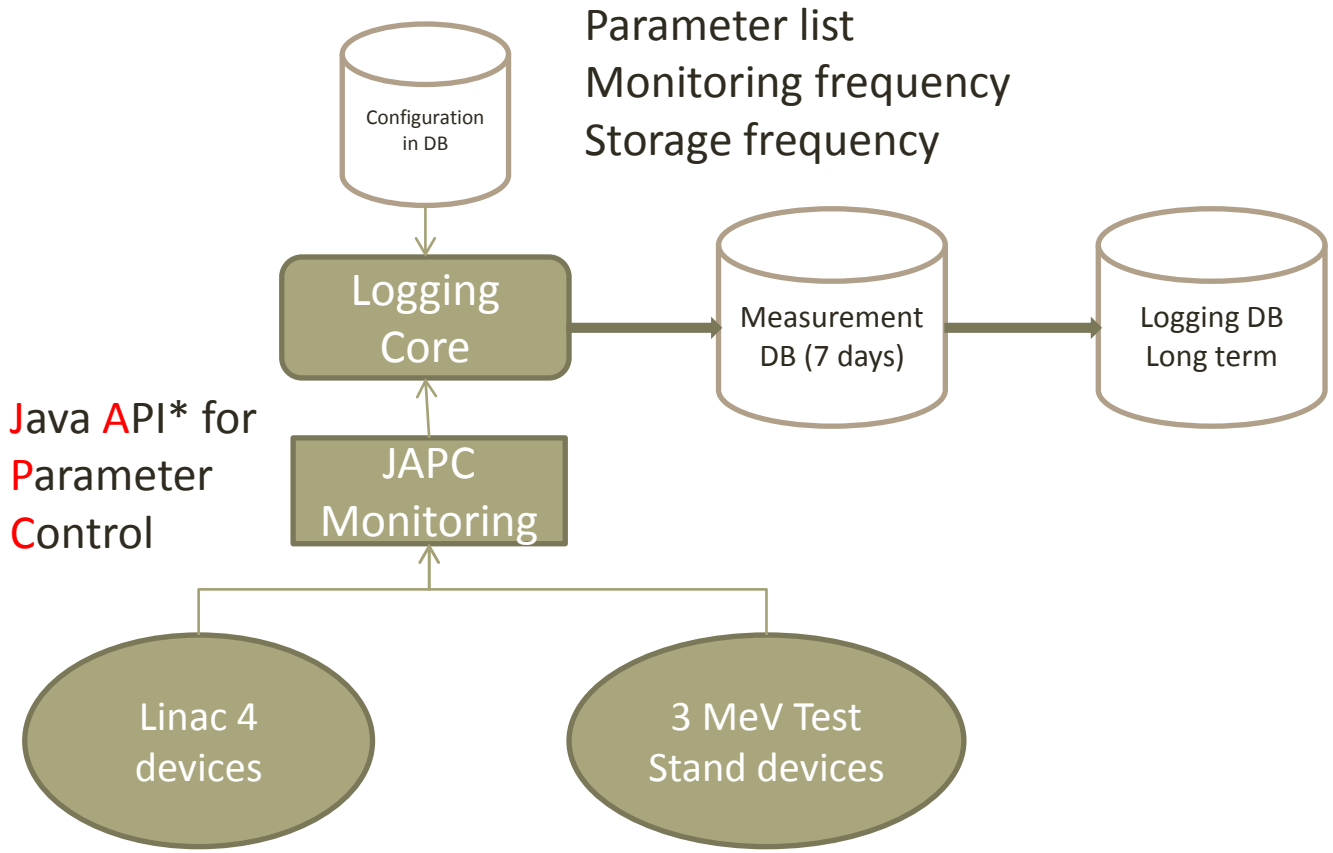
- 6 scopes in 2 FEC for linac4 and the same for the Test Stands.
- 48 signals are foreseen to be acquired by OASIS. (30% connected)

List of signals

Linac 4 Tunel	3MeV Test Stand	Description
L4L.SOL-ANTENA-I-AS	L4LT.SOL-ANTENA-I-AS	RF antenna current
L4L.COLLAR-I-AS	L4LT.COLLAR-I-AS	Collar electrode current, SF 10, A
L4L.COLLAR-V-AS	L4LT.COLLAR-V-AS	Collar electrode voltage, SF 100
L4L.FC-1-AS	L4LT.FC-1-AS	Faraday cup 1 current, SF 0.1, A
L4L.PLASMA-LIGHT-0-AS	L4LT.PLASMA-LIGHT-0-AS	Ignition chamber light signal 0°
L4L.PLASMA-LIGHT-15-AS	L4LT.PLASMA-LIGHT-15-AS	Ignition chamber light signal 15°
L4L.PLASMA-LIGHT-30-AS	L4LT.PLASMA-LIGHT-30-AS	Ignition chamber light signal 30°
L4L.RF-P-REFL-AS	L4LT.RF-P-REFL-AS	RF reflected power
L4L.RF-P-FW-AS	L4LT.RF-P-FW-AS	RF forward power
L4L.GAS-PIEZO-V-AS	L4LT.GAS-PIEZO-V-AS	Piezo valve voltage, SF 100
L4L.IGN-V-AS	L4LT.IGN-V-AS	Ignition pulser voltage, SF 1000
L4L.IGN-I-AS	L4LT.IGN-I-AS	Ignition pulser current, SF 20, A
L4L.SOURCE-V-AS	L4LT.SOURCE-V-AS	HT power supply voltage
L4L.SOURCE-I-AS	L4LT.SOURCE-I-AS	HT power supply current
L4L.PULLER-V-AS	L4LT.PULLER-V-AS	Puller HT power supply voltage
L4L.PULLER-I-AS	L4LT.PULLER-I-AS	Puller HT power supply current
L4L.DUMP-V-AS	L4LT.DUMP-V-AS	Dump HT power supply voltage
L4L.DUMP-I-AS	L4LT.DUMP-I-AS	Dump HT power supply current
L4L.EINZEL-V-AS	L4LT.EINZEL-V-AS	Einzel HT power supply voltage
L4L.EINZEL-I-AS	L4LT.EINZEL-I-AS	Einzel HT power supply current
L4L.SRC-PRES-1-AS	L4LT.SRC-PRES-1-AS	Source Pressure
L4L.SRC-PRES-2-AS	L4LT.SRC-PRES-2-AS	Source Pressure
L4L.EINZ-PRES-AS	L4LT.EINZ-PRES-AS	Einzel pressure
L4L.LEBT-PRES-AS	L4LT.LEBT-PRES-AS	LEBT Pressure

LOGGING Service

Operational on the whole CERN accelerator
Aim : to capture and store any relevant accelerator data



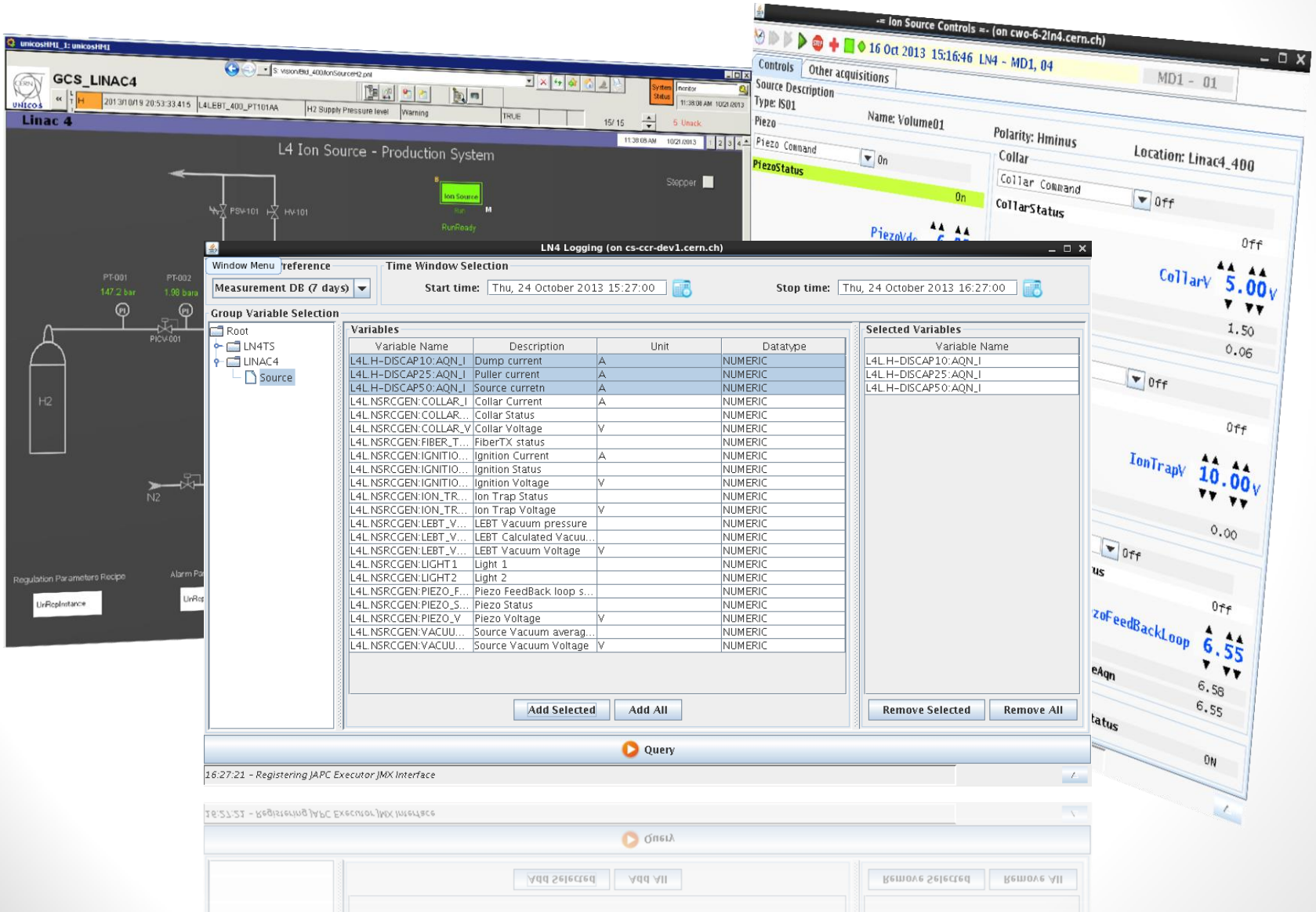
* API = Application Programming Interface

List of parameter logged

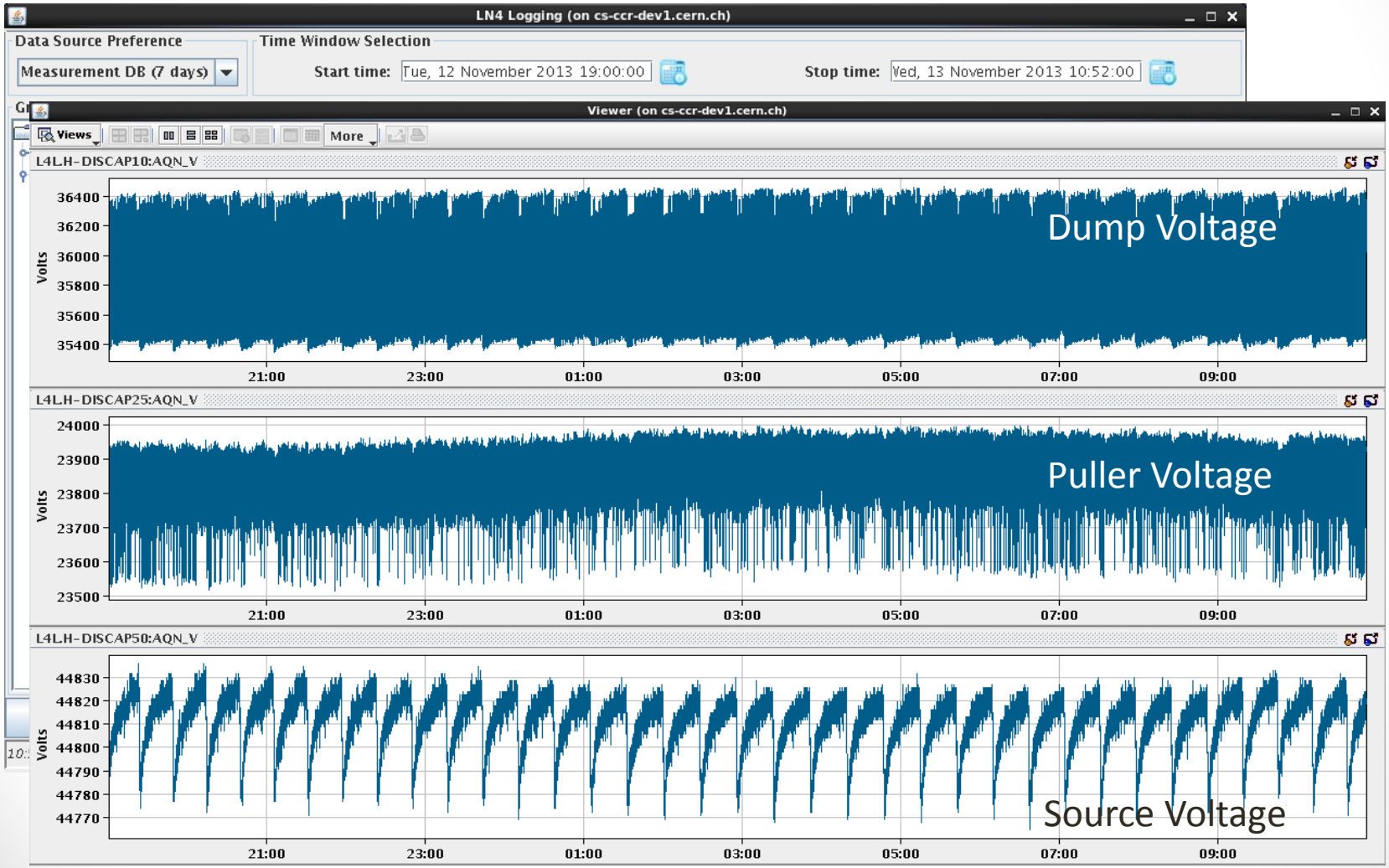
- Description of the working source (Type, Name, Polarity,…)
- 48 waveforms 5000pts(time window 1ms).
  - Settings : sampling rate, cursors.
  - Average, Standard Deviation
- Others relevant parameter (Power Supplies acquisition, Pressures, Temperatures).
- Monitoring frequency : 0.83Hz.
- Storage frequency : every cycle in the short DB and on change in the long term database.

Exception: Waveforms every hour in the long term database.

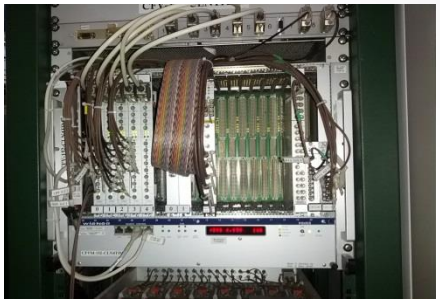
Specific Application



LOGGING display software



Timings editor



-= LN4 Ion Source Timing =- (on cwo-6-2ln4.cern.ch)

16 Oct 2013 15:28:04 LN4 - 01 MD1 | olga_cycle_V1

02 MD1 | olga_cycle_V1

Linac4 (Bldg. 400)

Dev Name	Description	Ref Name	Value	Acquisition
L4X.STARTGAS	Start gas pulse	L4X.SEJ	-2.300 ms	-2.3 ms
L4X.STARTIGN	Start ignition source	L4X.SEJ	-0.070 ms	-0.07 ms
L4X.STOPIGN	Stop ignition source	L4X.STARTIGN	0.040 ms	0.04 ms
L4X.RRFONSRC	Ready source RF ON	L4X.SEJ	-0.100 ms	-0.1 ms
L4X.FWSRCRF	Forewarning source RF	L4X.SEJ	-0.300 ms	-0.3 ms
L4X.FW-H-DISCAP	Forewarning for H-DISCAP	L4X.SEJ	-380.000 ms	-0.820 ms

L4X.STARTGAS
L4X.STARTIGN
L4X.STOPIGN
L4X.RRFONSRC
L4X.FWSRCRF
L4X.FW-H-DISCAP
L4X.W-H-DISCAP
L4X.S-H-DISCAP50
L4X.S-H-DISCAP25
L4X.S-H-DISCAP10

LN4:USER==MD1 - KnobsOpen (on cs-ccr-dev1.cern.ch)

More...

07 Nov 2013 16:15:58 LN4 - 04 MD1 | olga_cycle_V1

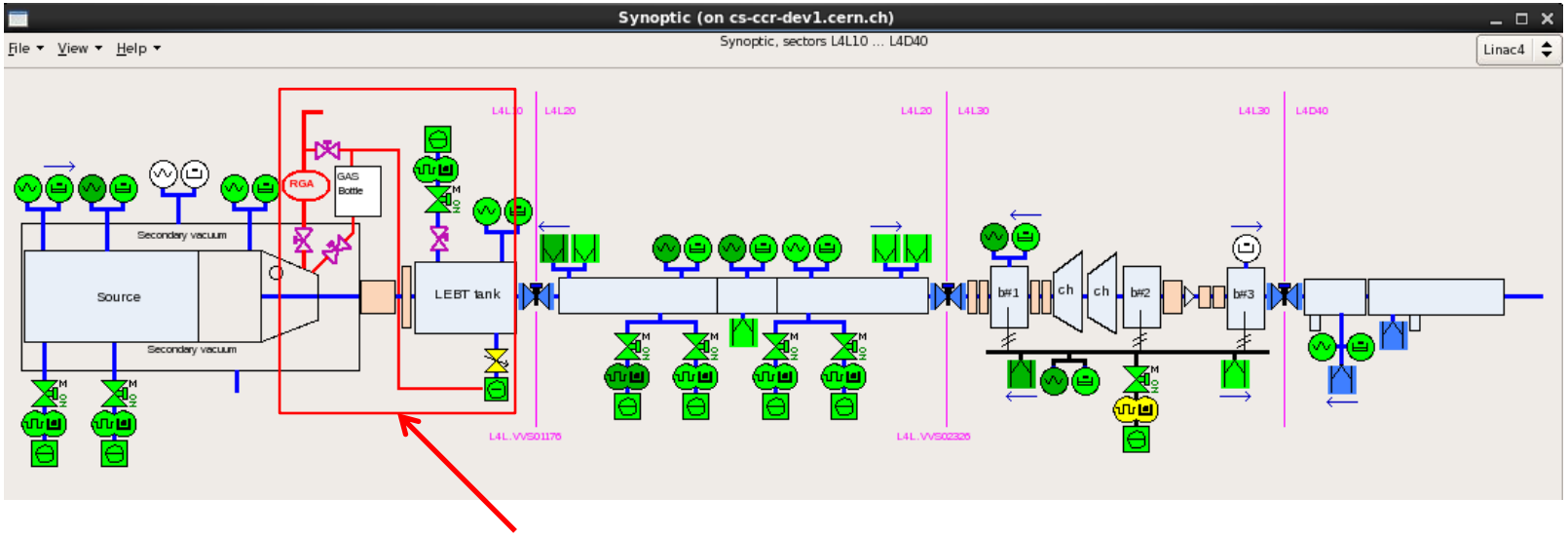
01 MD1 | olga_cycle_V1

L4X.SEJ	L4X.STARTGAS	L4X.RRFONSRC	L4X.FW-H-DISCAP
Pulse: Enable	Pulse: Enable	Pulse: Enable	Pulse: Disable
Load: BIX.W10-CT	Load: BIX.W10-CT	Load: BIX.W10-CT	Load: BIX.F900-CT
Delay	Delay	Delay	Delay
Ref: -	Ref: -	Ref: -	Ref: -
Init: 100000 10MHZ	Init: 77000 10MHZ	Init: 99000 10MHZ	Init: 520 1KHZ
Delay 100000 10MHZ	Delay 77000 10MHZ	Delay 99000 10MHZ	Delay 520 1KHZ

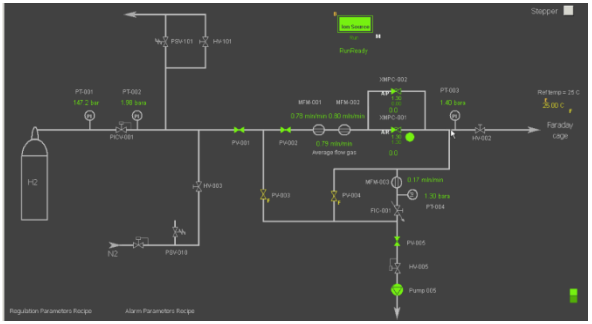
16:15:15 - Opening knob: L4X.FW-H-DISCAP...done

Synoptic:

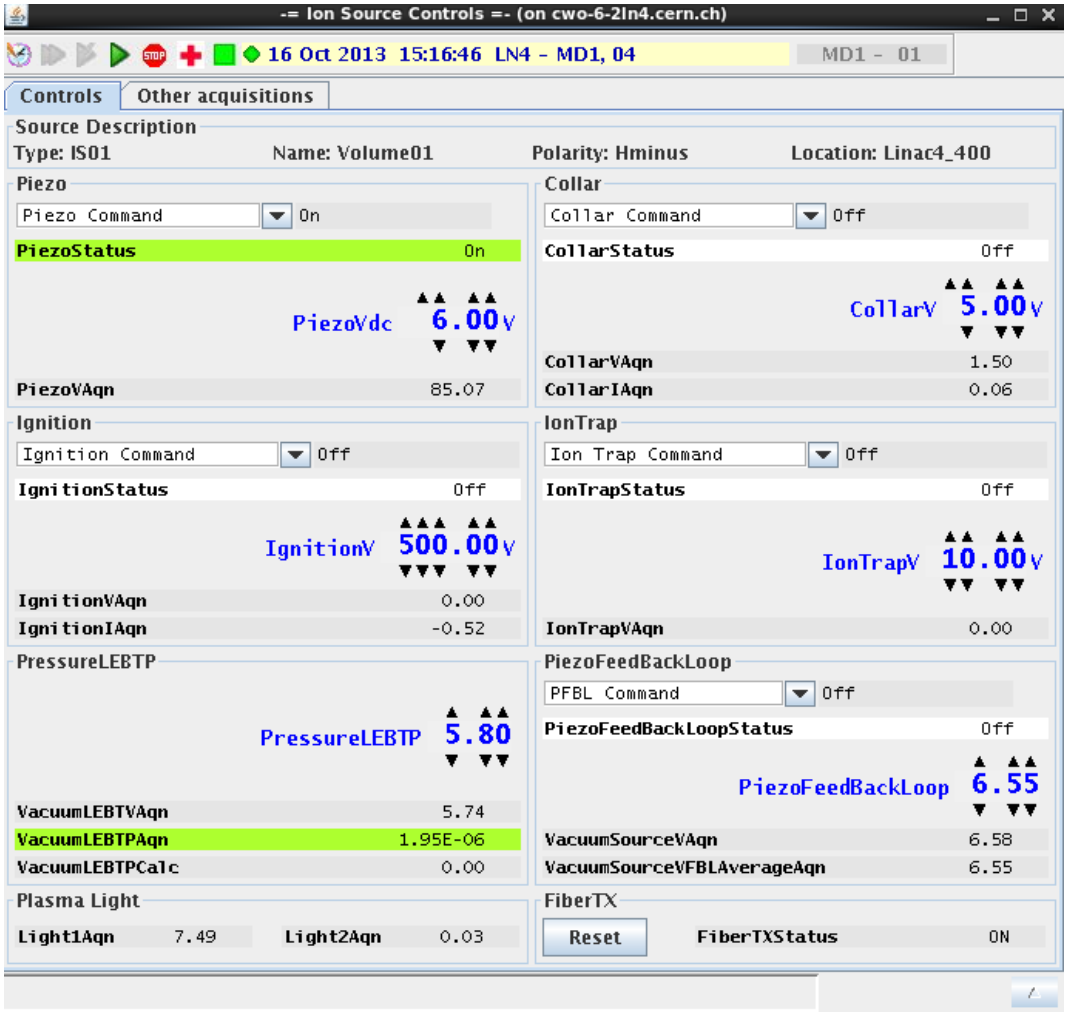
Vacuum



Red circuit/lines controlled by the Gas Delivery System Source and LEBT



General Source Control



Resources needed to implement a magnetron source

- Hardware (25kCHF, 0.5FTE)
  - Timing card
  - Cabling
  - PLC
  - Buffer cards
  - Oscilloscope for OASIS
- Software adaptation (0.5FTE)
  - Timing editor
  - General source control applications
  - FESA classes
  - Logging Service

Conclusion/outlook

- The control system of the Ion Source is based on existing components and systems developed for the LHC and injectors accelerators (LSA, INCA, WS, Knobs, OASIS and Logging Service). BE-CO is responsible of the maintenance and the configuration is done by BE/OP
- Java Operational applications will be maintain by BE-OP and BE-ABP
- PH-DT and TE-VSC groups are responsible of their Specific application
- Finalize the connection of the missing signal to OASIS + Logging settings 0.5FTE
- 1FTE and 25kCHF are needed to implement the Magnetron source in the current control system.