# 7th Silx Code Camp
# June 18, 2018

## This talk

- Introduction
  - Novelties (version 0.8.0)
- Status of silx (version 0.7.0)
- Goals of the code camp
  - For users
  - For core developers
- Hands on!

# Stats Widget

## Deal with:

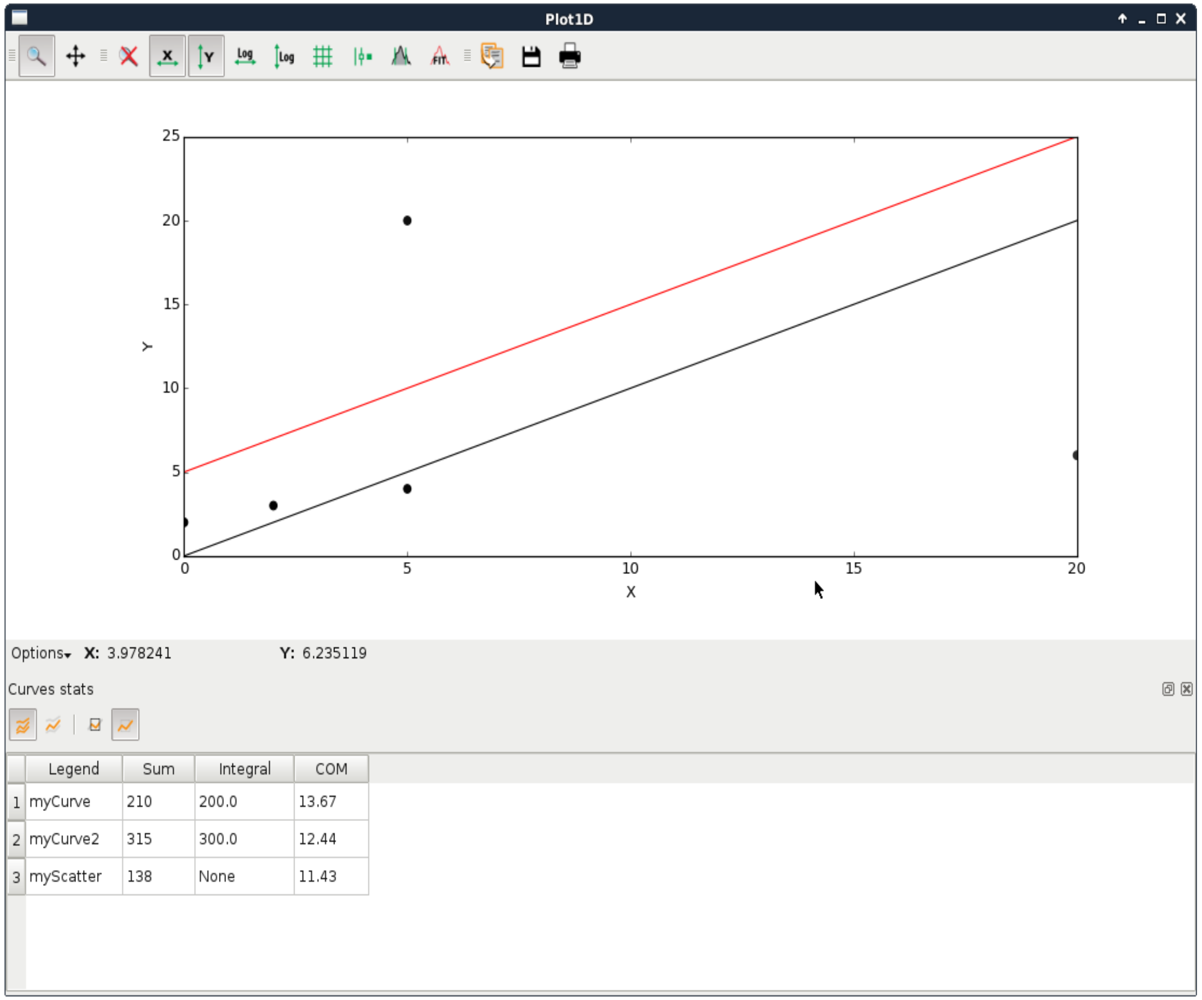
- curves
- Images
- Scatters
- Histograms

## Can calculate on:

- All items or active items
- Full data range or visible one (no interpolation !!!)

## Example:

*examples/plotStats.py*



X: 3.978241 Y: 6.235119

| | Legend | Sum | Integral | COM |
|---|---|---|---|---|
| 1 | myCurve | 210 | 200.0 | 13.67 |
| 2 | myCurve2 | 315 | 300.0 | 12.44 |
| 3 | myScatter | 138 | None | 11.43 |

## Stats Widget. Creating Stats from function

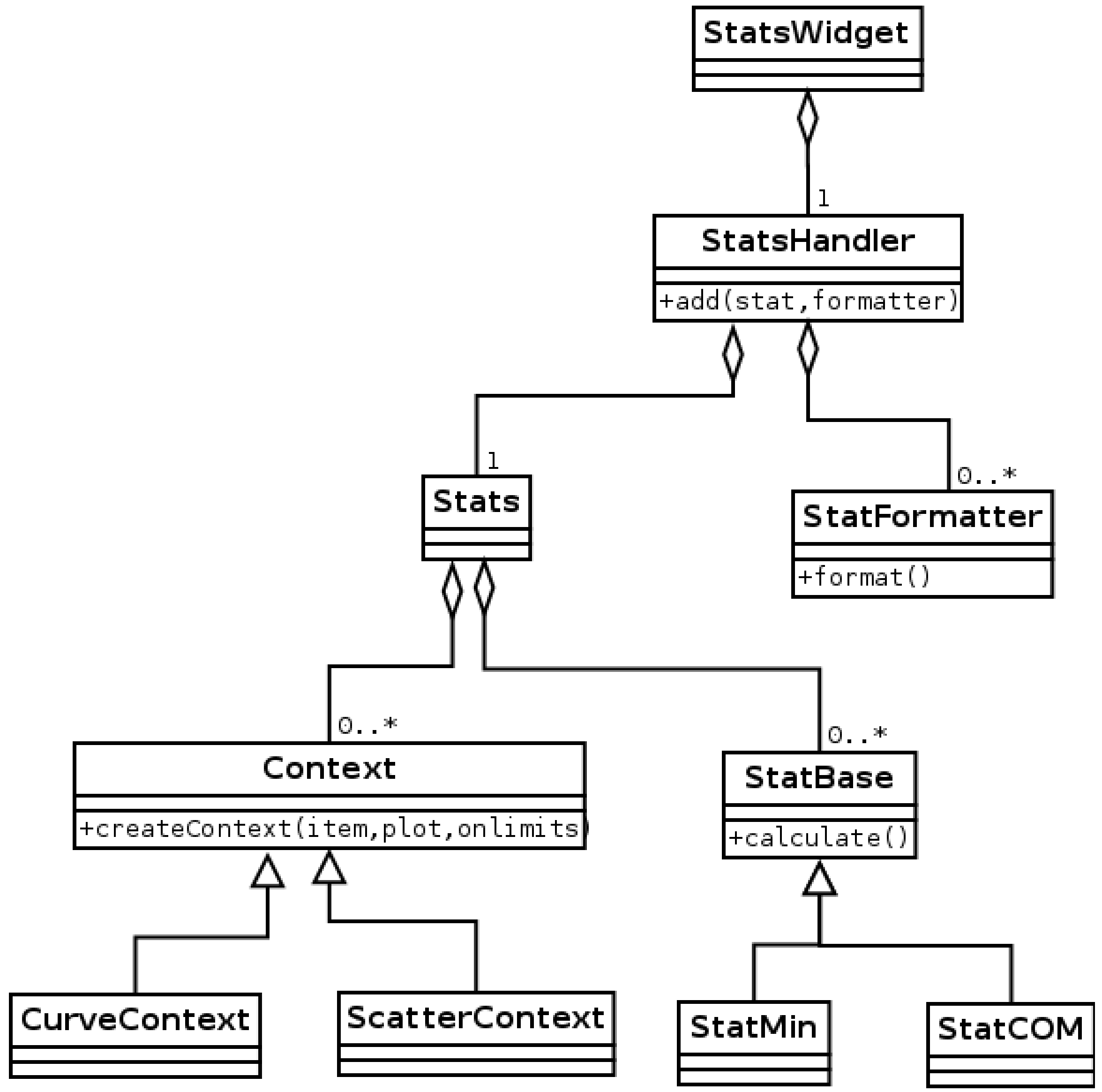
```
stats = [
    ('sum', numpy.sum),
]
plot.getStatsWidget().setStats(stats)
```

Statistics will use the `Context` class to reach data.
When using a function pointer it will use the `values` variable of the context.
So the function should be compatible with the type

| | Accessible 'filtered' data | Values variable | Type of 'values' |
|---|---|---|---|
| CurveContext | xData, yData | yData | 1D array |
| HistogramContext | xData, yData | yData | 1D array |
| ImageContext | imageData | imageData | 2D or 3D array |
| ScatterContext | Xdata, yData, values | values | 1D array |

+ access to some generic cache (min, max values). Cache might increased if necessary or have a more advanced API.

# StatsWidget. Advanced Usage



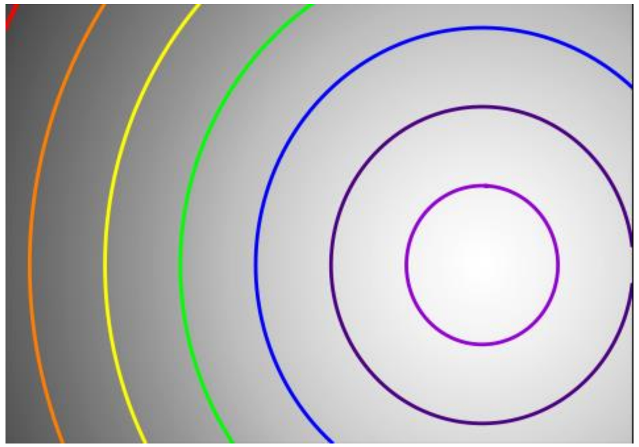
## Stats Widget. Creating stats from inheritance

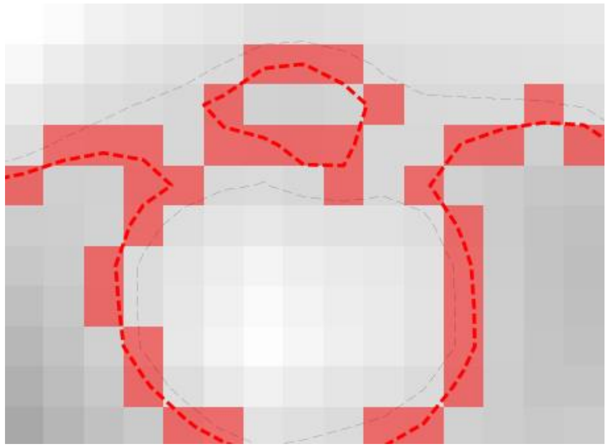
```
class COM(StatBase):
    """
    Compute data center of mass
    """
    def __init__(self):
        StatBase.__init__(self, name='COM')

    def calculate(self, context):
        if context.kind in ('curve', 'histogram'):
            xData, yData = context.data
            com = numpy.sum(xData * yData).astype(numpy.float32) /
                     numpy.sum(yData).astype(numpy.float32)
            return com
        elif context.kind == 'scatter':
            xData = context.data[0]
            values = context.values
            com = numpy.sum(xData * values).astype(numpy.float32 /
                     numpy.sum(values).astype(numpy.float32)
            return com
```

```
    stats = [
        (COM(), StatFormatter(formatter='{0:.2f}')),   # or (COM(), StatFormatter(formatter='{0:.2f}'))
    ]
    plot.getStatsWidget().setStats(stats)
```

## Marching Squares Algorithm

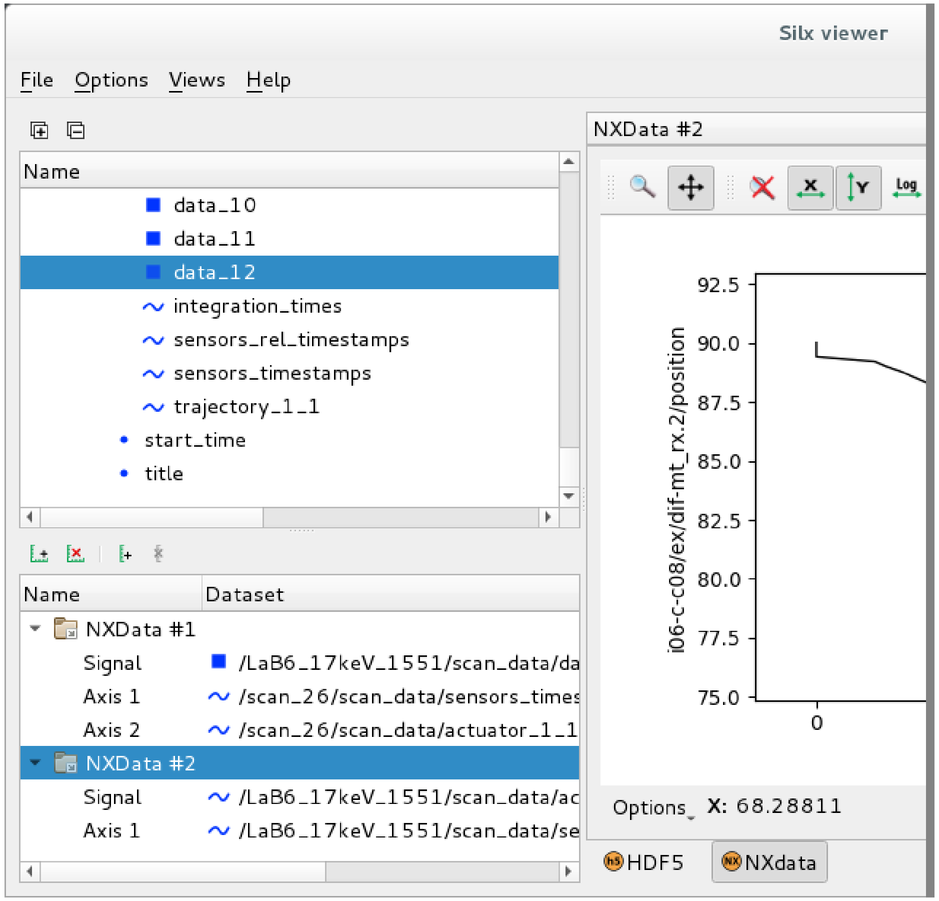
- **Designed to speed up PyFAI calibration GUI**
  - Cython + OpenMP
  - Support masking
  - Optimization to reach many contours from the same gradient image
  - Reach contours or pixels
- **Example:** `examples/findContours.py`





# Silx View

- **Save user preferences**
  - Colormap
  - Y-axis orientation for images
  - OpenGL/matplotlib
  - Dialog location
- **View to compose custom NXdata**
  - Drag and drop datasets and axes



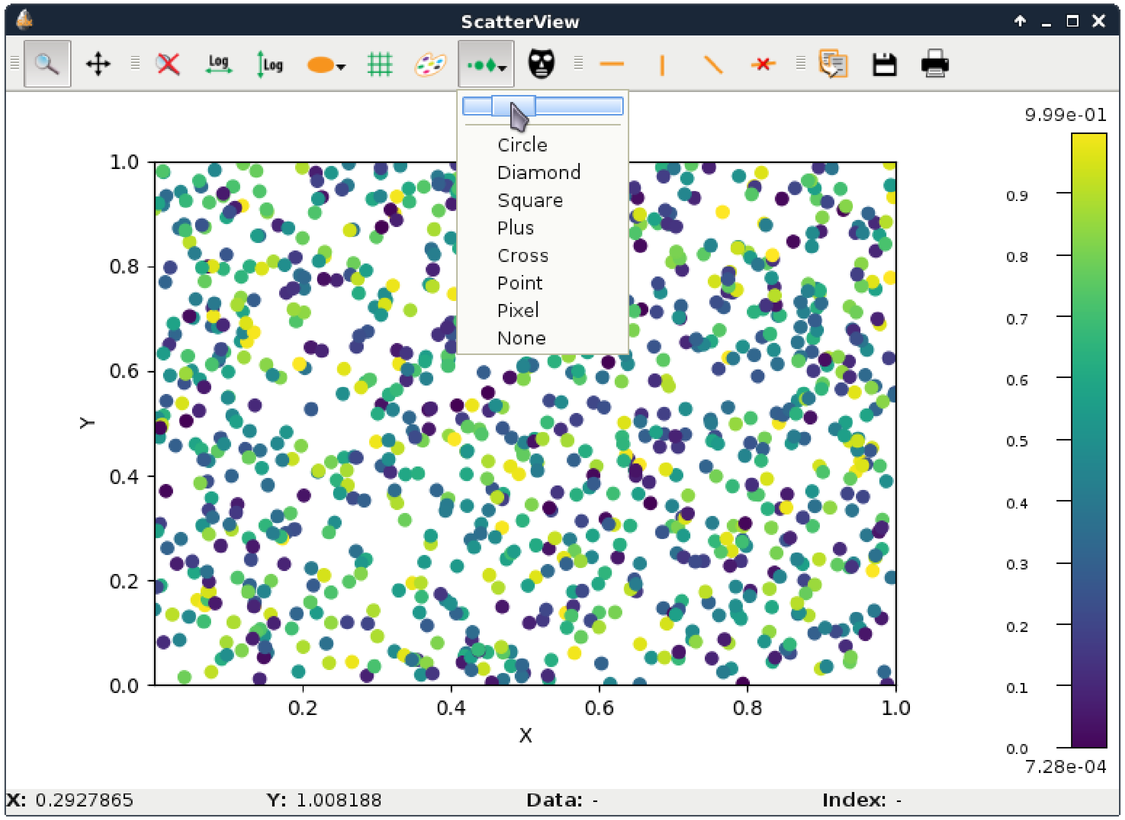
| Name |
|---|
| data_10 |
| data_11 |
| data_12 |
| integration_times |
| sensors_rel_timestamps |
| sensors_timestamps |
| trajectory_1_1 |
| start_time |
| title |

| Name | Dataset |
|---|---|
| NXData #1 | |
| Signal | /LaB6_17keV_1551/scan_data/da |
| Axis 1 | /scan_26/scan_data/sensors_times |
| Axis 2 | /scan_26/scan_data/actuator_1_1 |
| NXData #2 | |
| Signal | /LaB6_17keV_1551/scan_data/ac |
| Axis 1 | /LaB6_17keV_1551/scan_data/se |

## Scatter Plot: ScatterView

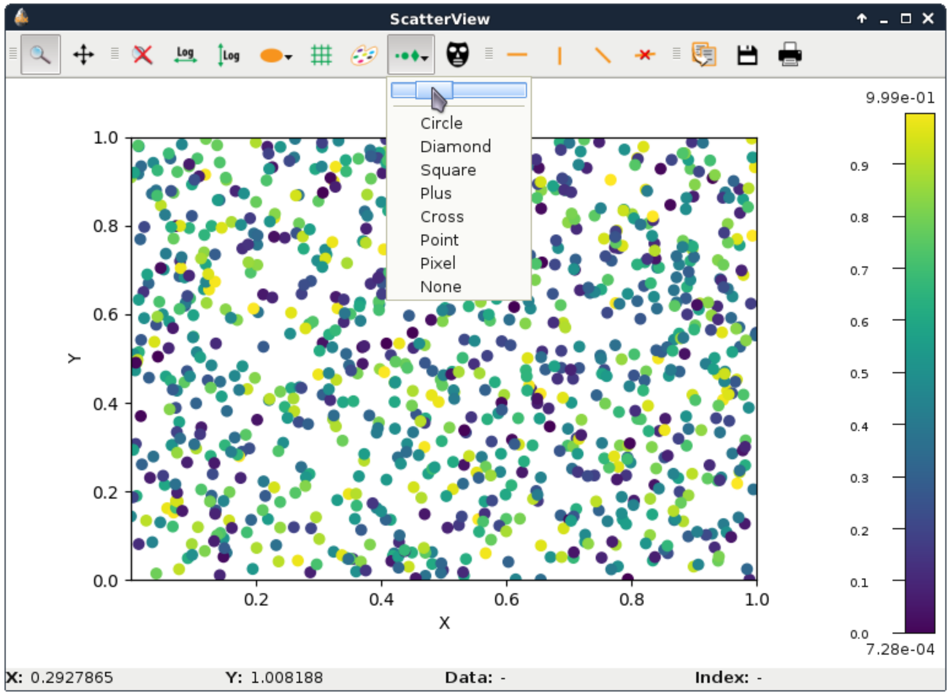
```
from silx.gui.plot.ScatterView import
ScatterView
```

Doc: http://www.silx.org/doc/silx/dev/modules/gui/plot/scatterview.html



# ScatterView: Features

- Standard plot control, colorbar
- Points size/shape control
- Mask
- Profile

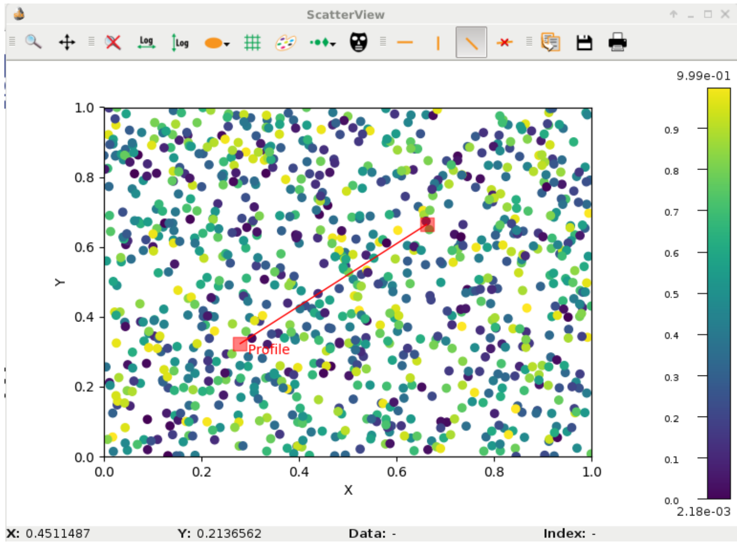


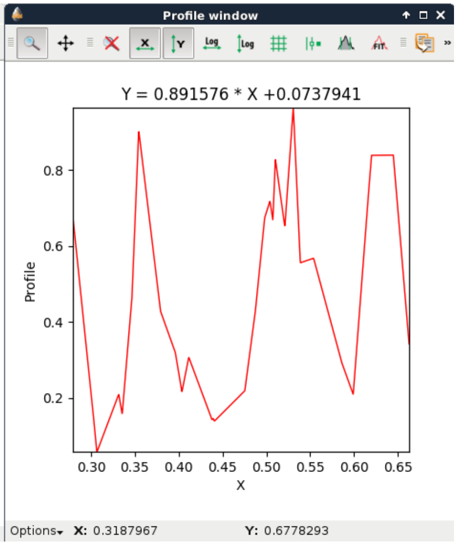
X: 0.2927865 Y: 1.008188 Data: - Index: -

## Scatter Plot: Profile Tool

- Scatter plot profile tool as a toolbar:
  - Horizontal, vertical, line profile
  - Based on Delaunay triangulation + interpolation:
    - Using scipy `LinearNDInterpolator` if available
    - Fallback to matplotlib interpolator

Doc: http://www.silx.org/doc/silx/dev/modules/gui/plot/tools.html#scatterprofiletoolbar

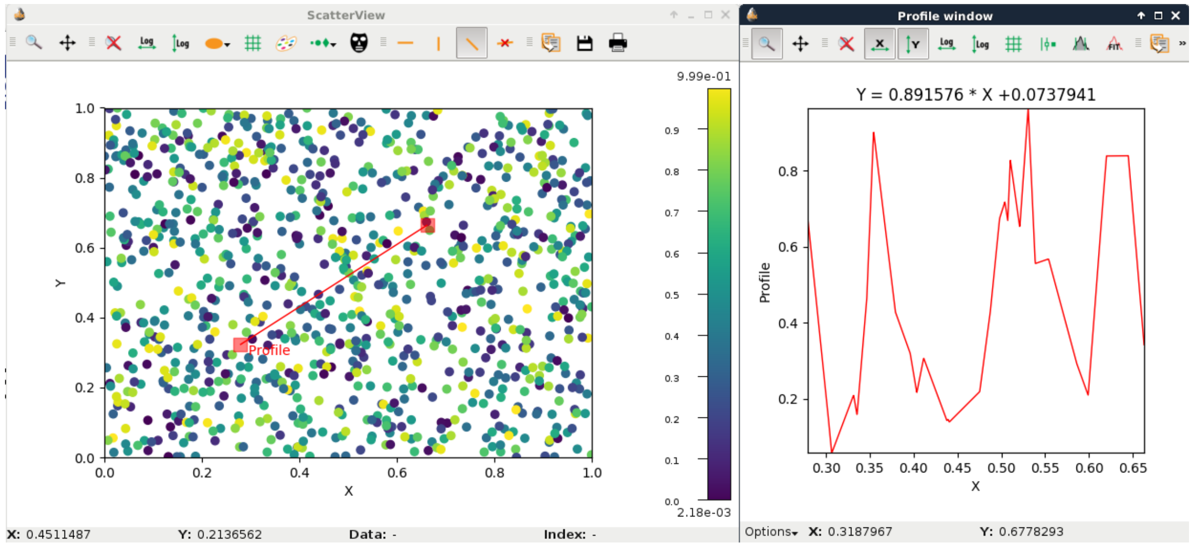




The European Synchrotron | ESRF

# Scatter Plot: Profile Tool

- **Future improvements:**
  - Support log scaled plot axes
  - Add more profile evaluation methods:
    - Nearest
    - Inverse distance weighting

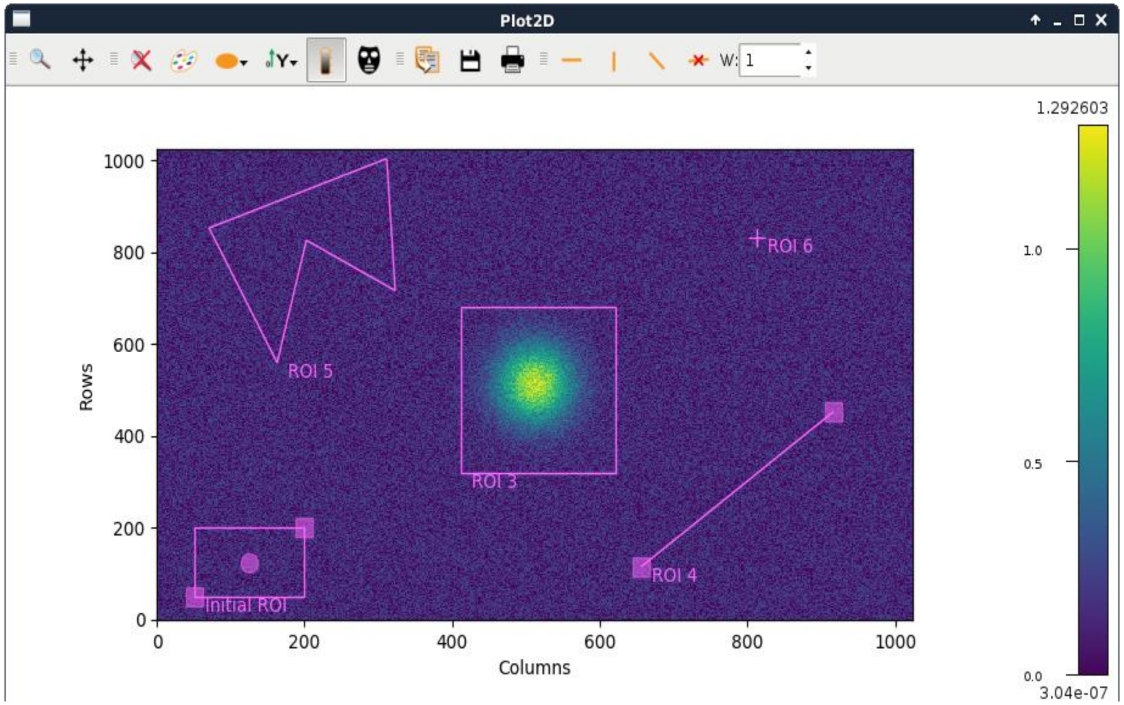


# Interactive Regions of Interest

- `silx.gui.plot.tools.roi:`
  - Regions of interest on a plot with different shapes
  - Editable interactively

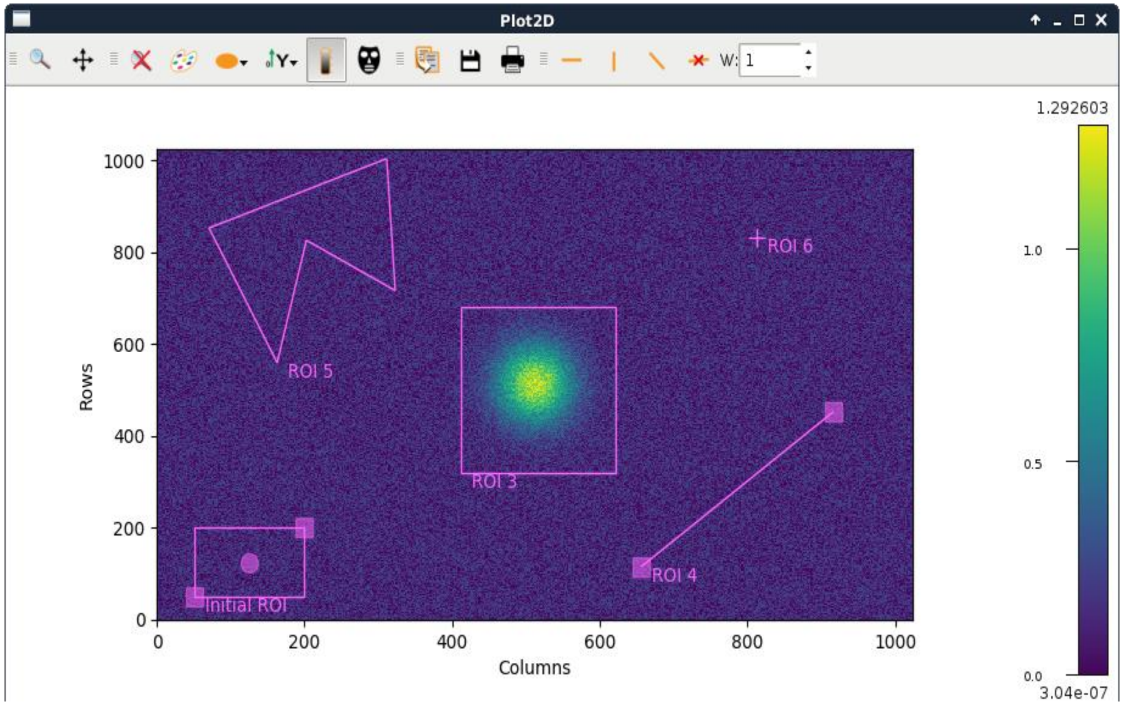
Doc: http://www.silx.org/doc/silx/dev/modules/gui/plot/tools.html#module-silx.gui.plot.tools.roi

Sample code: plotInteractiveImageROI.py



# Interactive Regions of Interest

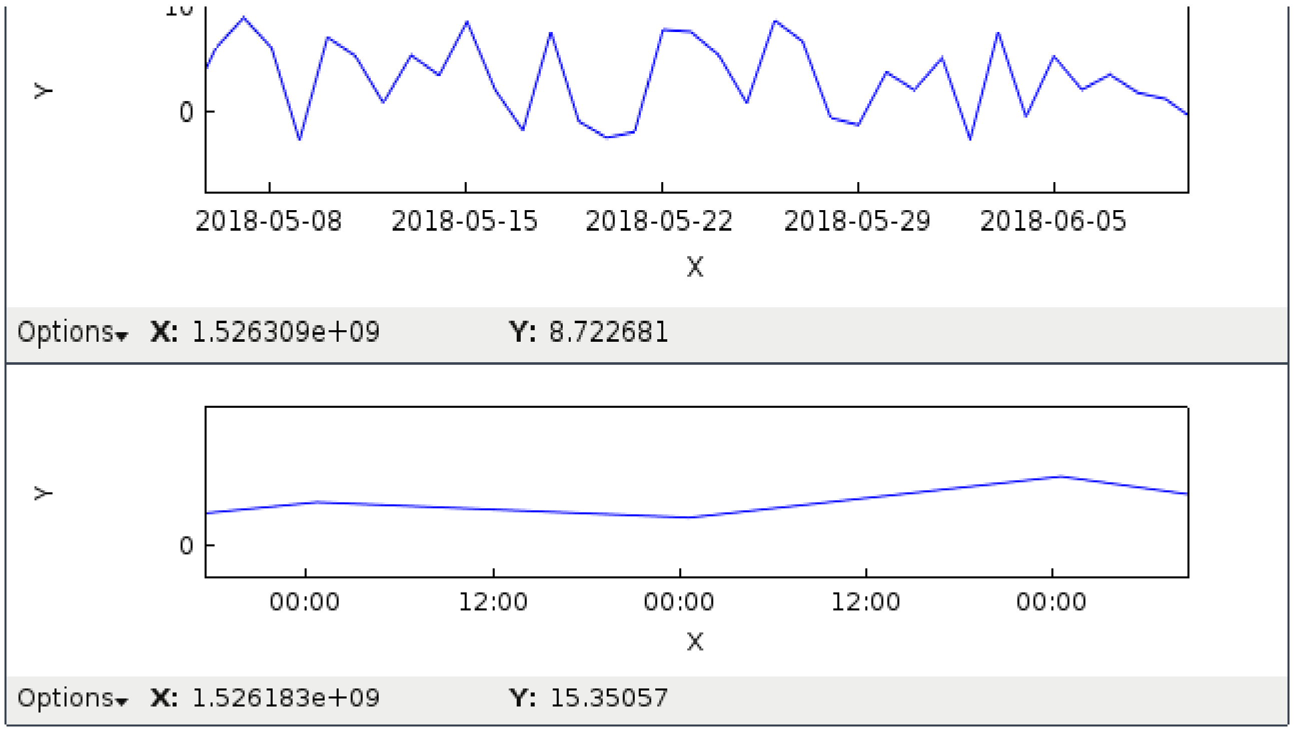
- **Future improvements:**
  - Add more ROI shapes
  - Snap to ROI curve/image
  - Integrate further with plot
- **API might change**



# silx.gui.plot Time series

- X axis labels displayed as dates or times depending on scale
- Thanks to Pepijn Kenter (SRON: Netherlands Institute for Space Research)

Doc: http://www.silx.org/doc/silx/dev/modules/gui/plot/items.html#silx.gui.plot.items.Axis.setTickMode



X: 1.526309e+09 Y: 8.722681

X: 1.526183e+09 Y: 15.35057

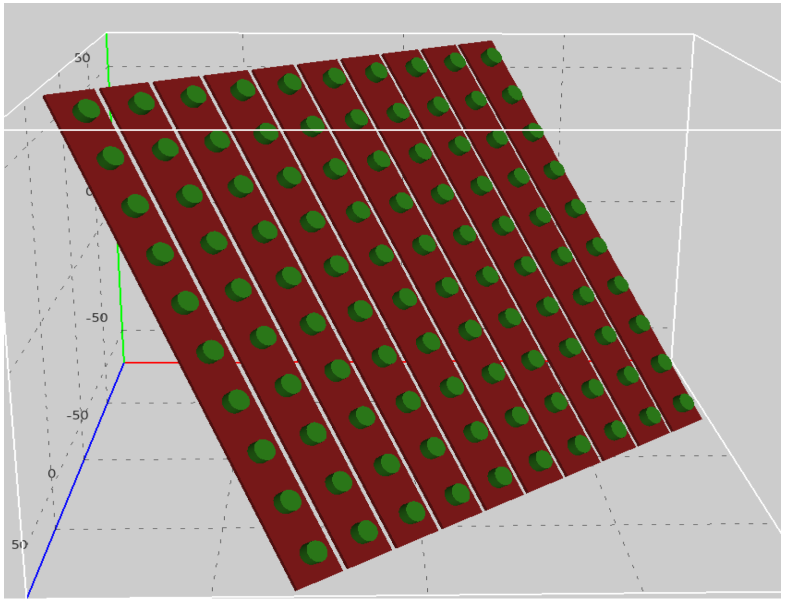
# Plot Widget Toolbars

- **Idea: Make plot widgets more modular:**
  - Allow to reuse `QAction` and `QToolBar`:

```
from silx.gui import qt
from silx.gui.plot import PlotWidget, tools
[...]
window = qt.QMainWindow()        # Create a window
plot = PlotWidget(window)        # Create a plot
window.setCentralWidget(plot)   # Place plot in window

# Add plot zoom/pan toolbar to the window
window.addToolBar(tools.InteractiveModeToolBar(parent=window, plot=plot))

# Add copy/save/print toolbar to the window
window.addToolBar(tools.OutputToolBar(parent=window, plot=plot))
[...]
window.show()
```

# silx.gui.plot3d: Simple 3D Shapes

- Simple shapes: Cubes, cylinders, hexagons
- Allows to render many similar shapes at once
- Thanks to Guillaume Communie (ISDD/Detector & Electronics)



## Asynchronous Widget Update

- **Function to update widgets (asynchronously) from a thread:**

```
from silx.gui.utils.concurrent import
submitToQtMainThread
```

- **Returns a Python `Future` object which allows to know when function is performed and get the result.**
- **Thanks to Hans Fangohr (European XFEL) for plotUpdateImageFromThread.py sample code**

Doc: http://www.silx.org/doc/silx/dev/modules/gui/utils.html

Sample code: plotUpdateCurveFromThread.py, plotUpdateImageFromThread.py

## Miscellaneous

- **Colormap code in C/OpenMP:**
  - Faster computation
  - `sqrt` and `arcsinh` normalization (not yet integrated in the plot)
- **PlotWidget OpenGL backend:**
  - Improve support of `float64` data while using `float32` on the GPU.

## Dropped Support

- Debian 7 (as Debian does...)
- “Old” versions of IPython console widget that do not play well with PyQt5

## This talk

- Introduction
  - Novelties (version 0.8.0)
- Status of silx (version 0.7.0)
- Goals of the code camp
  - For users
  - For core developers
- Hands on!

## Structure of silx

- gui: Graphical User Interface widgets
  - Plot, image display, masks, HDF5 tree view, fitting
- image: Image processing tools
  - Image interpolation, registration and drawing primitives
- io: Input / Ouput
  - Support for SPEC, HDF5 and image formats
- math:
  - least squares fit with constraints, isosurface calculations, histograms, …
- opencl: Optimize the use of GPU (FBP, registration, median filter, …)
- third-party: External utilities
- utils: Internal utilities
- sx: Convenience module for interactive use

## silx.resources

Container of icons, opencl programs, …

Provisions for simplifying handling of frozen binaries

A project can use silx as resource provider

```
import silx.resources

PYFAI_RESOURCE_DIR = None  # It has to be set for Debian package

silx.resources.register_resource_directory(
    "pyfai",
    pyFAI.resources,
    forced_path=PYFAI_RESOURCE_DIR)

filename = silx.resources.resource_filename("pyfai:calibrant/LaB6.C")

import silx.opencl.utils
filename = silx.opencl.utils.get_cl_file("pyfai:opencl/integrate")

import silx.gui.icons
icon = silx.gui.icons.getIcons("pyfai:icons/pyfai")
```

## Plot: Object API

When getting a curve or an image from a Plot widget in silx, it used to return a list describing this item.

- Since v0.5.0 it returns an object:
  - Add support for updating items in the Plot: curve, image, markers...
  - Mostly backward-compatible with previous API

- Documentation:

http://www.silx.org/doc/silx/dev/modules/gui/plot/items.html

# Plot: Object and Functional APIs

- Example: Getting image information:

```
from silx import sx
w = sx.imshow(img)
```

- Object API:

```
image = w.getActiveImage()
data = image.getData(copy=True)
scale = image.getScale()
```

- Legacy API:

```
image = w.getActiveImage()
data = image[0]
scale = image[4]['scale']
```

## Plot: Object and Functional APIs

Example: Updating an image:

```
from silx import sx
w = sx.imshow(img)
```

- Object API:

```
image = w.getActiveImage()
image.setScale(2., 2.)
```

- Legacy API:

```
data, legend, info, pixmap, params = w.getActiveImage()
w.addImage(data,
           legend=legend,
           info=info,
           pixmap=pixmap,
           scale=(2., 2.))
```

## Colormap Object (silx.gui.plot.Colormap)

Colormaps are now defined as a ***Colormap*** object instead of a dictionary.

This allow modifications on colormaps objects to be managed by other classes such as ***PlotWidget*** or ***ColorBar*** (using Qt.Signal).

```
from silx.gui.plot.Colormap import Colormap

colormap = Colormap(name='temperature',
                    normalization=Colormap.LOGARITHM,
                    vmin=None,
                    vmax=None)
```

**API with colormaps as a dictionary is kept but deprecated.**

## silx.gui.plot API

- Add signals on *PlotWidget* items (i.e. curves, images, markers,…) notifying updates: *sigItemChanged*

- Internals: Merged classes *Plot* and *PlotWidget*

## PlotWidget axis

- Provide a plot axis API

  *axes =plot.getXAxis(), plot.getYAxis()*

  - Provides getters, setters
  - Signals on limits, scale, label, direction

- Constraints on axes

  *xaxis.setLimitsConstraints(minPos, maxPos)*

  *xaxis.setRangeConstraints(minRange, maxRange)*

  - A demo is available at *examples/plotLimits.py*

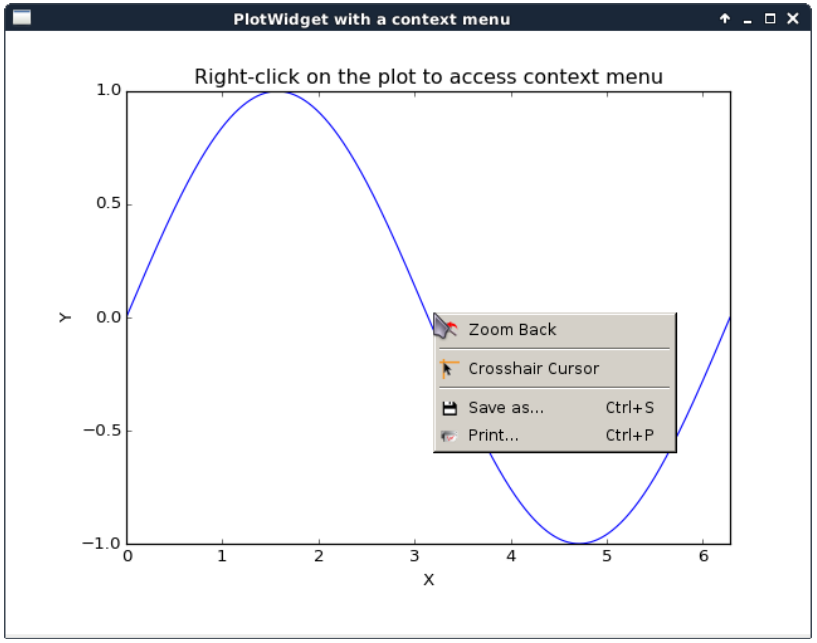
- Helper to synchronize axes

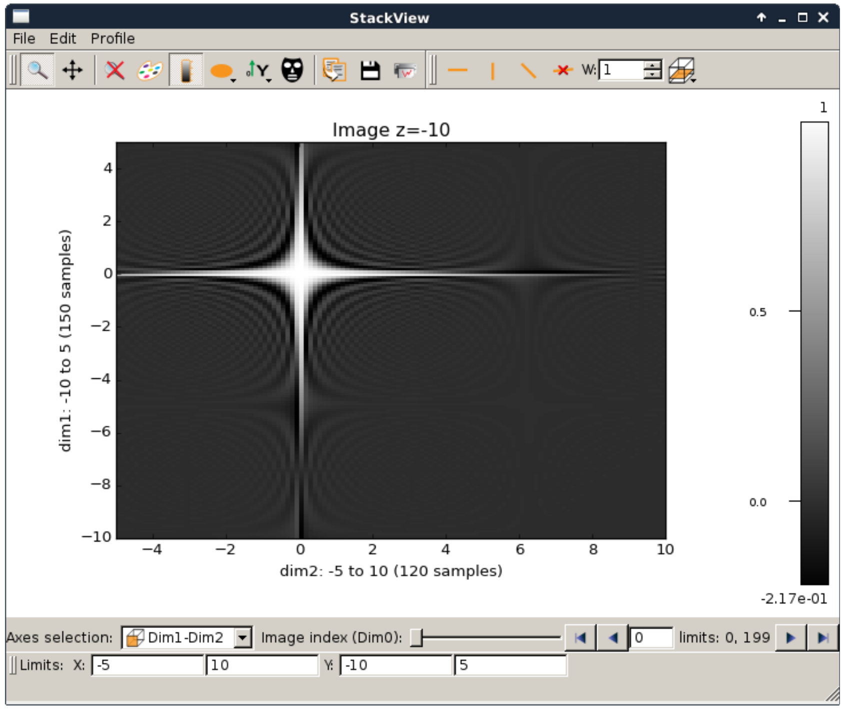
```
from silx.gui.plot.utils.axis import SyncAxes
sync = SyncAxes([plot1.getXAxis(),
                 plot2.getXAxis(),
                 plot3.getXAxis()])
```

  - A demo is available at *examples/syncaxis.py*

- PlotWidget: Add support for context menu:
  *plotContextMenu.py*

- PlotWindow, Plot2D
  *- Add colorbar*


PlotWidget with a context menu
Right-click on the plot to access context menu
Zoom Back
Crosshair Cursor
Save as... Ctrl+S
Print... Ctrl+P
x
y

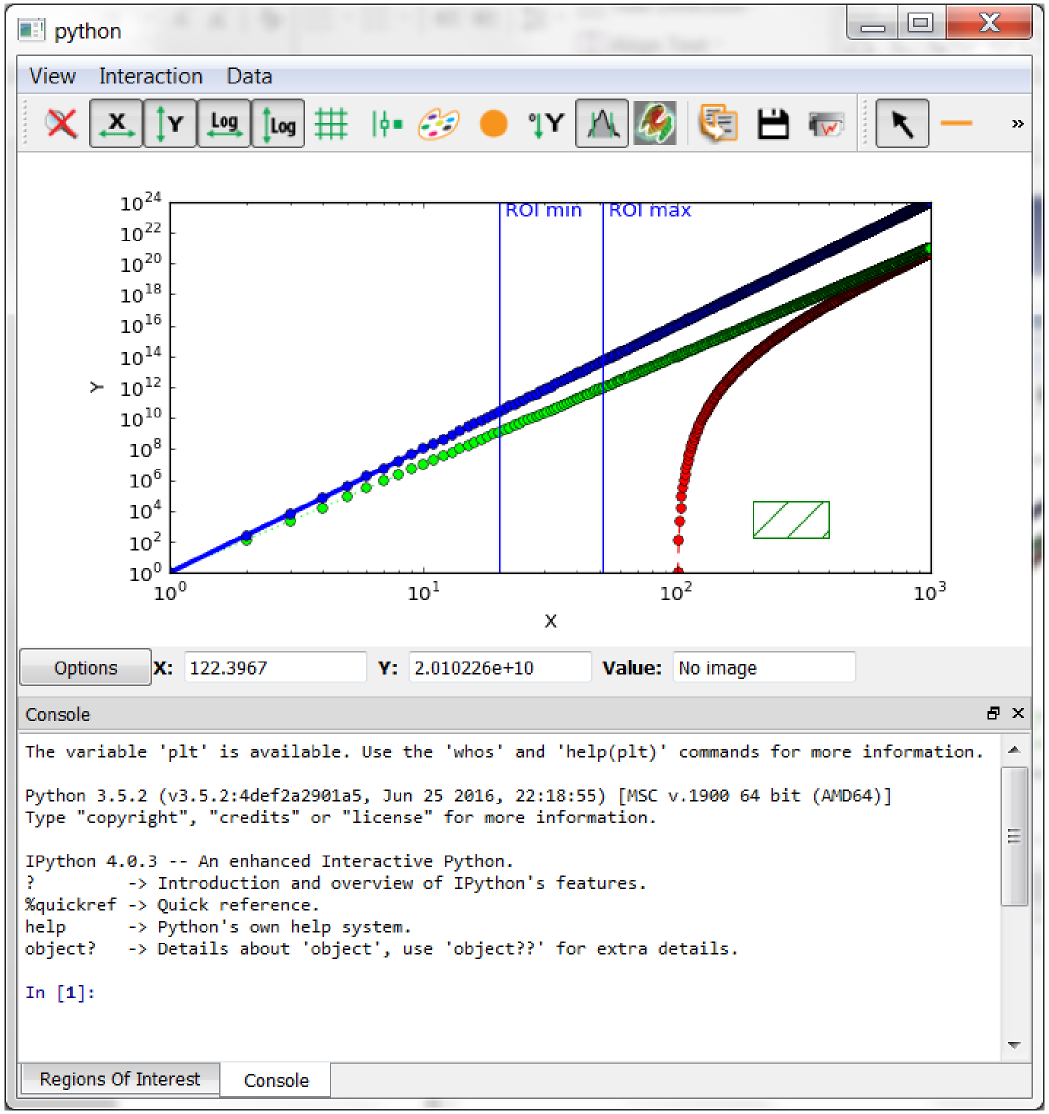

StackView
File Edit Profile
Image z=-10
dim1: -10 to 5 (150 samples)
dim2: -5 to 10 (120 samples)
-2.17e-01
Axes selection: Dim1-Dim2
Image index (Dim0):
limits: 0, 199
Limits: X: -5 10 Y: -10 5

## silx.gui: Plot 1D

- Visualize 1D data
- Apply ROIs on them
- Control the plot via an interactive console
- Fitting capabilities
- Object oriented API

# silx.gui: base widgets for scientific applications

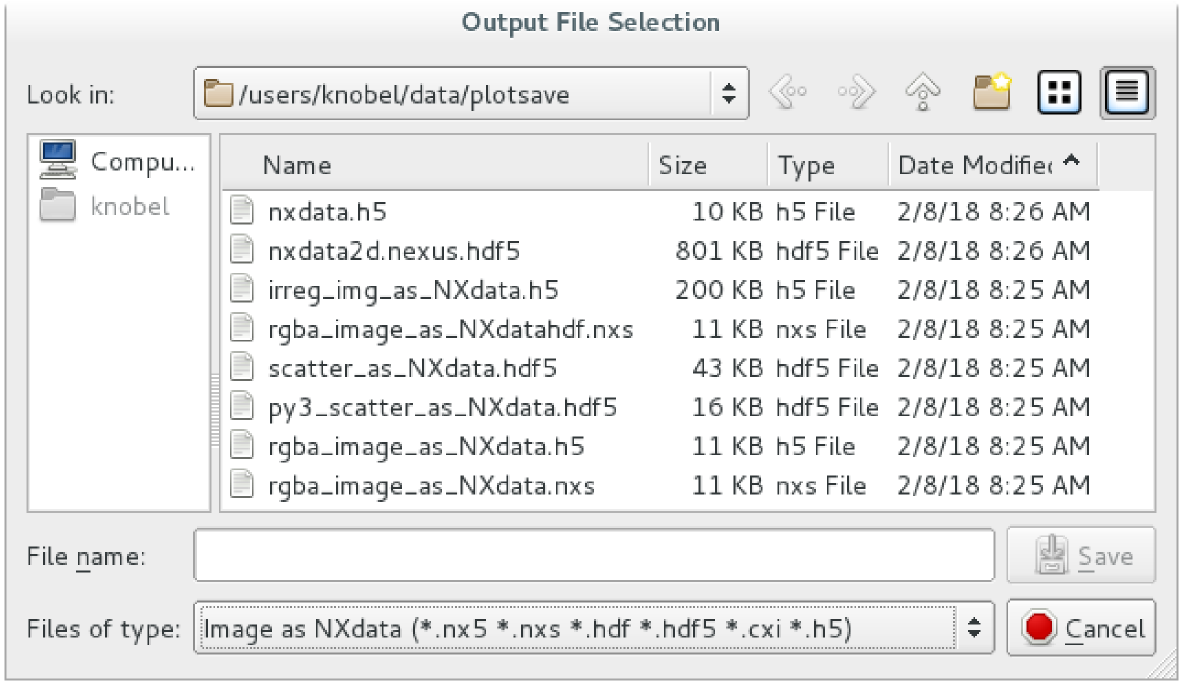
- Browsing file contents
  - Single widget for HDF5, SPEC, Images
- Plotting curves
  - with ROI, fitting
- Display of images
  - with masks, profiles
- Interactive console



```
The variable 'plt' is available. Use the 'whos' and 'help(plt)' commands for more information.

Python 3.5.2 (v3.5.2:4def2a2901a5, Jun 25 2016, 22:18:55) [MSC v.1900 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 4.0.3 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.

In [1]:
```

# Plot SaveAction : add save as NXdata

- Save active curve, active scatter or active image to *NXdata*



Output File Selection

Look in: /users/knobel/data/plotsave

| Name | Size | Type | Date Modified |
|---|---|---|---|
| nxdata.h5 | 10 KB | h5 File | 2/8/18 8:26 AM |
| nxdata2d.nexus.hdf5 | 801 KB | hdf5 File | 2/8/18 8:26 AM |
| irreg_img_as_NXdata.h5 | 200 KB | h5 File | 2/8/18 8:25 AM |
| rgba_image_as_NXdatahdf.nxs | 11 KB | nxs File | 2/8/18 8:25 AM |
| scatter_as_NXdata.hdf5 | 43 KB | hdf5 File | 2/8/18 8:25 AM |
| py3_scatter_as_NXdata.hdf5 | 16 KB | hdf5 File | 2/8/18 8:25 AM |
| rgba_image_as_NXdata.h5 | 11 KB | h5 File | 2/8/18 8:25 AM |
| rgba_image_as_NXdata.nxs | 11 KB | nxs File | 2/8/18 8:25 AM |

File name:

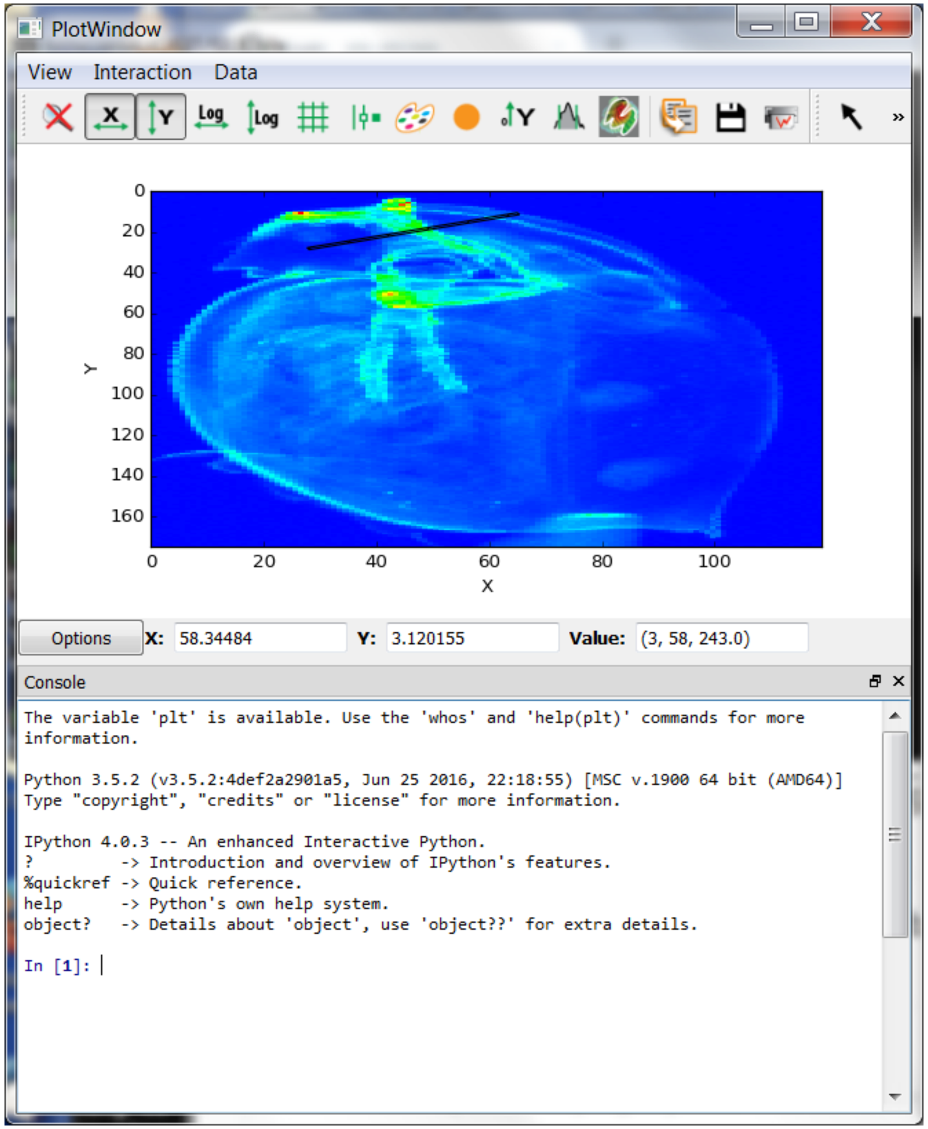
Files of type: Image as NXdata (*.nx5 *.nxs *.hdf *.hdf5 *.cxi *.h5)

- Can save some parts of plot state (title, axis labels, active data...) but not all (no curve style, colormap info, additional data items...)
- Future improvements: add a dialog to specify output group in an existing HDF5 file

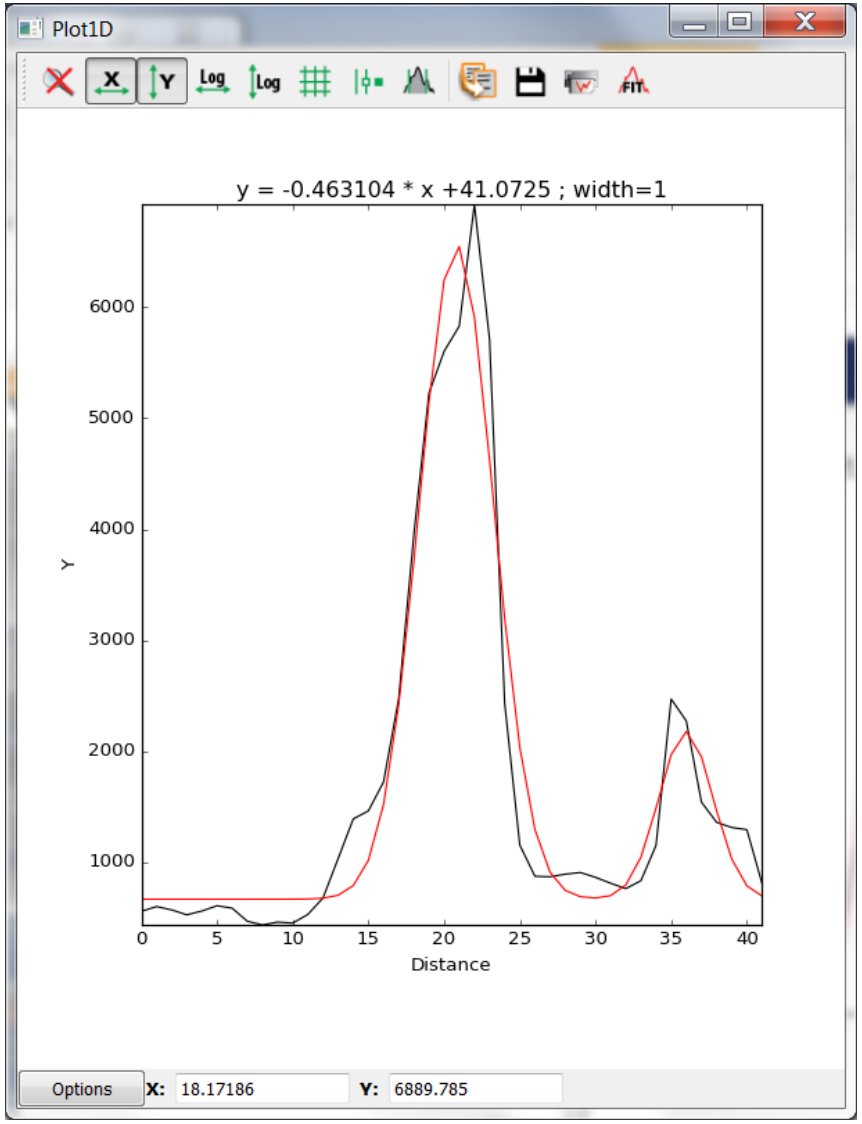
## silx.gui: Plot 2D

- Visualize 2D data (Images and Stacks of Images)
  - Support Median Filters, Profiles and Masks on them
- Visualize 3D data as scatter plots
  - Support  Masks on them
- Apply different colormaps
- Plot an image with associated histograms
- Visualize 3D scalar fields (Isosurfaces)

# Full-featured widgets

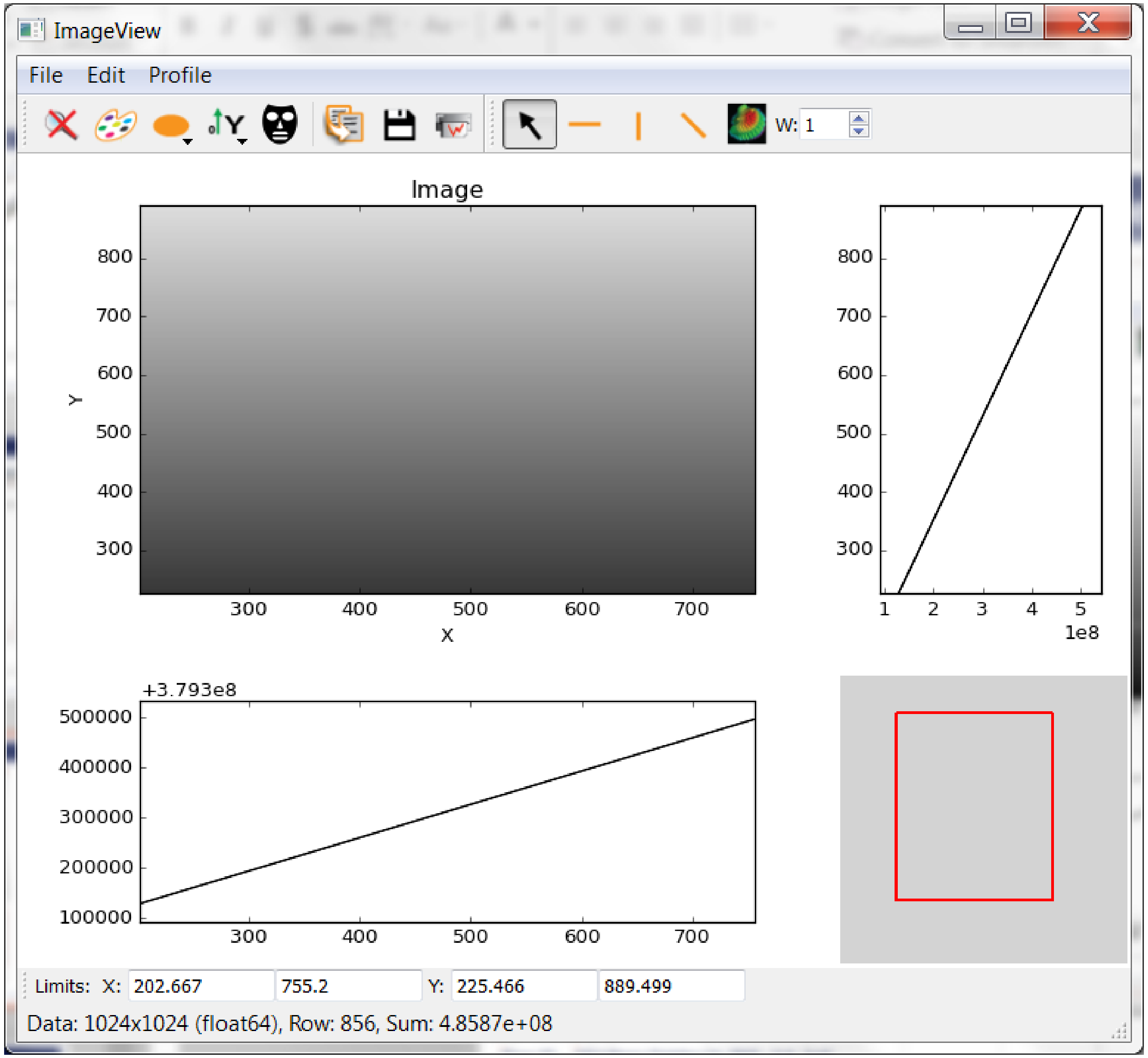


```
The variable 'plt' is available. Use the 'whos' and 'help(plt)' commands for more
information.

Python 3.5.2 (v3.5.2:4def2a2901a5, Jun 25 2016, 22:18:55) [MSC v.1900 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 4.0.3 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object', use 'object??' for extra details.

In [1]: |
```



Plot1D
y = -0.463104 * x +41.0725 ; width=1
Y
Distance
Options X: 18.17186 Y: 6889.785

# Full-featured Widgets

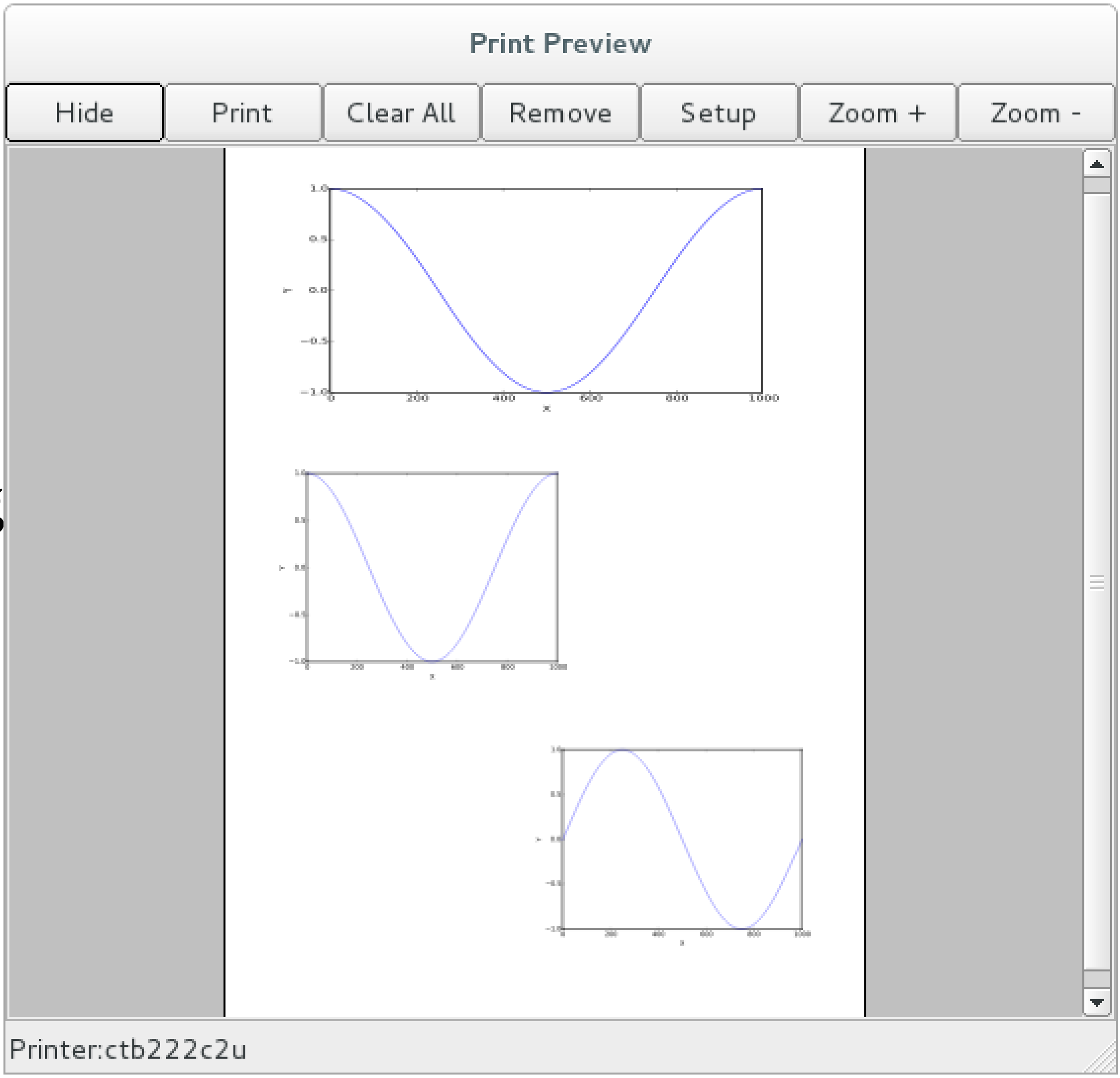


Limits: X: 202.667 755.2 Y: 225.466 889.499

Data: 1024x1024 (float64), Row: 856, Sum: 4.8587e+08

# Print Preview

- Print preview dialog (with addImage, addPixmap and addSvgItem methods)
- Tool button for a plot widg *(to send the plot as an SVG item)*
- Items can be dragged and resized. (*Geometry can be configured prior to send the plot).*

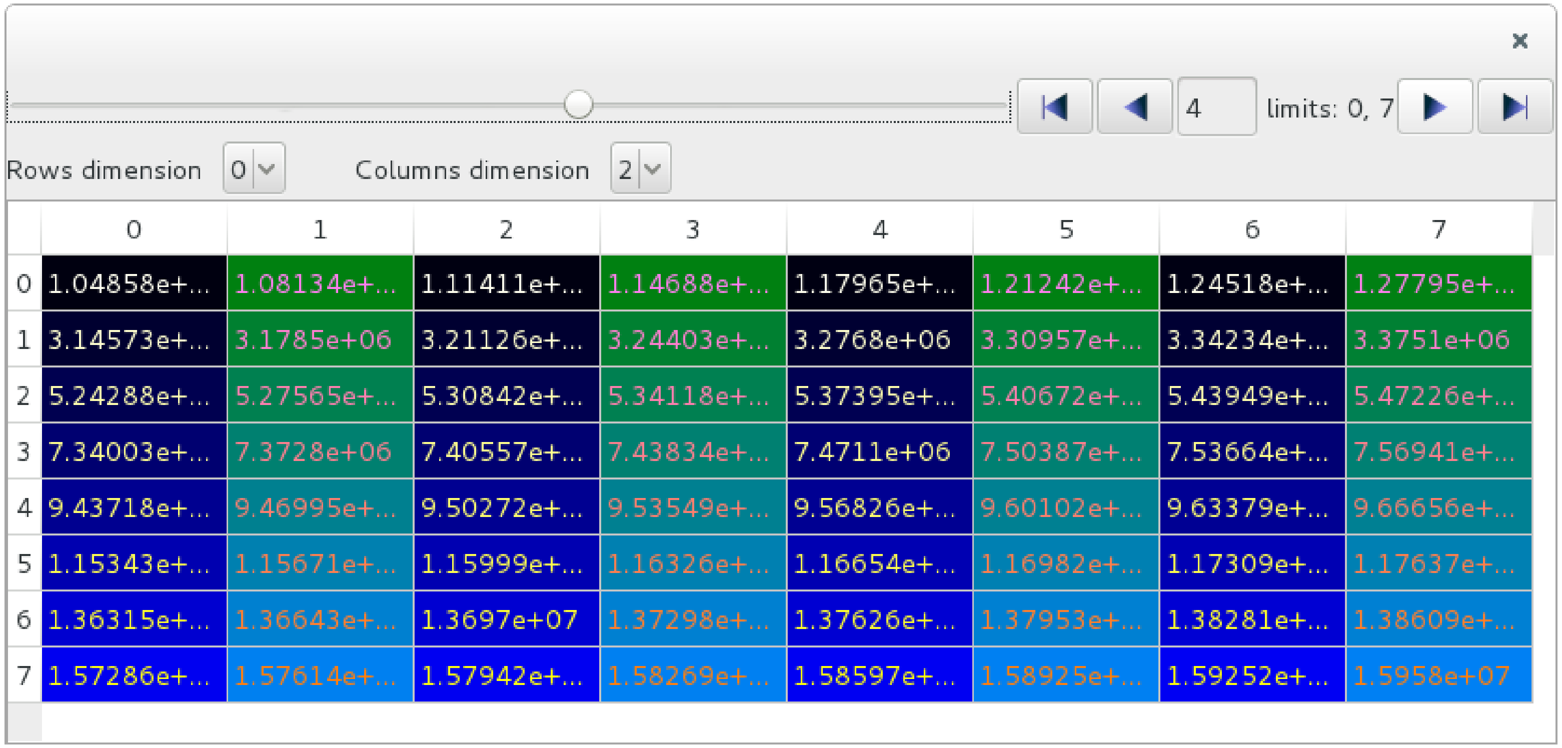


Printer:ctb222c2u

# silx.gui.data.ArrayTableWidget

- Display arrays and datasets of any number of dimensions in a TableView

- Lazy loading for datasets: only the currently displayed 2D slice is read from HDF5 file



4 limits: 0, 7

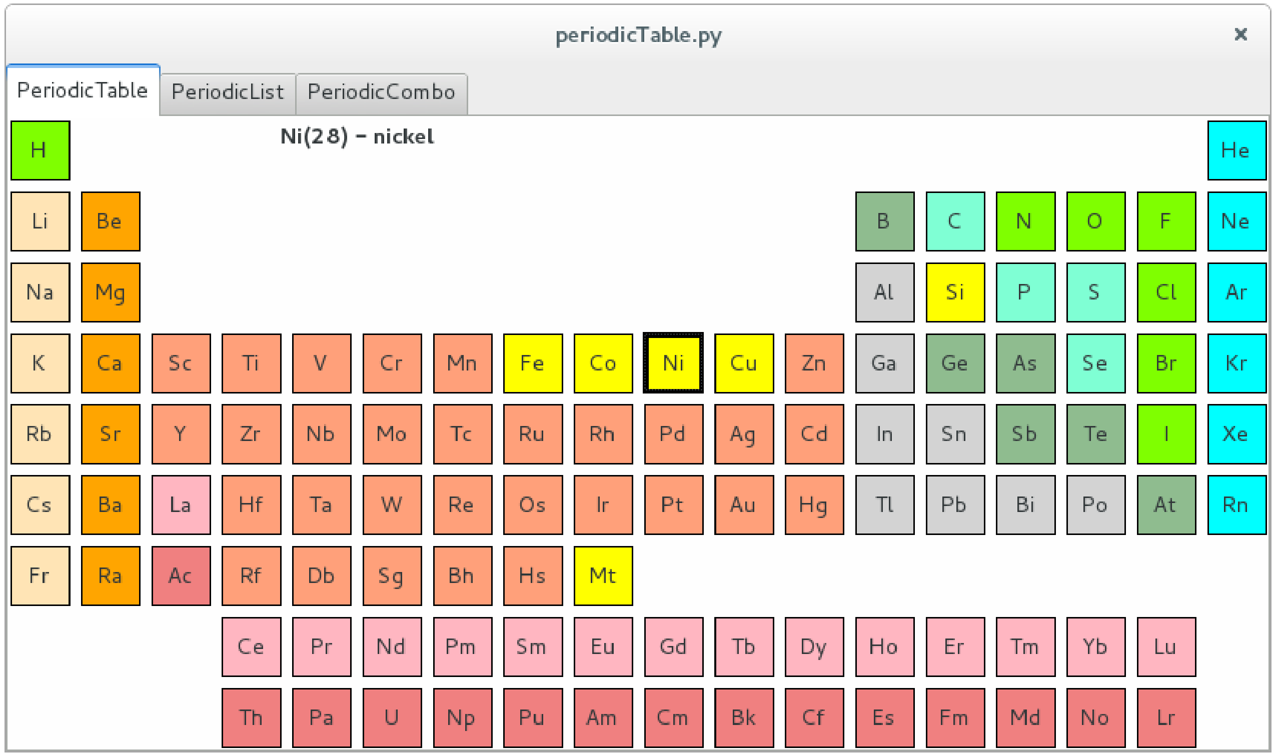
Rows dimension 0 Columns dimension 2

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 0 | 1.04858e+... | 1.08134e+... | 1.11411e+... | 1.14688e+... | 1.17965e+... | 1.21242e+... | 1.24518e+... | 1.27795e+... |
| 1 | 3.14573e+... | 3.1785e+06 | 3.21126e+... | 3.24403e+... | 3.2768e+06 | 3.30957e+... | 3.34234e+... | 3.3751e+06 |
| 2 | 5.24288e+... | 5.27565e+... | 5.30842e+... | 5.34118e+... | 5.37395e+... | 5.40672e+... | 5.43949e+... | 5.47226e+... |
| 3 | 7.34003e+... | 7.3728e+06 | 7.40557e+... | 7.43834e+... | 7.4711e+06 | 7.50387e+... | 7.53664e+... | 7.56941e+... |
| 4 | 9.43718e+... | 9.46995e+... | 9.50272e+... | 9.53549e+... | 9.56826e+... | 9.60102e+... | 9.63379e+... | 9.66656e+... |
| 5 | 1.15343e+... | 1.15671e+... | 1.15999e+... | 1.16326e+... | 1.16654e+... | 1.16982e+... | 1.17309e+... | 1.17637e+... |
| 6 | 1.36315e+... | 1.36643e+... | 1.3697e+07 | 1.37298e+... | 1.37626e+... | 1.37953e+... | 1.38281e+... | 1.38609e+... |
| 7 | 1.57286e+... | 1.57614e+... | 1.57942e+... | 1.58269e+... | 1.58597e+... | 1.58925e+... | 1.59252e+... | 1.5958e+07 |

# silx.gui.widgets.PeriodicTable

- Periodic table, list (QTreeView) and combo/dropdown list providing minimal data for elements: symbol, name, atomic number, mass

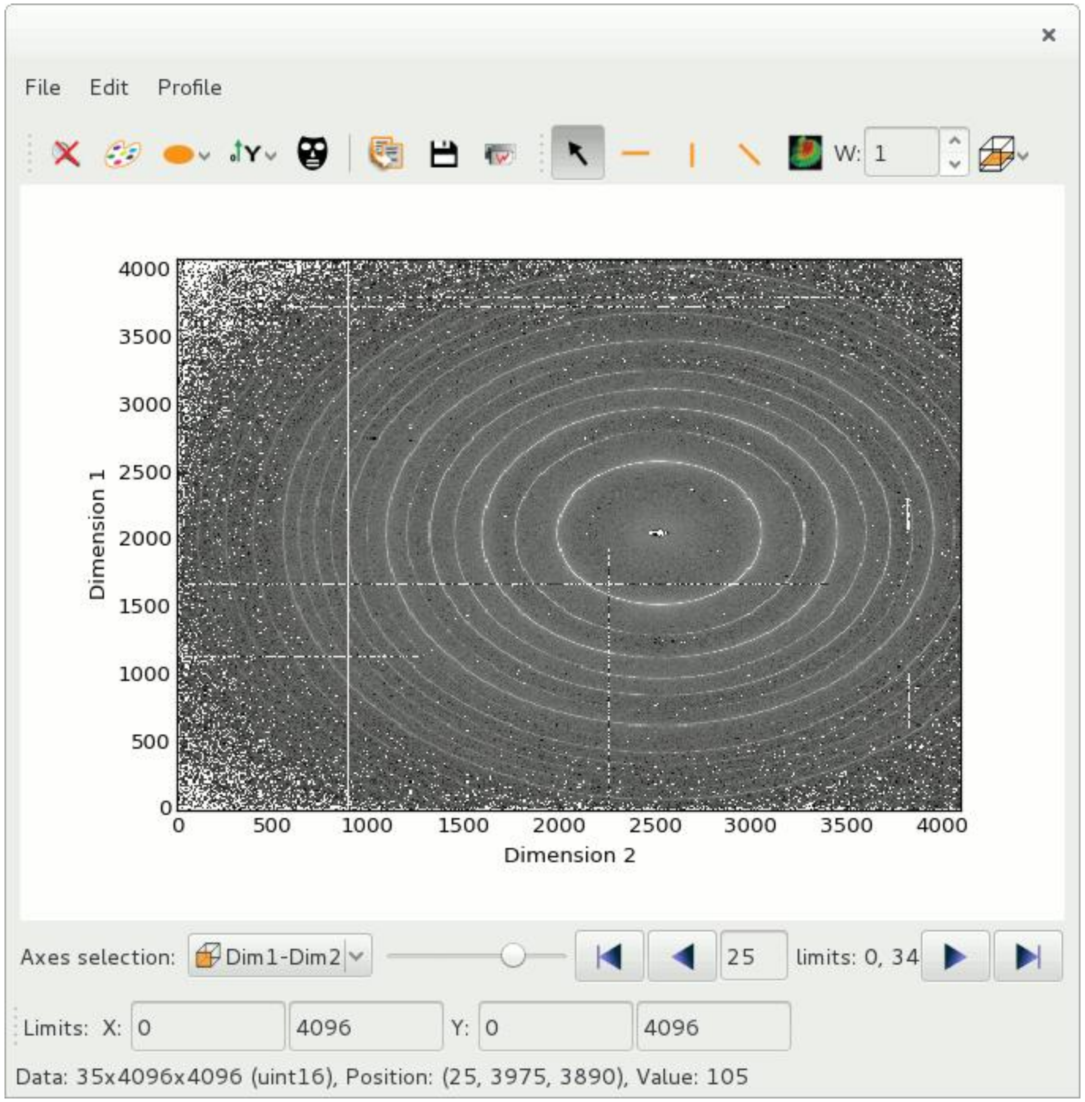
- Selectable elements, signals for element clicked and selection changed events


periodicTable.py
PeriodicTable
PeriodicList
PeriodicCombo
H He
Li Be B C N O F Ne
Na Mg Al Si P S Cl Ar
K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr
Rb Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe
Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn
Fr Ra Ac Rf Db Sg Bh Hs Mt
Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr

Ni(28) – nickel

# silx.gui.plot.StackView

- Viewing 3D arrays, 3D datasets or list of 2D arrays as a stack of images.
- Axes selection
- Profile tool to extract a 2D slice from the 3D stack
- Lazy loading for datasets (except when doing diagonal 3D profile)



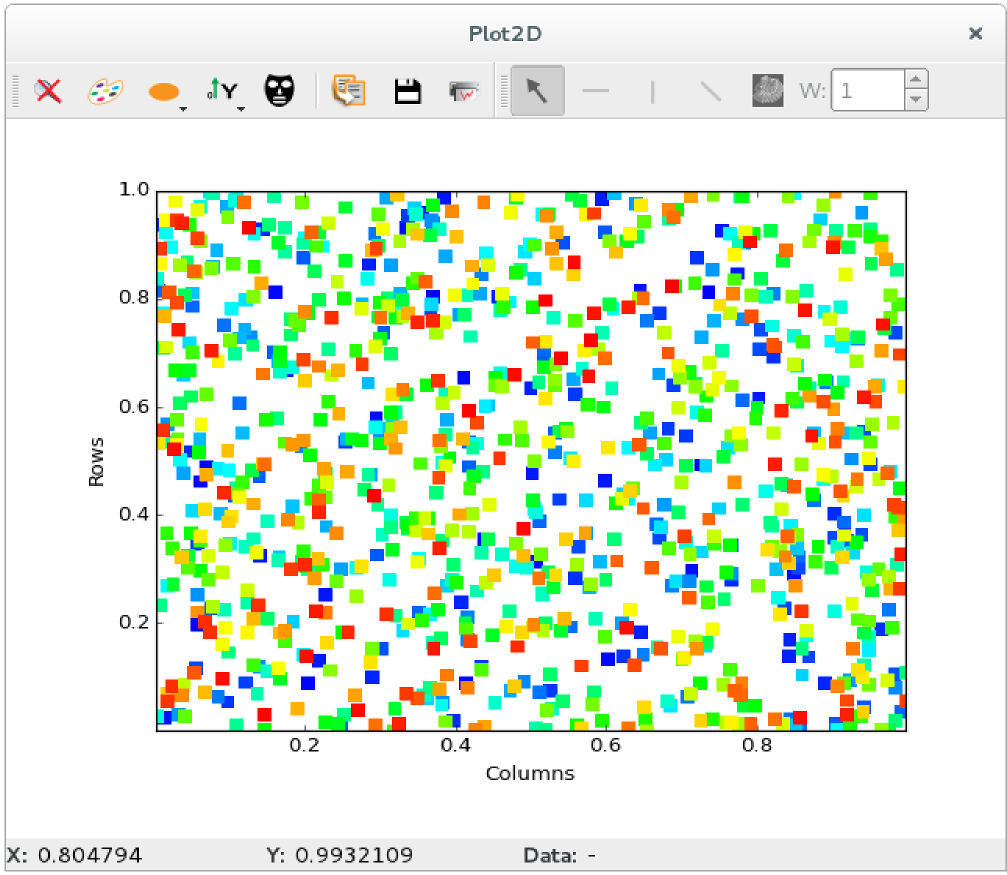
Axes selection: Dim1-Dim2 25 limits: 0, 34

Limits: X: 0 4096 Y: 0 4096

Data: 35x4096x4096 (uint16), Position: (25, 3975, 3890), Value: 105

# silx.gui.plot Scatter Objects

```python
import numpy
import sys
from silx.gui import qt
from silx.gui.plot import Plot2D

app = qt.QApplication([])
win = Plot2D()

win.addScatter(x=numpy.random.random(1000),
               y=numpy.random.random(1000),
               value=numpy.arange(1000),
               legend="my scatter")

sc = win.getScatter("my scatter")
sc.setSymbol("s")                      # square
sc.setSymbolSize(50)
sc.setColormap({'name': 'temperature',
                'normalization': 'linear',
                'autoscale': True,
                'vmin': 0.0, 'vmax': 1,})
win.resetZoom()
win.show()
sys.exit(app.exec_())
```



X: 0.804794 Y: 0.9932109 Data: -

## OpenGL in *plot3d* and *plot*

- Support for Qt >= 5.4 OpenGL Widgets *(QOpenGLWidget)*

- Better support of OpenGL context issues (i.e. missing QtOpenGL, ssh GLX forwarding disabled,…) : display an error message rather than raising exceptions.

- First steps of Continuous Integration for OpenGL-based widgets

## silx.gui.plot OpenGL Rendering

Matplotlib and OpenGL rendering backends in silx.gui.plot widgets:

- Usage: Set argument backend='gl‘ in widget constructor for: PlotWidget, PlotWindow, Plot1D, Plot2D, StackView, ImageView

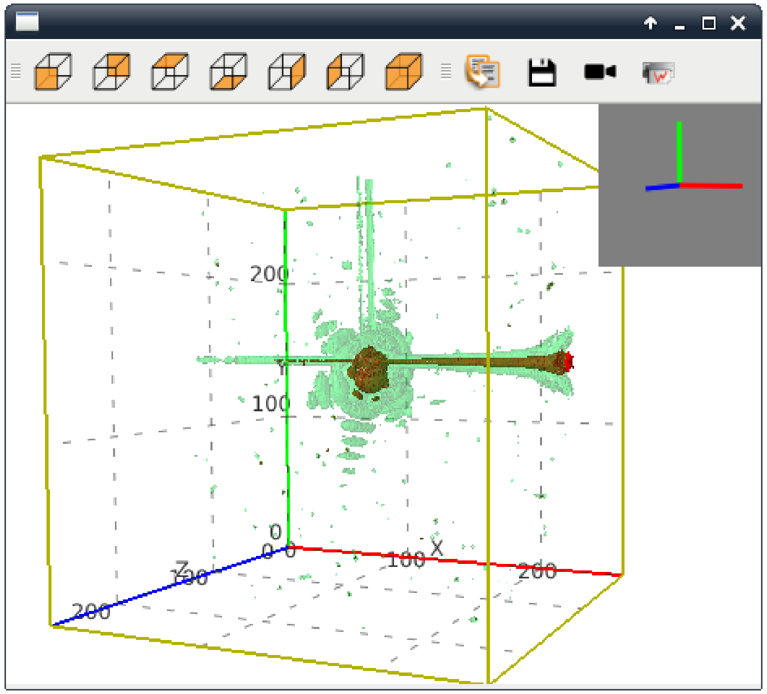
- Example:

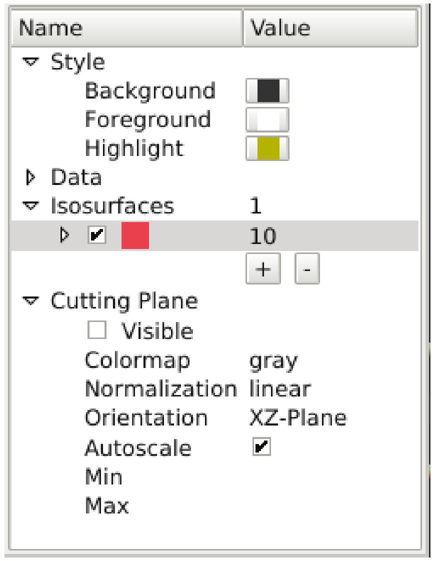
```
from silx import sx
plot = sx.Plot2D(backend='gl')
plot.show()
```

## silx.gui.plot3d

Silx 3D Visualization

- Dependencies
  - PyQt.QtOpenGL
  - PyOpenGL 3.x
  - OpenGL 2.1 subset
- Qt widgets for 3D plotting
  - ScalarFieldView (scalar field visualization)
  - Iso-surfaces
  - Cutting plane
- Based on an internal 3D scene structure

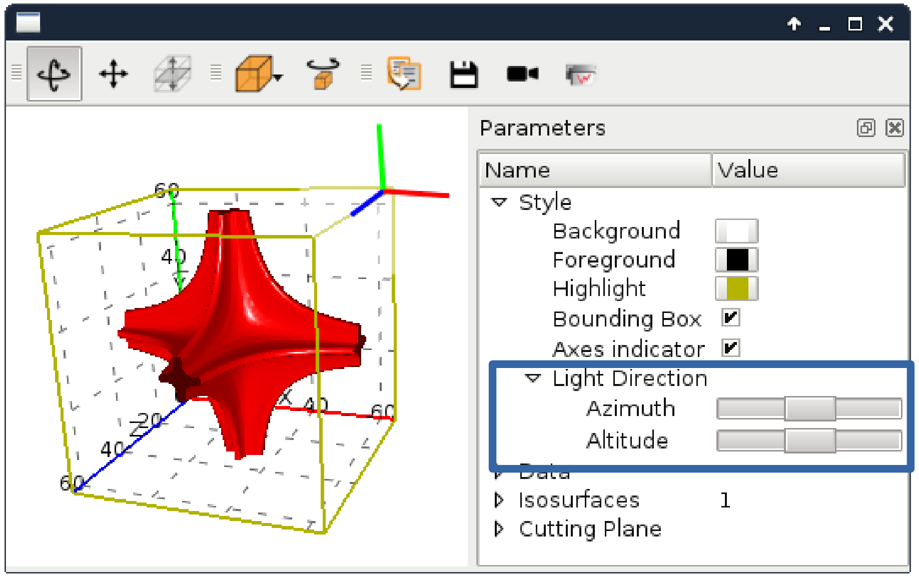




| Name | Value |
|---|---|
| ▿ Style | |
| Background | ⬛ |
| Foreground | ⬜ |
| Highlight | 🟨 |
| ▹ Data | |
| ▿ Isosurfaces | 1 |
| ▹ ✓ 🟥 | 10 |
| | + - |
| ▿ Cutting Plane | |
| ☐ Visible | |
| Colormap | gray |
| Normalization | linear |
| Orientation | XZ-Plane |
| Autoscale | ✓ |
| Min | |
| Max | |

# silx.gui.plot3d: ScalarFieldView

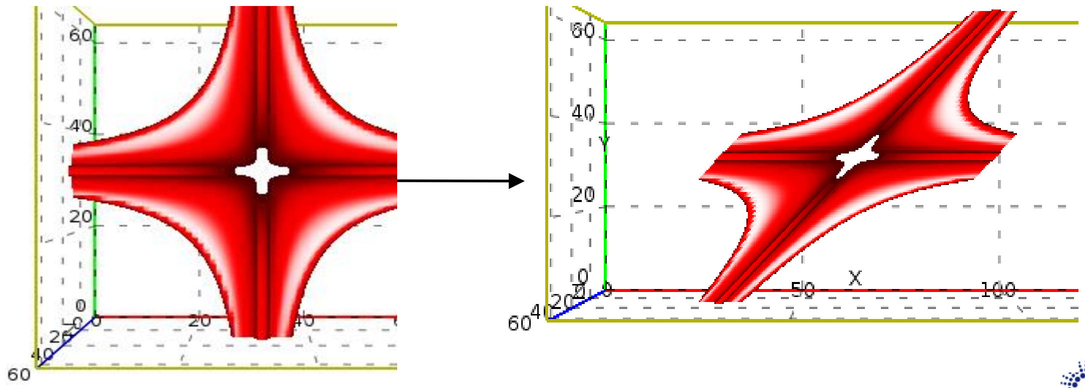
- Add light control


Parameters

| Name | Value |
|---|---|
| ▿ Style | |
| Background | ⬜ |
| Foreground | ⬛ |
| Highlight | 🟨 |
| Bounding Box | ✓ |
| Axes indicator | ✓ |
| ▿ Light Direction | |
| Azimuth | |
| Altitude | |
| ▹ Data | |
| ▹ Isosurfaces | 1 |
| ▹ Cutting Plane | |

- Support of 3x3 matrix transform (for non-orthogonal axes support) to 3D scalar field visualization widget (`ScalarFieldView`):

```
scalarFieldView.setTransformMatrix((
        (1., 1., 0.),
        (0., 1., 0.),
        (0., 0., 1.)))
```

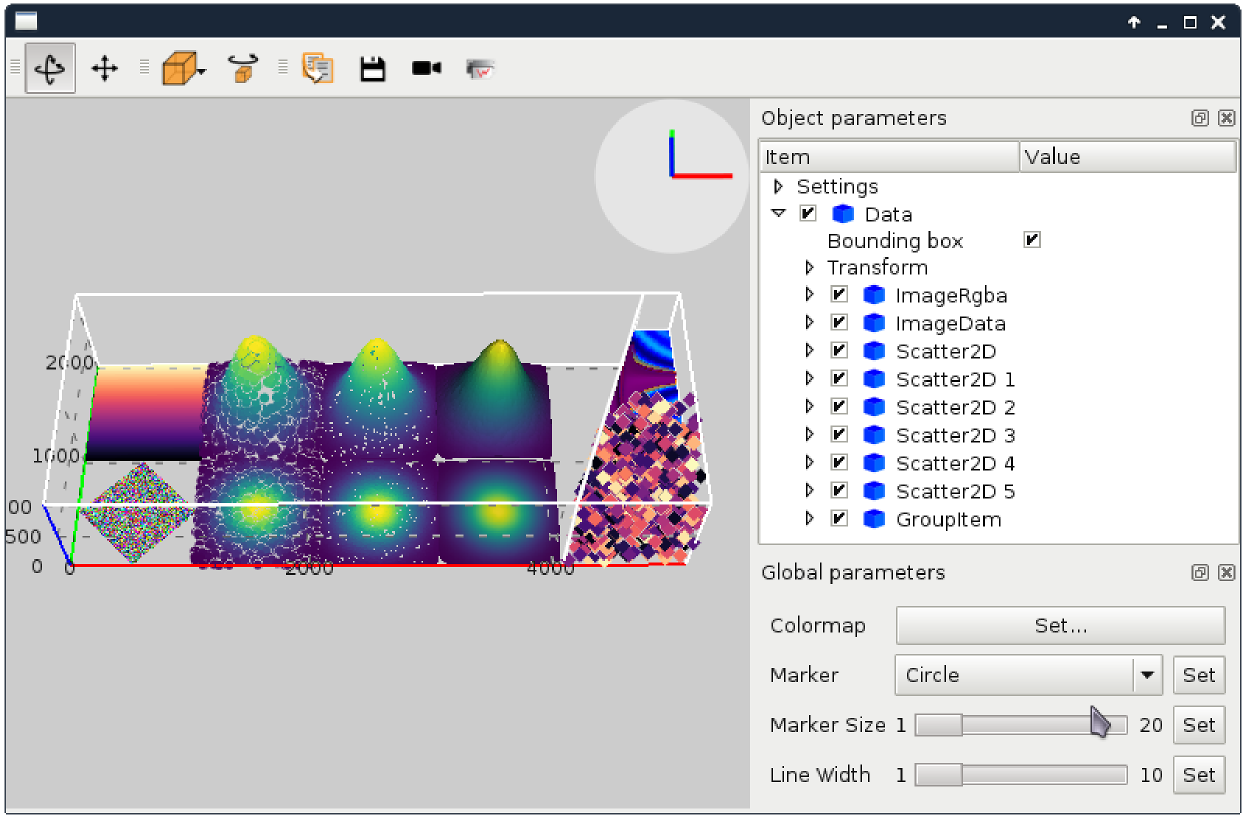


The European Synchrotron | ESRF

# silx.gui.plot3d: Scene widgets

General purpose 3D visualization widget and associated tools:

- Goal: Replacement candidate for PyMca OpenGL tab



Colormap: Set...

Marker: Circle

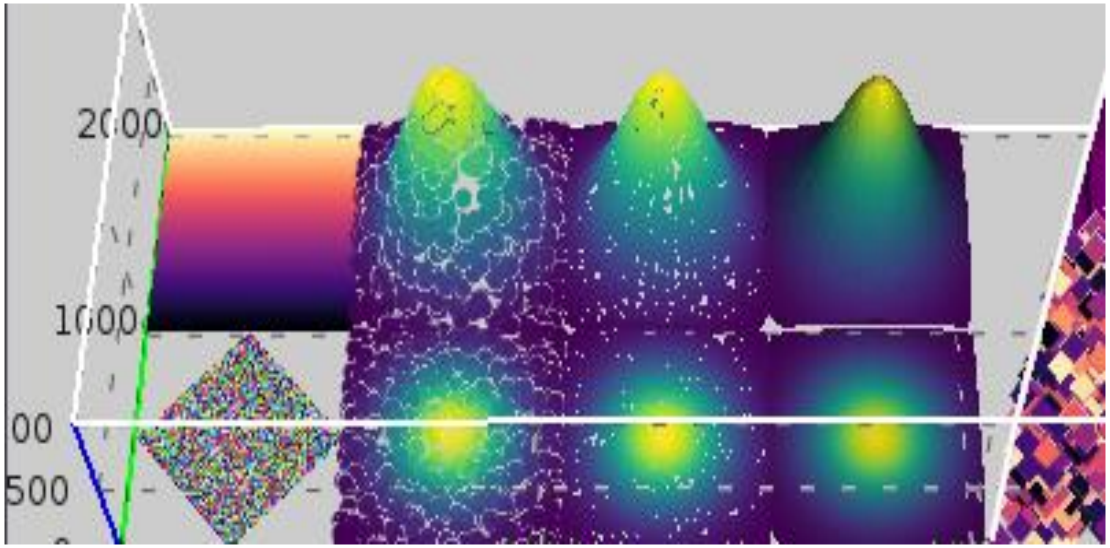
Marker Size: 1 – 20

Line Width: 1 – 10

# silx.gui.plot3d: Scene available items

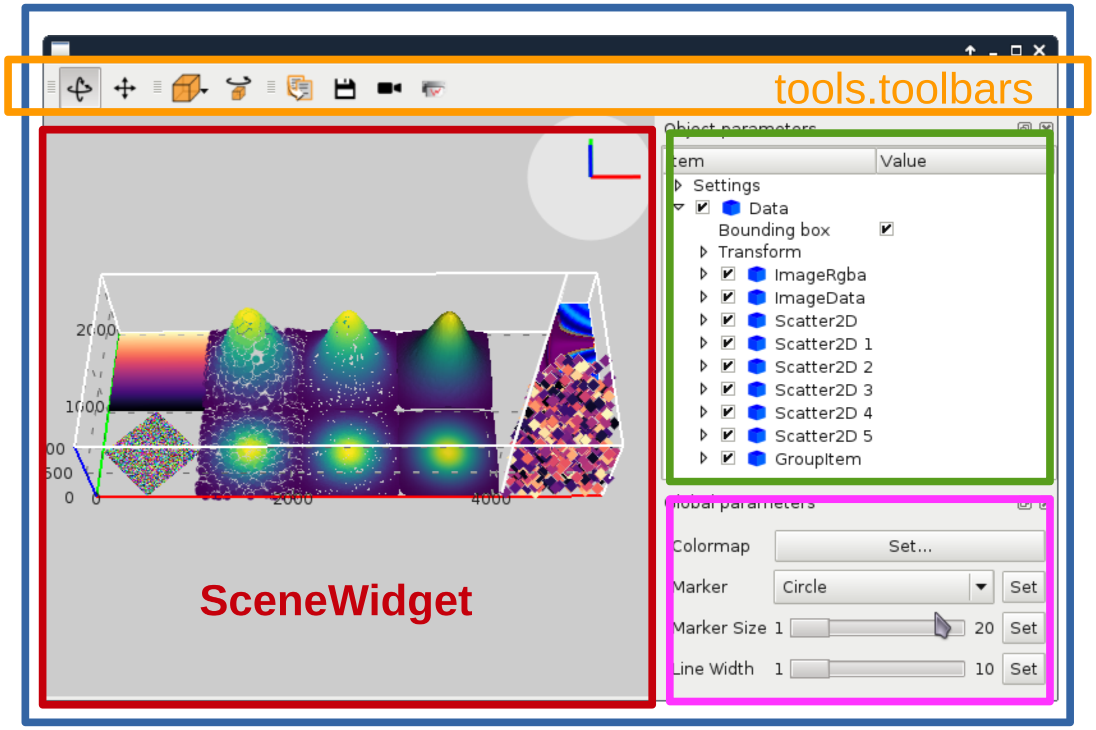
`silx.gui.plot3d.items`:

- Images: `ImageData`, `ImageRgba`
- Scatter plots: `Scatter2D`, `Scatter3D`
- Scalar fields (with a cut plane and isosurfaces): `ScalarField3D`
- A clipping plane: `ClipPlane`
- 3D meshes: `Mesh`
- Groups: `GroupItem`, `GroupWithAxesItem`



# silx.gui.plot3d: Scene widgets structure

SceneWindow



| Item | Value |
|---|---|
| Settings | |
| ☑ Data | |
| Bounding box | ☑ |
| Transform | |
| ☑ ImageRgba | |
| ☑ ImageData | |
| ☑ Scatter2D | |
| ☑ Scatter2D 1 | |
| ☑ Scatter2D 2 | |
| ☑ Scatter2D 3 | |
| ☑ Scatter2D 4 | |
| ☑ Scatter2D 5 | |
| ☑ GroupItem | |

Colormap: Set...
Marker: Circle — Set
Marker Size: 1 — 20 — Set
Line Width: 1 — 10 — Set

ParamTreeView

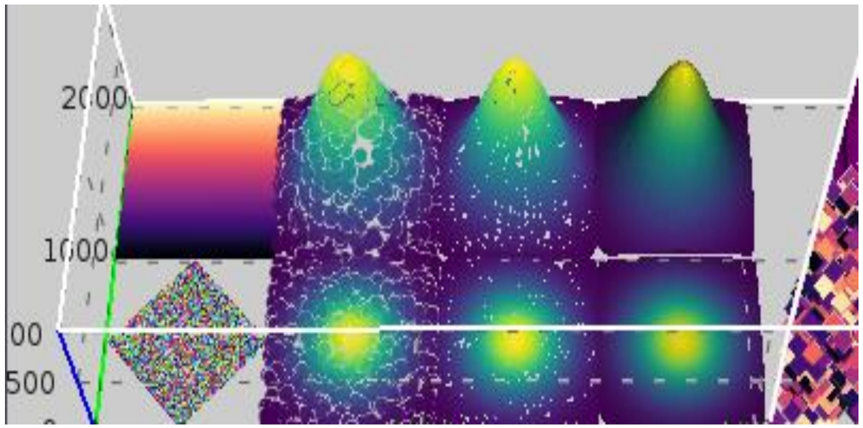
tools.GroupPropertiesWidget

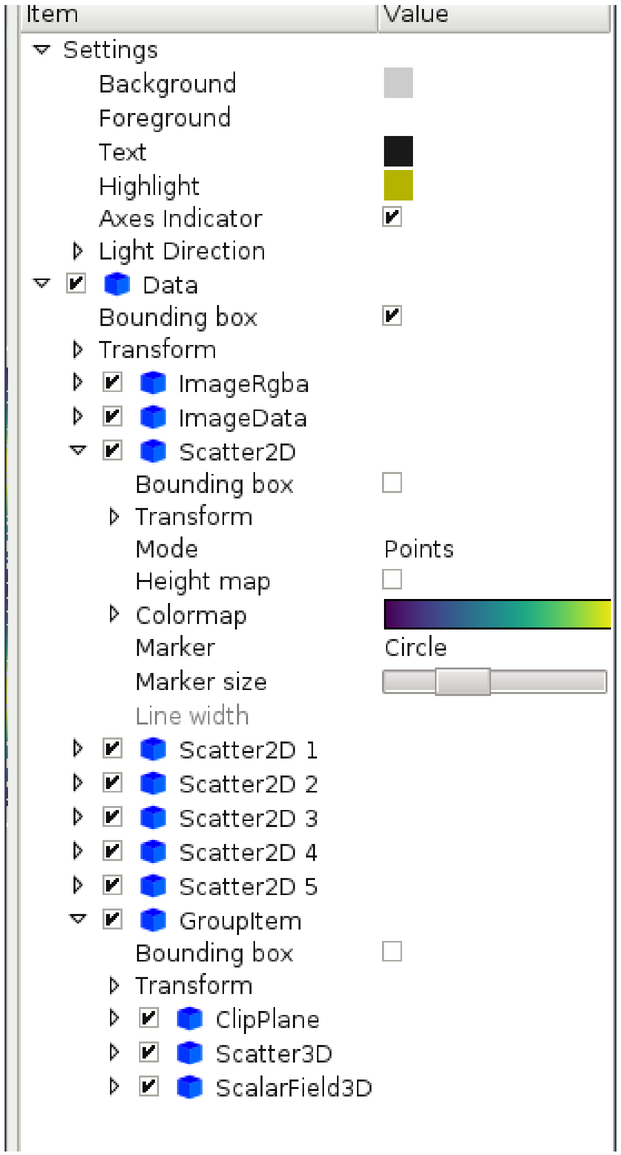
# silx.gui.plot3d: ParamTreeView

Content/Parameter tree based on:

- `silx.gui.plot3d.ParamTreeView`
- `SceneWidget.model()`

- If there is interest,
this can be adapted to 1D, 2D `PlotWidget`





| Item | Value |
|---|---|
| ▿ Settings | |
| Background | ⬜ |
| Foreground | |
| Text | ⬛ |
| Highlight | 🟨 |
| Axes Indicator | ☑ |
| ▹ Light Direction | |
| ▿ ☑ Data | |
| Bounding box | ☑ |
| ▹ Transform | |
| ▹ ☑ ImageRgba | |
| ▹ ☑ ImageData | |
| ▿ ☑ Scatter2D | |
| Bounding box | ☐ |
| ▹ Transform | |
| Mode | Points |
| Height map | ☐ |
| ▹ Colormap | |
| Marker | Circle |
| Marker size | |
| Line width | |
| ▹ ☑ Scatter2D 1 | |
| ▹ ☑ Scatter2D 2 | |
| ▹ ☑ Scatter2D 3 | |
| ▹ ☑ Scatter2D 4 | |
| ▹ ☑ Scatter2D 5 | |
| ▿ ☑ GroupItem | |
| Bounding box | ☐ |
| ▹ Transform | |
| ▹ ☑ ClipPlane | |
| ▹ ☑ Scatter3D | |
| ▹ ☑ ScalarField3D | |

## silx.gui.plot3d: Future

- Interaction:
  - Item selection
  - Picking of data
  - Selection/edition of Region of Interest (line, box)
- Display of statistical indicators (at least for 3D scalar fields)
- Additional scene items:
  - Surface plot for images
  - 3D complex data as colormapped isosurfaces
  - Vector field
  - …
- Testing: Lack of automated tests
- Visual improvements: transparency, ticks and labels layout...
- Optimizations:
  - Benchmarking
  - Threaded computation of isosurfaces, delaunay

## silx.math: miscellaneous mathematical functions

- Non-linear least squares with constraints on fitting parameters
    - Has a configuration widget for easy integration into GUIs
- 1D peak search
- Isosurface calculations with Marching Cubes algorithm
    - For 4D visualization (visualization of scalar fields)
- N-dimensional histograms based on look-up tables
- Fitting functions with automatic estimation of initial parameters
- 1D and 2D median filters

## Median Filter (C++)

*silx.math.medianfilter*

medfilt(data, kernel_size=3, bool conditional=False)

- 1D-2D median filter
  - data: 1D or 2D numpy array
  (specialized functions medfilt1d and medfilt2d available)
  - kernel_size int or tuple
  - Conditional if True apply conditional median filtering
  (apply only if pixel value is window minimum or maximum)

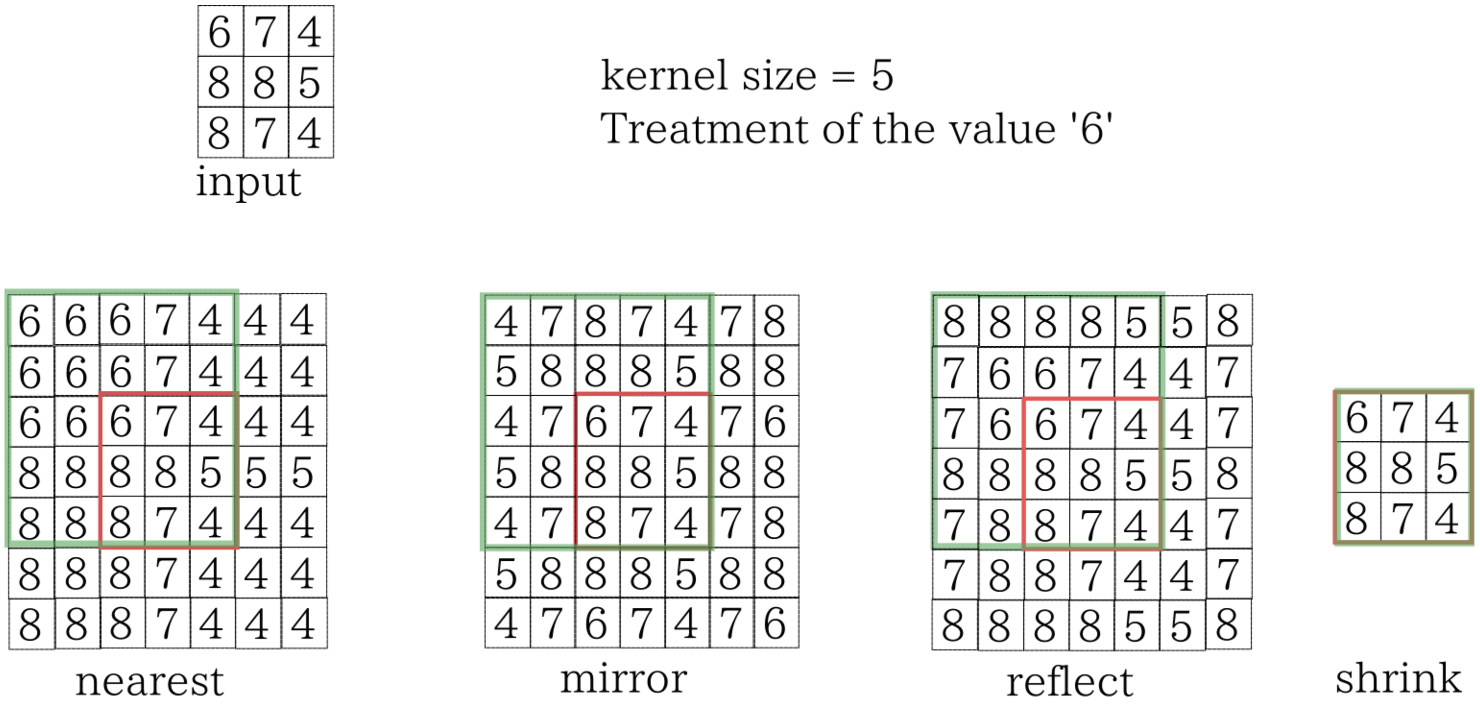
- Example:

```
from silx.math.medianfilter import medfilt2d
dataOut = medfilt2d(image,
                    kernel_size=(3, 3),
                    conditional=False)
```

# Median Filter (silx.math.medianfilter)

Previously only 'nearest' mode.

**Cpp** Implementation of 'reflect', 'mirror' and 'shrink' modes.



input

| | | |
|---|---|---|
| 6 | 7 | 4 |
| 8 | 8 | 5 |
| 8 | 7 | 4 |

nearest

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | 6 | 6 | 7 | 4 | 4 | 4 |
| 6 | 6 | 6 | 7 | 4 | 4 | 4 |
| 6 | 6 | 6 | 7 | 4 | 4 | 4 |
| 8 | 8 | 8 | 8 | 5 | 5 | 5 |
| 8 | 8 | 8 | 7 | 4 | 4 | 4 |
| 8 | 8 | 8 | 7 | 4 | 4 | 4 |
| 8 | 8 | 8 | 7 | 4 | 4 | 4 |

mirror

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | 7 | 8 | 7 | 4 | 7 | 8 |
| 5 | 8 | 8 | 8 | 5 | 8 | 8 |
| 4 | 7 | 6 | 7 | 4 | 7 | 6 |
| 5 | 8 | 8 | 8 | 5 | 8 | 8 |
| 4 | 7 | 8 | 7 | 4 | 7 | 8 |
| 5 | 8 | 8 | 8 | 5 | 8 | 8 |
| 4 | 7 | 6 | 7 | 4 | 7 | 6 |

reflect

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | 8 | 8 | 8 | 5 | 5 | 8 |
| 7 | 6 | 6 | 7 | 4 | 4 | 7 |
| 7 | 6 | 6 | 7 | 4 | 4 | 7 |
| 8 | 8 | 8 | 8 | 5 | 5 | 8 |
| 7 | 8 | 8 | 7 | 4 | 4 | 7 |
| 7 | 8 | 8 | 7 | 4 | 4 | 7 |
| 8 | 8 | 8 | 8 | 5 | 5 | 8 |

shrink

| | | |
|---|---|---|
| 6 | 7 | 4 |
| 8 | 8 | 5 |
| 8 | 7 | 4 |

```
from silx.math import medianfilter
import numpy

img = numpy.random.rand(48, 48)
medianfilter.medfilt2d(image=img, kernel_size=3, conditional=False, mode='reflect')
```

## Median Filter (GPU)

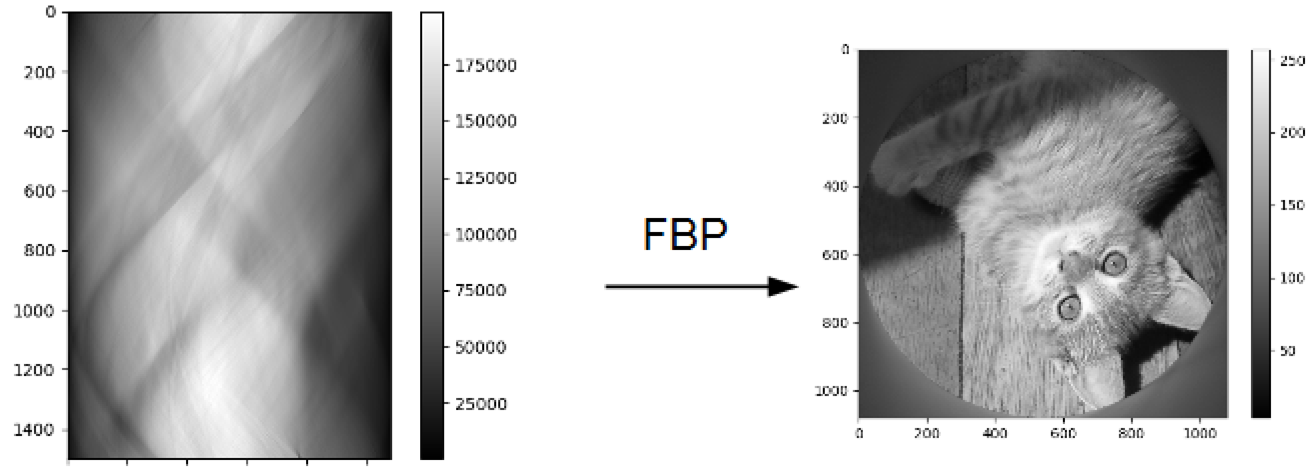
*silx.opencl.medfilt2d*

- OpenCL implementation of the median filter
  - Works best on GPU, and large neighborhood
  - PR pending (not yet merged)

```
from silx.opencl import medfilt2d
from scipy.misc import ascent
from scipy.ndimage import filters

img = ascent().astype(“float32”)
%timeit filters.median_filter(img, (55,55))

import silx.image
%timeit silx.image.medfilt2d(img, (55,55))

from silx.opencl import medifilt
%timeit medfilt.medfilt2d(img, (55,55))
```

## Filtered Back Projection in silx

- Filtered Back-Projection (**FBP**) is the usual reconstruction method in (parallel) tomography
- silx now provides a FBP module
- The filtering can be omitted if the data is already filtered
- Works on both GPU and CPU (Mac OS is not supported)



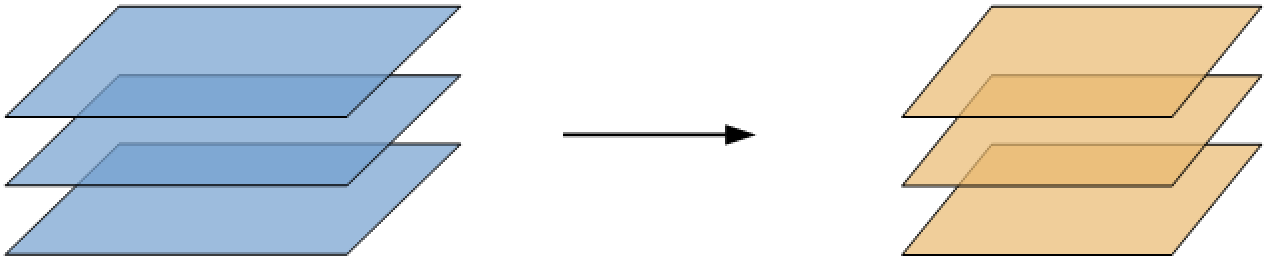
sinogram

slice

## Filtered Back Projection in silx

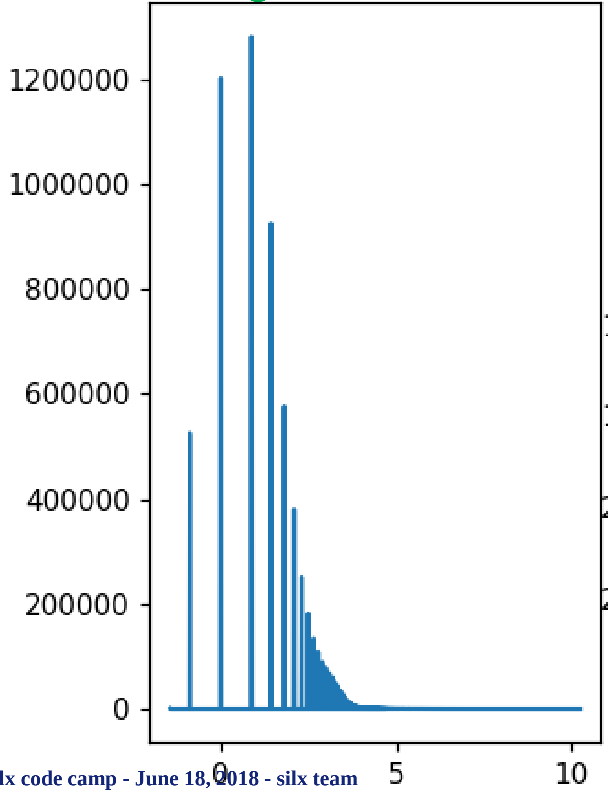
- Principle : define a geometry and use it to reconstruct one or several sinograms.
- Geometry = sinogram shape, [series of angles, slice shape, rotation center position]

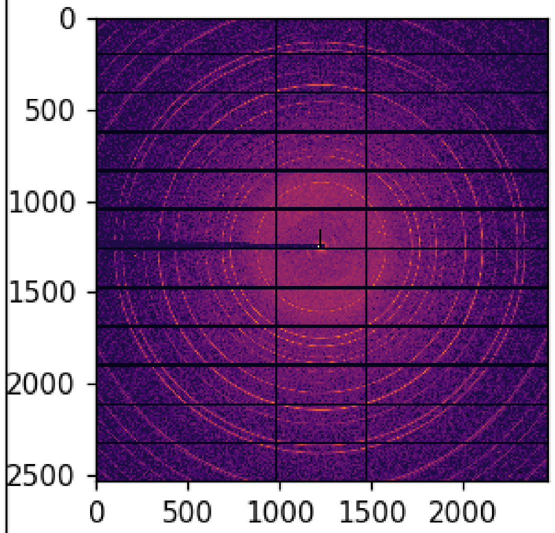
```
from  silx.opencl.backprojection import Backprojection
# Compute the tomography geometry
tomo_geometry = Backprojection(sinograms_stack.shape[1:],
                               axis_position=1337,
                               devicetype='GPU')

# Allocate the memory for volume reconstruction
num_sinos = sinograms_stack.shape[0]
reco = np.zeros((num_sinos,) + tomo_geometry.shape)
# Reconstruct
for i in range(num_sinos):
    reco[i] = tomo.fbp(sinograms_stack[i])
```



## CoDec : Byte offset for CBF processing on GPU

- `silx.opencl.codec.byte_offset`
  - OpenCL-based CBF compression
- 10x speed-up for compression/decompression of CBF streams
  - Compatible with the new Image processing framework
  - Compatible with pyFAI azimuthal integration
- Accepted in J. Synchrotron Radiation https://doi.org/10.1107/S1600577518000607

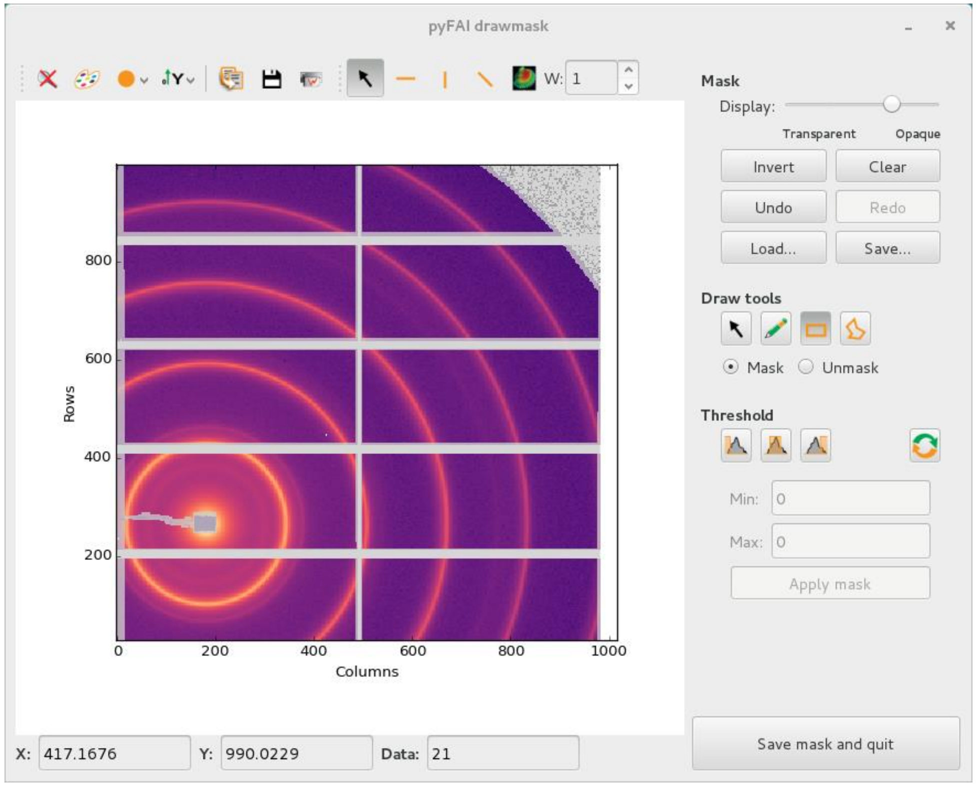




The European Synchrotron | ESRF

# silx.image: image processing tools

- Basic shapes for masks
  - Line profiles
  - Polygons
  - Circle
- Bilinear interpolation
  - Used to scale up/down images to display
- Gaussian blurring of images
  - GPU accelerated via OpenCL
- Image registration and alignment (SIFT)
  - GPU accelerated via OpenCL
- Median Filter
  - GPU accelerated via OpenCL

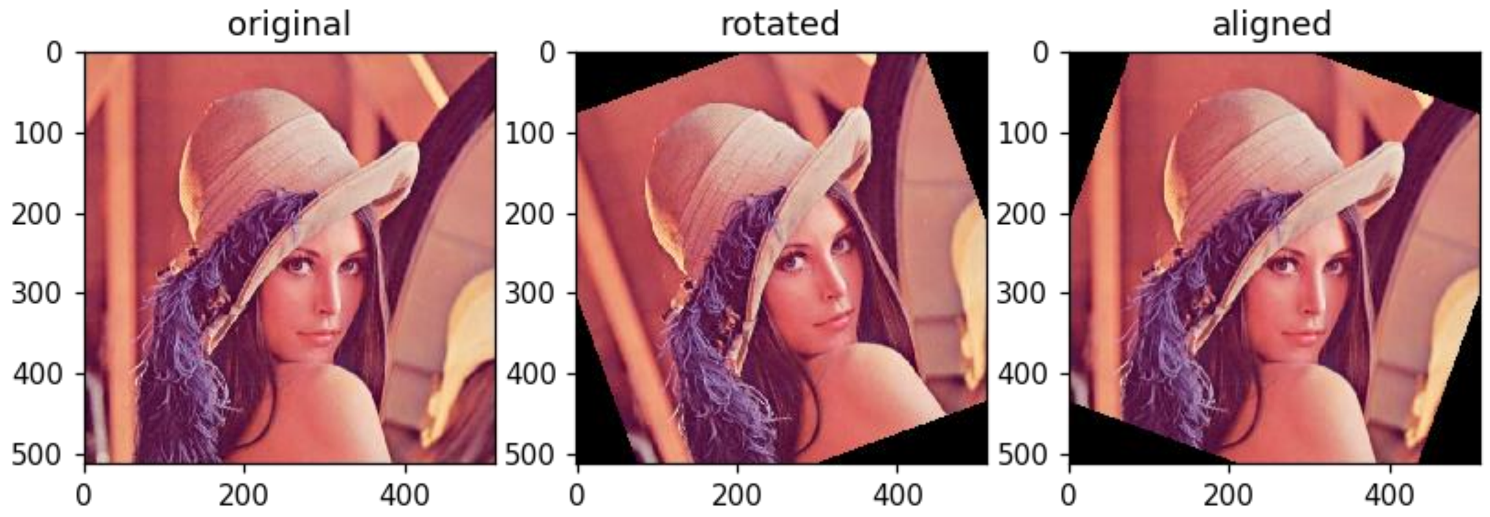


## Image processing on opencl devices (GPU)

- New image processing framework:
  - Allows to exchange buffers on the device
  - Allows the creation of work-flow without copying data back & forth
  - Better performances
- Few image treatments implemented:
  - Buffer conversion to float arrays from any integer
  - Min/Max search (double-reduction)
  - Image normalization
  - Image histogram
- Tutorial available:
  - https://github.com/kif/silx/blob/1199_ocl_image/doc/source/Tutorials/Image.ipynb

## Sift: Image alignment

- Use the “image” framework.
- Major re-work for compatibility with PyOpenCL > 2015
- Compatibility with “spectre” corrections
- Many memory-leak corrected
- New tutorial based on jupyter notebook.
  https://github.com/silx-kit/silx/blob/master/doc/source/Tutorials/Sift/sift.ipynb

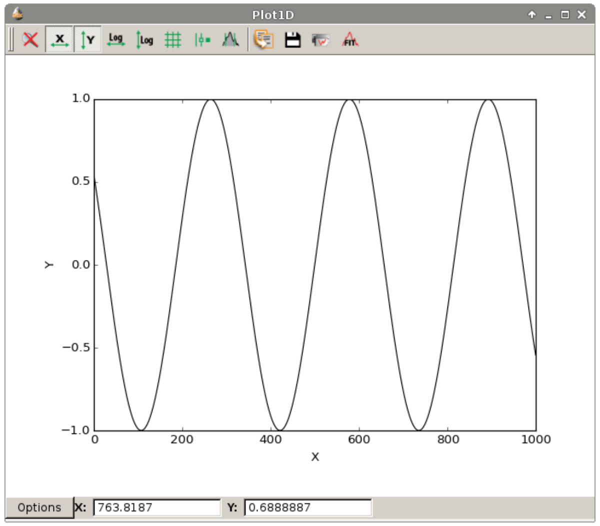


# silx.sx: a module to simplify interactive use

pylab like module on steroids

- 1D plotting: ROI, fitting & printing

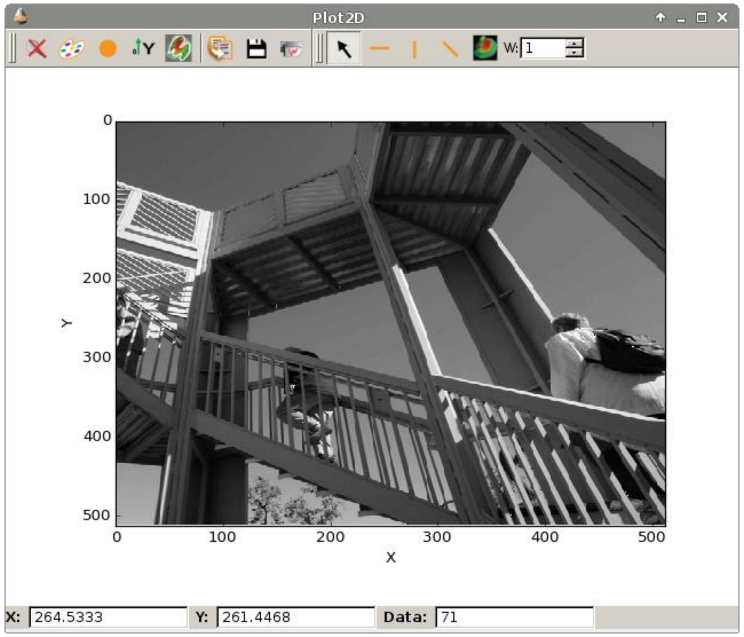
```
>>> from silx import sx
>>> from numpy import sin, linspace
>>> sx.plot(sin(linspace(-10, 10, 1000)))
```



X: 763.8187 Y: 0.6888887

- 2D display: intensity, mask, profile

```
>>> from scipy.misc import ascent
>>> sx.imshow(ascent())
```



X: 264.5333 Y: 261.4468 Data: 71

# silx.io: input / output

- Built-in support of CSV, SPEC and TIFF
  - Images, SPEC files accessed in the same way as HDF5 files

    Unified widget dealing with ALL supported data formats!!!!!
  - Provide bridges SPEC ←→ HDF5 and octave ←→ HDF5
  - Utilities to save and restore configurations as HDF5, json or ini files
- HDF5 is supported via h5py
- Images (and many detector formats) are supported via FabIO

## silx.io.commonh5

- This new module provides a common base for *silx.io.spech5* and *silx.io.fabioh5* to provide the h5py-like API for various data formats.

- If new formats are handled by silx in the future, and they inherit the commonh5 classes, they will benefit from the existing tools:

    - *silx.io.convert*

    - *silx.io.utils* (is_dataset, is_group, is_file,…)

## silx.io.nxdata

- New functions
  - is_NXentry_with_default_NXdata(group)
  - is_NXroot_with_default_NXdata(group)
  - get_default(group)
    - Returns default silx.io.NXdata object or None. Group parameter can be NXdata, NXentry or NXroot.

  - save_NXdata(filename, signal, axes=None,
    signal_name=“data”, axes_names=None,
    signal_long_name=None, axes_long_names=None,
    signal_errors=None, axes_errors=None,
    title=None, interpretation=None,
    nxentry_name="entry", nxdata_name=None)

## silx.io.convert

- Module

- Before only SPEC files could be converted (*silx.io.spectoh5*)
- New *silx.io.convert* supports Fabio images (replaces *spectoh5)*

- Application

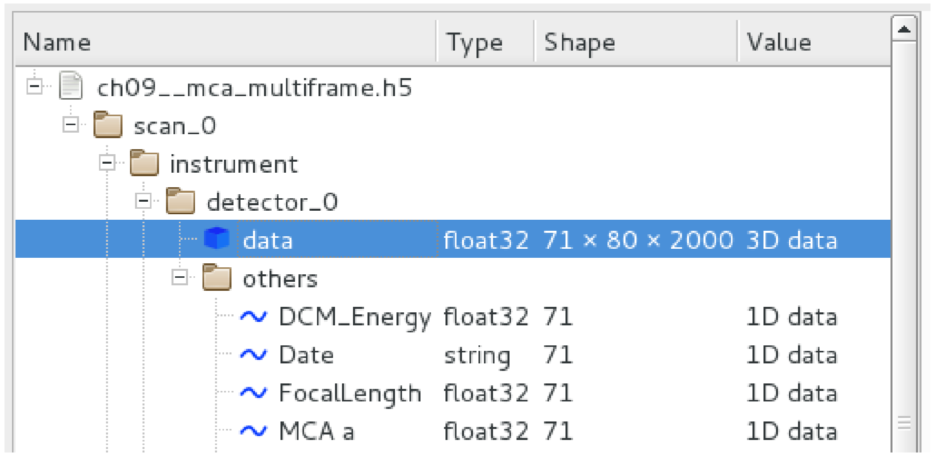
- New command line application to convert files to HDF5

*silx convert –help*
*silx convert filename*

## silx convert

- Convert series of single frame images (EDF, TIFF...) into a HDF5 multiframe stack

```
silx convert --file-pattern ch09__mca_0005_0000_%d.edf -o ch09__mca_multiframe.h5
```



```
Name                          Type     Shape              Value
ch09__mca_multiframe.h5
  scan_0
    instrument
      detector_0
        data                  float32  71 × 80 × 2000     3D data
        others
          DCM_Energy          float32  71                 1D data
          Date                string   71                 1D data
          FocalLength         float32  71                 1D data
          MCA a               float32  71                 1D data
```

```
silx convert -h
```

## silx convert

- Merging SPEC and EDF files.
  - Step 1. Convert the SPEC file to HDF5 file

```
silx convert spec_file_name -o hdf5_file_name.h5
```

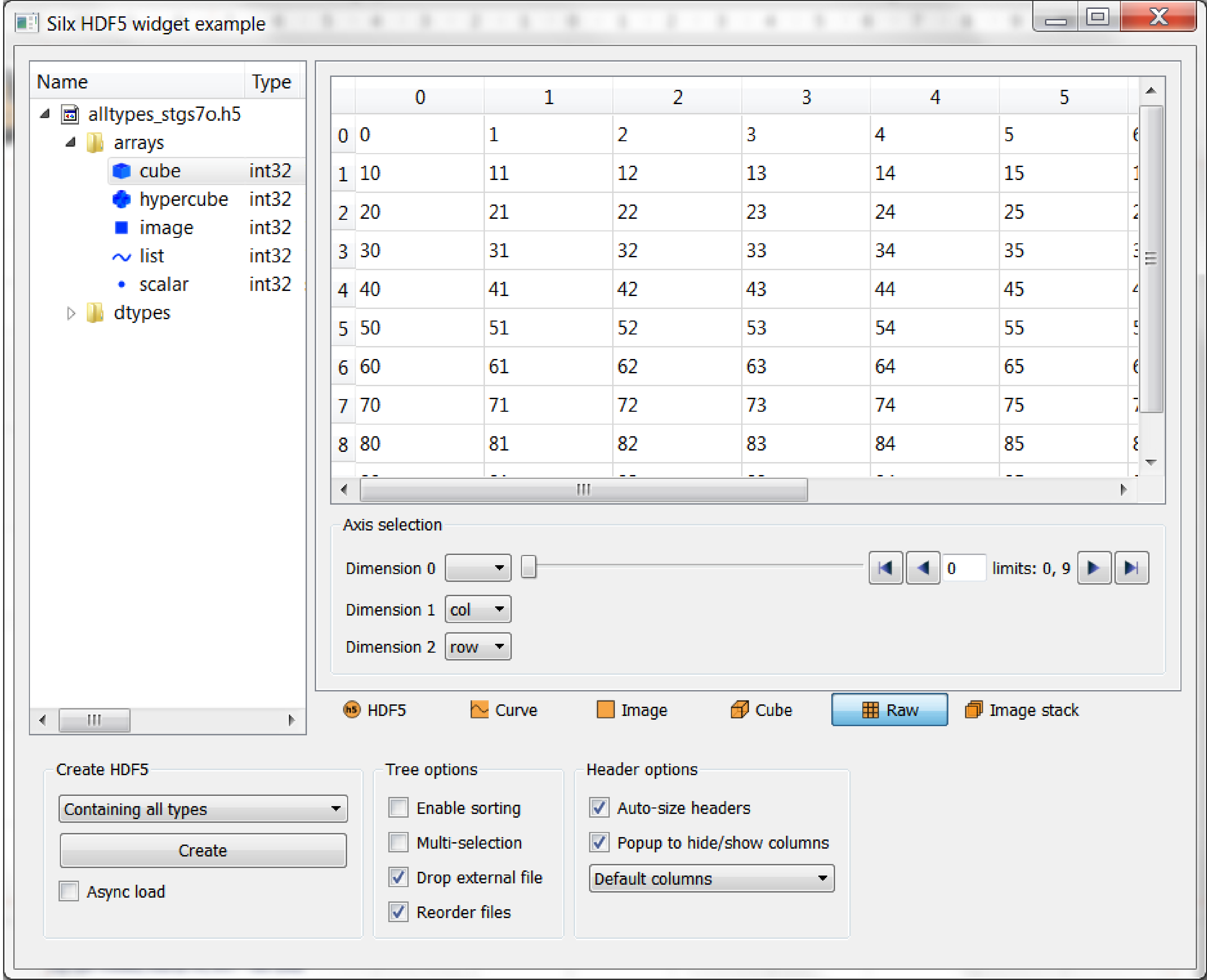
  - Step 2. Convert the EDF files selecting target path in generated HDF5 file

```
silx convert --file-pattern=root_%04d.edf --begin=100 --end=199 \
          --mode=r+ -o hdf5_file_name.h5::/1.1/instrument/detector_0
```

  - Hint  Multiple indices supported (indexed files, indexed directories, …)

```
root_ssss_dddd_nnnn.edf

--file-pattern=root_%04d_%04d_$04d.edf -begin=1,0,0 -end=1,0,99
```

7th silx code camp - June 18, 2018 - silx team



Silx HDF5 widget example

| Name | Type |
|---|---|
| alltypes_stgs7o.h5 | |
| arrays | |
| cube | int32 |
| hypercube | int32 |
| image | int32 |
| list | int32 |
| scalar | int32 |
| dtypes | |

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 2 | 3 | 4 | 5 |
| 1 | 10 | 11 | 12 | 13 | 14 | 15 |
| 2 | 20 | 21 | 22 | 23 | 24 | 25 |
| 3 | 30 | 31 | 32 | 33 | 34 | 35 |
| 4 | 40 | 41 | 42 | 43 | 44 | 45 |
| 5 | 50 | 51 | 52 | 53 | 54 | 55 |
| 6 | 60 | 61 | 62 | 63 | 64 | 65 |
| 7 | 70 | 71 | 72 | 73 | 74 | 75 |
| 8 | 80 | 81 | 82 | 83 | 84 | 85 |

Axis selection

Dimension 0: (blank) — 0 — limits: 0, 9

Dimension 1: col

Dimension 2: row

HDF5 · Curve · Image · Cube · [✓ Raw] · Image stack

Create HDF5

Containing all types

Create

☐ Async load

Tree options

☐ Enable sorting

☐ Multi-selection

☑ Drop external file

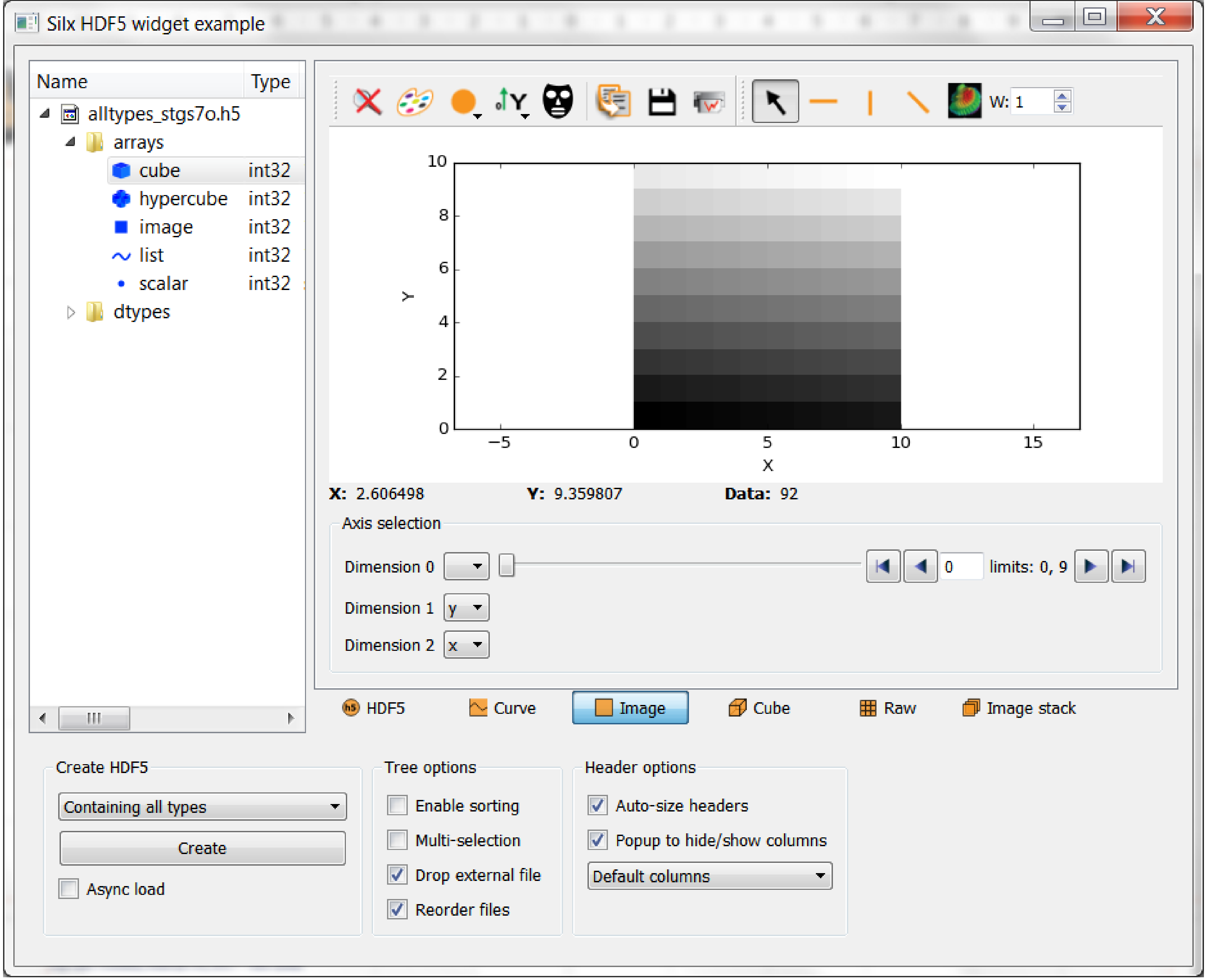
☑ Reorder files

Header options

☑ Auto-size headers

☑ Popup to hide/show columns

Default columns



| Name | Type |
|---|---|
| alltypes_stgs7o.h5 | |
| arrays | |
| cube | int32 |
| hypercube | int32 |
| image | int32 |
| list | int32 |
| scalar | int32 |
| dtypes | |

**X:** 2.606498 **Y:** 9.359807 **Data:** 92

Axis selection

Dimension 0 — 0 limits: 0, 9

Dimension 1 y

Dimension 2 x

Create HDF5

Containing all types

☐ Async load

Tree options

☐ Enable sorting

☐ Multi-selection

☑ Drop external file

☑ Reorder files

Header options

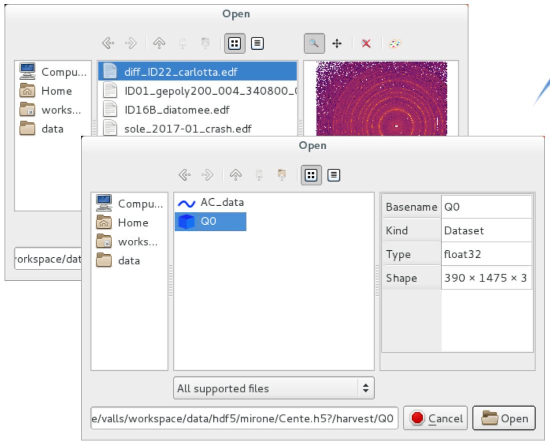
☑ Auto-size headers

☑ Popup to hide/show columns

Default columns

# Dialog to reach data

File system



| | |
|---|---|
| Basename | Q0 |
| Kind | Dataset |
| Type | float32 |
| Shape | 390 × 1475 × 3 |

e/valls/workspace/data/hdf5/mirone/Cente.h5?/harvest/Q0

**silx.gui.dialog**

URL

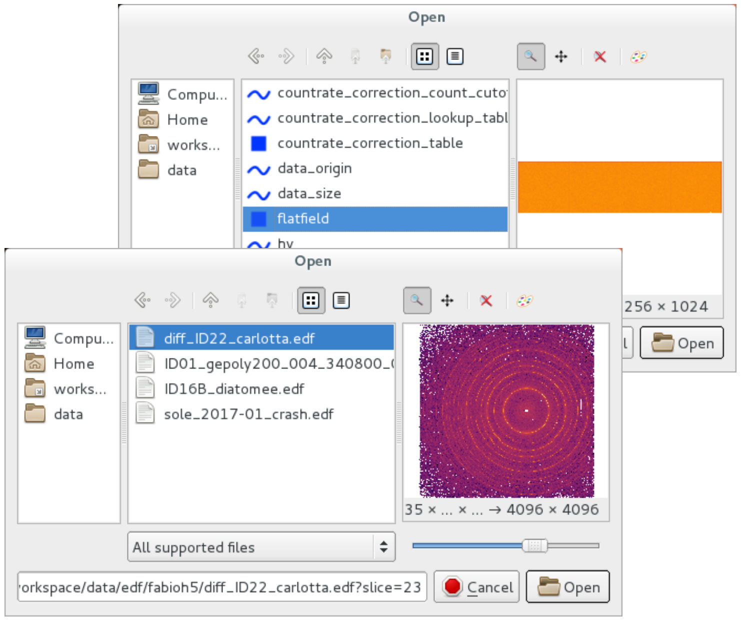
**silx.io.open**

(h5py-like context)

**silx.io.get_data**

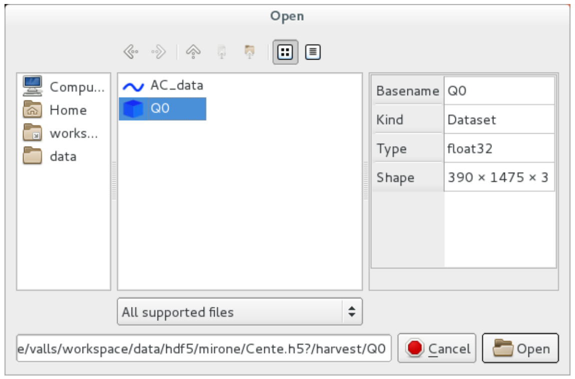
(numpy data)

## Data dialogs



countrate_correction_count_cuto
countrate_correction_lookup_tabl
countrate_correction_table
data_origin
data_size
flatfield
hv
256 × 1024

diff_ID22_carlotta.edf
ID01_gepoly200_004_340800_(
ID16B_diatomee.edf
sole_2017-01_crash.edf
35 × ... × ... → 4096 × 4096
All supported files
orkspace/data/edf/fabioh5/diff_ID22_carlotta.edf?slice=23



AC_data
Q0

| | |
|---|---|
| Basename | Q0 |
| Kind | Dataset |
| Type | float32 |
| Shape | 390 × 1475 × 3 |

All supported files
e/valls/workspace/data/hdf5/mirone/Cente.h5?/harvest/Q0

`ImageFileDialog`

- Specialised to select an image
- Support slicing of hypercubes
- Support h5-like
- Support raw image files (edf, tiff, cbf)

`DataFileDialog`

- Select anything from h5-like structure
- Filter to select only datasets or groups

## Data URLs

- **Custom schemes**
  - `silx:///home/user/foo.edf?path=/group/&slice=5`
  - `fabio:///home/user/foo.edf?slice=5`
  - Also available for relative paths
- **Reach data from datasets and fabio URLs**

```
data = silx.io.get_data(url)
```

- **Reach data from other URLs**

```
with silx.io.open(url) as node:
        print(node)
```

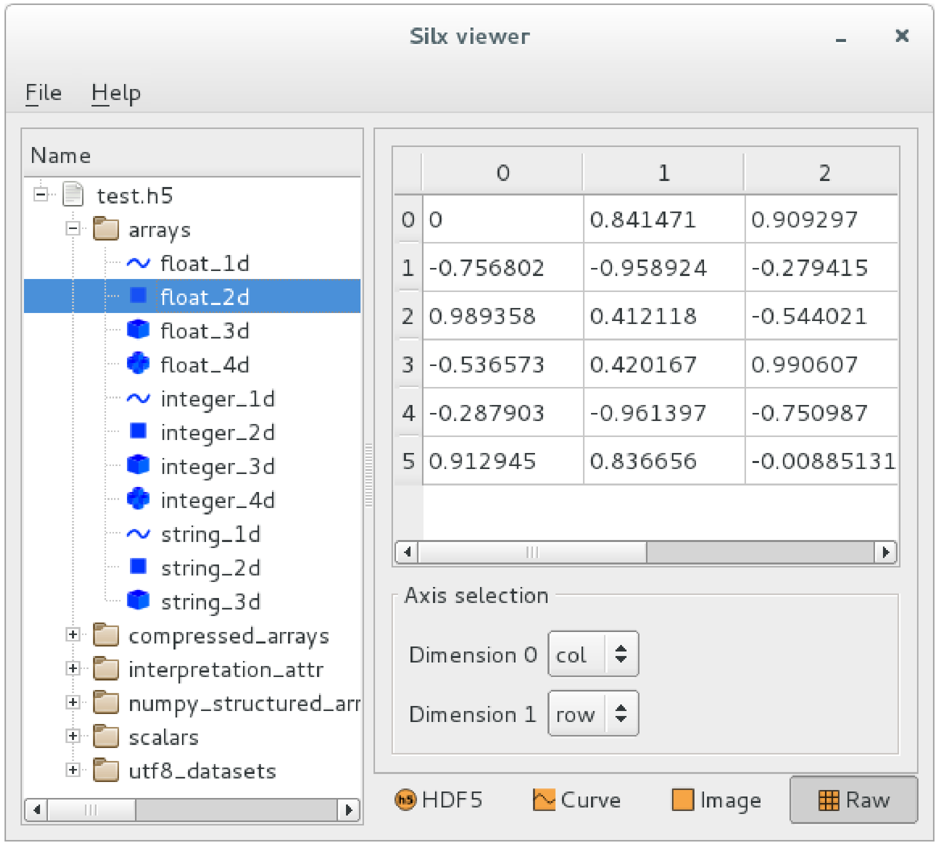
- **An object is provided to parse our URLs**
  - `silx.io.url.DataUrl`
- **We also support h5pyd URLs**
  - `http://127.0.0.1:5000/tall.public.hdfgroup.org`

# Viewer Application

- Browse and display HDF5 files
  *(plus any supported file as HDF5)*

- File from:
  - *command line / open dialog / drag and drop*

- Commands
  - *silx view <filename>*
  - *python -m silx view*
  - *python3 -m silx view*
  - *./bootstrap.py silx view*



|   | 0 | 1 | 2 |
|---|---|---|---|
| 0 | 0 | 0.841471 | 0.909297 |
| 1 | -0.756802 | -0.958924 | -0.279415 |
| 2 | 0.989358 | 0.412118 | -0.544021 |
| 3 | -0.536573 | 0.420167 | 0.990607 |
| 4 | -0.287903 | -0.961397 | -0.750987 |
| 5 | 0.912945 | 0.836656 | -0.00885131 |

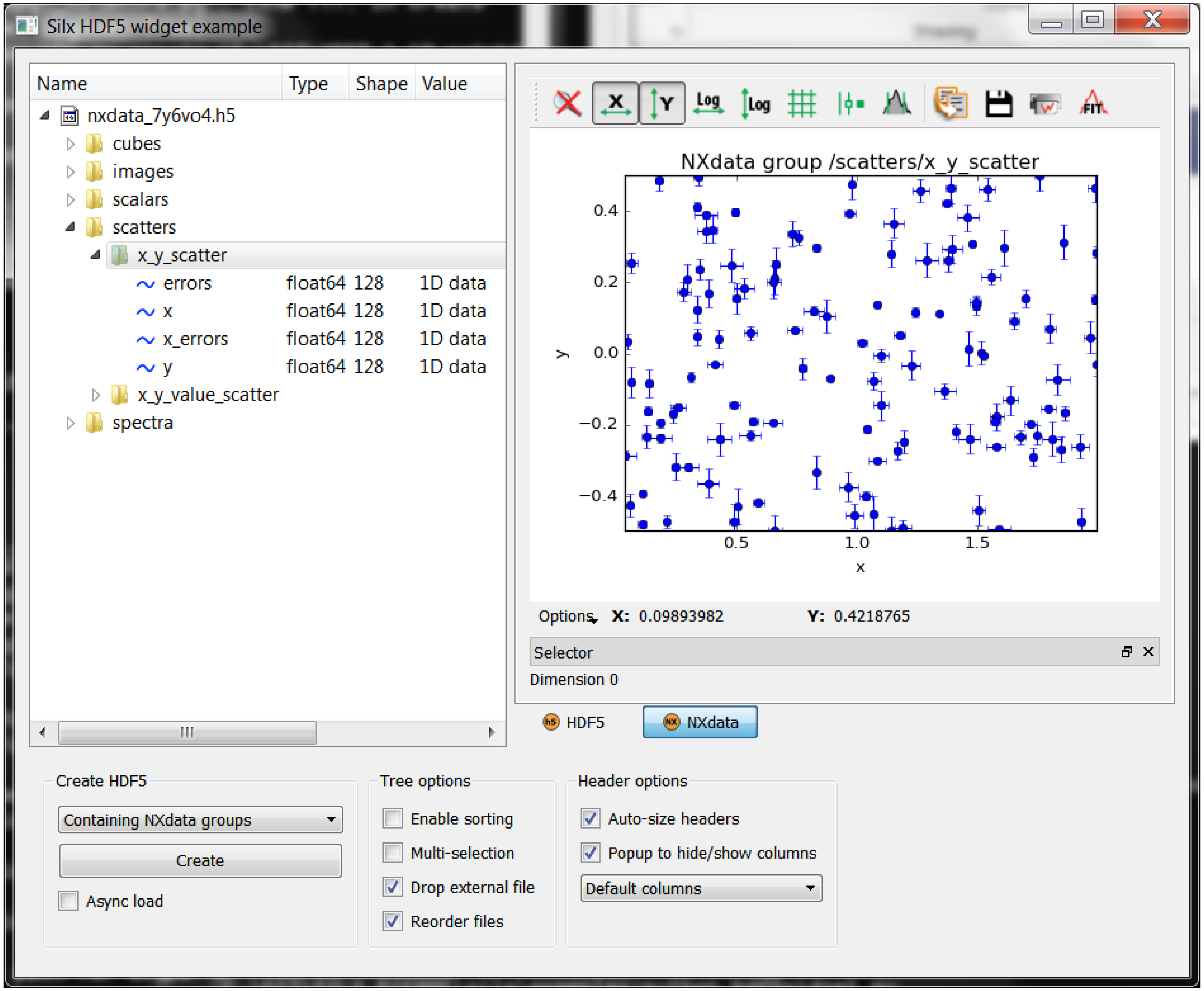
## NXdataViewer

- Data viewer for viewing data in a Nexus NXdata group

- Supports:
  - Scalars, curves, images, scatters, image stack for 3D data
  - Uncertainties, displayed as error bars for 1D data
  - Axes scaling (via @axes)
  - Axes labels (via @long_name)
  - Forcing of predefined views for high dimensionality data (via @interpretation=scalar/spectrum/image)

- See examples/hdf5widget.py for a demo
  (Create HDF5 > Containing NXdata groups)

# silx view – Generic Viewer Interpreting NXdata Groups



| Name | Type | Shape | Value |
|---|---|---|---|
| nxdata_7y6vo4.h5 | | | |
| cubes | | | |
| images | | | |
| scalars | | | |
| scatters | | | |
| x_y_scatter | | | |
| errors | float64 | 128 | 1D data |
| x | float64 | 128 | 1D data |
| x_errors | float64 | 128 | 1D data |
| y | float64 | 128 | 1D data |
| x_y_value_scatter | | | |
| spectra | | | |

X: 0.09893982 Y: 0.4218765

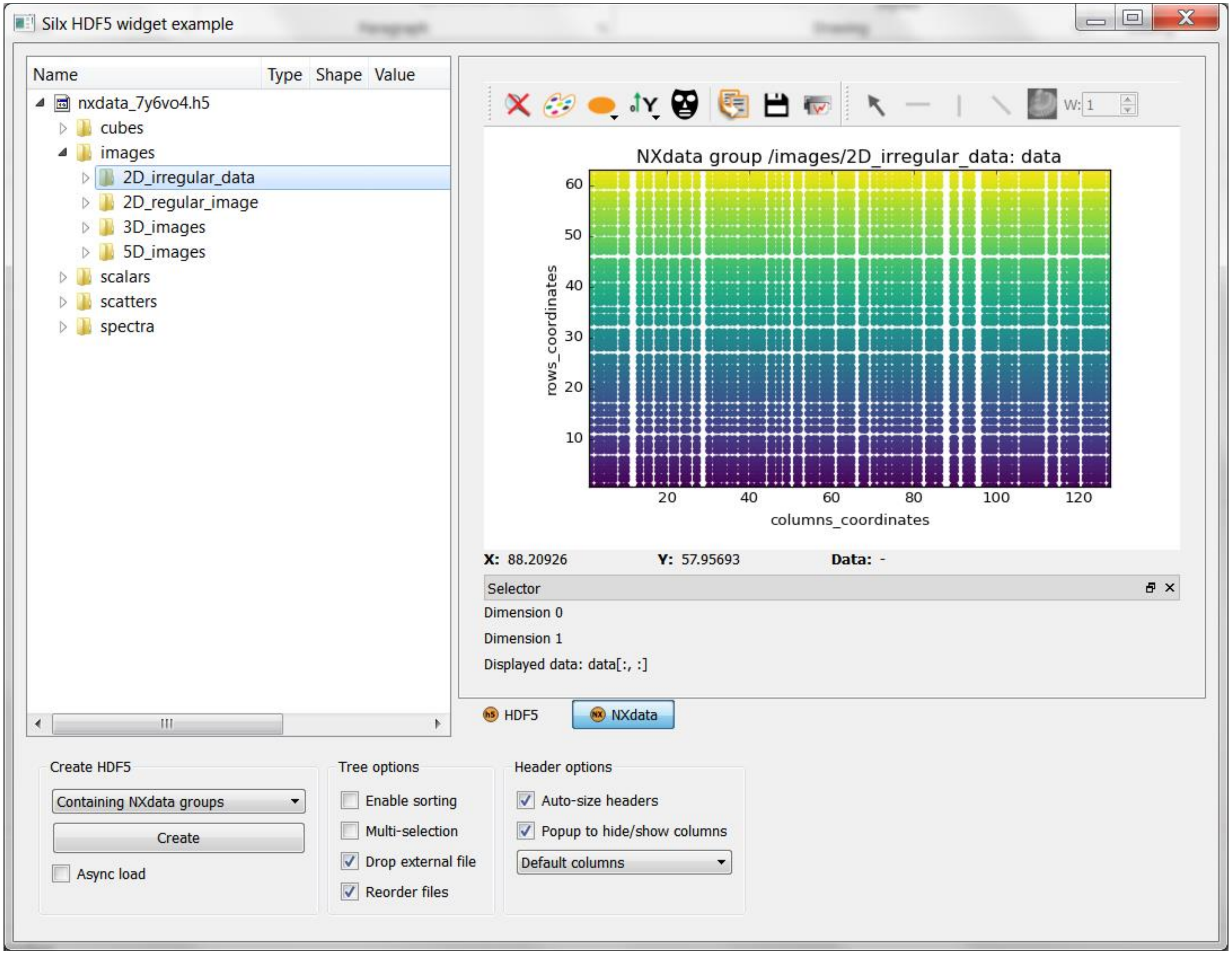
Dimension 0

Create HDF5
- Containing NXdata groups
- Async load

Tree options
- Enable sorting
- Multi-selection
- ✓ Drop external file
- ✓ Reorder files

Header options
- ✓ Auto-size headers
- ✓ Popup to hide/show columns
- Default columns

# NXdataViewer


Silx HDF5 widget example

| Name | Type | Shape | Value |
|---|---|---|---|
| nxdata_7y6vo4.h5 | | | |
| cubes | | | |
| images | | | |
| 2D_irregular_data | | | |
| 2D_regular_image | | | |
| 3D_images | | | |
| 5D_images | | | |
| scalars | | | |
| scatters | | | |
| spectra | | | |

X: 88.20926 Y: 57.95693 Data: -

Selector
Dimension 0
Dimension 1
Displayed data: data[:, :]

HDF5 | NXdata

Create HDF5
Containing NXdata groups
Create
Async load

Tree options
Enable sorting
Multi-selection
[✓] Drop external file
[✓] Reorder files

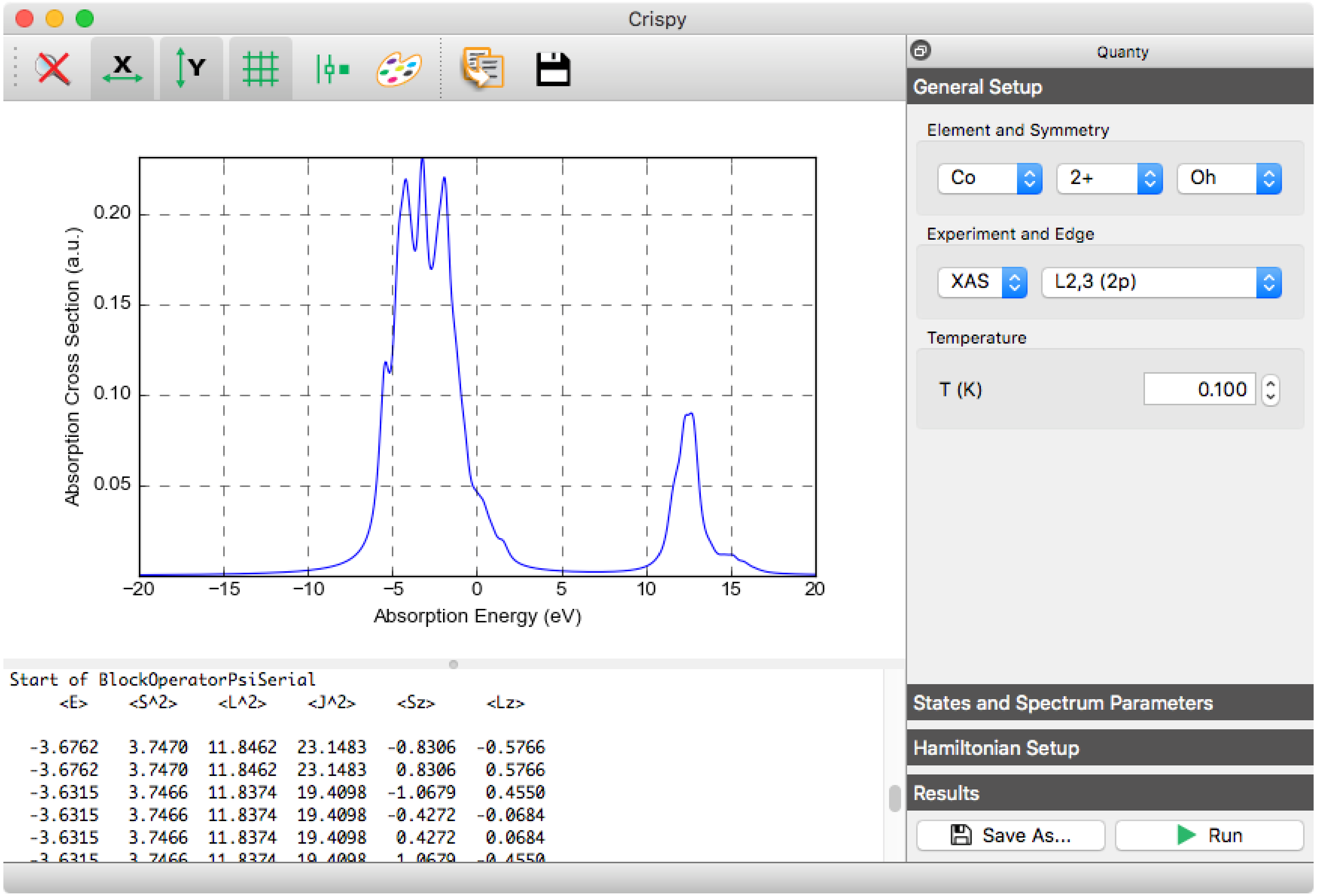
Header options
[✓] Auto-size headers
[✓] Popup to hide/show columns
Default columns

## silx view

- Display *NXdata* view when viewing a *NXentry* or a *NXroot* group defining a @default attribute pointing to a valid *NXdata* group.

```
root:NXroot
  @default = "main_entry"

  main_entry:NXentry
    @default = "data"

    data:NXdata
      @signal = "counts"
      @axes = "mr"
      counts: float[100]
      mr: float[100]

  secondary_entry:Nxentry
    ...
```

# Applications - Crispy



General Setup

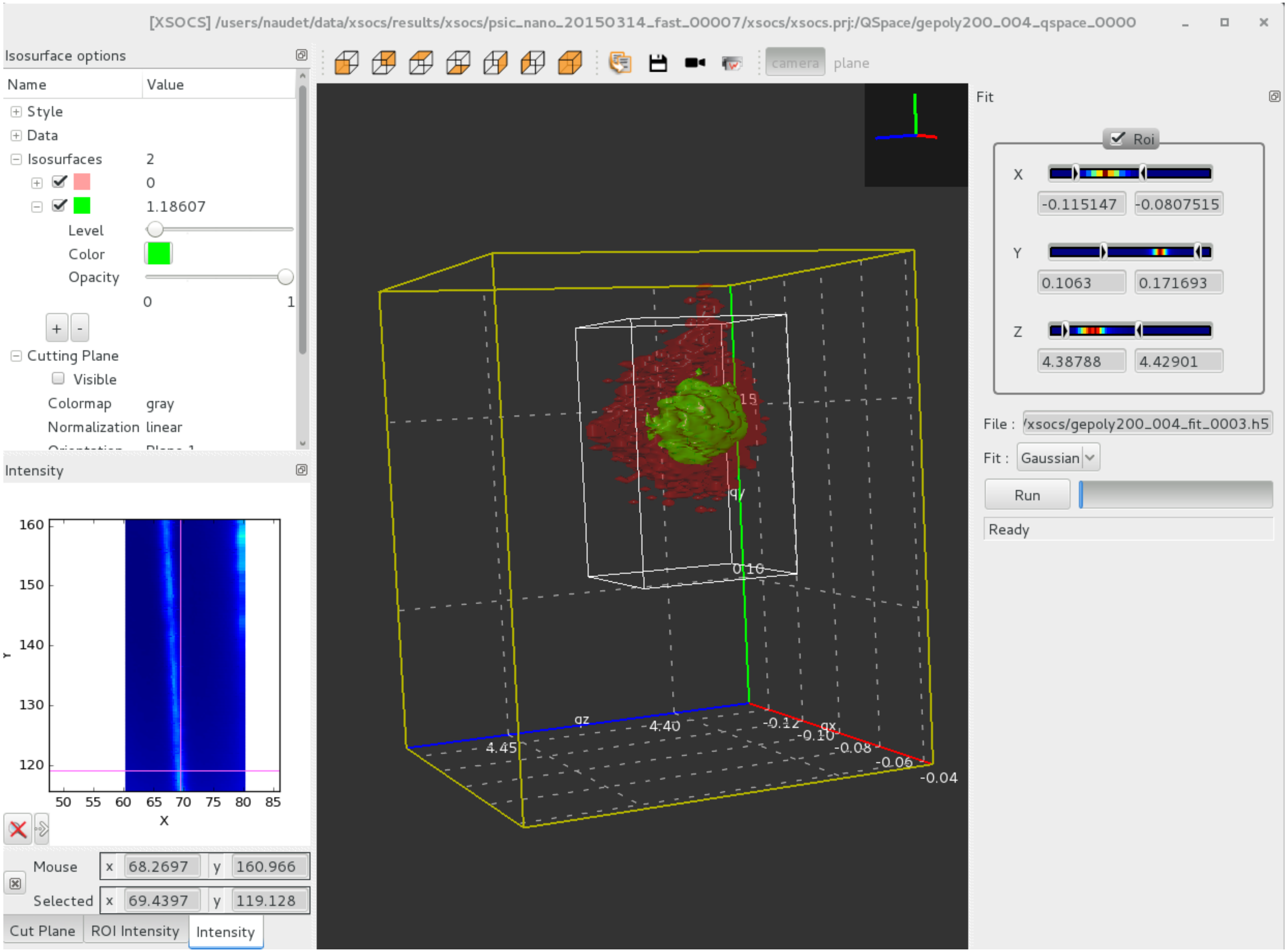
Element and Symmetry: Co, 2+, Oh

Experiment and Edge: XAS, L2,3 (2p)

Temperature: T (K) 0.100

```
Start of BlockOperatorPsiSerial
     <E>      <S^2>     <L^2>     <J^2>     <Sz>      <Lz>

  -3.6762   3.7470  11.8462  23.1483  -0.8306  -0.5766
  -3.6762   3.7470  11.8462  23.1483   0.8306   0.5766
  -3.6315   3.7466  11.8374  19.4098  -1.0679   0.4550
  -3.6315   3.7466  11.8374  19.4098  -0.4272  -0.0684
  -3.6315   3.7466  11.8374  19.4098   0.4272   0.0684
  -3.6315   3.7466  11.8374  19.4098   1.0679  -0.4550
```

# Applications - XSOCS



[XSOCS] /users/naudet/data/xsocs/results/xsocs/psic_nano_20150314_fast_00007/xsocs/xsocs.prj:/QSpace/gepoly200_004_qspace_0000

Isosurface options

| Name | Value |
|---|---|
| Style | |
| Data | |
| Isosurfaces | 2 |
| ✓ 🟥 | 0 |
| ✓ 🟩 | 1.18607 |
| Level | |
| Color | 🟩 |
| Opacity | |
| | 0 1 |
| Cutting Plane | |
| Visible | |
| Colormap | gray |
| Normalization | linear |

Mouse x 68.2697 y 160.966

Selected x 69.4397 y 119.128

Fit

✓ Roi

| | | |
|---|---|---|
| X | -0.115147 | -0.0807515 |
| Y | 0.1063 | 0.171693 |
| Z | 4.38788 | 4.42901 |

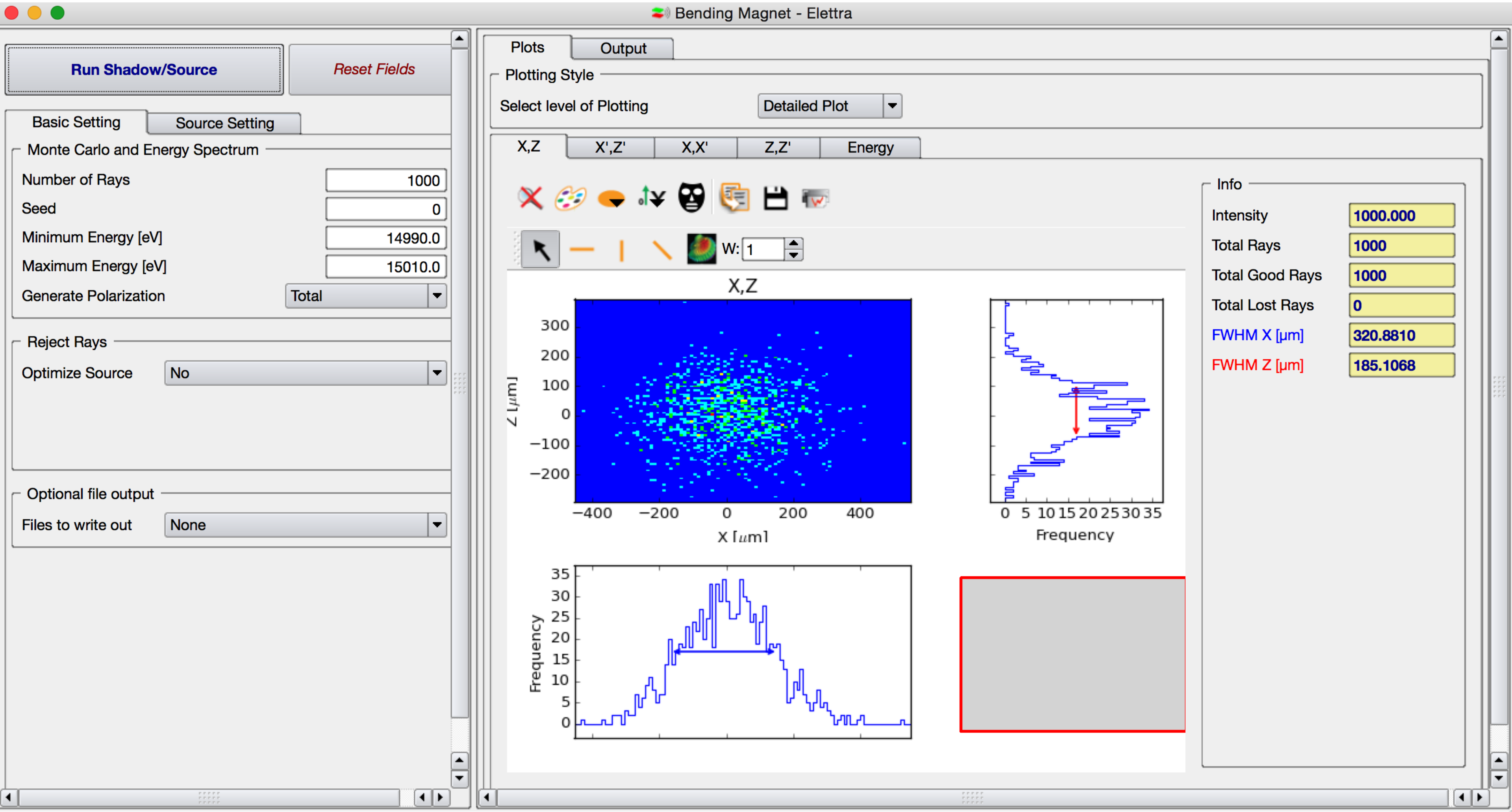
File : /xsocs/gepoly200_004_fit_0003.h5

Fit : Gaussian

Run

Ready

# Applications - OASYS



Bending Magnet - Elettra

Run Shadow/Source | Reset Fields

Basic Setting | Source Setting

Monte Carlo and Energy Spectrum

| | |
|---|---|
| Number of Rays | 1000 |
| Seed | 0 |
| Minimum Energy [eV] | 14990.0 |
| Maximum Energy [eV] | 15010.0 |
| Generate Polarization | Total |

Reject Rays

Optimize Source: No

Optional file output

Files to write out: None

Plots | Output

Plotting Style

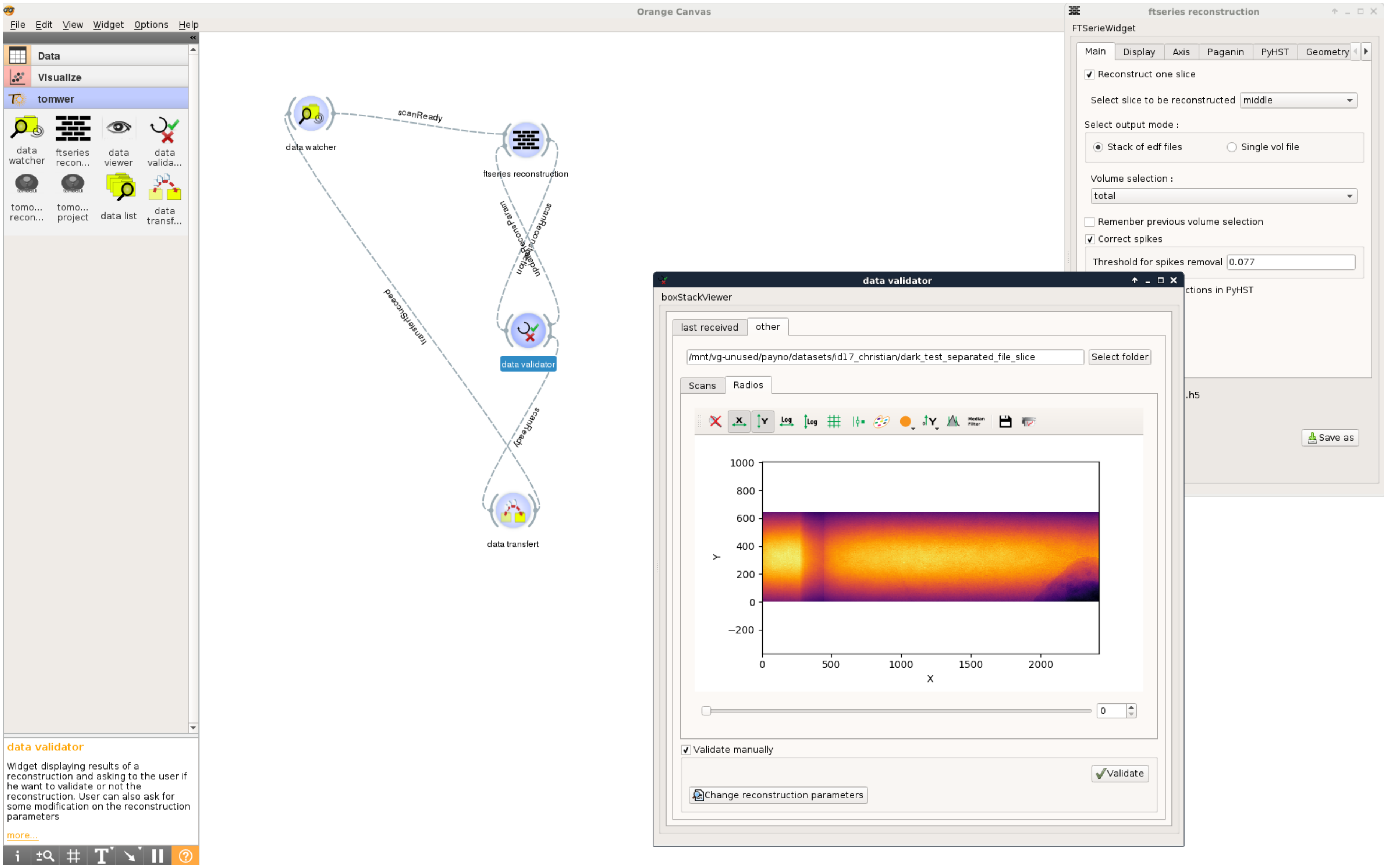
Select level of Plotting: Detailed Plot

X,Z | X',Z' | X,X' | Z,Z' | Energy

Info

| | |
|---|---|
| Intensity | 1000.000 |
| Total Rays | 1000 |
| Total Good Rays | 1000 |
| Total Lost Rays | 0 |
| FWHM X [μm] | 320.8810 |
| FWHM Z [μm] | 185.1068 |

# Applications – Tomography Workflows



data validator

Widget displaying results of a reconstruction and asking to the user if he want to validate or not the reconstruction. User can also ask for some modification on the reconstruction parameters

more...

✓ Reconstruct one slice

Select slice to be reconstructed: middle

Select output mode : ● Stack of edf files ○ Single vol file

Volume selection : total

☐ Remember previous volume selection

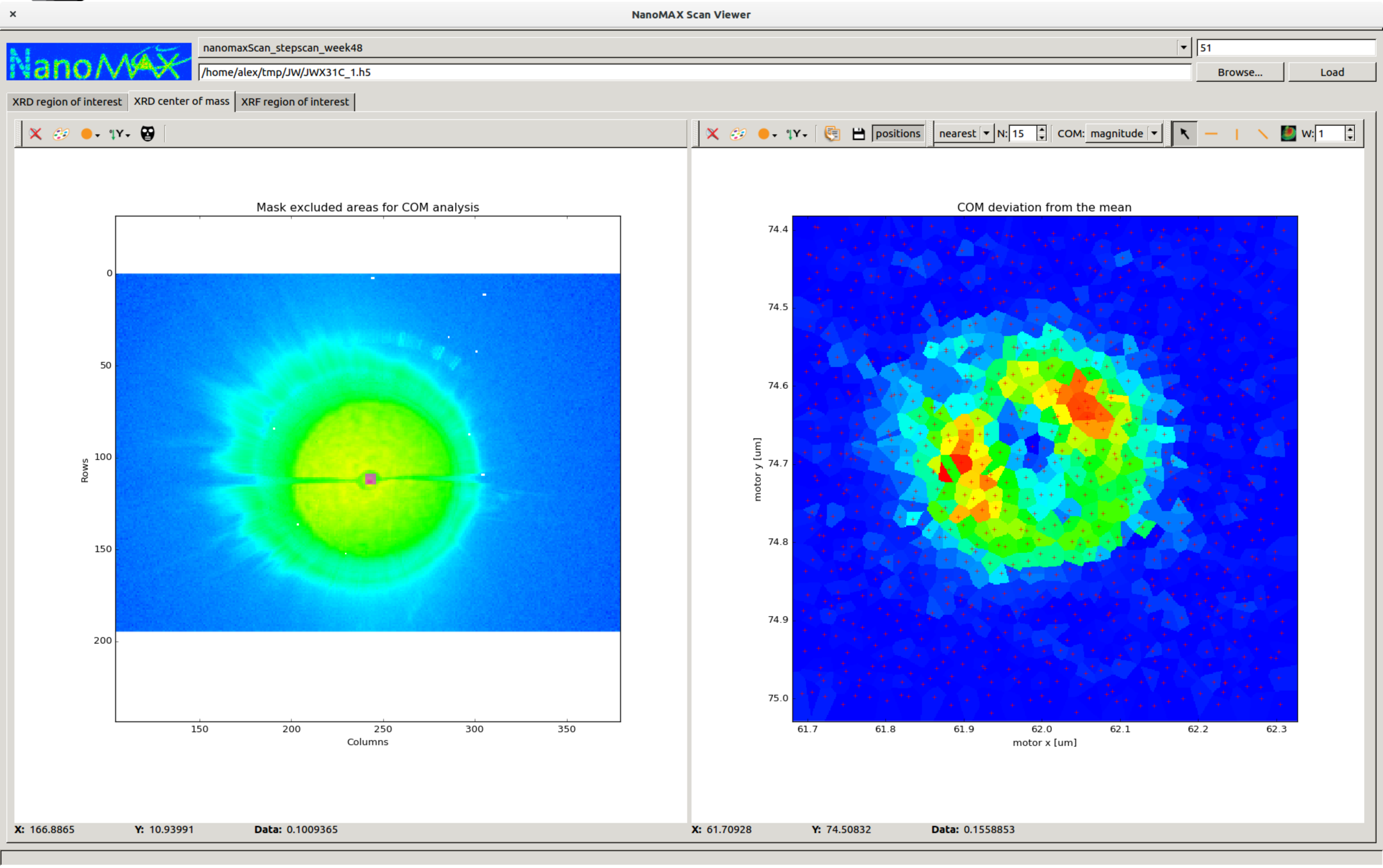
✓ Correct spikes

Threshold for spikes removal 0.077

/mnt/vg-unused/payno/datasets/id17_christian/dark_test_separated_file_slice

✓ Validate manually

# Applications – Nanomax@Max IV



NanoMAX Scan Viewer

nanomaxScan_stepscan_week48

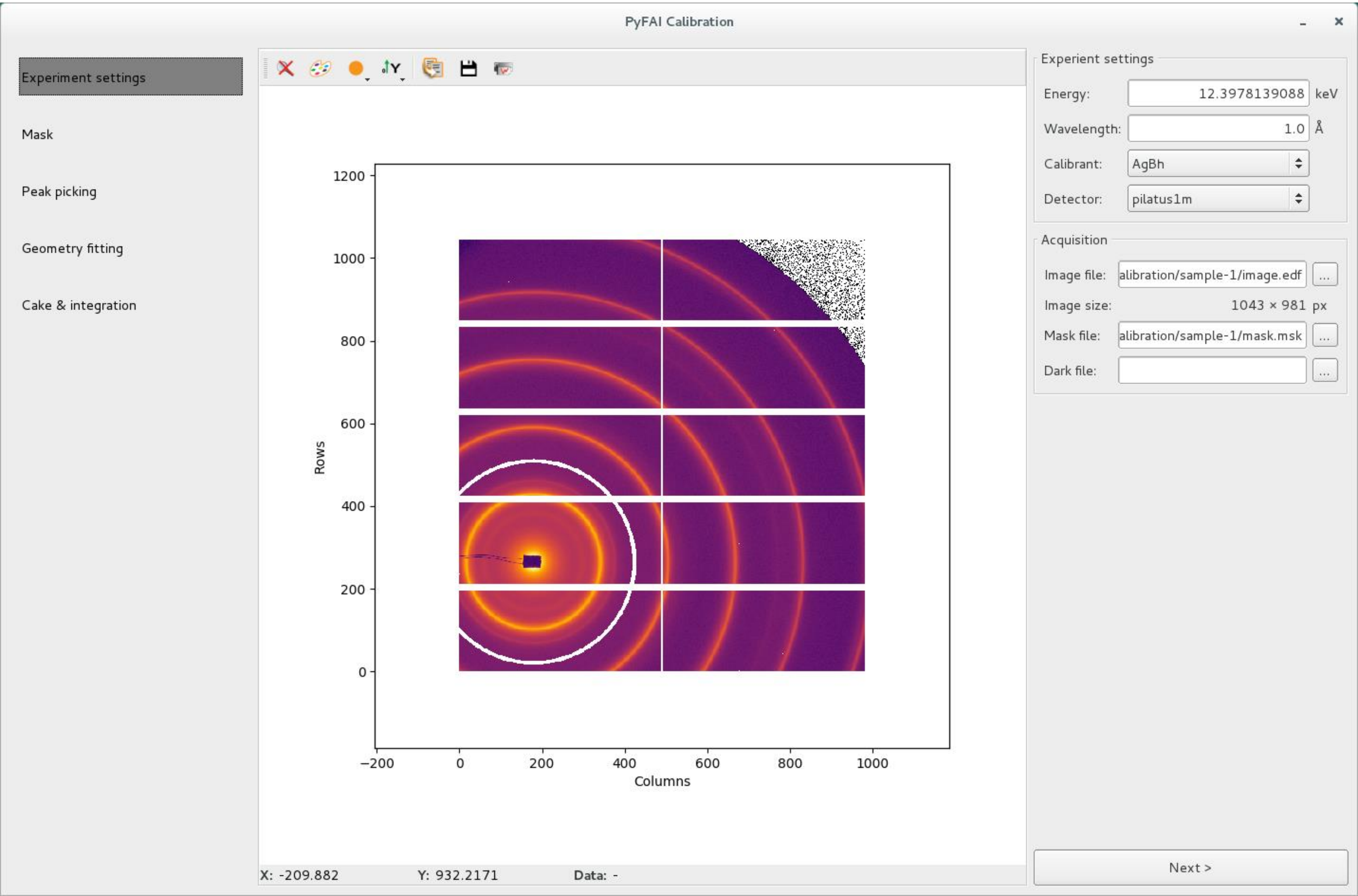
51

/home/alex/tmp/JW/JWX31C_1.h5

X: 166.8865 Y: 10.93991 Data: 0.1009365

X: 61.70928 Y: 74.50832 Data: 0.1558853

# pyFAI Calibration - Settings



PyFAI Calibration

- Experiment settings
- Mask
- Peak picking
- Geometry fitting
- Cake & integration

Experient settings

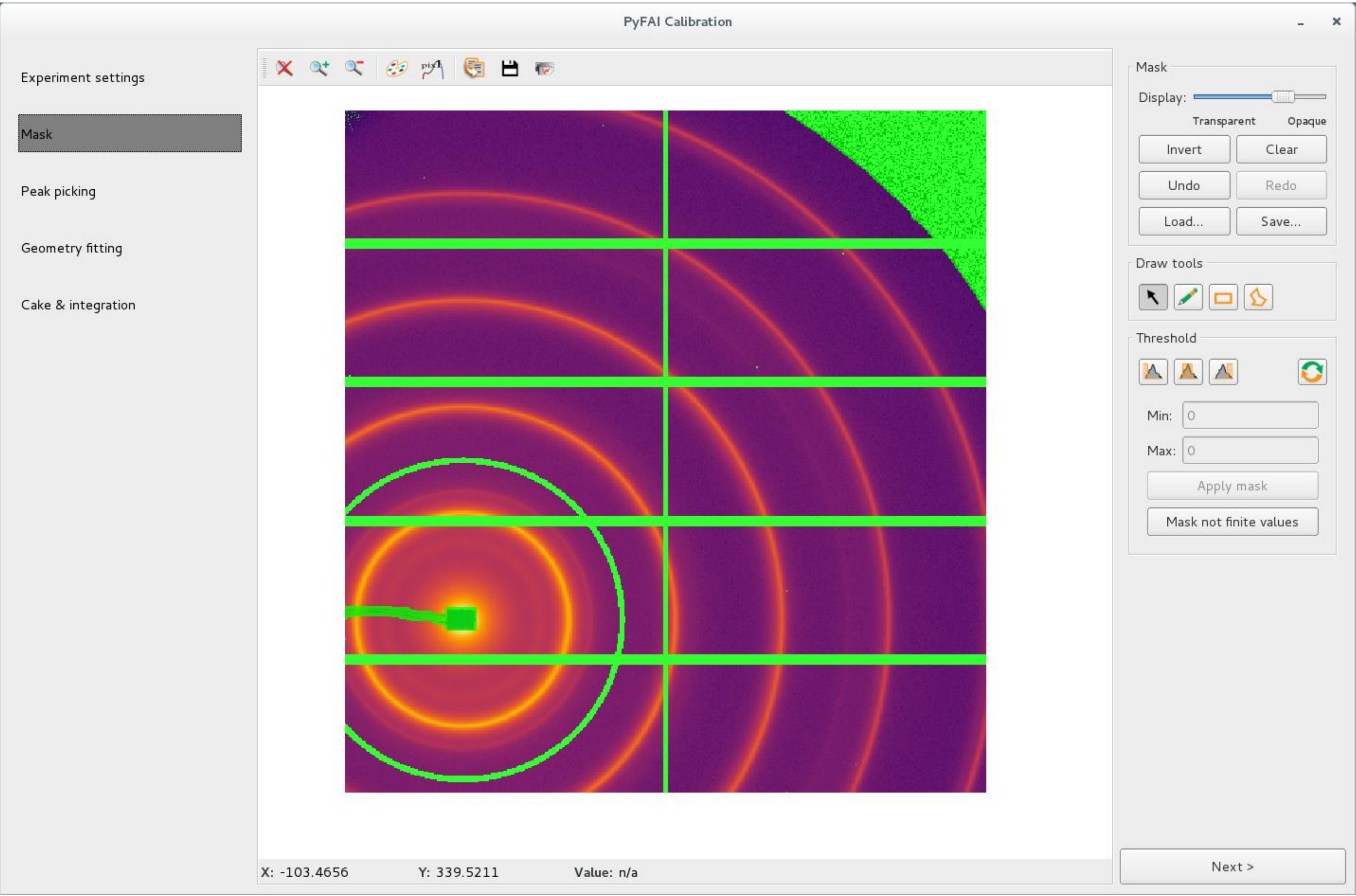
| | | |
|---|---|---|
| Energy: | 12.3978139088 | keV |
| Wavelength: | 1.0 | Å |
| Calibrant: | AgBh | |
| Detector: | pilatus1m | |

Acquisition

| | | |
|---|---|---|
| Image file: | alibration/sample-1/image.edf | ... |
| Image size: | 1043 × 981 | px |
| Mask file: | alibration/sample-1/mask.msk | ... |
| Dark file: | | ... |

X: -209.882 Y: 932.2171 Data: -

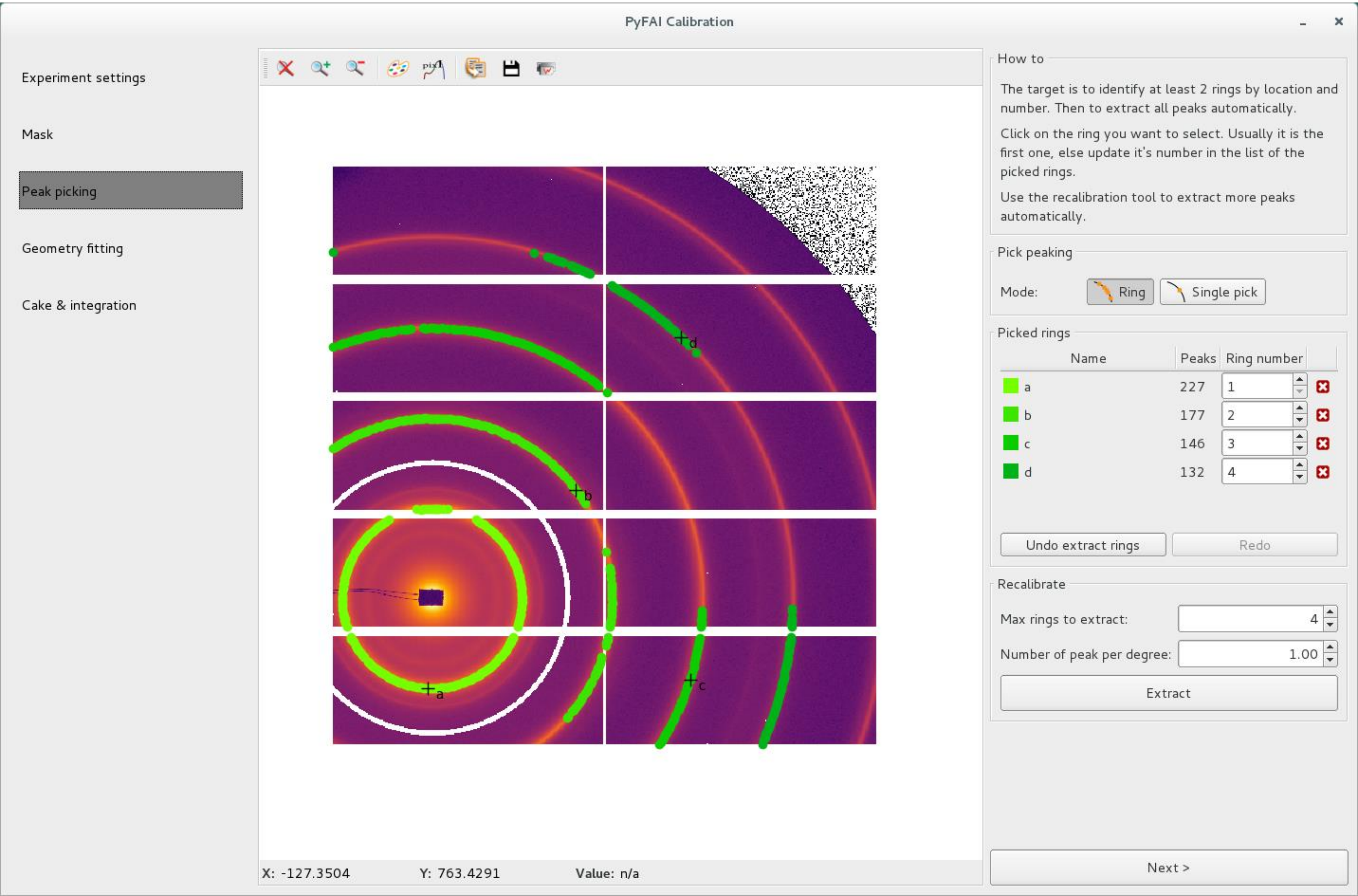
# pyFAI Calibration - Mask



Min: 0
Max: 0

X: -103.4656 Y: 339.5211 Value: n/a

# pyFAI Calibration – Peak Picking



PyFAI Calibration

- Experiment settings
- Mask
- Peak picking
- Geometry fitting
- Cake & integration

**How to**

The target is to identify at least 2 rings by location and number. Then to extract all peaks automatically.

Click on the ring you want to select. Usually it is the first one, else update it's number in the list of the picked rings.

Use the recalibration tool to extract more peaks automatically.

**Pick peaking**

Mode: [✓ Ring] Single pick

**Picked rings**

| | Name | Peaks | Ring number |
|---|---|---|---|
| 🟩 | a | 227 | 1 |
| 🟩 | b | 177 | 2 |
| 🟩 | c | 146 | 3 |
| 🟩 | d | 132 | 4 |

Undo extract rings | Redo

**Recalibrate**

Max rings to extract: 4

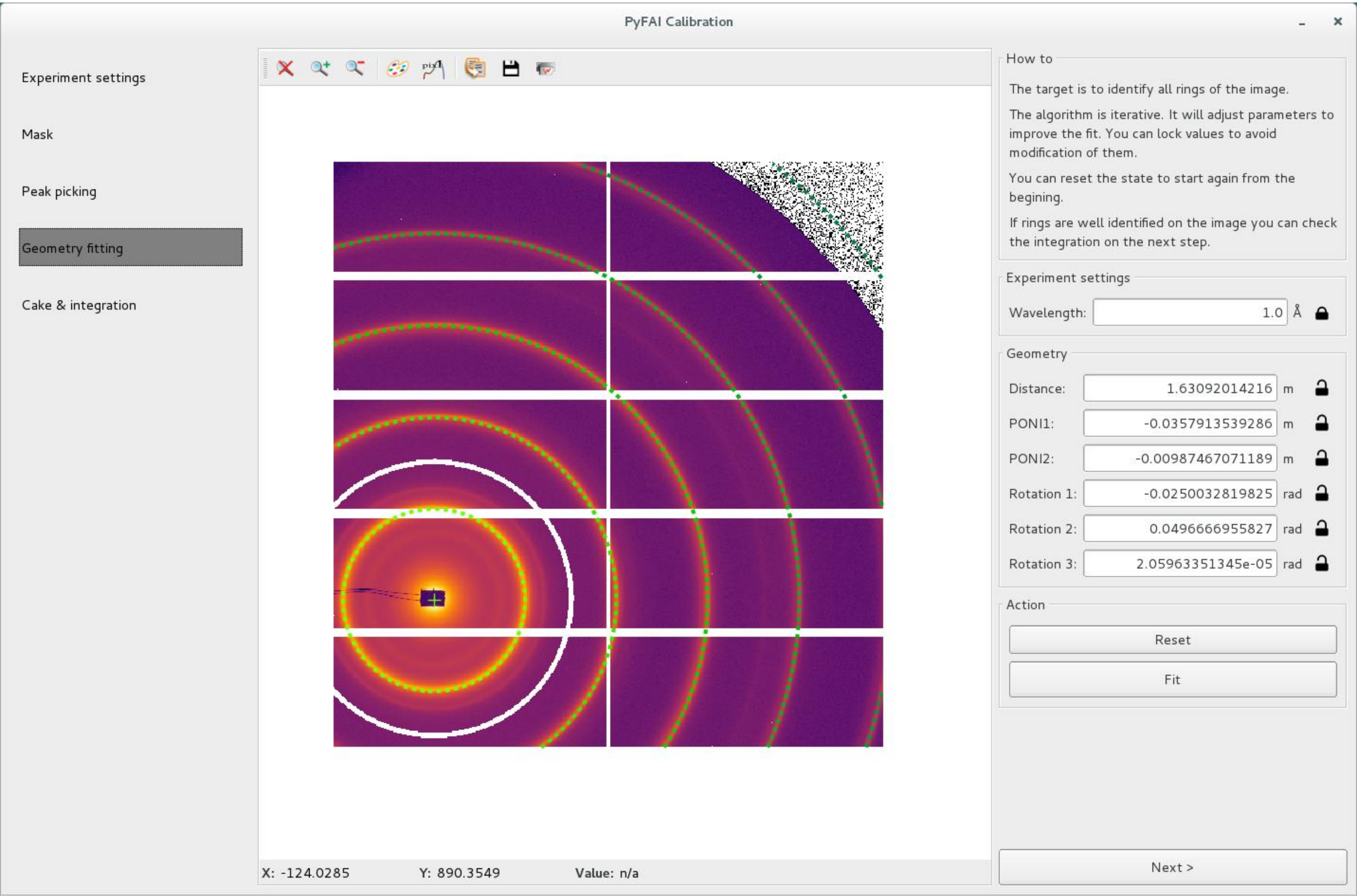
Number of peak per degree: 1.00

Extract

Next >

X: -127.3504 Y: 763.4291 Value: n/a

# pyFAI Calibration – Geometry Fitting



How to

The target is to identify all rings of the image.

The algorithm is iterative. It will adjust parameters to improve the fit. You can lock values to avoid modification of them.

You can reset the state to start again from the begining.

If rings are well identified on the image you can check the integration on the next step.

Experiment settings

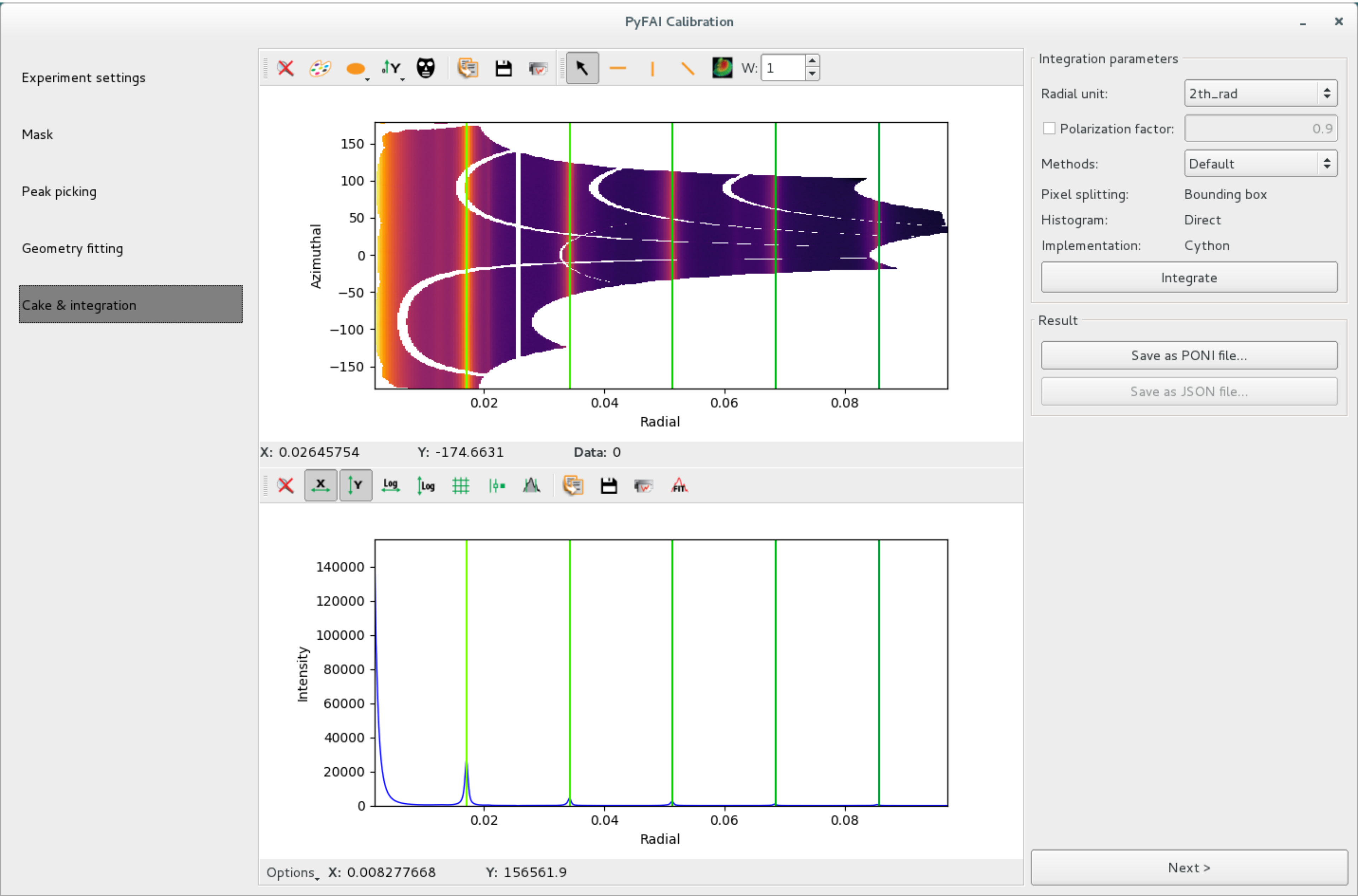
| | | |
|---|---|---|
| Wavelength: | 1.0 | Å |

Geometry

| | | |
|---|---|---|
| Distance: | 1.63092014216 | m |
| PONI1: | -0.0357913539286 | m |
| PONI2: | -0.00987467071189 | m |
| Rotation 1: | -0.0250032819825 | rad |
| Rotation 2: | 0.0496666955827 | rad |
| Rotation 3: | 2.05963351345e-05 | rad |

X: -124.0285  Y: 890.3549  Value: n/a

# pyFAI Calibration – Cake and Integrtion



Integration parameters

Radial unit: 2th_rad

Polarization factor: 0.9

Methods: Default

Pixel splitting: Bounding box

Histogram: Direct

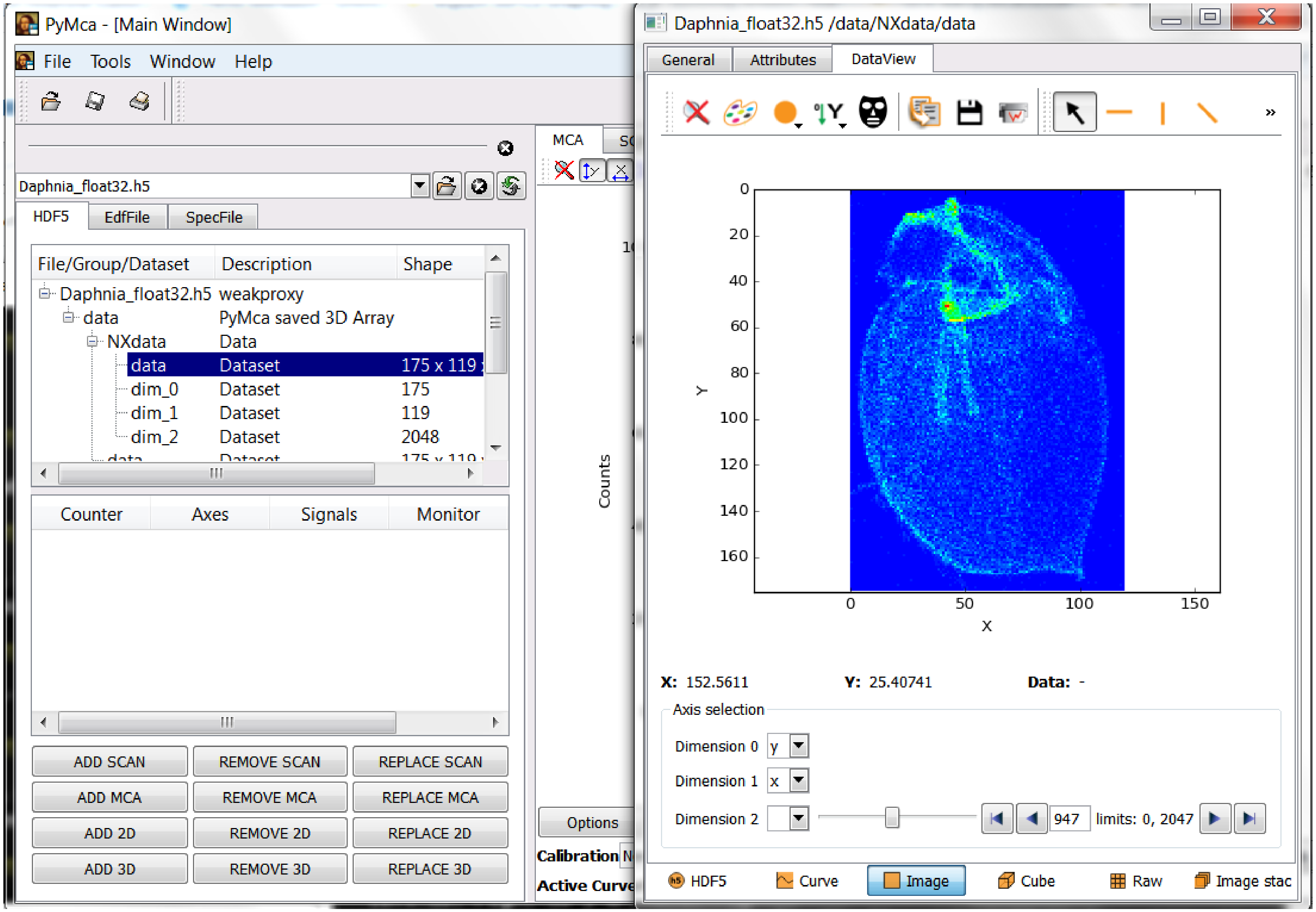
Implementation: Cython

Result

X: 0.02645754 Y: -174.6631 Data: 0

X: 0.008277668 Y: 156561.9

# PyMca - silx DataViewer replacing PyMca TableView



PyMca - [Main Window]

File Tools Window Help

Daphnia_float32.h5

HDF5 EdfFile SpecFile

| File/Group/Dataset | Description | Shape |
|---|---|---|
| Daphnia_float32.h5 | weakproxy | |
| data | PyMca saved 3D Array | |
| NXdata | Data | |
| data | Dataset | 175 x 119 |
| dim_0 | Dataset | 175 |
| dim_1 | Dataset | 119 |
| dim_2 | Dataset | 2048 |
| data | Dataset | 175 x 119 |

| Counter | Axes | Signals | Monitor |
|---|---|---|---|

Daphnia_float32.h5 /data/NXdata/data

General Attributes DataView

X: 152.5611 Y: 25.40741 Data: -

Axis selection

Dimension 0 y

Dimension 1 x

Dimension 2 947 limits: 0, 2047

- This release
  - I/O dialogs, h5pyd support, data URLs
  - silx view full support of NXdata groups
  - silx convert as generic merge tool
  - Plot3D: SceneGraph and SceneItems.
  - OpenCL: image processing, byte offset…
- 2018
  - SceneGraph interaction
  - Statistics in Curves, Images, Volumes
  - PyMca using silx 3D graphics
- Let the library grow according to the needs of applications

## Role of Non-core developers

- Identify something you are interested on
- Try to achieve it
- Wow! I can do what I want, what next?
  - Start again
  - Make suggestions
  - Contribute with a demo/recipe
- I cannot do it
  - Ask help

## Role of core developers

- Help non-core developers
- Create issues
  - Bugs
  - Documentation
  - Desired features
- Fix issues
  - Bugs
  - Documentation
  - Unlikely for new features
- Review pull requests

## Hands on!

- Try to start with a single entry point www.silx.org
    - You should be able to install 0.7.0 version
- For this code camp we'll use 0.8.0a, you can either:
    - clone the repository (and use your compilation chain)
    - install a nightly built package (debian)
    - use a pre-built binary wheel:
        - http://www.silx.org/pub/wheelhouse/