Introduction

Her we presume that you follow steps to build or buy the hardware implementation of the ONE-PIX kit and install the ONE-PIX software on your raspberry pi.

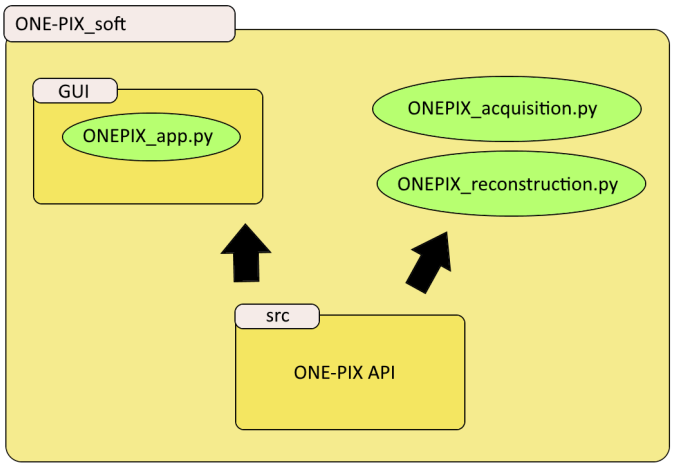
If it's not the case you can follow theses steps :

- Hardware building tutorial
- Readme installation

Software description

ONE-PIX software is stored on the Raspbian Desktop of the Raspberry pi in the "ONE-PIX/ONE-PIX_soft" folder.

The software allows to control and synchronize every component of the ONE-PIX kit to launch hypercubes acquisitions and analyse them. There is two way to use the ONE-PIX software:



The easiest way is to use the Python GUI interface (see section 5 and 6 to use it). It allows to run acquisition and analyze it without writing a single line of code. The advantage of using GUI interface is its simplicity. However, its use does not allow more experienced users to do more advanced analysis. For these users, it will be necessary to use scripts adapted to their needs. Two scripts have already been implemented and stored here to get started :

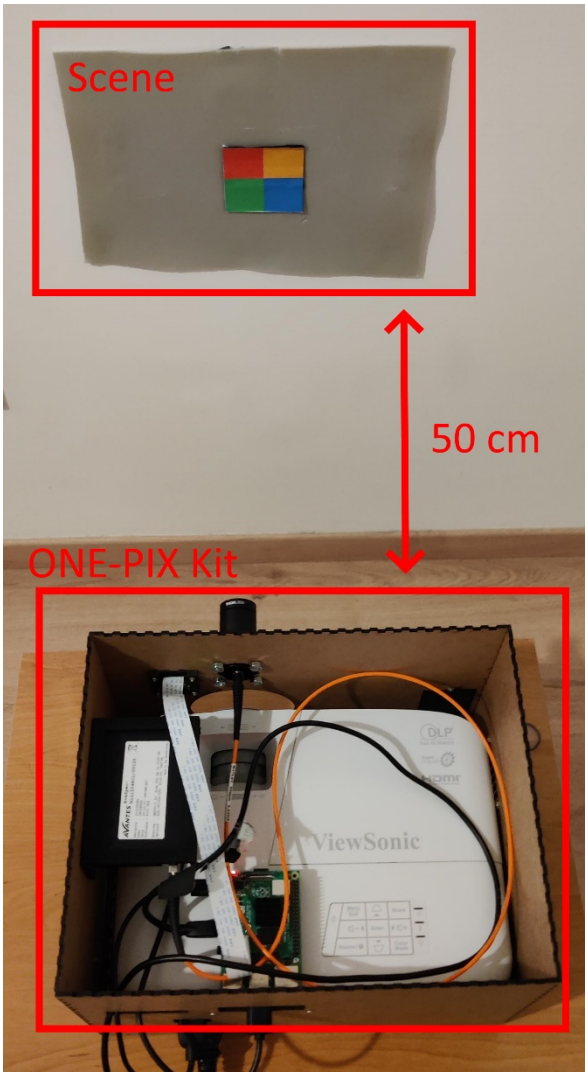
- ONEPIX_acquisition.py
- ONEPIX_reconstruction.py

Using your own Python script implied to have programming skills in Python but allow more analytical possibility and more modularity for acquisitions.

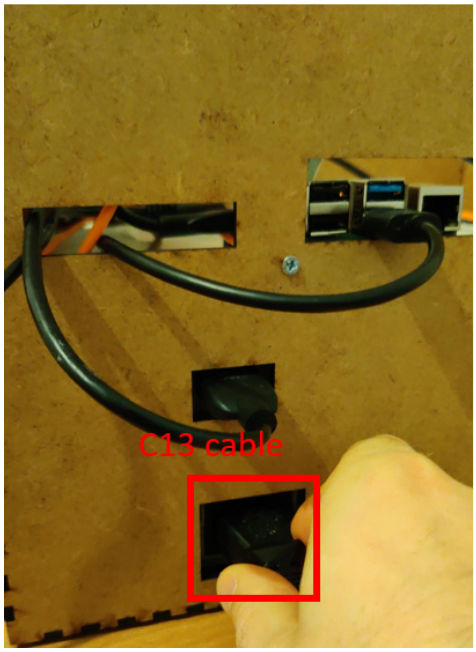
In both cases, GUI interface and script examples are based on the ONE-PIX API. The API consists of several Python libraries containing all functions needed to launch acquisition reconstruct and analyse hypercubes. The documentation of this API can be found here.

Hardware installation

1) Place the ONE-PIX kit horizontally on stable surface at the recommended working distance of 50 cm of the scene to measure.

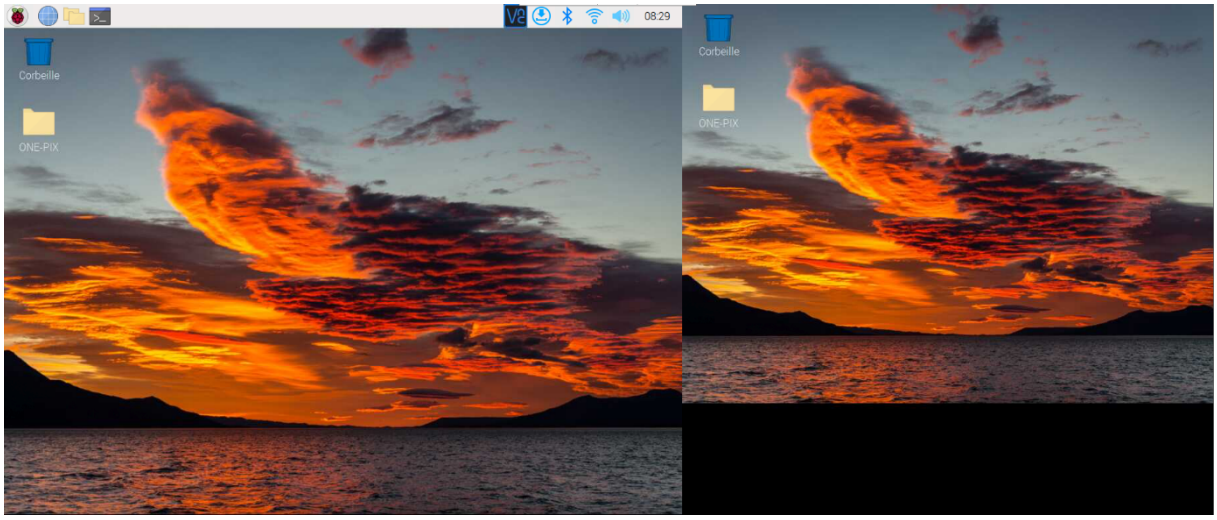


2) Powering the projector: connect C13 alimentation cable to the projector at the back side of the ONE-PIX kit (see point 1 section 2.3 mechanical view) and powering it.

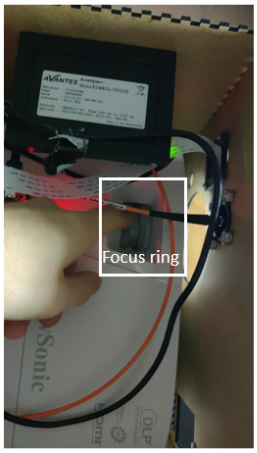


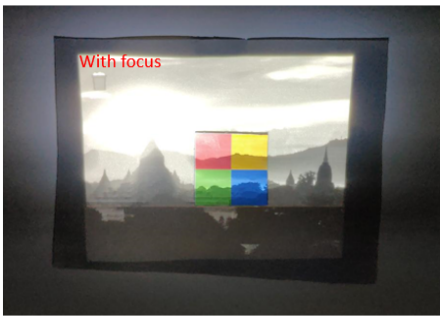
3) When you see the projection of the projector on the scene powering the Raspberry pi cable and remote control it with VNC viewer.

You will see it:



4) Open the top side of the ONE-PIX test and use the ring to adjust focus and zoom on the scene to see clearly the projected desktop of the pi on the scene.



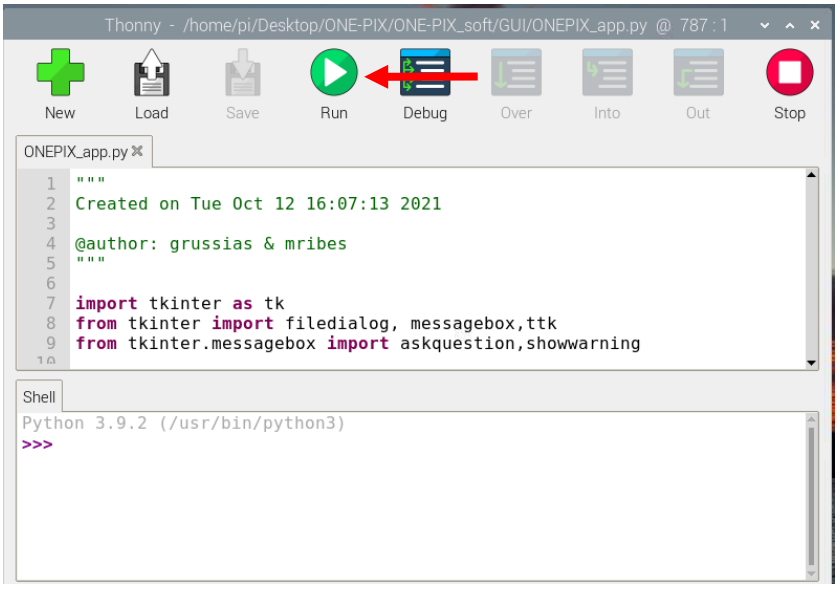


5) Close the top side of the ONE-PIX kit

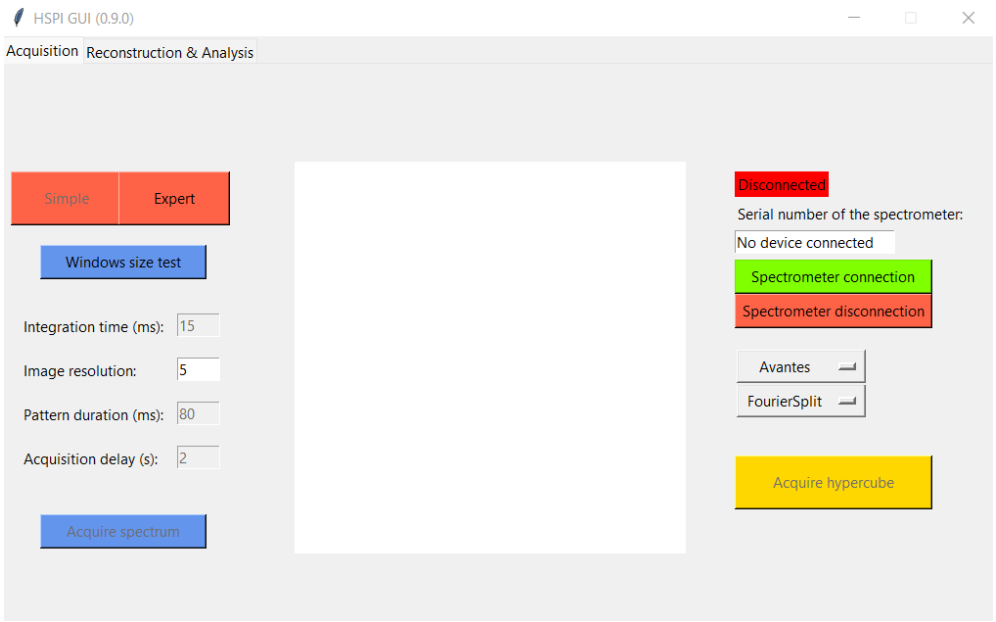
Run ONE-PIX kit GUI interface

For complete description of the ONE-PIX GUI interface, refer to the ONE-PIX GUI user manual.

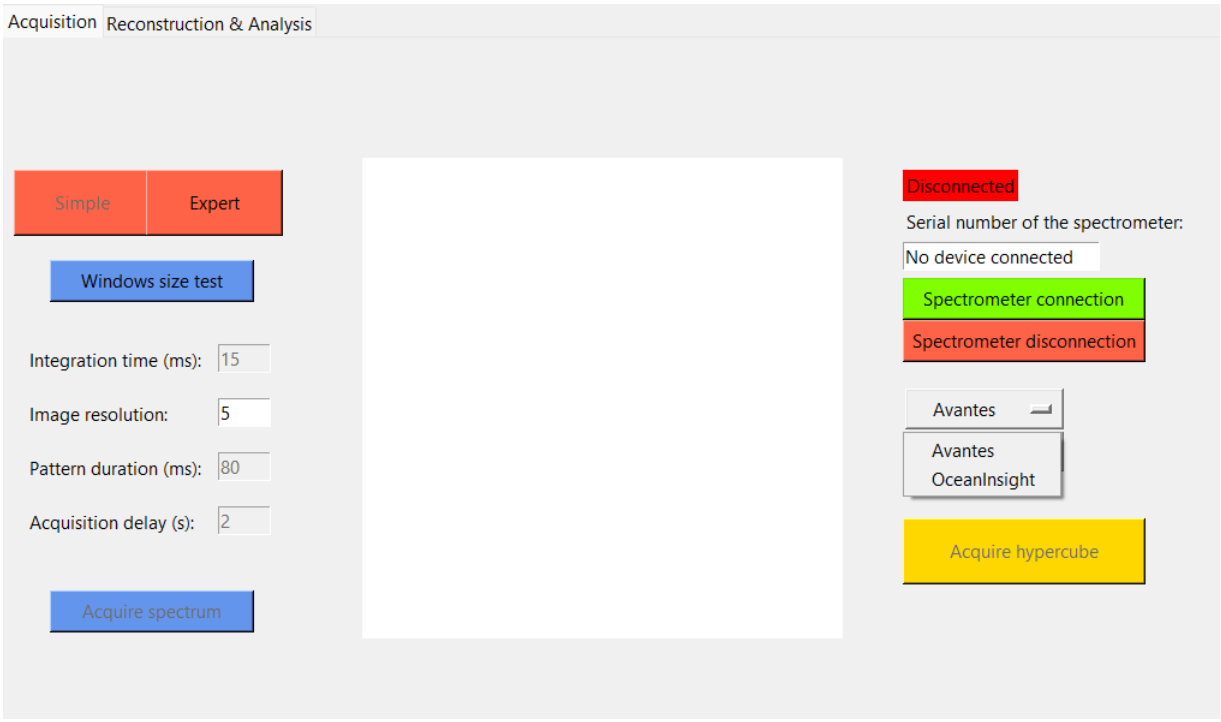
1) Open the *ONE-PIX_soft*/GUI folder and double click on the *ONEPIX_app.py* file. The Thonny IDE for Python will be pop on the screen



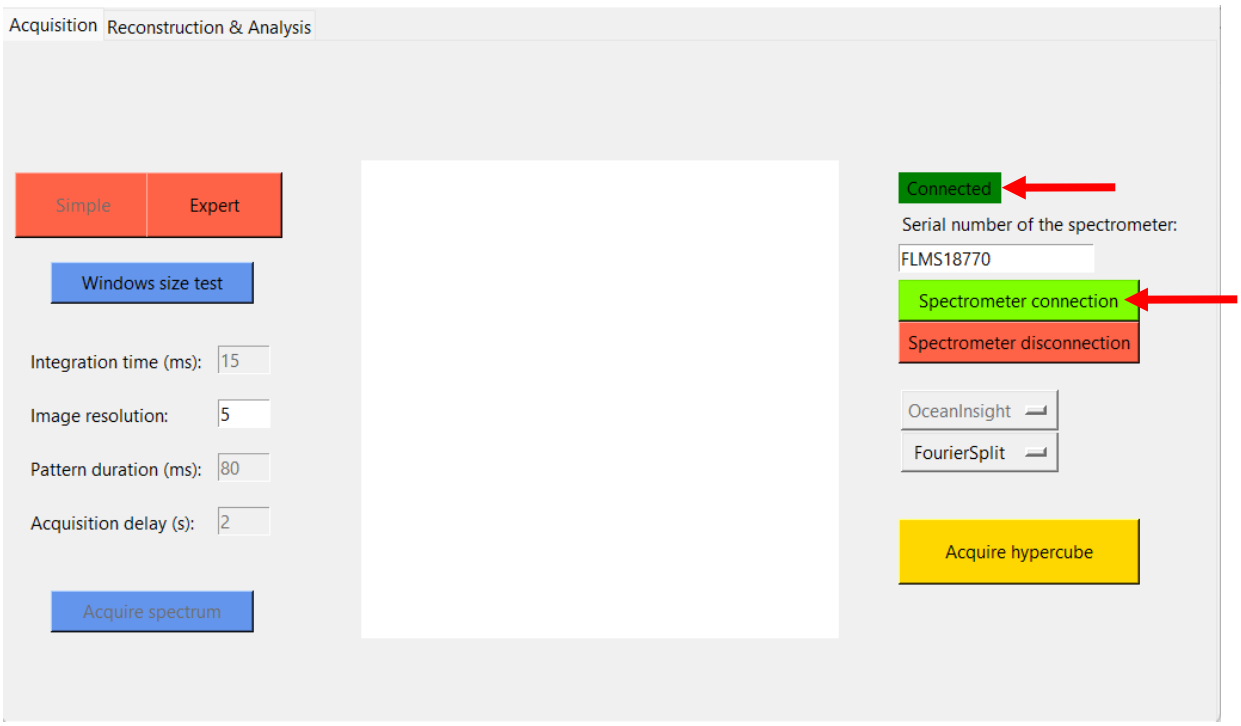
2) Click on run and the GUI interface will pop-up:



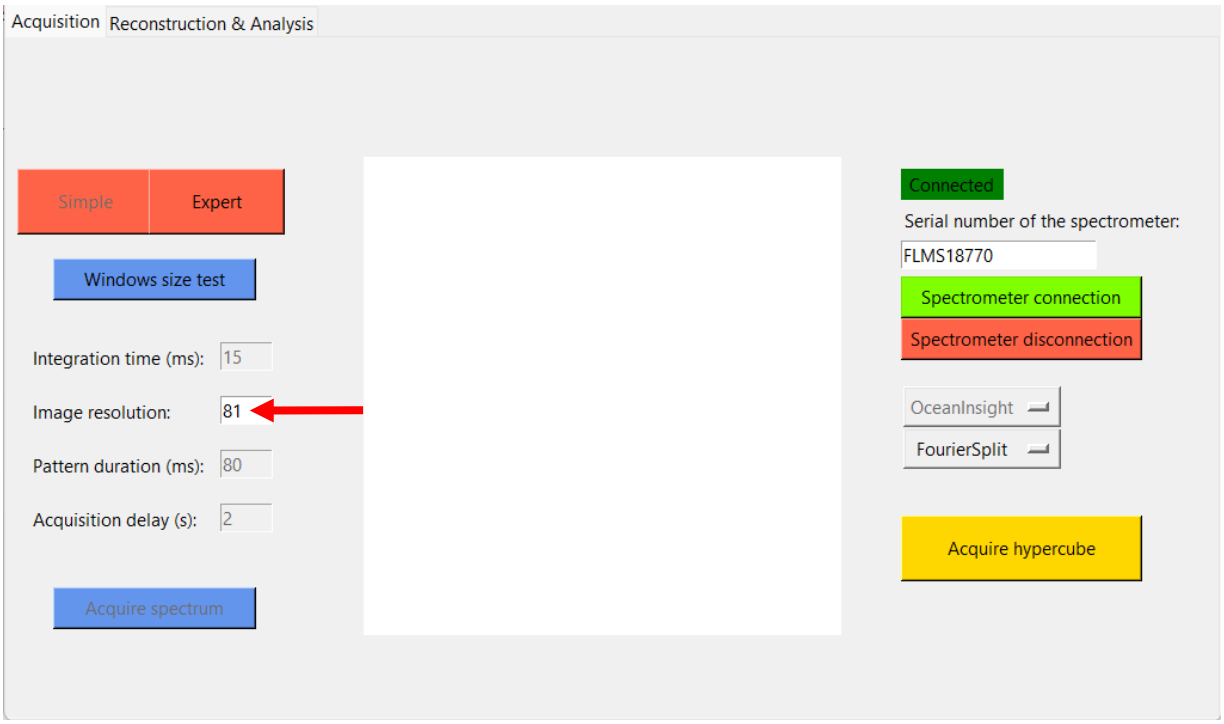
3) Select your model of spectrometer on the scrolling menu:



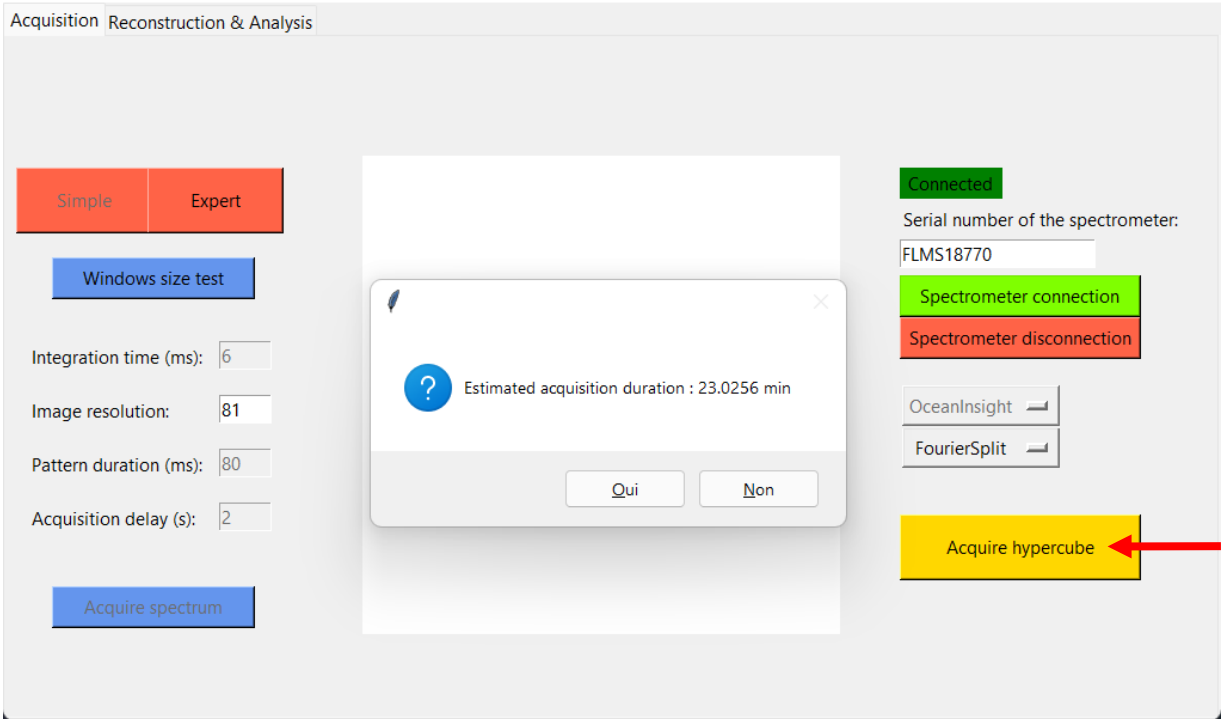
4) Connect your spectrometer to the GUI interface by clicking on spectrometer connection button. After the connection, the red indicator « Disconnected » changes into a green « Connected » label.



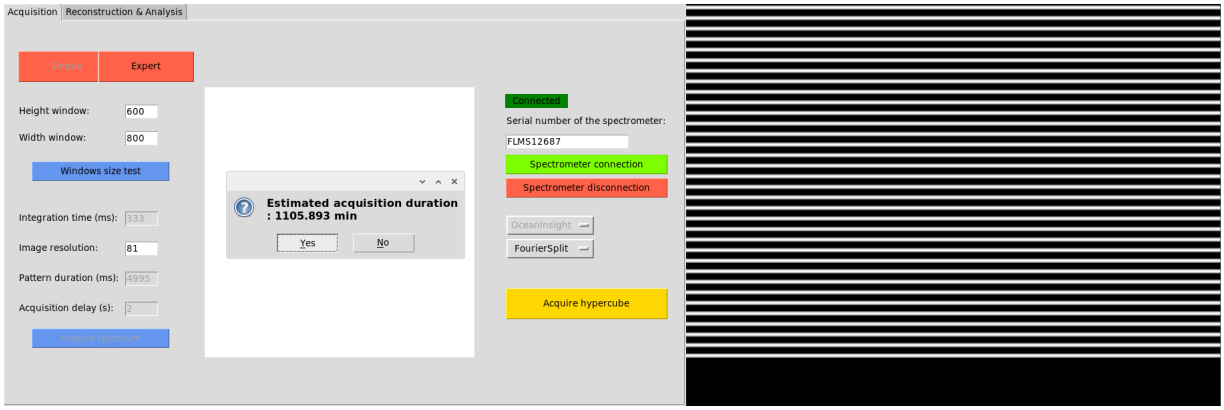
5) Enter the desired spatial resolution of the hypercube before running acquisition :



6) Run the acquisition by clicking on the yellow button “Acquire hypercube”. The ONE-PIX kit will calculate the optimal integration time for the acquisition. In order to fix a specific integration time, use the expert mode (see GUI interface user manual).
A window appears before the acquisition can begin with the estimated measurement time. Click on ok to start it.



7) Now the acquisition begins and you can see projected patterns on the scene and on the second screen of the Raspberry pi desktop. Wait the end of the acquisition.



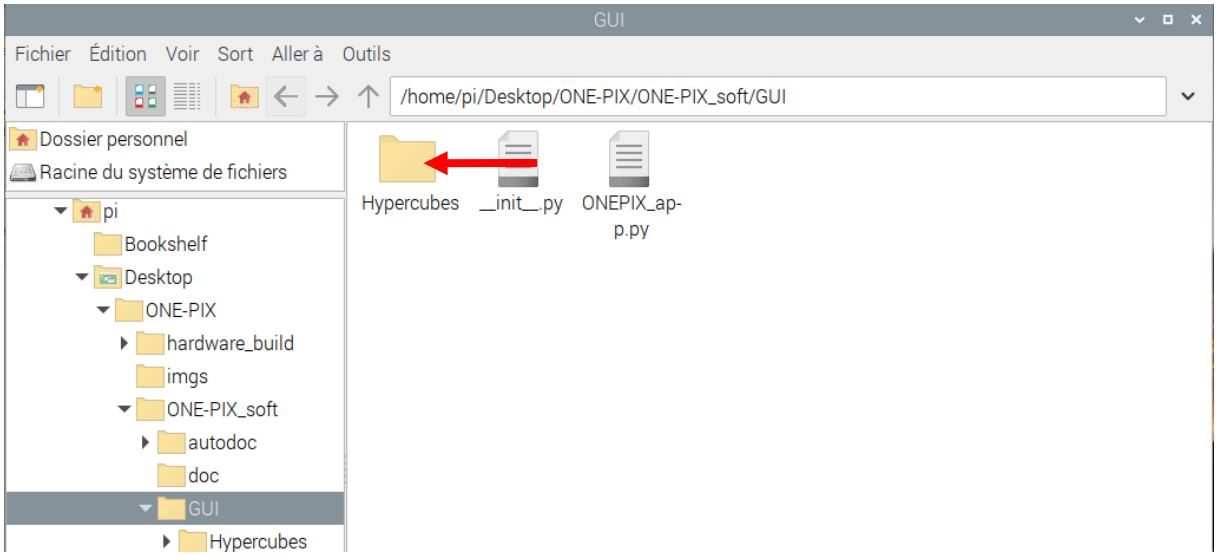
At the end of acquisition, the ONE-PIX soft save measure in a specific folder. For more information about measures storage see Hypercube format section.

To have more information about visualisation and analyse of hypercube, see the analyse a hypercube section or ONE-PIX GUI user manual.

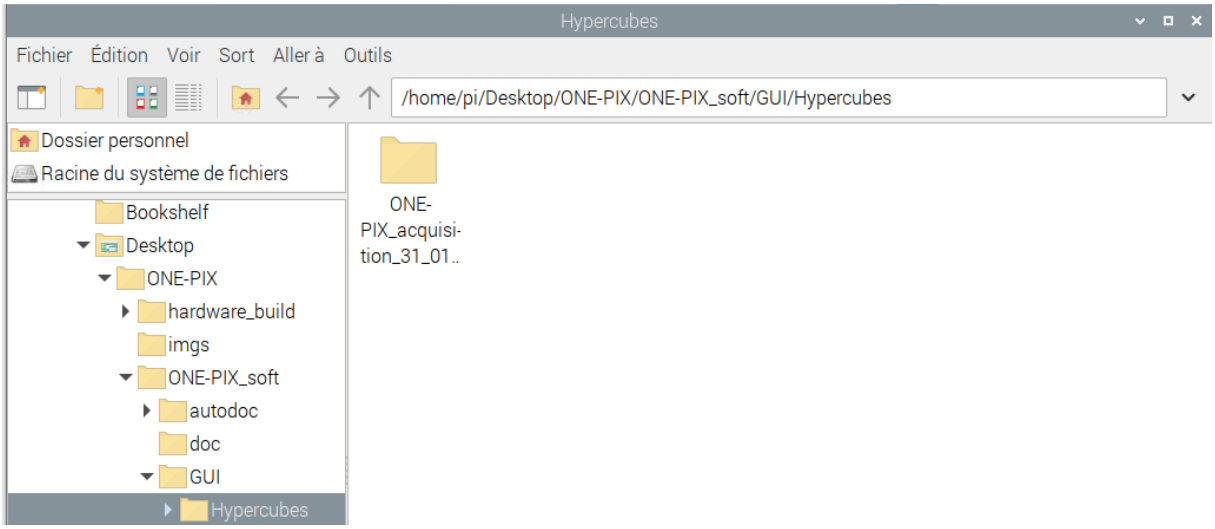
Visualize and analyse a hypercube

Hypercube format storage

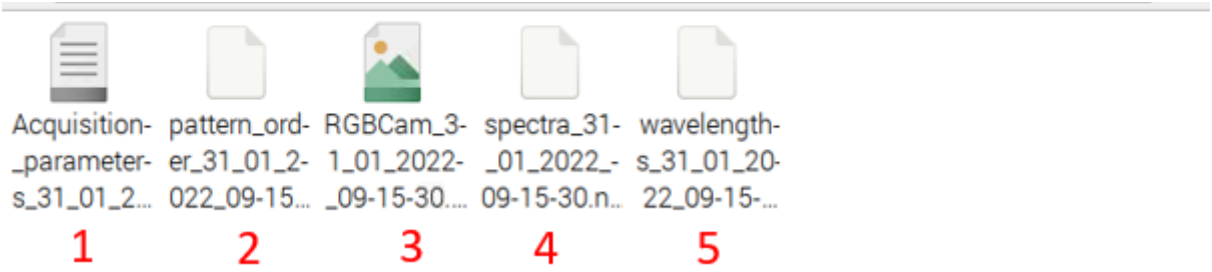
After acquisitions, measured data are stored in the Hypercubes folder located at the root of the HSPI_soft folder.



These data are stored a dedicated folder. The folder name is ONE-PIX_acquisition + date and time of the acquisition :



An acquisition folder contains 5 files :



1: Acquisition parameter +date/time: This text file contains the following acquisition parameters:

- Acquisition method : the single pixel method used to acquire hypercube
- Acquisition time : total duration of the acquisition
-Spectrometer: The serial number of the spectrometer used for the acquisition
-Number of projected patterns : the number of projected patterns on the scene
-Height of pattern window : Height resolution in pixels of the projected pattern
-Width of pattern window : Width resolution in pixels of the projected pattern

-Dark pattern duration : the pause time before the acquisition run

-Integration time : integration time of the spectrometer

2: Pattern_order + date/time: NumPy file containing a list of chronological spatial frequency.

3: RGBcam +date/time: JPEG file containing the RGB image of the scene acquire with the Raspberry pi camera.

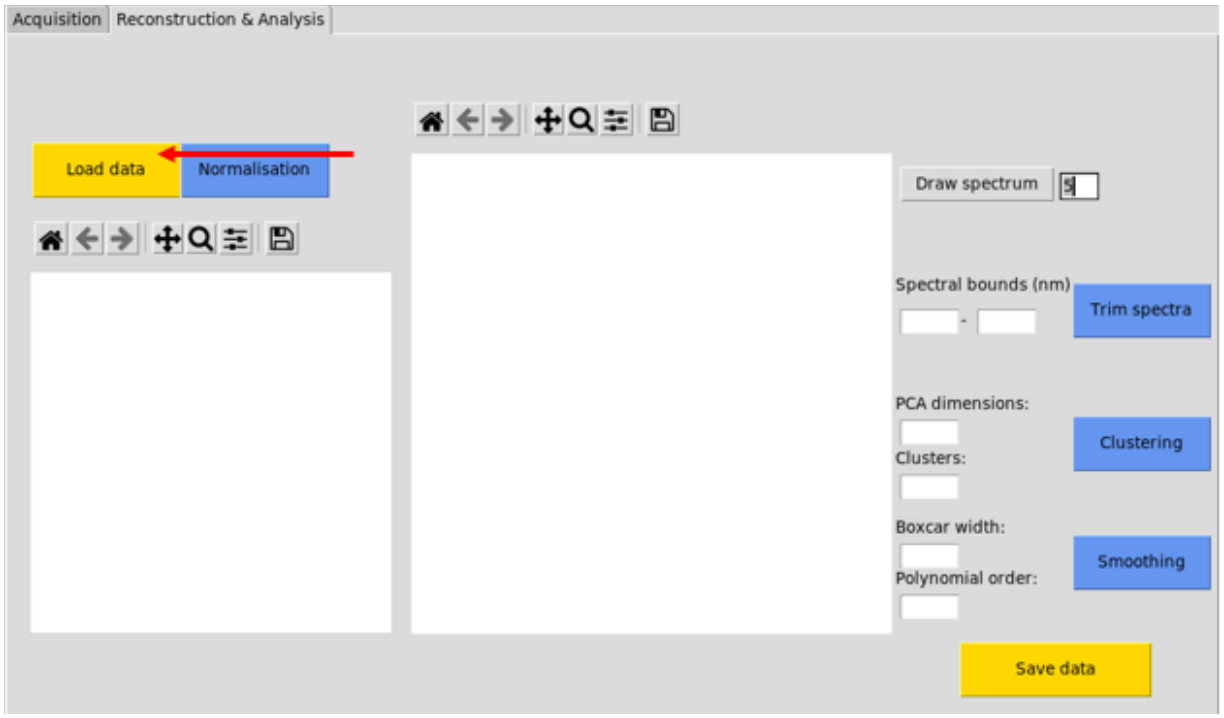
4: Spectra + date/time: NumPy file containing spectra corresponding of each projected pattern.

: wavelengths +date/time: NumPy file containing spectra's associated wavelengths.

Analyse a hypercube

To visualize in false RGB colours the measured hypercube or analyse it, click on the "Reconstruction & Analysis" widget. For a complete description of the widget, refer to the GUI user manual.

Load measures on the GUI interface by clicking on the yellow button "Load data".



Select the folder which contains measures by double clicking on it.