Ocsilloscope 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

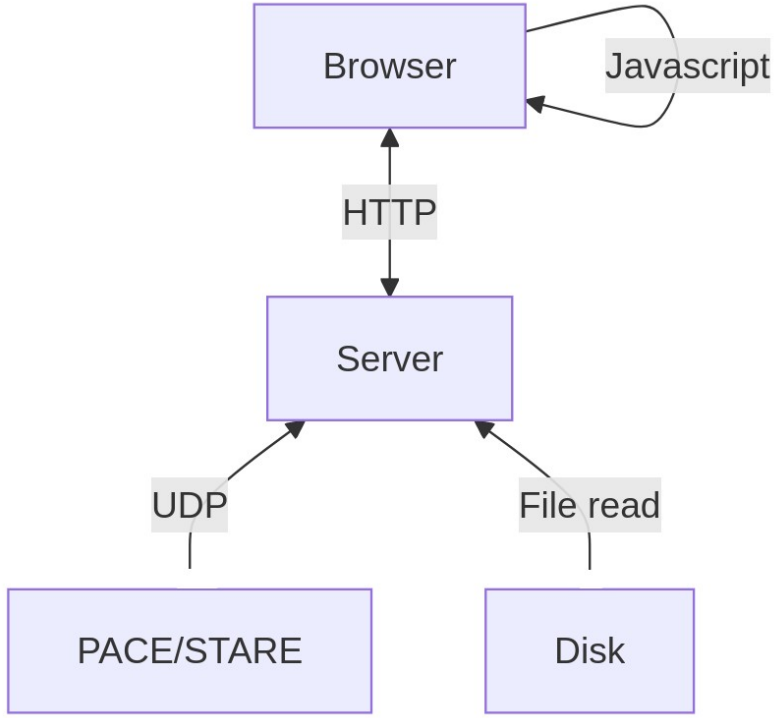
- Technical specifications
  - First version: Functional specifications
    - Inspired from: Perytech Oscilloscope Software
  - Detailled version:Detailled technical specifications
- 2 Months intership
  - Owen Pichot, 2nd year Bachelor at Colmar UIT
  - Followed by C. Bonnin
  - At IPHC
- Integrated 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 functionnalities in Javascript
- GUI elements in HTML
- Appearance in CSS

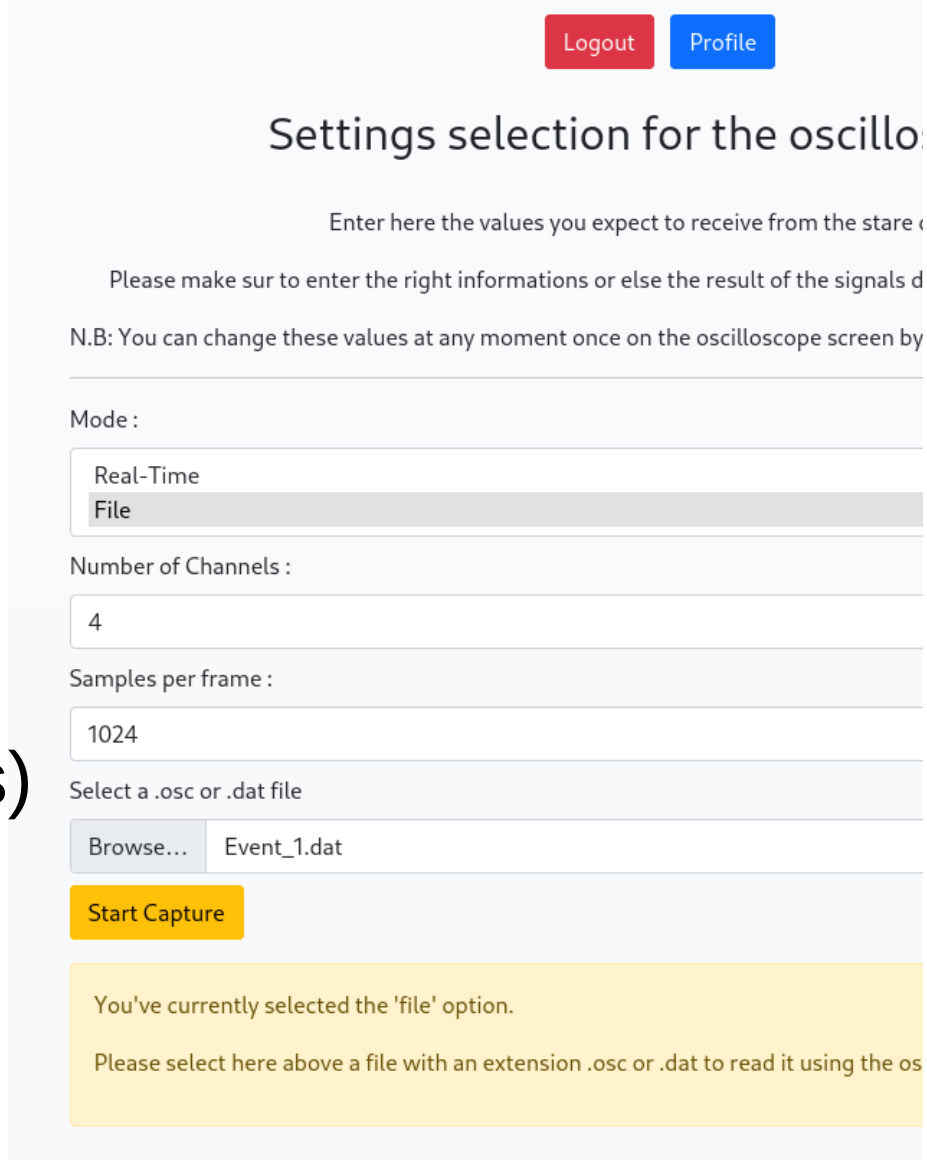
Data transfers

- Transfer rates high enough to allow
  - 10 channels from a file
- Javascript in brower 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)

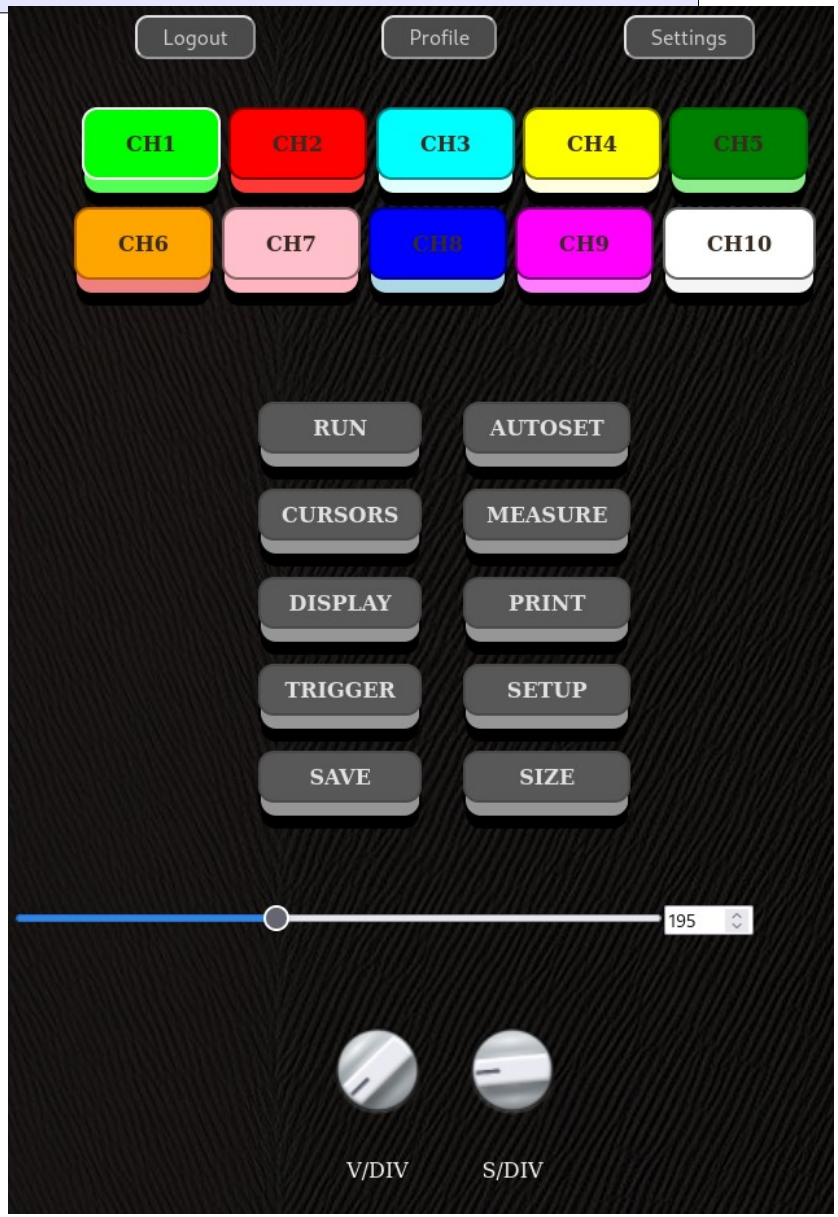


Main screen

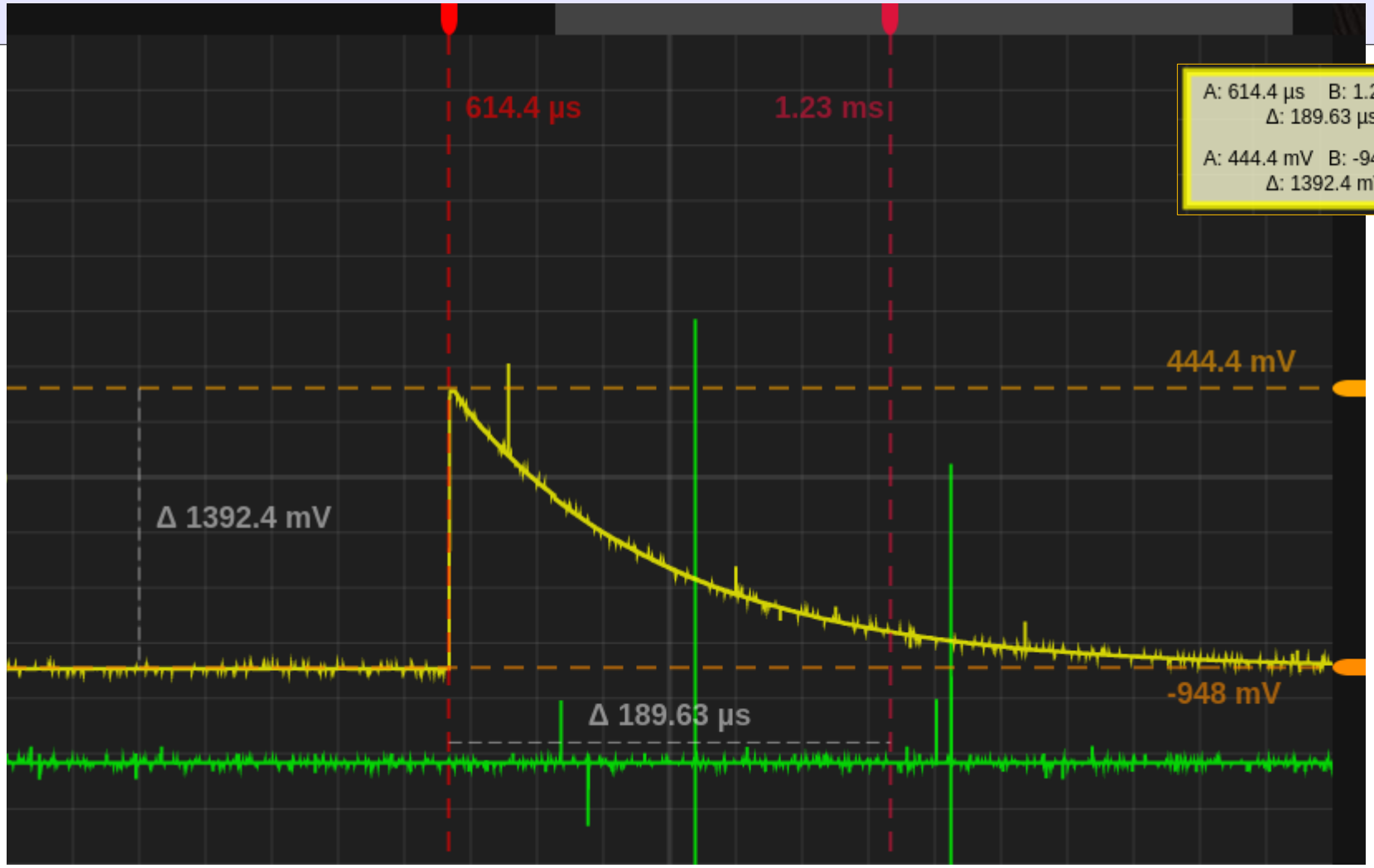

Logout
Profile
Settings
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
CH9
CH10
RUN
AUTOSET
CURSORS
MEASURE
DISPLAY
PRINT
TRIGGER
COLORS
SAVE
SIZE
21
V/DIV
S/DIV
550.0 mv/dv
550.0 mv/dv
275.0 mv/dv
343.8 mv/dv
--.--
2.42 µs/div

Channels selection

- 10 selectables 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



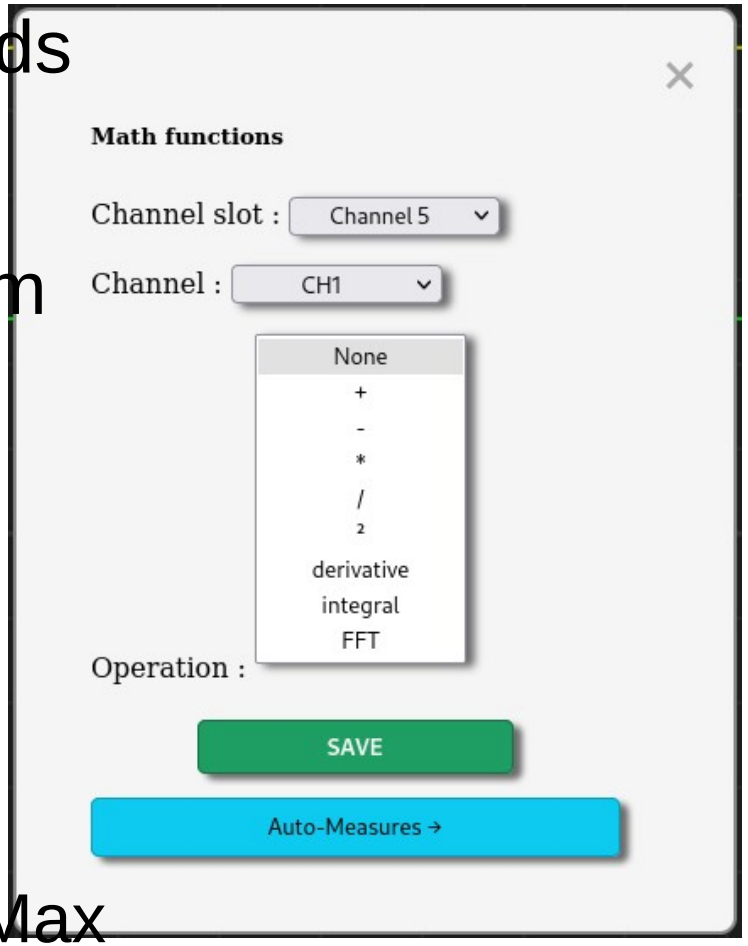
Cursors



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

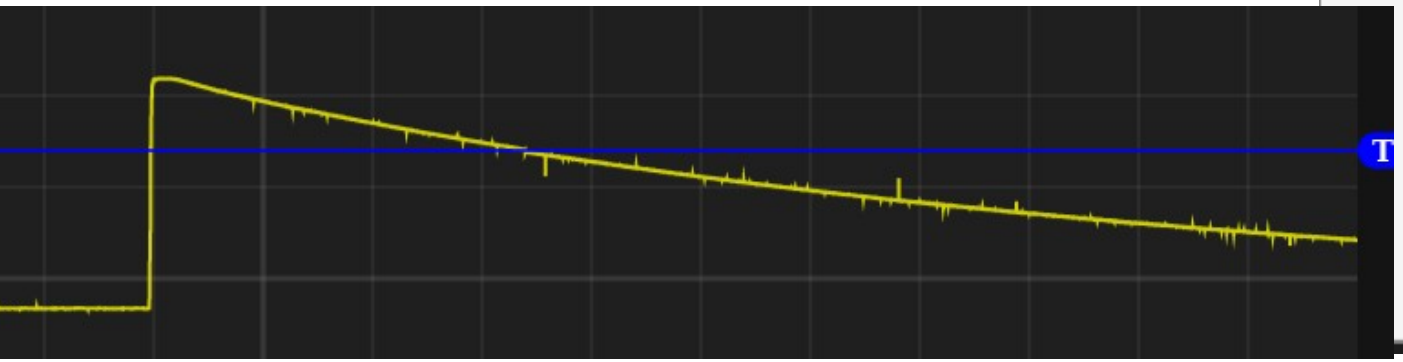
Generated channels and Measures

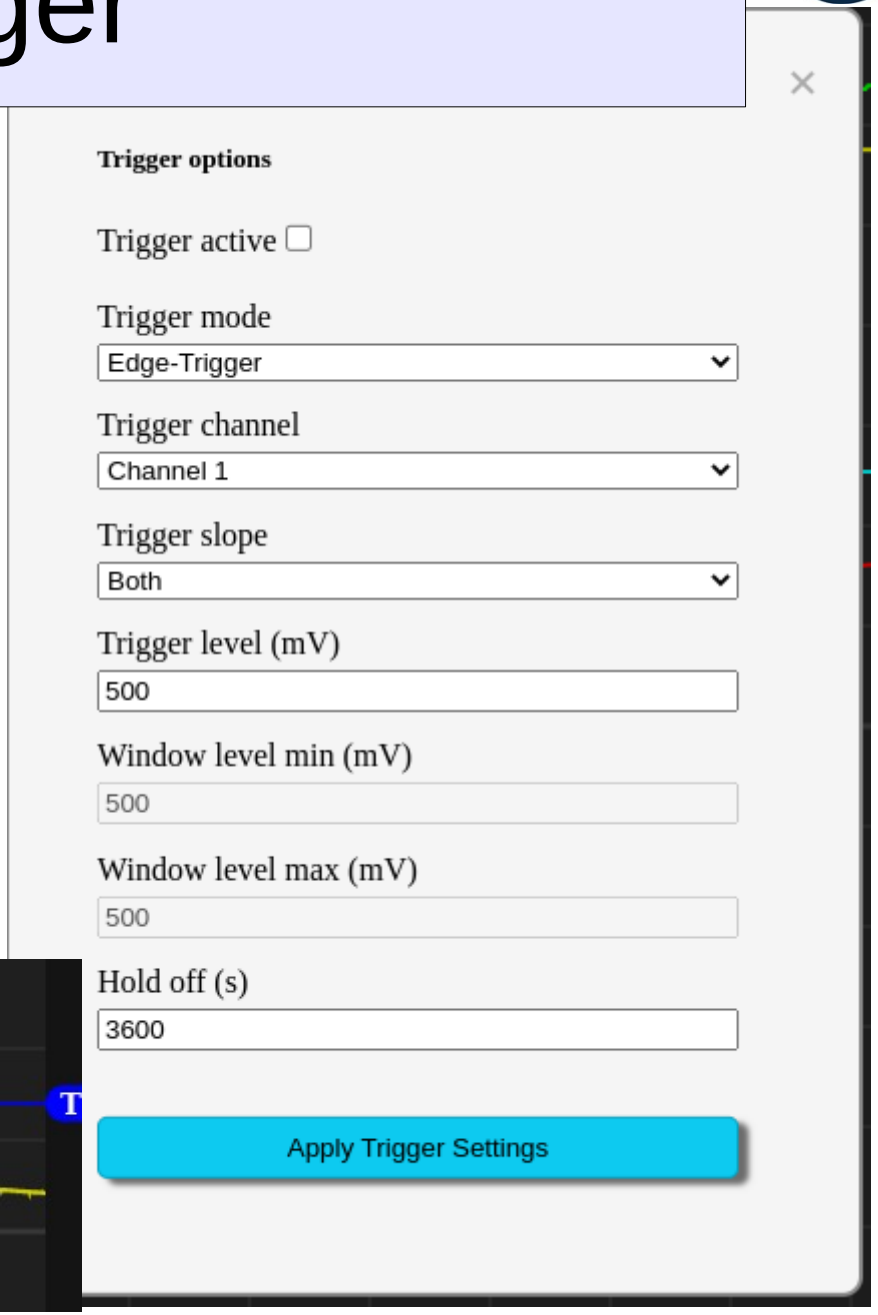
- Active channels can be used as operands
- to generated a new one (up to 10)
- Measures values displayed at the bottom of the screen
  - Minimum, maximum (Min, Max)
  - Max amplitude (Vpp)
  - Average, median (Avg, Mid)
  - Root Mean Square (RMS)
  - Frequencies detection (Freq, Min freq, Max freq)



(re) Trigger

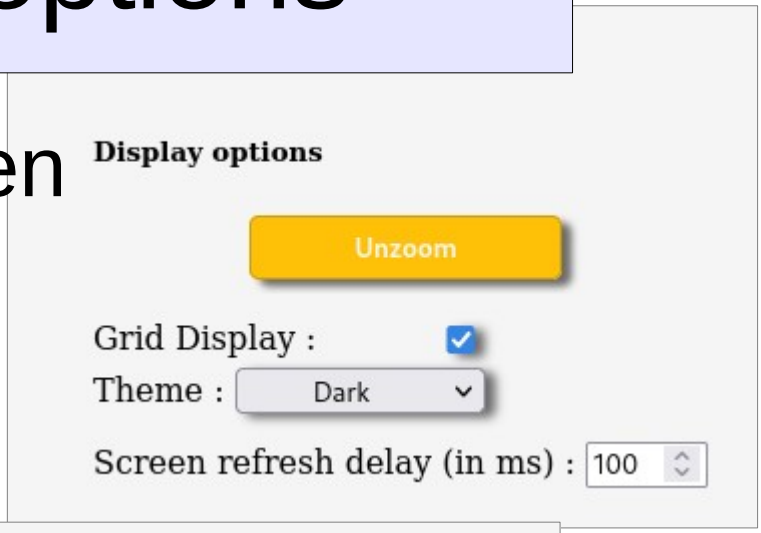
- Allows to trig again incoming data
- Mode Edge or Window
- Input channel selection
- Slope (falling / rising)
- Thresholds
  - Edge: 1, window: 2
  - Edge one can be set graphically

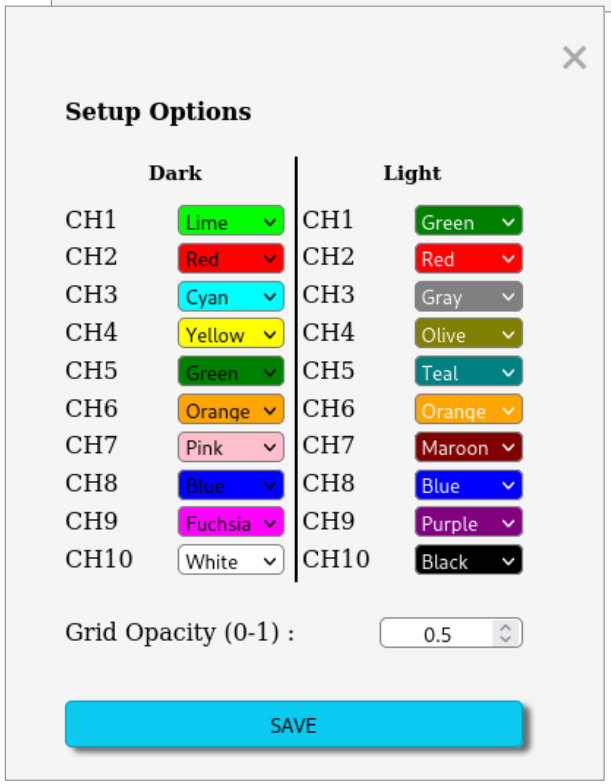




Zoom and Display options

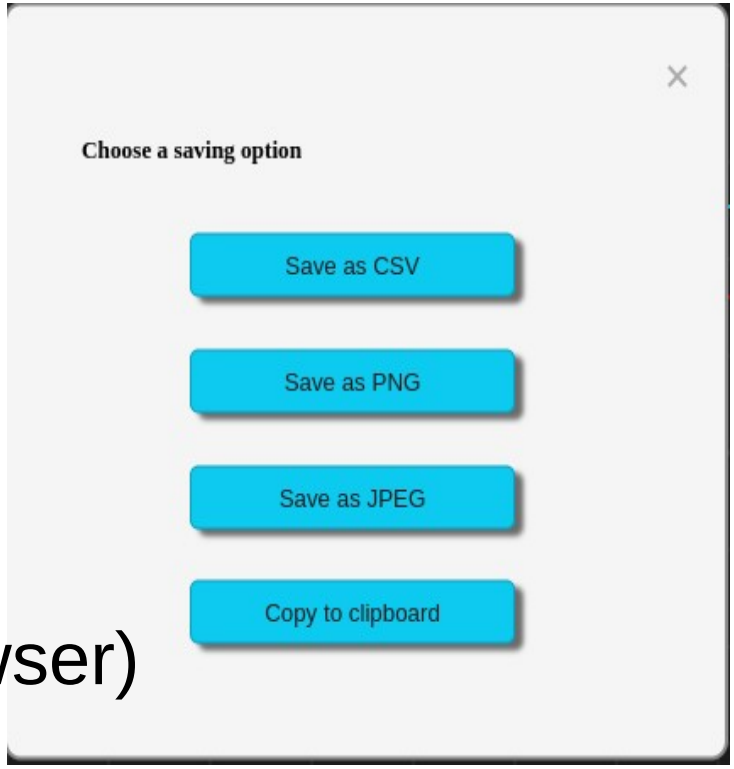
- Zoom by selecting an area on screen
- Grid (de)activation
- Theme (Dark / Light)
- Screen refresh delay
- Colors saved in user preferences
- Color list for each theme





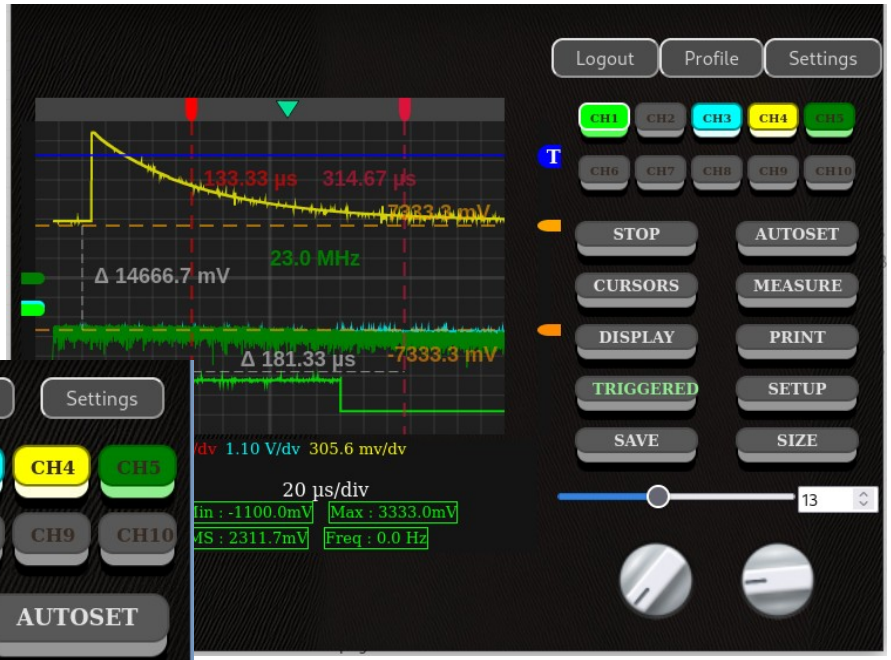
Exports and screenshot

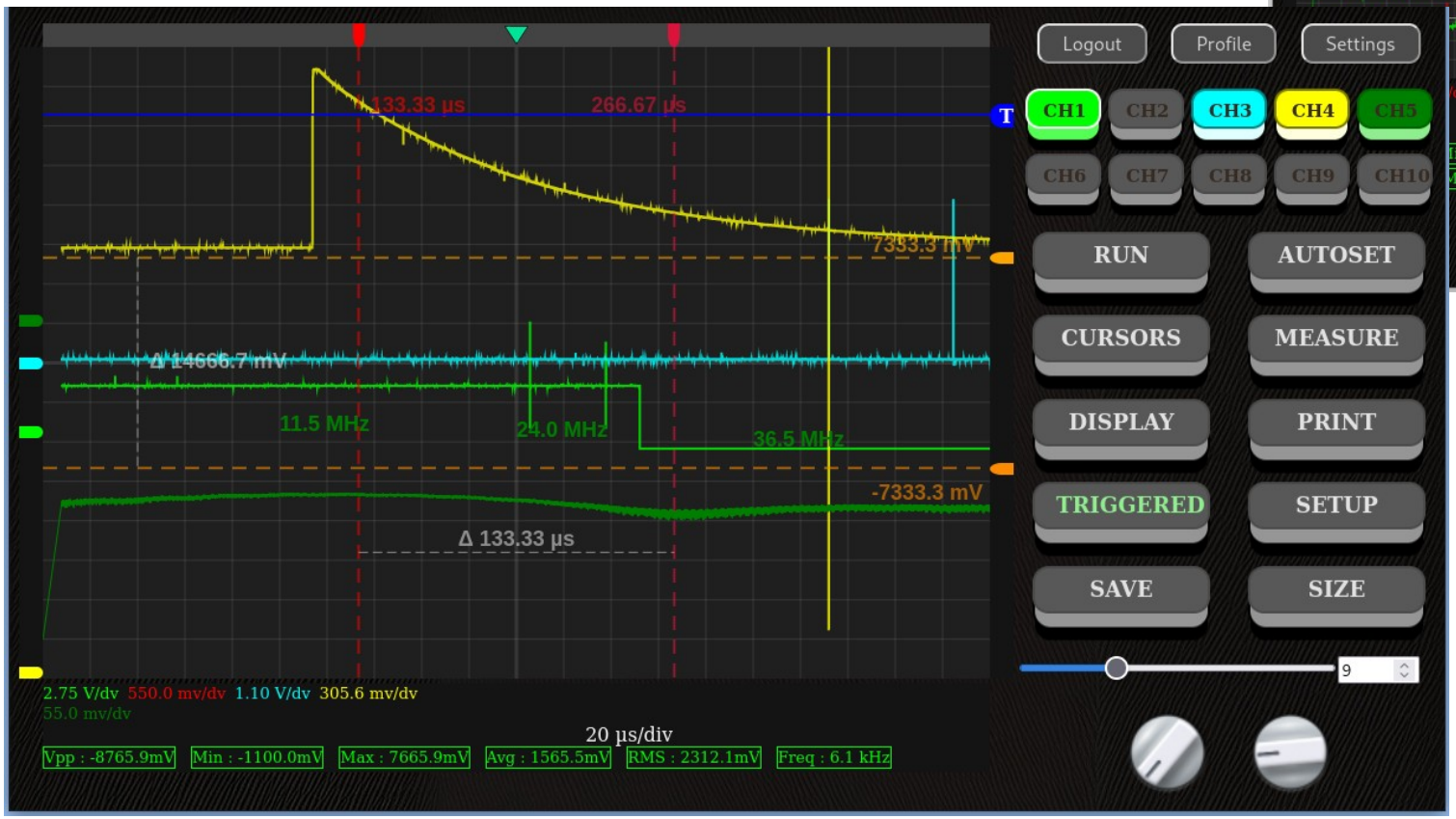
- The Print button directly saves the screen into a PNG image file
- The Save button exports data into:
  - CSV text file
  - PNG image file
  - JPEG image file
  - Clipboard image (if supported by browser)



5 screen sizes

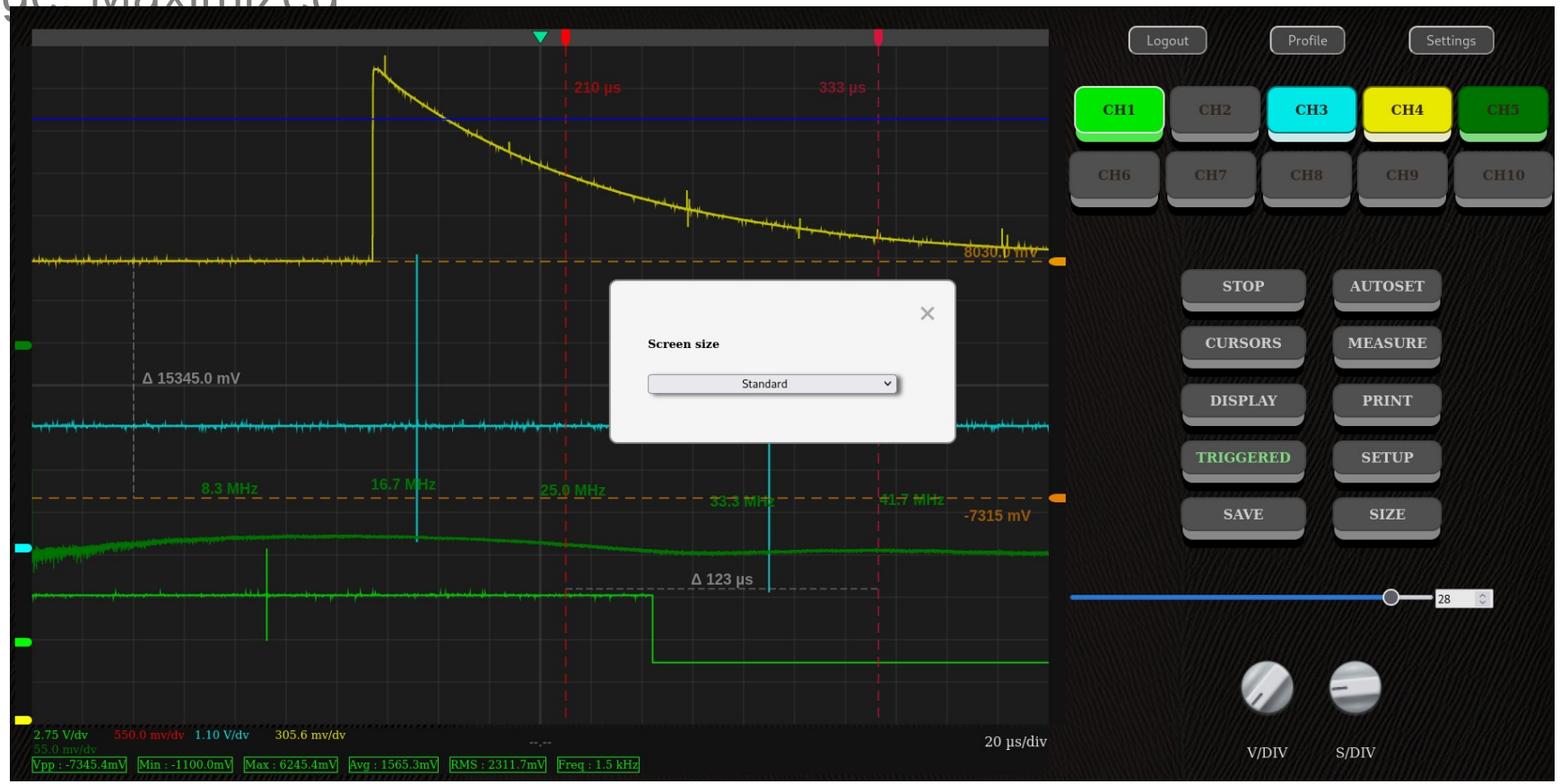
- Tiny (400 x 267)
- Small (800 x 533)
- Standard, Large, Maximized





5 screen sizes

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

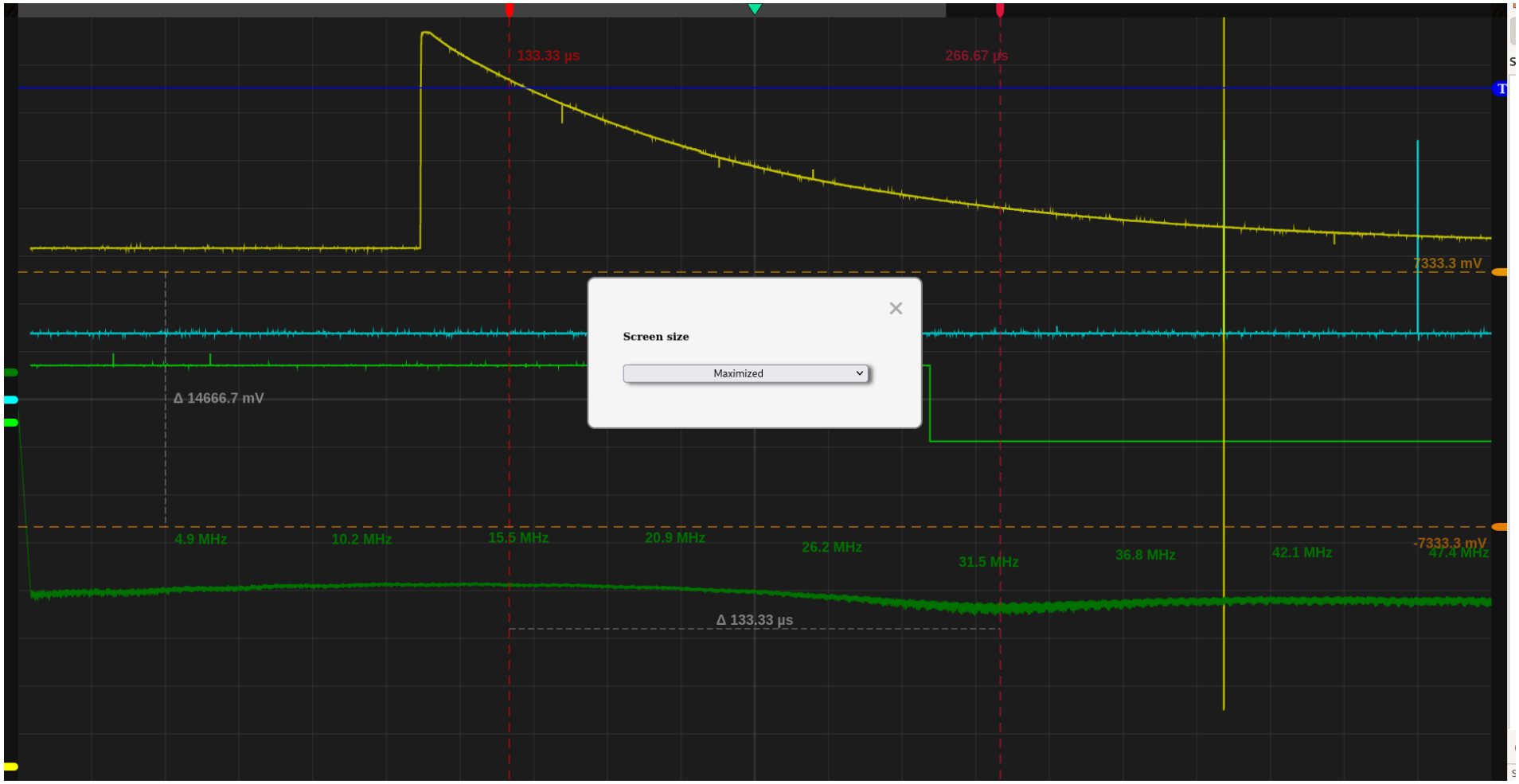


5 screen sizes

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

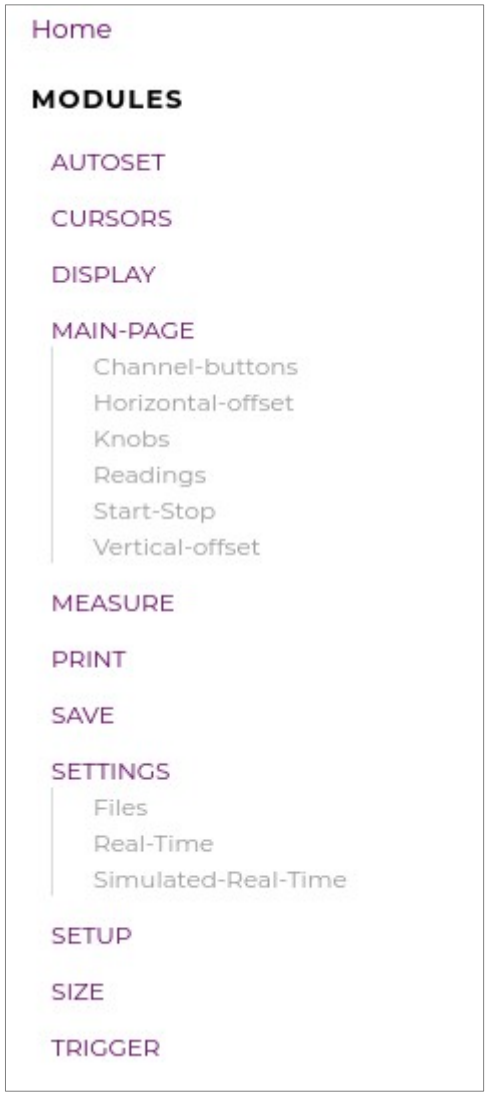
5 screen sizes

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



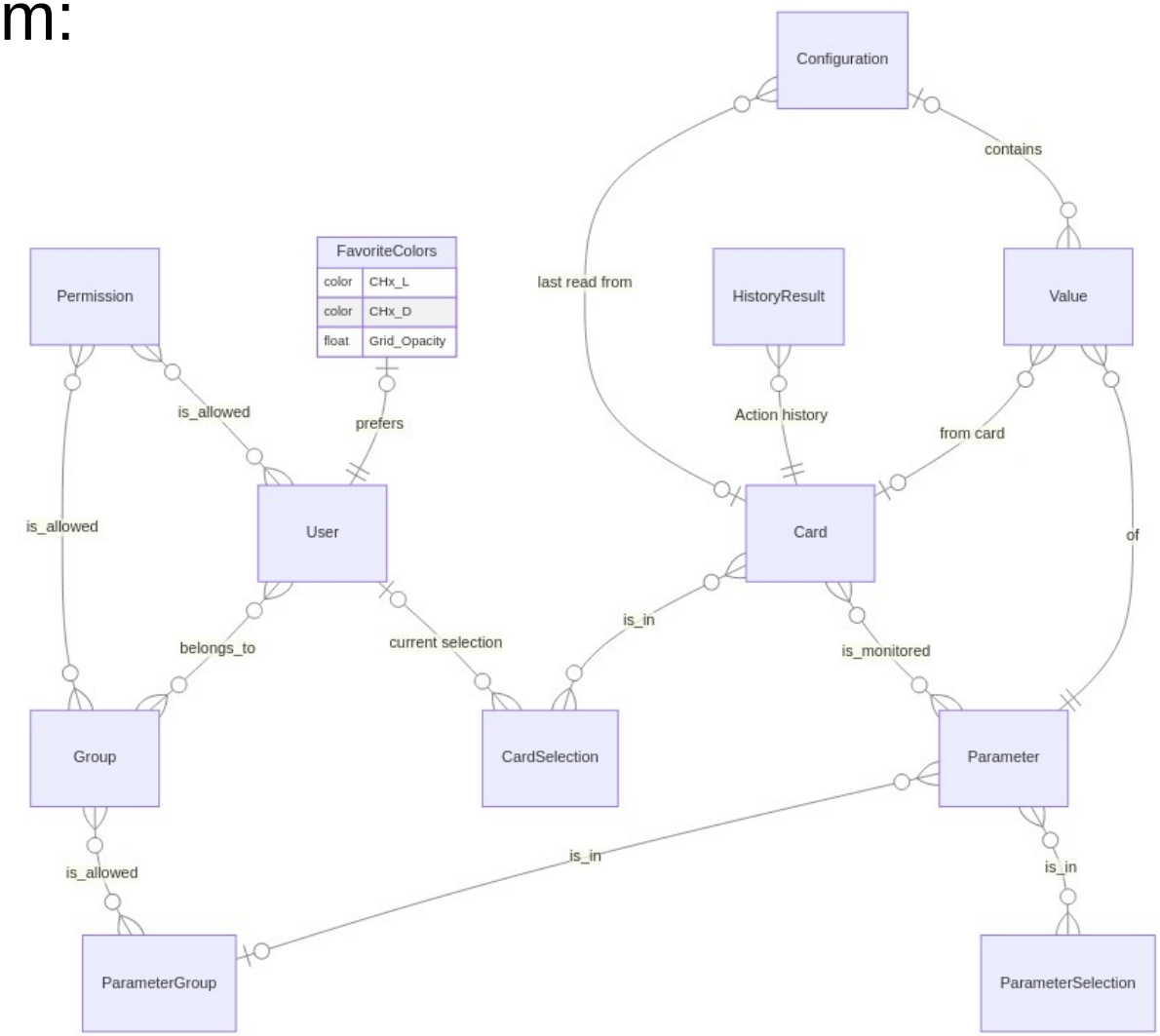
Online documentation

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



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

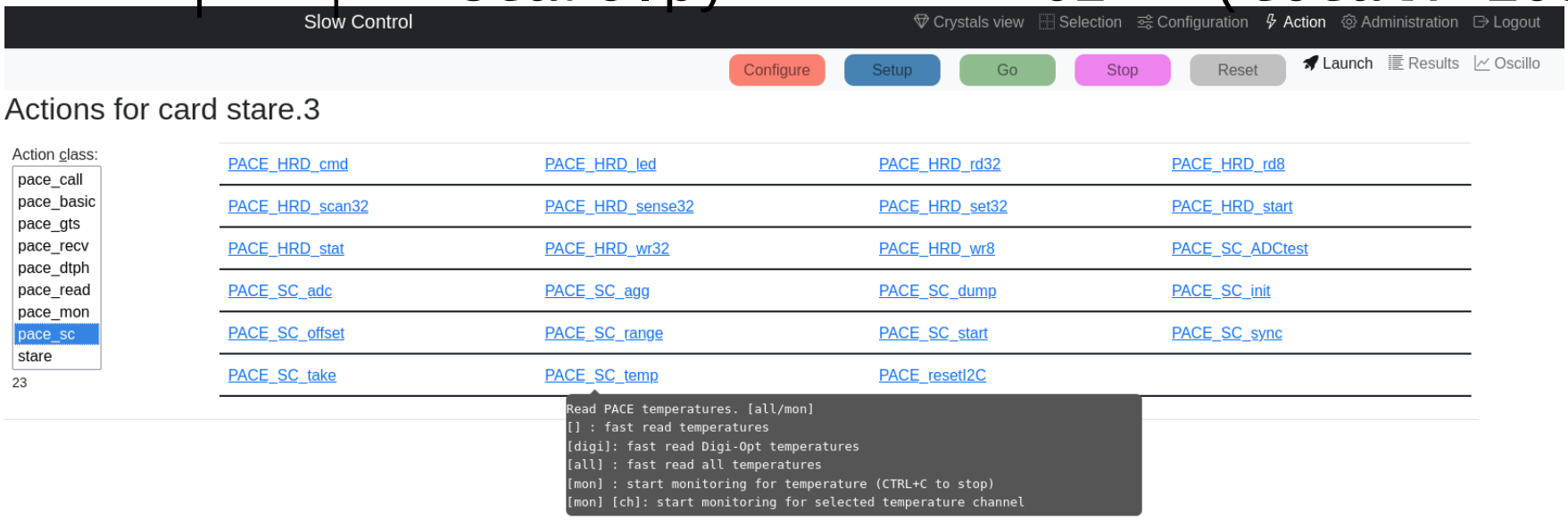
card IP

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

Actions on cards

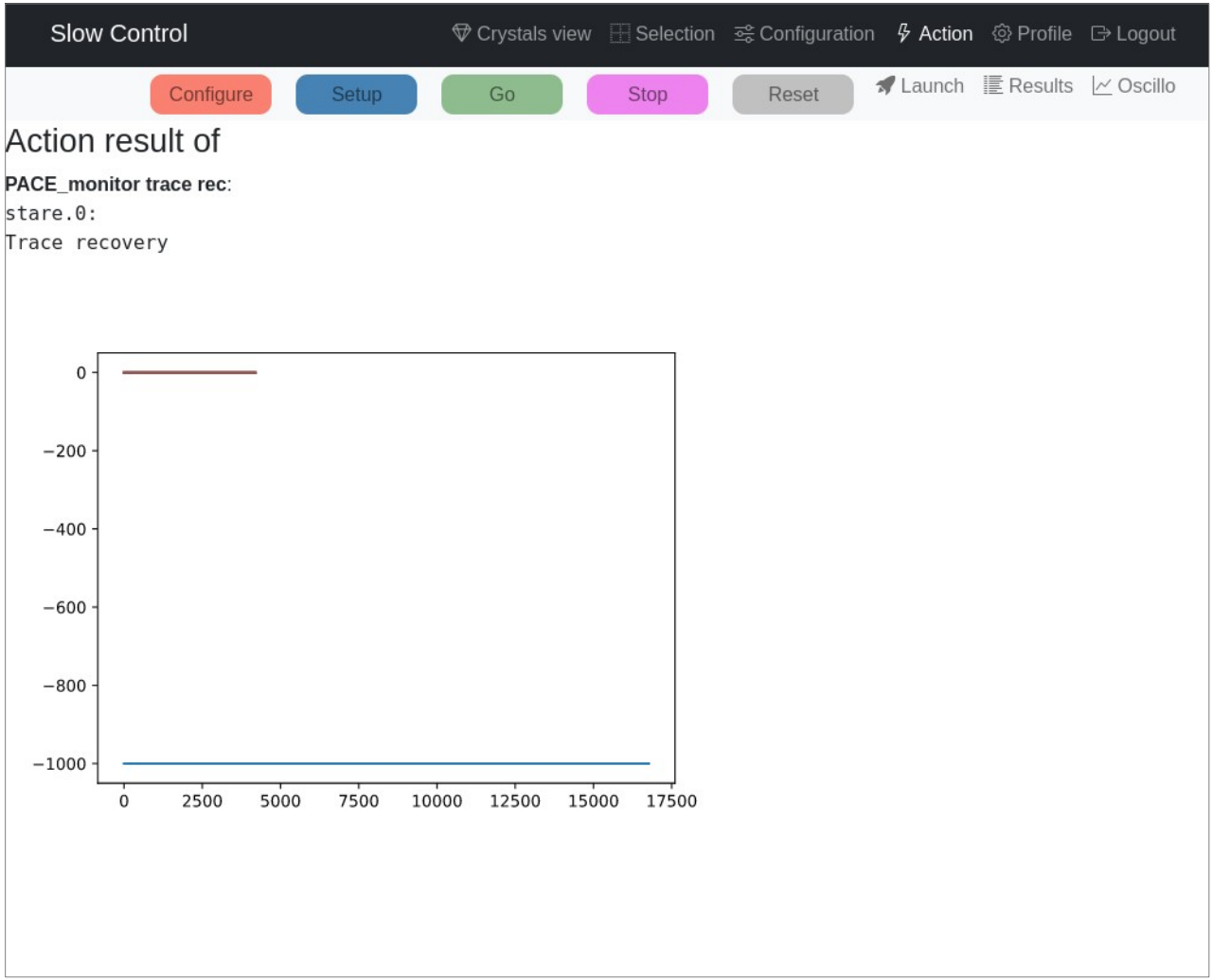
- ~~CMD_Test.py~~ → Ph2_PACE_CMD

```
├── lib
│   ├── pace_basic.py      13
│   ├── pace_call.py       8
│   ├── pace_dtph.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)
```



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

Todo

- 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