

Oscilloscope Software and Slow Control

AGATA Week 2024

Summary

- Development status
- Software Architecture and Data transfers
- Functionalities
 - Data source settings
 - Channels selection
 - Screen cursors
 - Generated channels and Measures
 - Trigger
 - Display features
- Slow control
 - Interface with TopologyManager

Development status

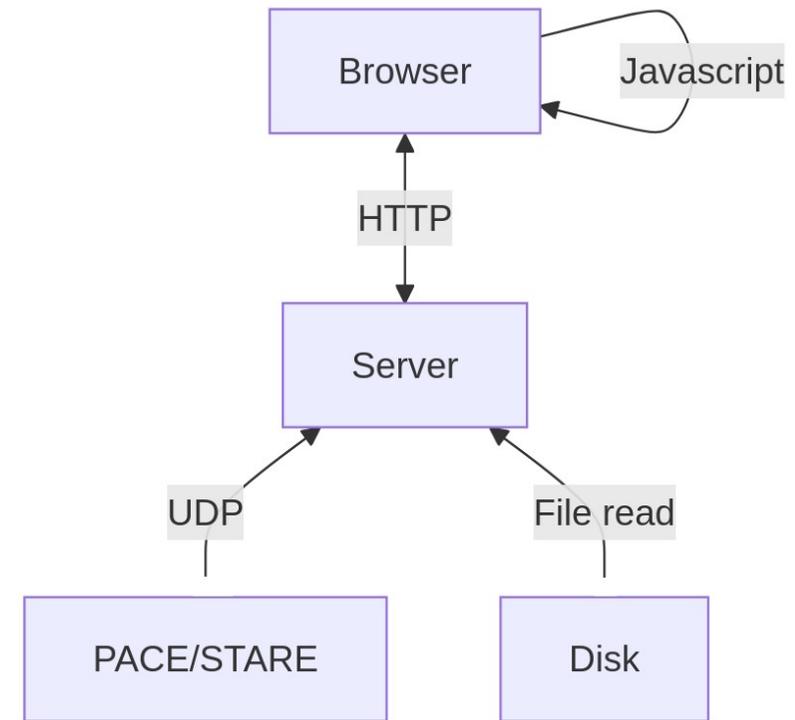
- Technical specifications
 - First version: [Functional specifications](#)
 - Inspired from: [Perytech Oscilloscope Software](#)
 - Detailed version: [Detailed technical specifications](#)
- 2 Months intership
 - Owen Pichot, 2nd year Bachelor at Colmar UIT
 - Followed by C. Bonnin
 - At IPHC
- Integrated as 2nd application in Slow Control software
- License CeCILL-B

Software Architecture

- Same as Slow Control
 - Python 3 server
 - Django framework
 - GUI in a browser
 - Database InfluxDB (for user preferences)
- Data transfers
 - From cards to Python server using UDP (or file reading)
 - From server to Browser using HTTP
- Screen functionalities in Javascript
- GUI elements in HTML
- Appearance in CSS

Data transfers

- Transfer rates high enough to allow
 - 10 channels from a file
- Javascript in browser quick enough to allow
 - Screen refresh frequency of 10 Hz
 - Compute calculated channels



Source settings

- 2 modes: from file or cards
- Number of channels (1 – 10)
- Size of frames (32 – 1 M samples)
- Data formats
 - Raw data format
 - Including small UDP headers
 - Oscillo file format (TNT .osc files)

[Logout](#) [Profile](#)

Settings selection for the oscillo

Enter here the values you expect to receive from the stare c

Please make sur to enter the right informations or else the result of the signals d

N.B: You can change these values at any moment once on the oscilloscope screen by

Mode :

Real-Time
File

Number of Channels :

4

Samples per frame :

1024

Select a .osc or .dat file

[Browse...](#) Event_1.dat

[Start Capture](#)

You've currently selected the 'file' option.

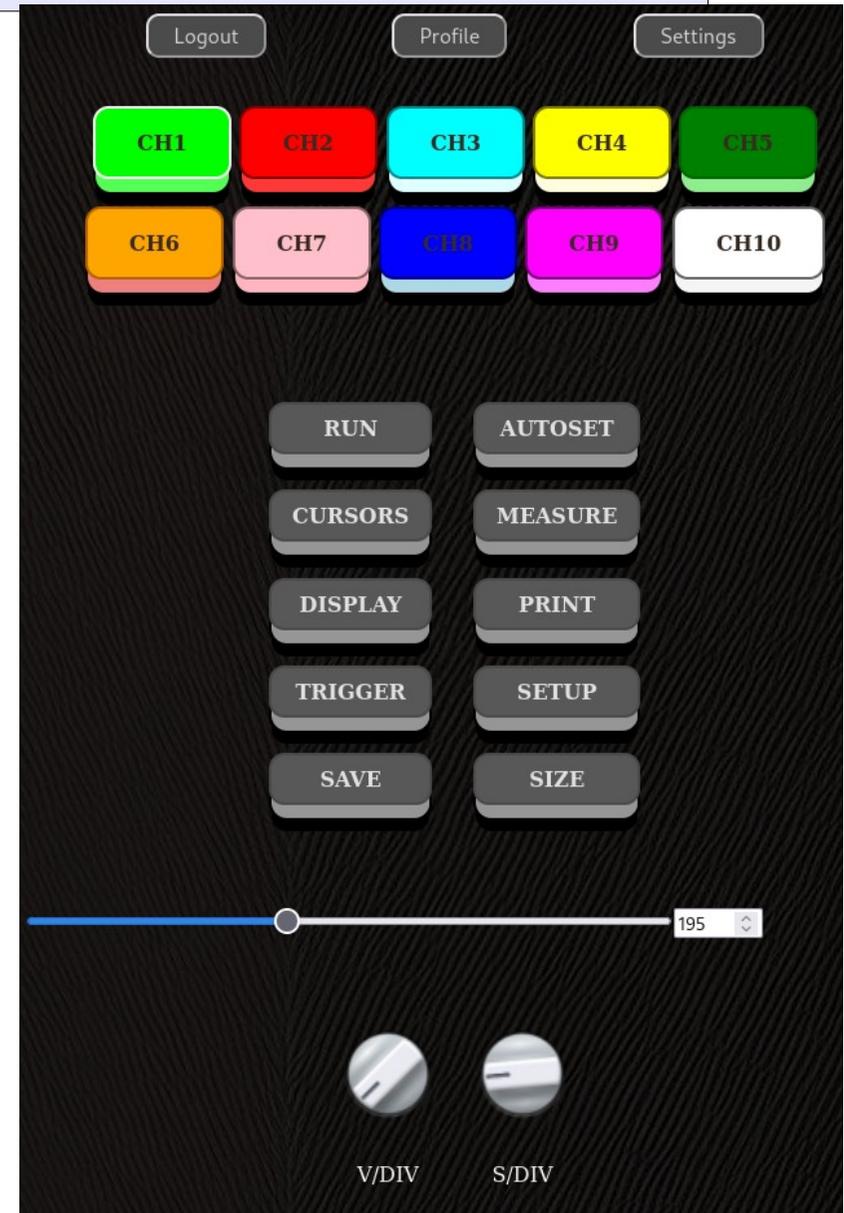
Please select here above a file with an extension .osc or .dat to read it using the os

Main screen

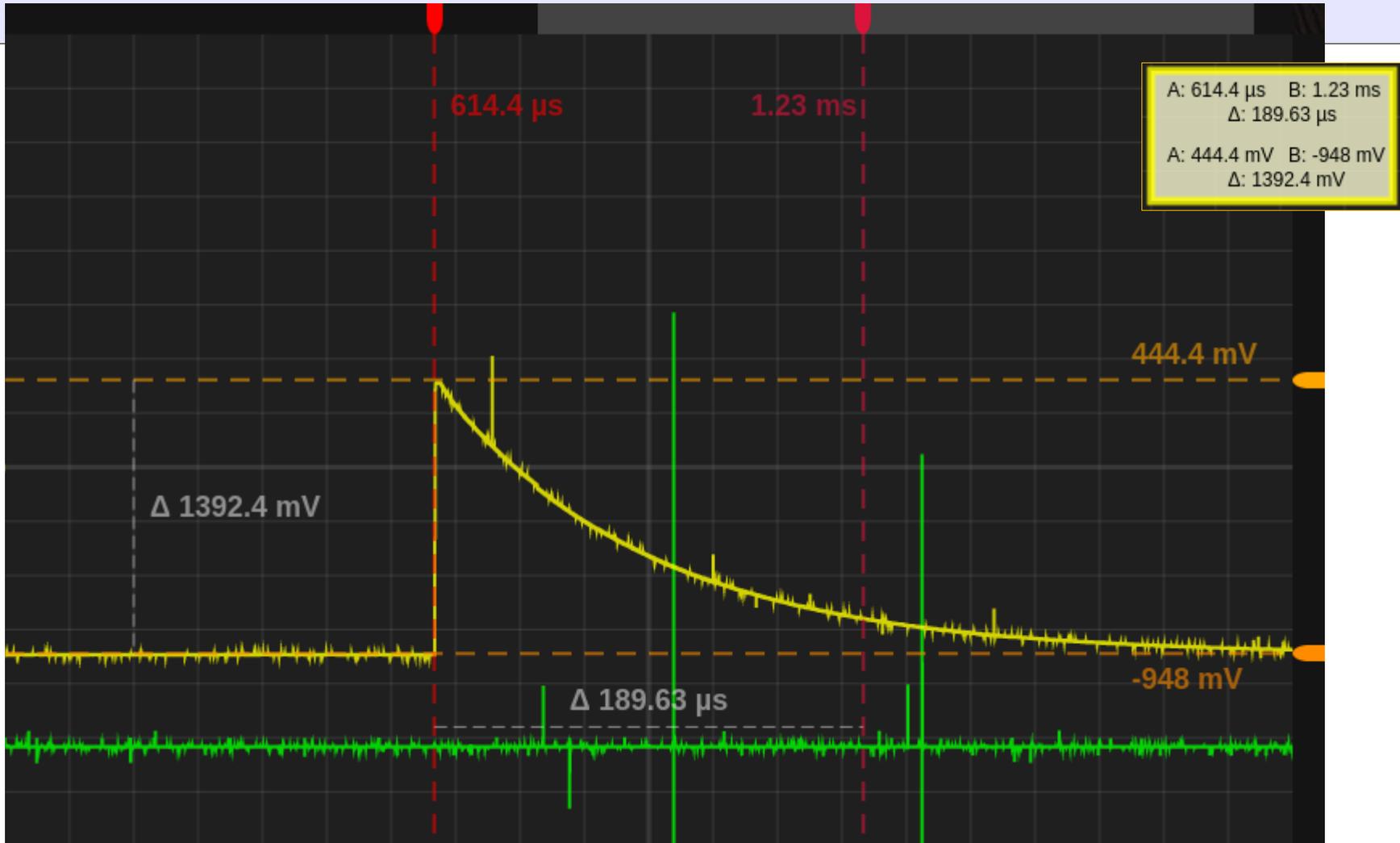


Channels selection

- 10 selectable channels
- Only focused channel can be zoomed
- Run / stop button
- Navigation bar through file
- Autoset to choose appropriate
 - horizontal time zoom and offset
 - vertical amplitude zoom and offset
 - For all channels at once



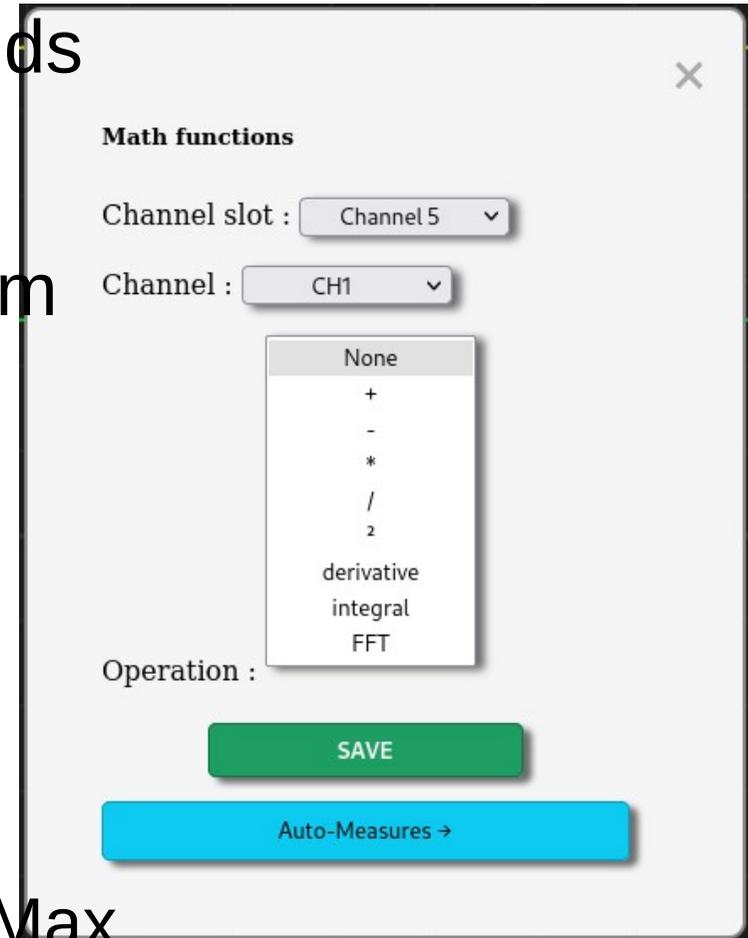
Cursors



- Time and voltage measures available
- Values displayed on screen or separate frame

Generated channels and Measures

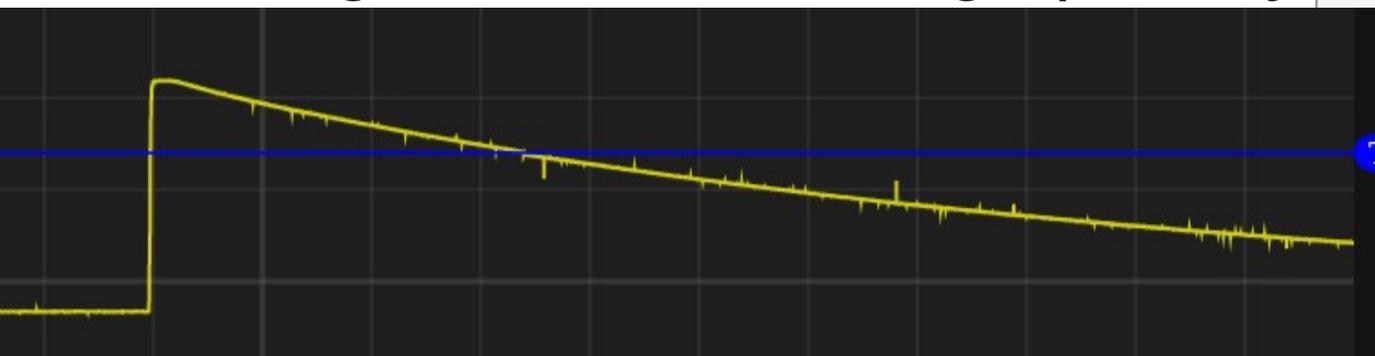
- Active channels can be used as operands
- to generated a new one (up to 10)
- Measures values displayed at the bottom of the screen
 - Minimum, maximum (Min, Max)
 - Max amplitude (Vpp)
 - Average, median (Avg, Mid)
 - Root Mean Square (RMS)
 - Frequencies detection (Freq, Min freq, Max freq)



Vpp : -5.4mV Min : 3337.3mV Max : 3342.7mV Avg : 3340.1mV Mid : 3340.0mV RMS : 3340.1mV Freq : 5.4 MHz Max Freq : 100.0 MHz Min Freq : 12.5 MHz

(re) Trigger

- Allows to trig again incoming data
- Mode Edge or Window
- Input channel selection
- Slope (falling / rising)
- Thresholds
 - Edge: 1, window: 2
 - Edge one can be set graphically



Trigger options

Trigger active

Trigger mode

Edge-Trigger ▾

Trigger channel

Channel 1 ▾

Trigger slope

Both ▾

Trigger level (mV)

500

Window level min (mV)

500

Window level max (mV)

500

Hold off (s)

3600

Apply Trigger Settings

Zoom and Display options

- Zoom by selecting an area on screen
- Grid (de)activation
- Theme (Dark / Light)
- Screen refresh delay
- Colors saved in user preferences
- Color list for each theme

Display options

Unzoom

Grid Display :

Theme : Dark

Screen refresh delay (in ms) : 100

Setup Options

Dark

Light

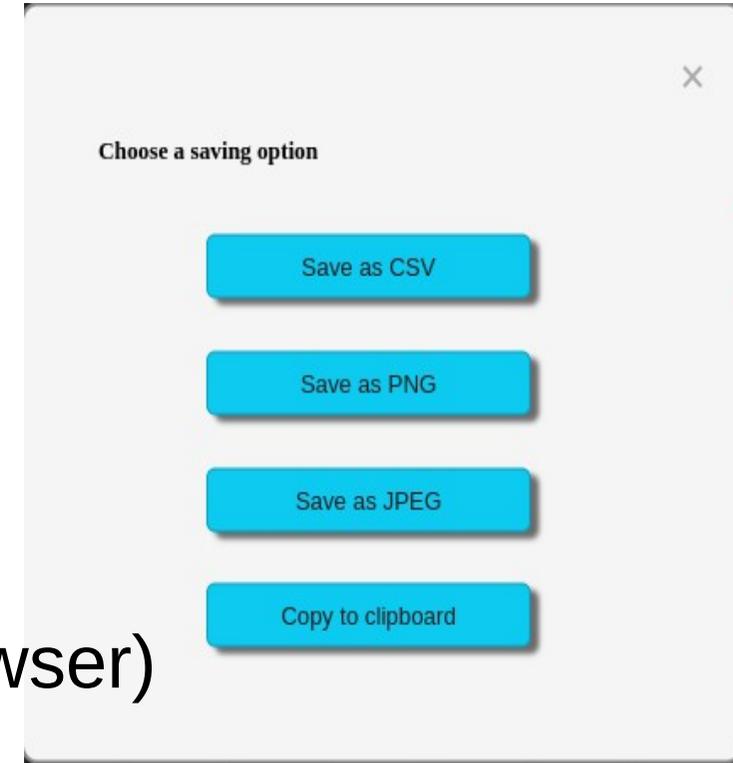
CH1	Lime	CH1	Green
CH2	Red	CH2	Red
CH3	Cyan	CH3	Gray
CH4	Yellow	CH4	Olive
CH5	Green	CH5	Teal
CH6	Orange	CH6	Orange
CH7	Pink	CH7	Maroon
CH8	Blue	CH8	Blue
CH9	Fuchsia	CH9	Purple
CH10	White	CH10	Black

Grid Opacity (0-1) : 0.5

SAVE

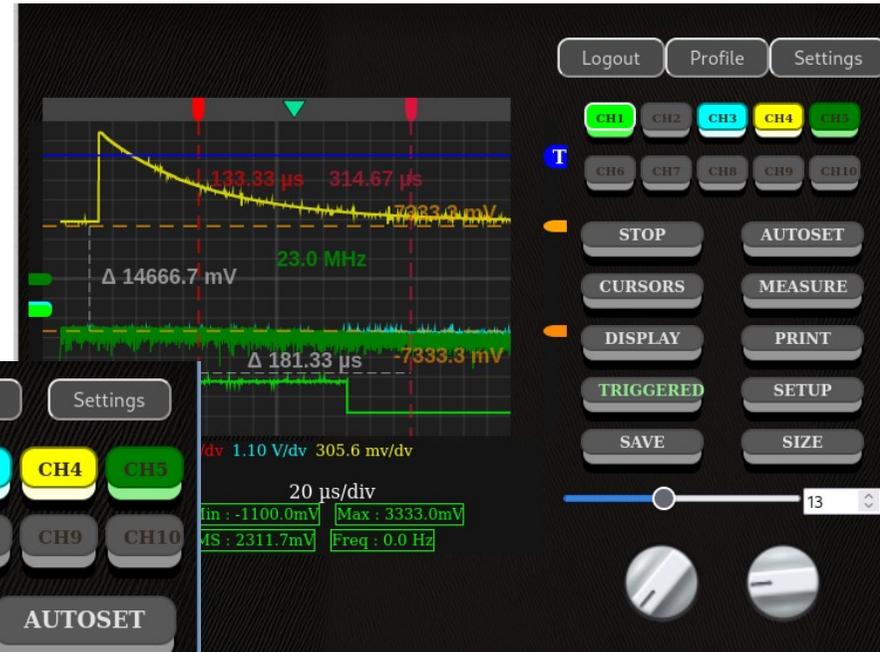
Exports and screenshot

- The Print button directly saves the screen into a PNG image file
- The Save button exports data into:
 - CSV text file
 - PNG image file
 - JPEG image file
 - Clipboard image (if supported by browser)



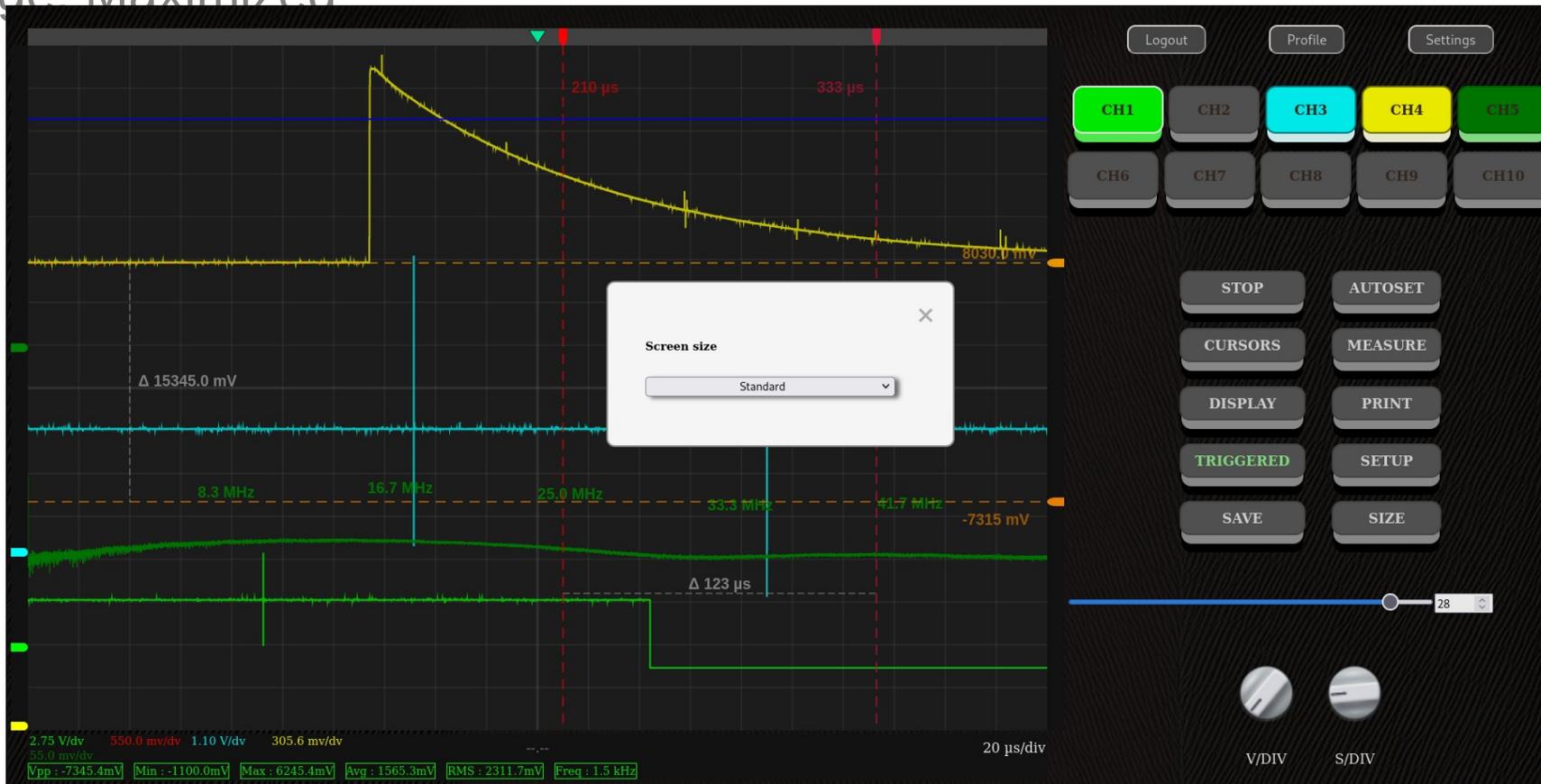
5 screen sizes

- Tiny (400 x 267)
- Small (800 x 533)
- Standard, Large, Maximized



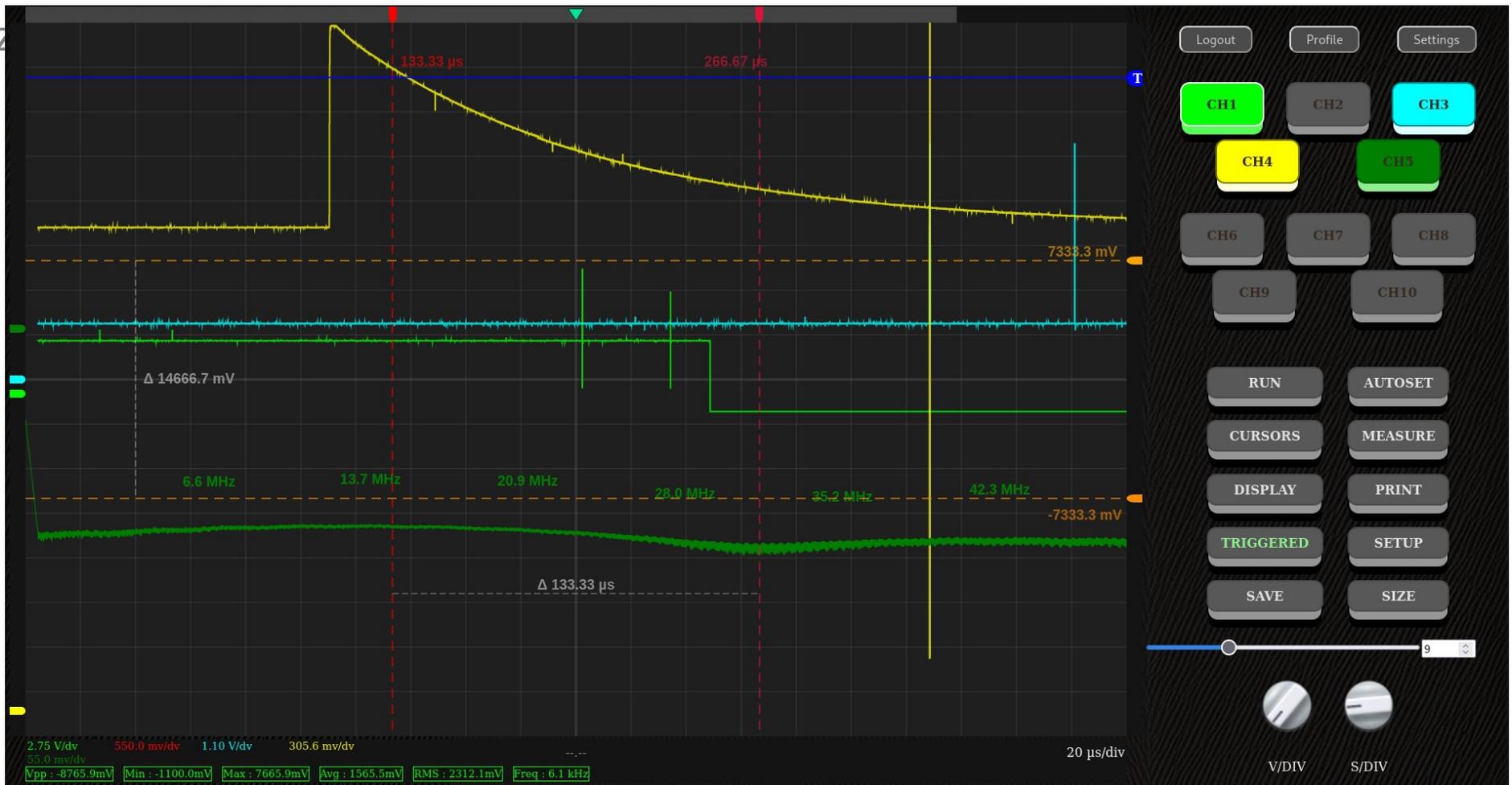
5 screen sizes

- Tiny, Small
- Standard (1200 x 800)
- Large, Maximized



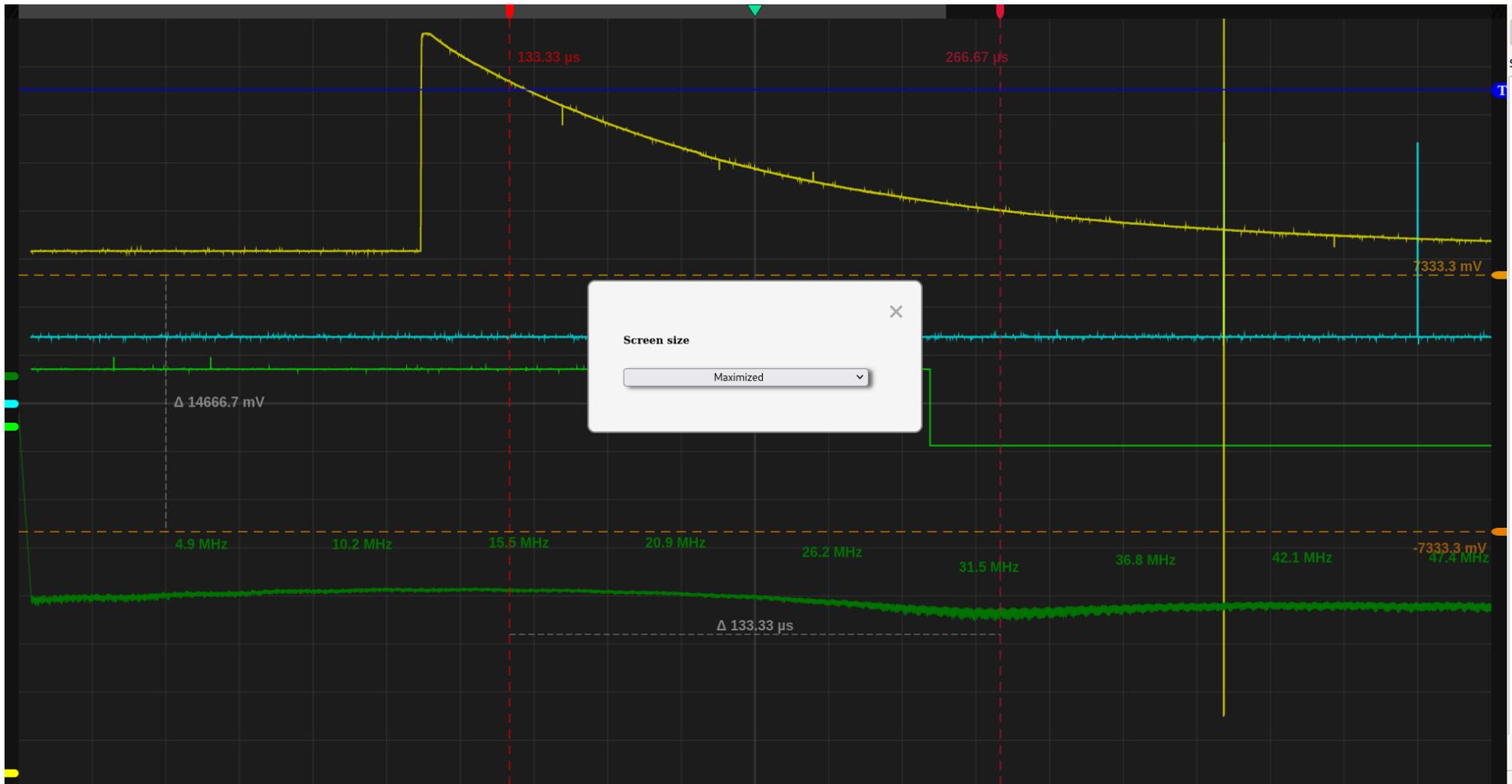
5 screen sizes

- Tiny, Small, Standard,
- Large (1400 x 900)
- Maximiz



5 screen sizes

- Tiny, Small, Standard, Large
- Maximized (screen only, no buttons, Esc to standard size)



Online documentation

- Contextual help by pressing F1
- All features described, screenshots, animations
- Browser popups must be allowed to open help page

Home

MODULES

AUTOSET

CURSORS

DISPLAY

MAIN-PAGE

Channel-buttons

Horizontal-offset

Knobs

Readings

Start-Stop

Vertical-offset

MEASURE

PRINT

SAVE

SETTINGS

Files

Real-Time

Simulated-Real-Time

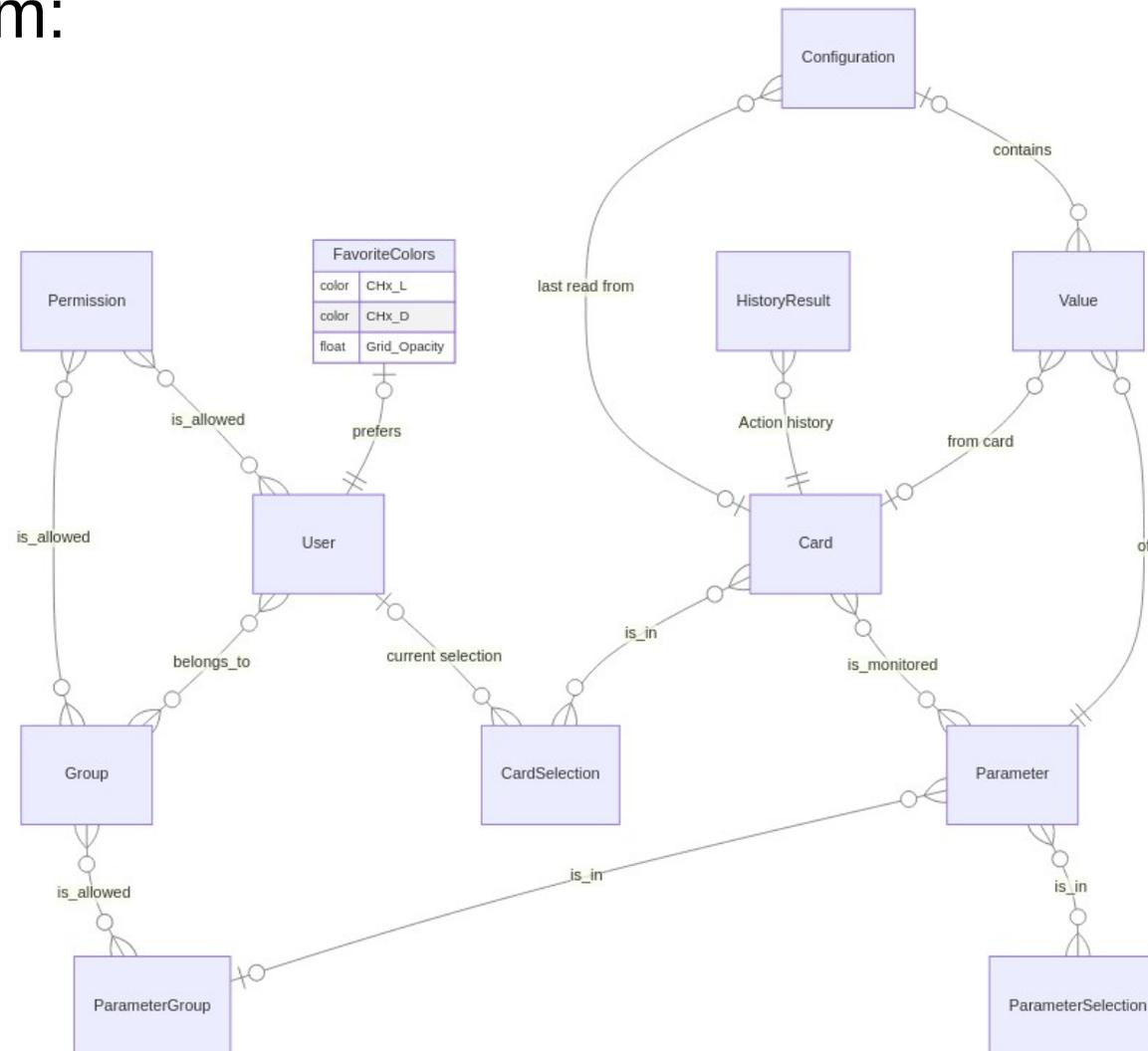
SETUP

SIZE

TRIGGER

Data model

Entity-relation diagram:



12 entities, 18 tables

Interface with TopologyManager

- TM gives information about available STARE cards

```

{"connections":[
  {
    "id":"stare.0",
    "uri":"chtcp-2.0://10.81.17.221:10203?target=10.81.17.157:50001",
    "address_table":"file:///... /Stare_Utility/STARE.xml",
    "cluster":"ATC01",
    "position":11,
    "crystal":"A", ...
  },
  ...
]}
  
```

controlhub IP

card IP

- Need to add address and port of inspection data output
- Loaded at startup, reloaded manually

Actions on cards

- ~~CMD_Test.py~~ → Ph2_PACE_CMD

lib	pace_basic.py	13
	pace_call.py	8
	pace_dtp.py	10
	pace_gts.py	16
	pace_mon.py	2
	pace_read.py	16
	pace_recv.py	13
	pace_sc.py	23
	stare.py	62
		(total: 163)

Slow Control Crystals view Selection Configuration Action Administration Logout

Configure Setup Go Stop Reset Launch Results Oscillo

Actions for card stare.3

- Action class:
- pace_call
 - pace_basic
 - pace_gts
 - pace_recv
 - pace_dtp
 - pace_read
 - pace_mon
 - pace_sc
 - stare

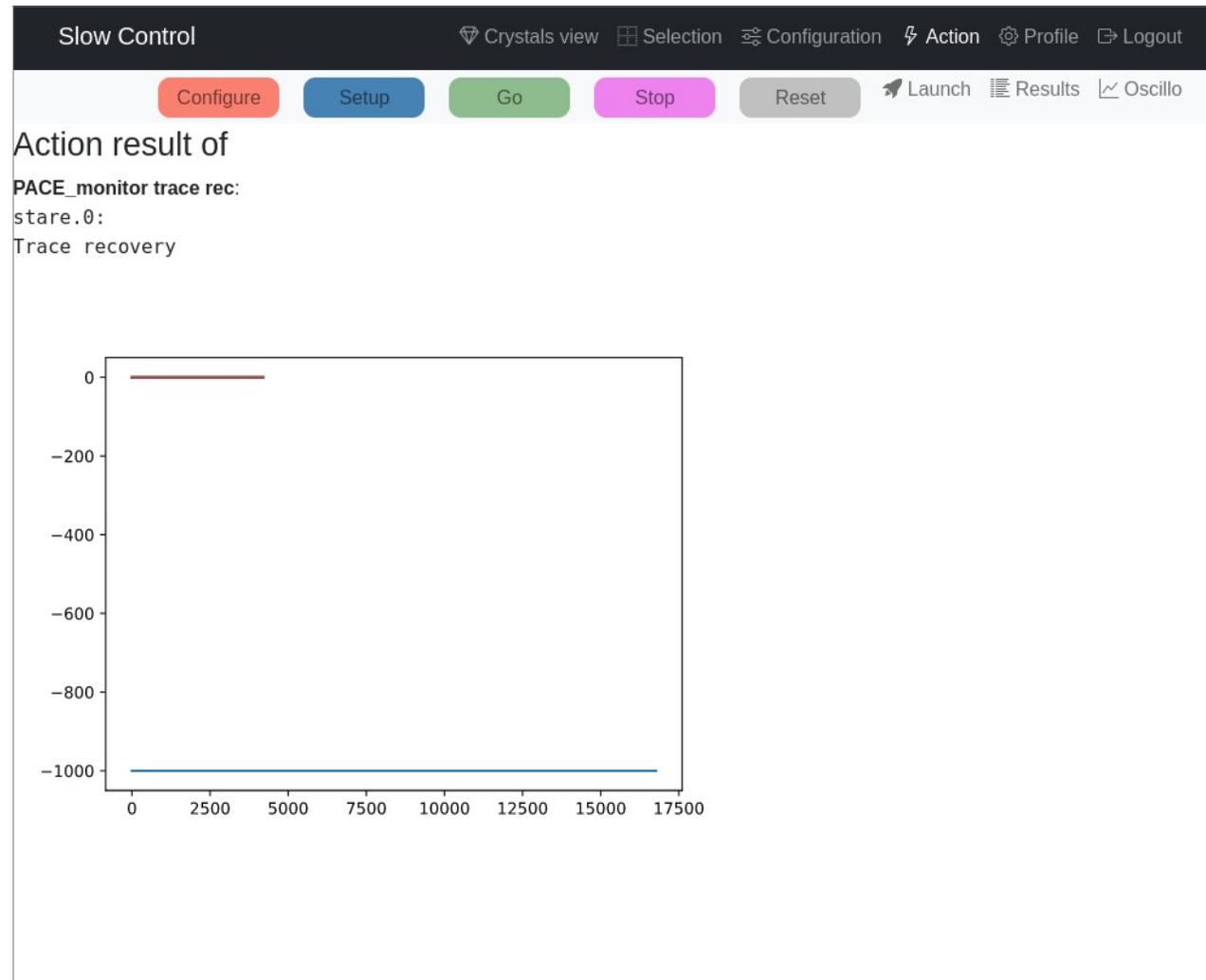
PACE_HRD_cmd	PACE_HRD_led	PACE_HRD_rd32	PACE_HRD_rd8
PACE_HRD_scan32	PACE_HRD_sense32	PACE_HRD_set32	PACE_HRD_start
PACE_HRD_stat	PACE_HRD_wr32	PACE_HRD_wr8	PACE_SC_ADCtest
PACE_SC_adc	PACE_SC_agg	PACE_SC_dump	PACE_SC_init
PACE_SC_offset	PACE_SC_range	PACE_SC_start	PACE_SC_sync
PACE_SC_take	PACE_SC_temp	PACE_reset12C	

```

Read PACE temperatures. [all/mon]
[] : fast read temperatures
[digi]: fast read Digi-Opt temperatures
[all] : fast read all temperatures
[mon] : start monitoring for temperature (CTRL+C to stop)
[mon] [ch]: start monitoring for selected temperature channel
    
```

Actions producing pictures

- Some actions produce graphics
 - Spectra,
 - traces,
 - energy



Links

- Sources: [IN2P3 Gitlab repository](#)
 - Use issues to report problems
 - [Functional specifications](#), [Technical specifications](#)
 - [Demonstration instance at IPHC](#)
 - Another one at Orsay
- [Included python scripts and address file](#) repository (needs Github login)
- IPBus software
 - CERN [web site](#)
 - [IPBus software sources](#)

- Slow Control
 - Connection to real STARE UDP inspection ports
 - Embed the commands that send data to those ports
- Oscilloscope
 - Curves vertical movements
 - Trigger settings (set window mode thresholds graphically)
 - Channel selection from Slow Control
 - Allow to reuse previously uploaded files

Thank you for your attention