MXCuBE and Qt4

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EMBL
40 YEARS | 1974–2014

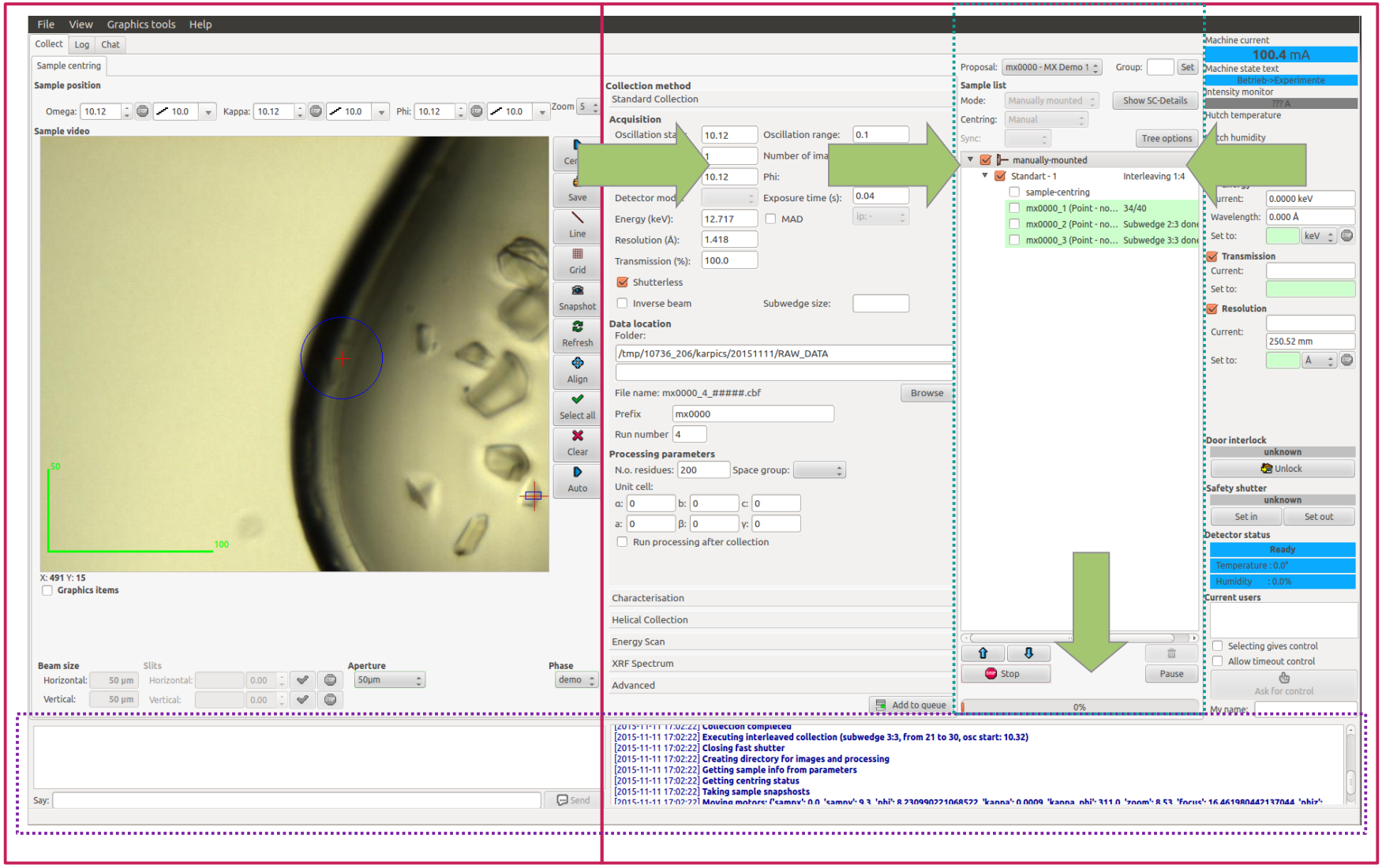
Content

Current status:

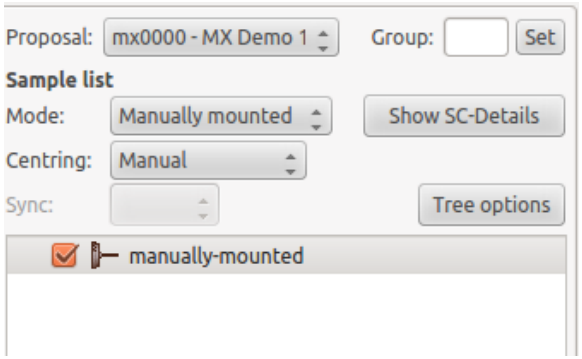
- Available bricks and functions
- Code clean up
- GUI Builder
- GraphicsManger hwobj
- Advanced methods (MeshScan, Xray-centring, etc.)
- Interleave feature

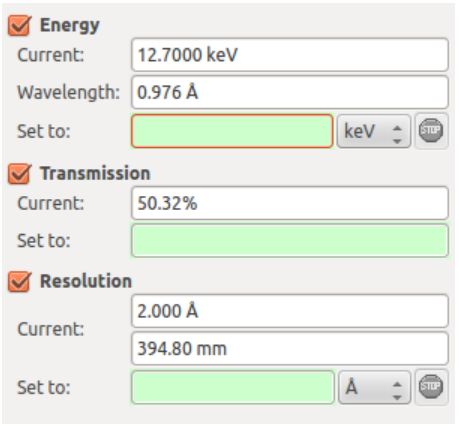
Conclusions and future

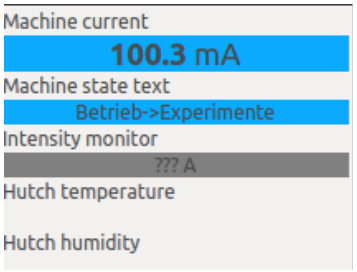
Available bricks (main GUI)

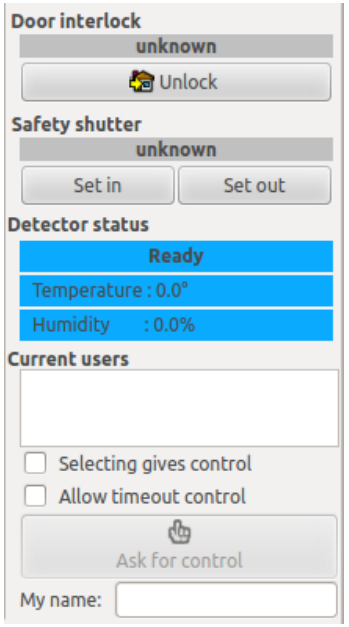


Available bricks

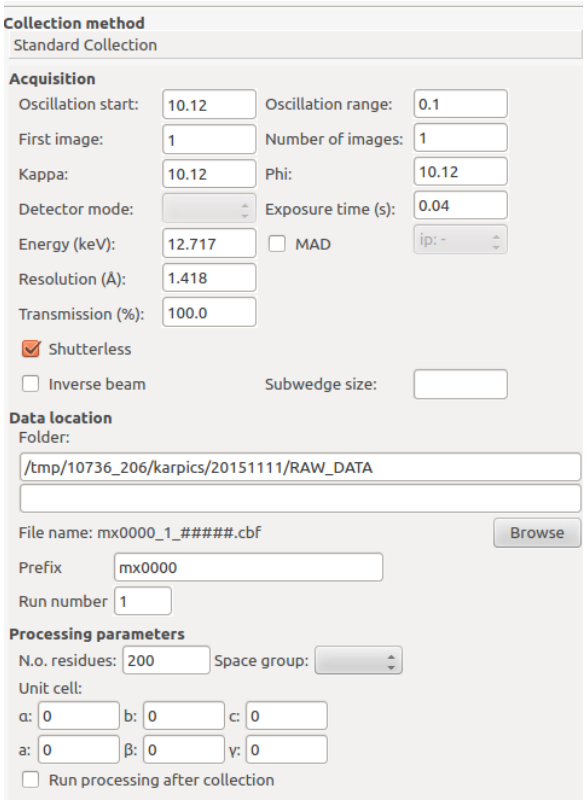


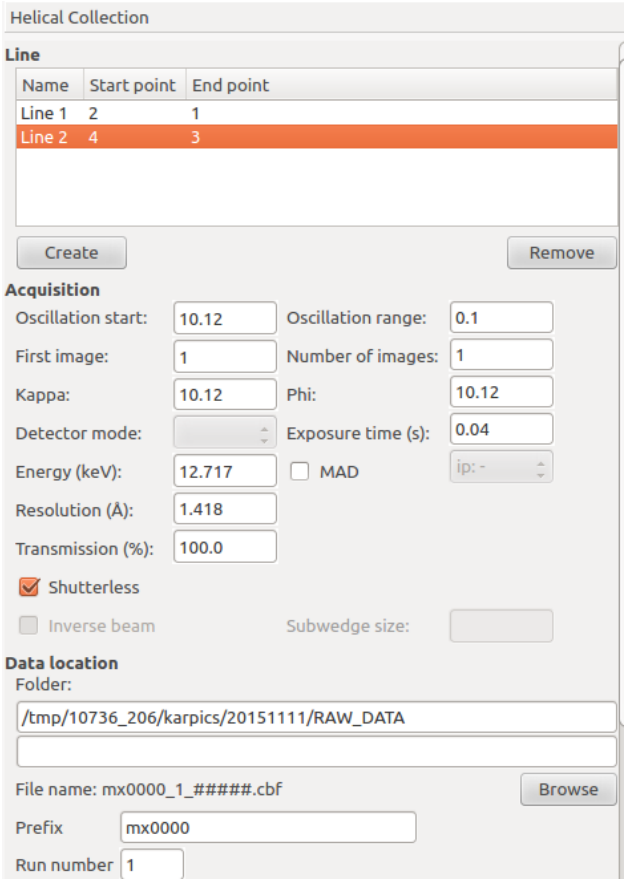


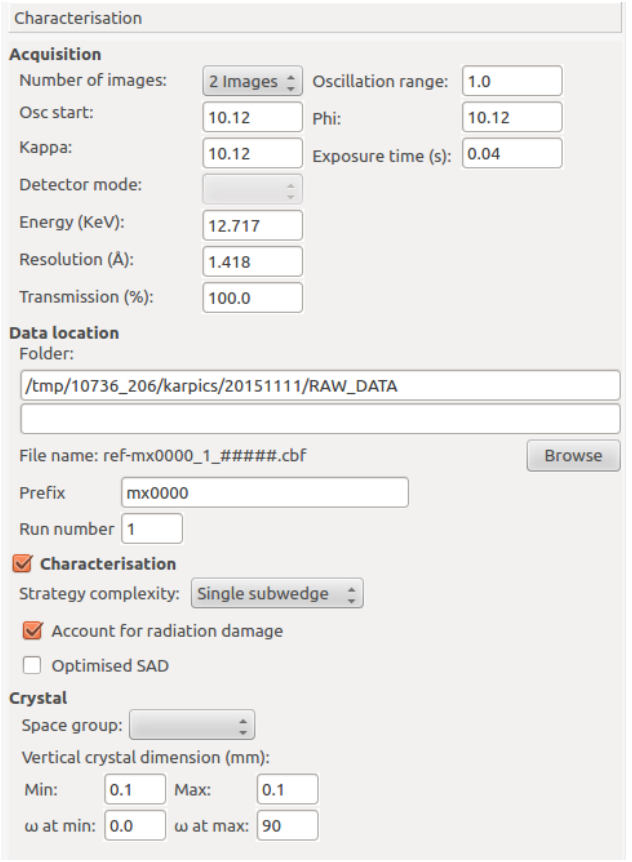




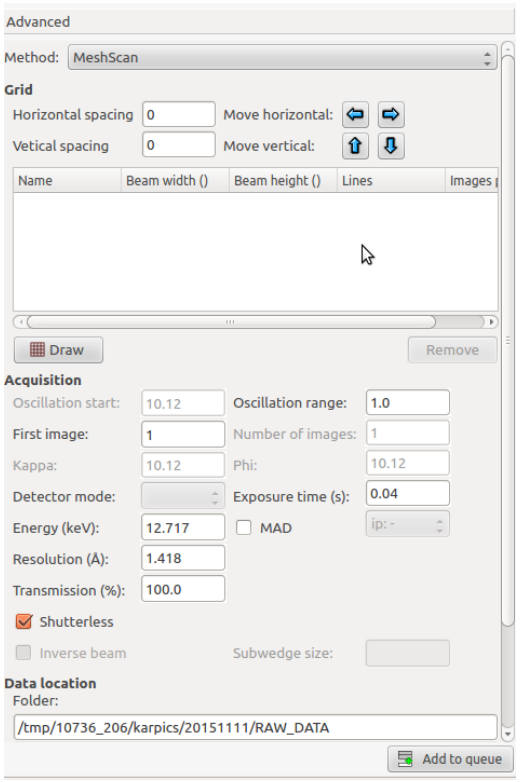
Available bricks (TaskToolBox)

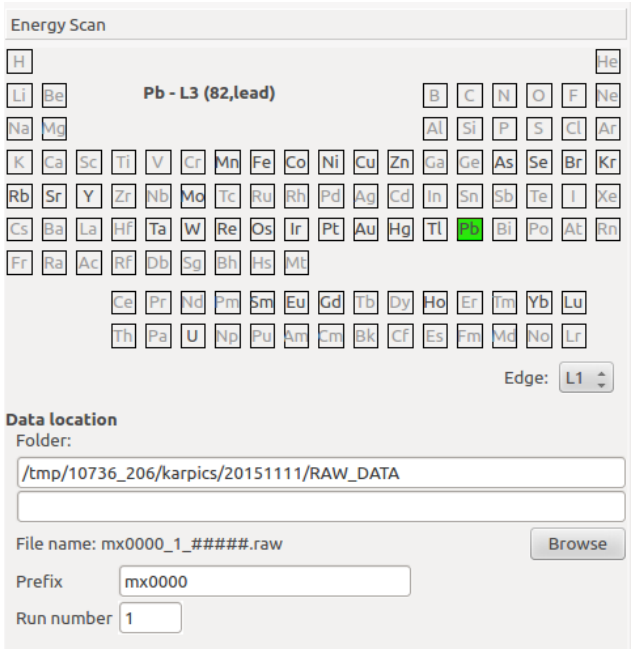


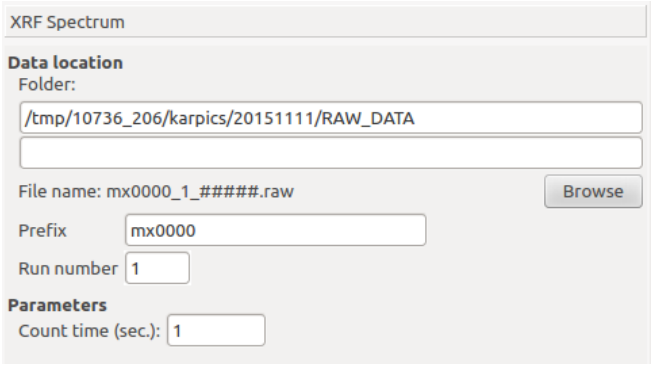




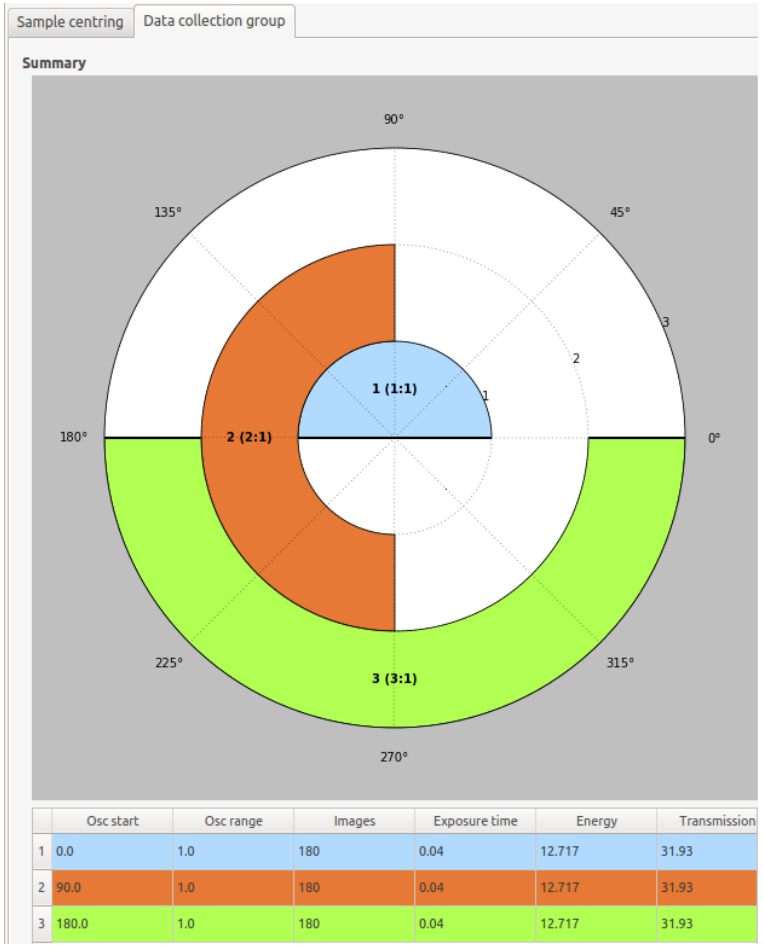
Available bricks (TaskToolBox)



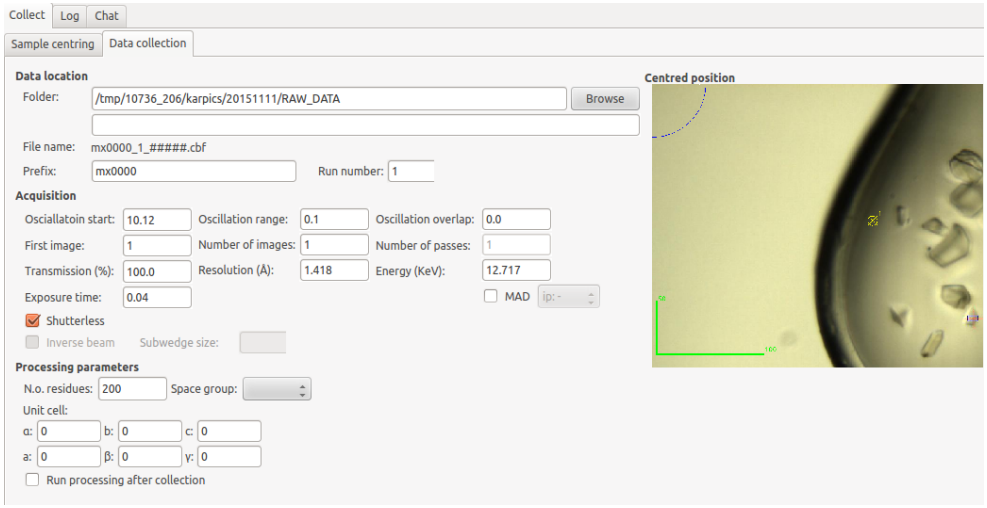


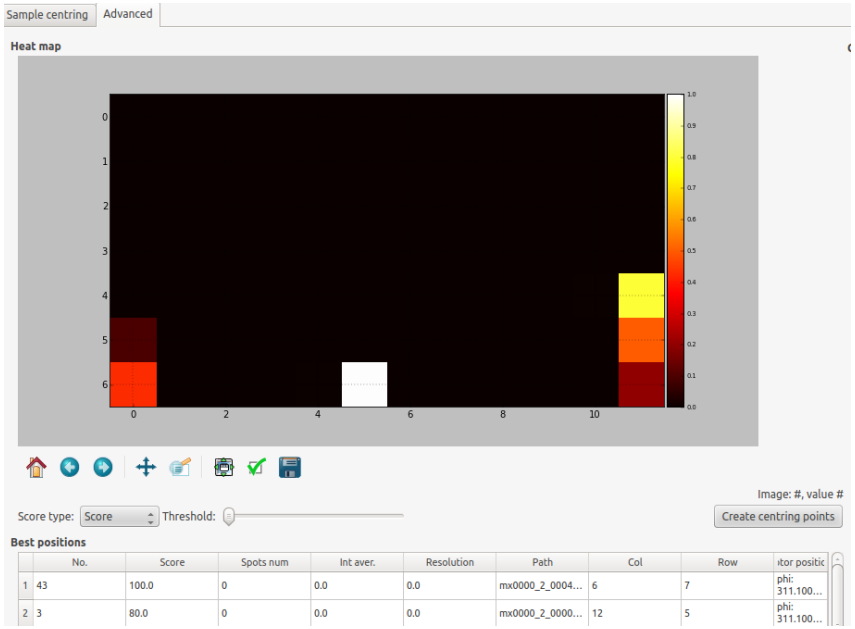


Available bricks (Parameters/Results)



	Osc start	Osc range	Images	Exposure time	Energy	Transmission
1	0.0	1.0	180	0.04	12.717	31.93
2	90.0	1.0	180	0.04	12.717	31.93
3	180.0	1.0	180	0.04	12.717	31.93





	No.	Score	Spots num	Int aver.	Resolution	Path	Col	Row	itor positic
1	43	100.0	0	0.0	0.0	mx0000_2_0004...	6	7	phi: 311.100...
2	3	80.0	0	0.0	0.0	mx0000_2_0000...	12	5	phi: 311.100...

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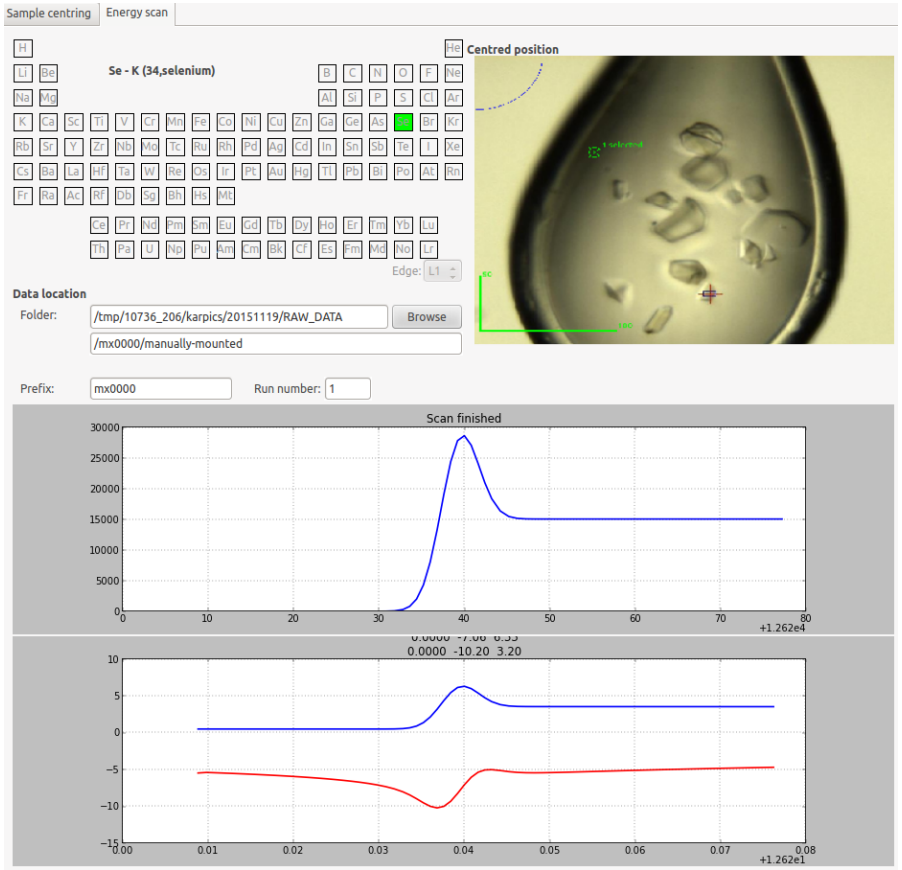
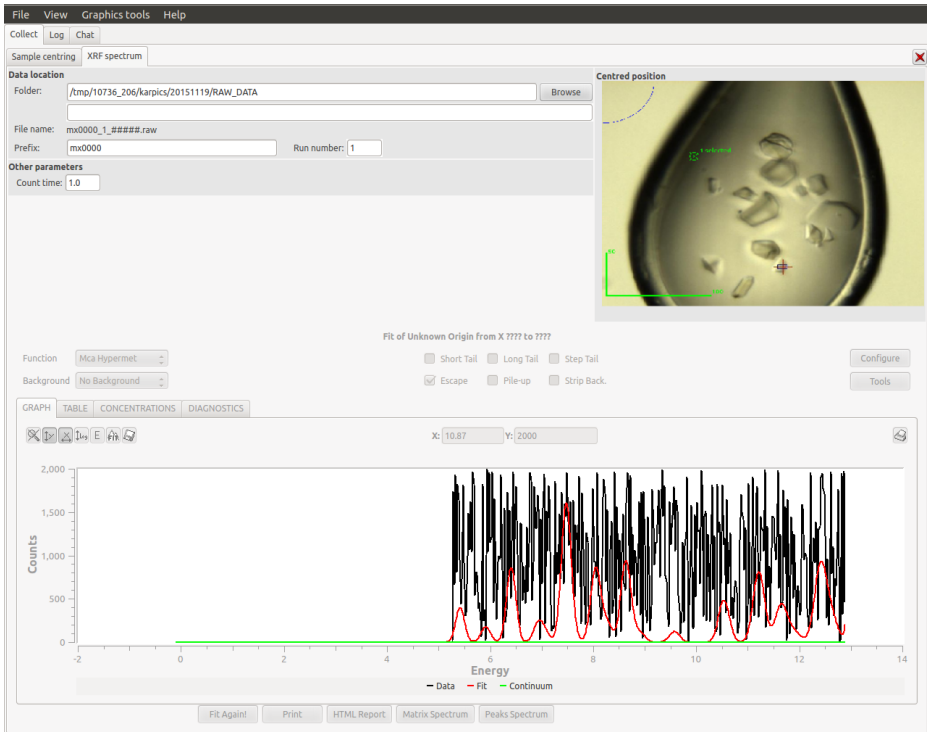
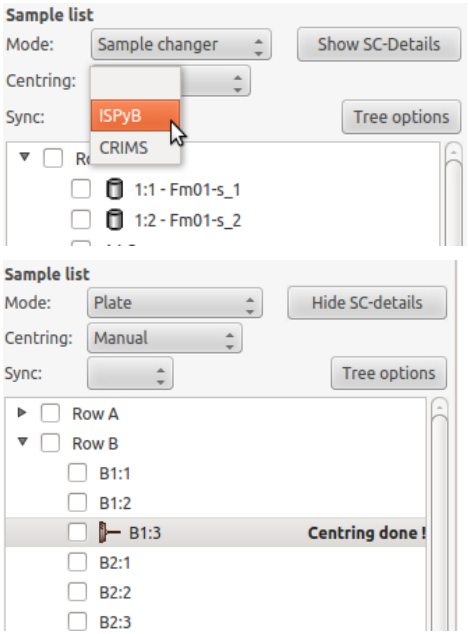
Available bricks (TaskToolBox)

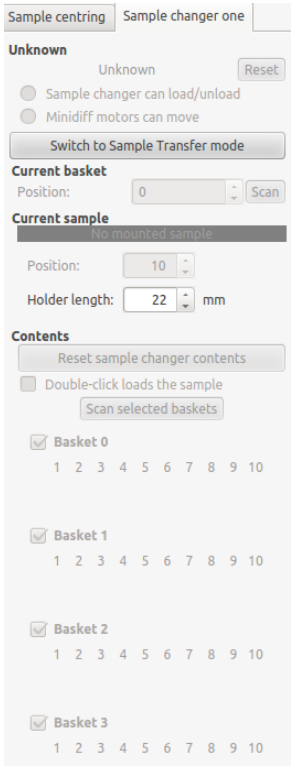


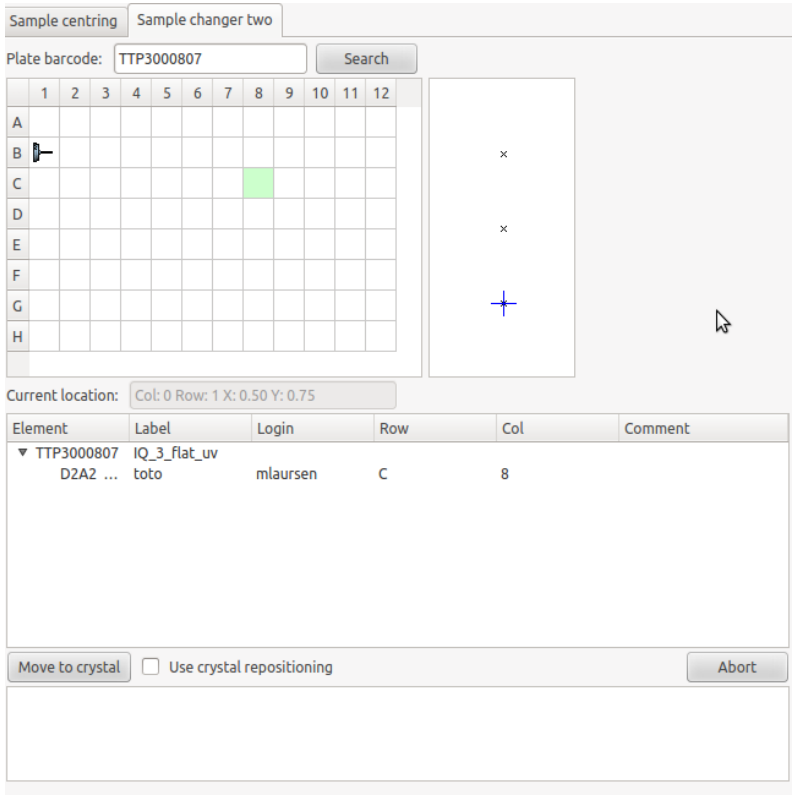


Available bricks (Sample changer, Plate manipulator)

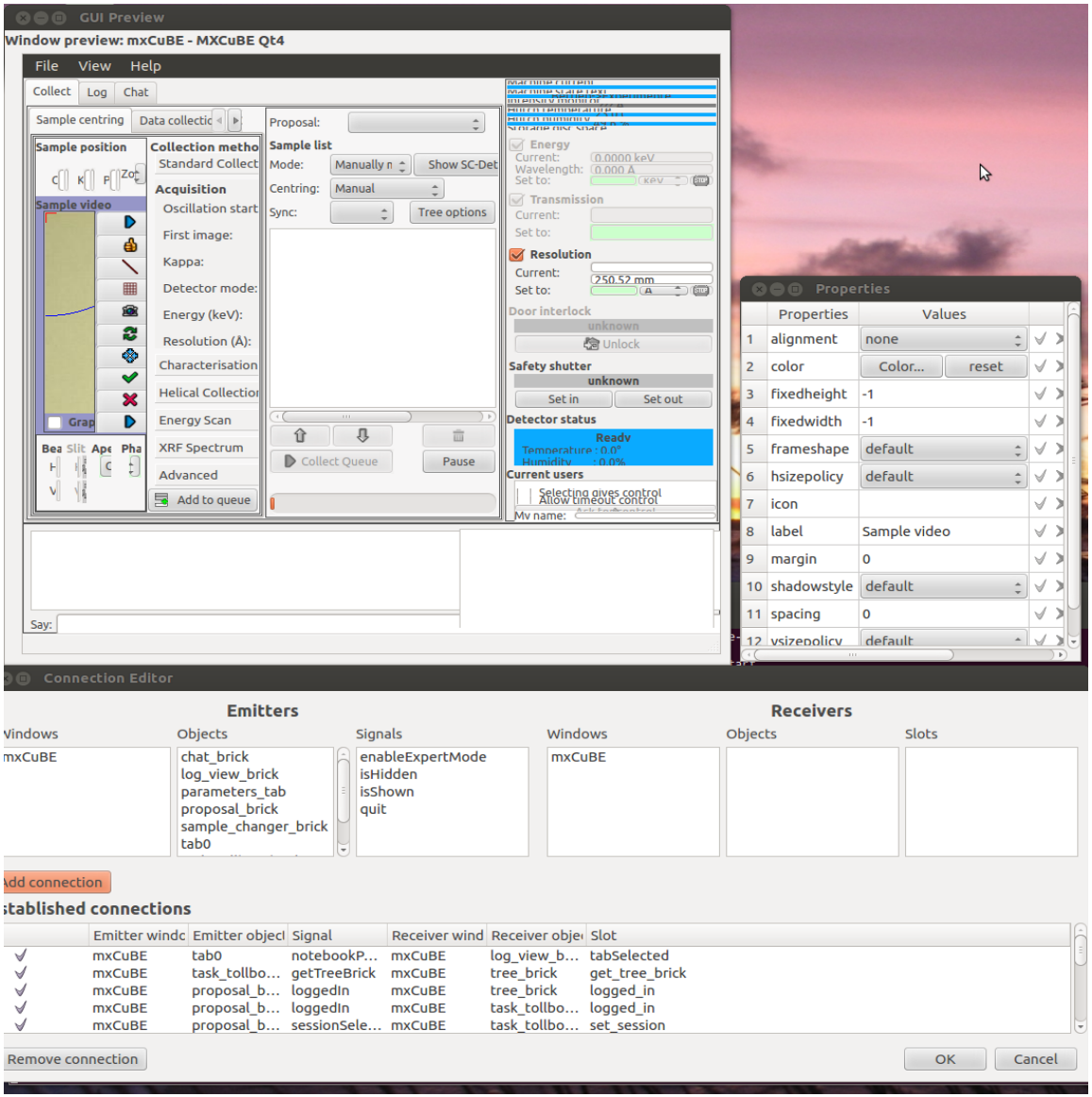
1. Possibility to configure two sample changers.
2. Information about plate from CRIMS.
3. Qt4_SampleChanger brick.
4. Qt4_PlateBrick to navigate in cell or move to crystal position.







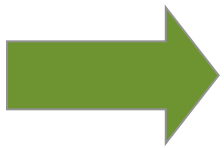
GUI builder



Code clean up

- All main bricks and widgets transformed to Qt4_.
- New layout manager for BlissFramework GUI.
- Qt4 branch merged in master branch and deleted after the merge.
- Improved code formating based on PEP 0008, regular check with pylint.
- New style Qt4 signal/slots between Bricks and widgets.
- Qt4 Designer used to create most of the widgets.

```
qt.QObject.connect(self._list_box,qt.SIGNAL(\
    "selectionChanged()"), self.list_box_selection_changed)

prefix_ledit = self._data_path_widget.\
       data_path_widget_layout.child('prefix_ledit')
run_number_ledit = self._data_path_widget.\
        data_path_widget_layout.child('run_number_ledit')

self.connect(prefix_ledit, qt.SIGNAL("textChanged\
      (const QString &)"), self._prefix_ledit_change)

self.connect(run_number_ledit,
       qt.SIGNAL("textChanged(const QString &)"),
       self._run_number_ledit_change)

self.connect(self._data_path_widget,
       qt.PYSIGNAL("path_template_changed"),
       self.handle_path_conflict)
```



```
self._lines_listwidget.itemSelectionChanged.connect(\
      self.lines_listwidget_selection_changed)

self._data_path_widget.data_path_layout.prefix_ledit.textChanged.\
       connect(self._prefix_ledit_change)
 self._data_path_widget.data_path_layout.run_number_ledit.\
          textChanged.connect(self._run_number_ledit_change)
self._data_path_widget.pathTemplateChangedSignal.connect(\
          self.handle_path_conflict)
```

How to improve code

1. pylint for code formatting and style.
2. radon to compute.

- Cyclomatic Complexity (A – F from low - simple block to very high - error-prone, unstable block)
- Maintainability Index score (A – C from very hight to Extremely low).

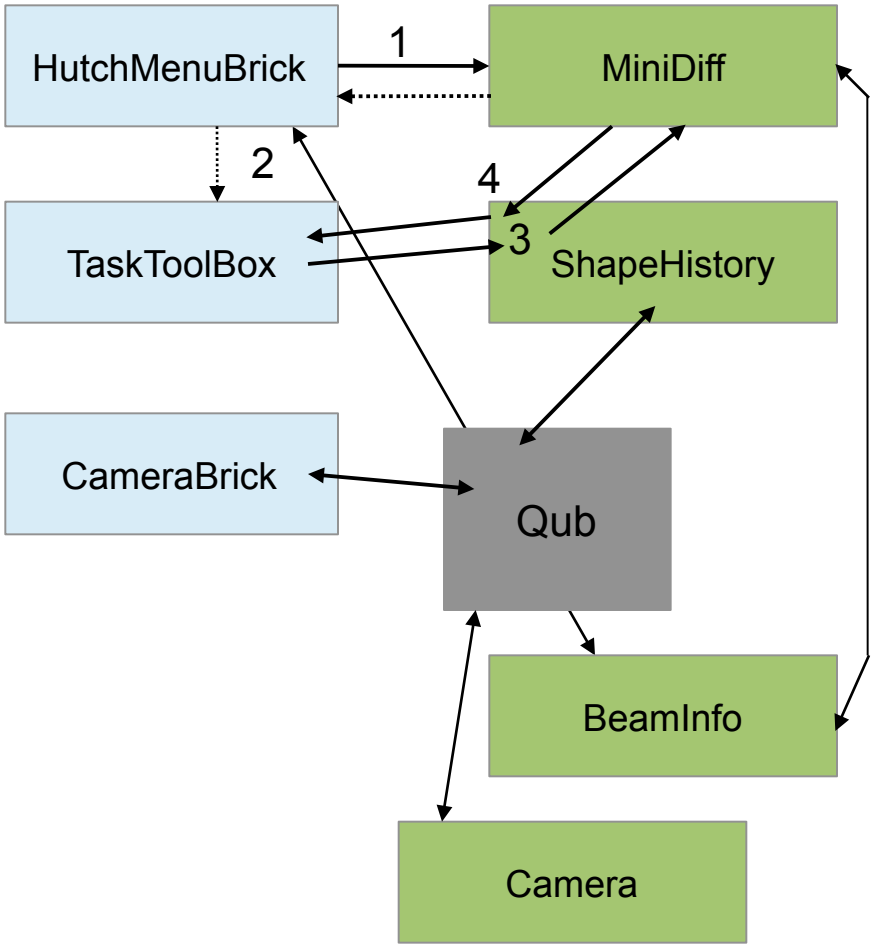
```
Global evaluation
-----------------
Your code has been rated at 8.54/10

Raw metrics
-----------

+----------+-------+------+---------+-----------+
|type      |number |%     |previous |difference |
+==========+=======+======+=========+===========+
|code      |653    |68.59 |NC       |NC         |
+----------+-------+------+---------+-----------+
|docstring |171    |17.96 |NC       |NC         |
+----------+-------+------+---------+-----------+
|comment   |37     |3.89  |NC       |NC         |
+----------+-------+------+---------+-----------+
|empty     |91     |9.56  |NC       |NC         |
+----------+-------+------+---------+-----------+
```

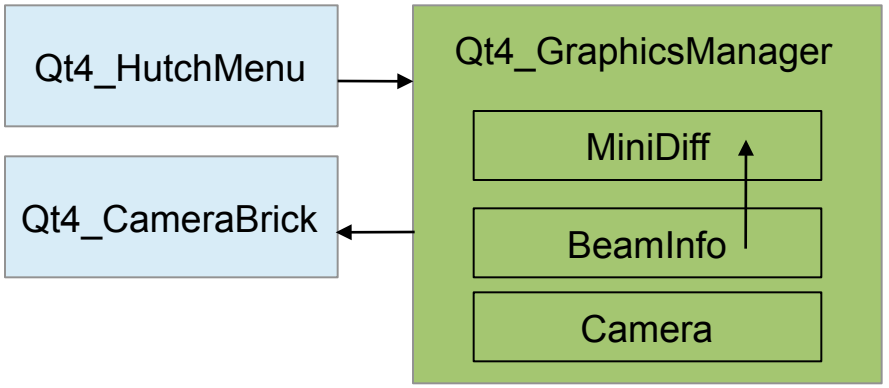
```
mxuser@mxVirtual:~$ radon cc mxcubeGit/Bricks/Qt4_*.py -a -nc
mxcubeGit/Bricks/Qt4_ProposalBrick2.py
    M 696:4 Qt4_ProposalBrick2.select_proposal - C
    M 618:4 Qt4_ProposalBrick2.propertyChanged - C
    M 801:4 Qt4_ProposalBrick2.select_todays_proposal - C
mxcubeGit/Bricks/Qt4_SampleChangerBrick3.py
    M 819:4 Qt4_SampleChangerBrick3.propertyChanged - C
    M 1055:4 Qt4_SampleChangerBrick3.infoChanged - C
mxcubeGit/Bricks/Qt4_TreeBrick.py
    M 190:4 Qt4_TreeBrick.propertyChanged - C
    M 383:4 Qt4_TreeBrick.refresh_sample_list - C

7 blocks (classes, functions, methods) analyzed.
Average complexity: C (13.2857142857)
```

```
mxuser@mxVirtual:~$ radon mi mxcubeQt4/Bricks/Qt4_*py -s
mxcubeQt4/Bricks/Qt4_AdvancedBrick.py - A (79.42)
mxcubeQt4/Bricks/Qt4_BeamSizeBrick.py - A (73.53)
mxcubeQt4/Bricks/Qt4_CharParametersBrick.py - A (76.33)
mxcubeQt4/Bricks/Qt4_DCGBrick.py - A (100.00)
mxcubeQt4/Bricks/Qt4_DCParametersBrick.py - A (72.85)
mxcubeQt4/Bricks/Qt4_DetectorStatusBrick.py - A (72.28)
mxcubeQt4/Bricks/Qt4_DoorInterlockBrick.py - A (72.98)
mxcubeQt4/Bricks/Qt4_EnergyScanParametersBrick.py - A (89.50)
mxcubeQt4/Bricks/Qt4_GraphicsManagerBrick.py - A (50.43)
```

GraphicsManager hwobj

Example: creating a new centring position with 3 clicks



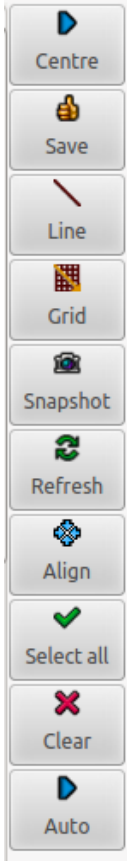


1. Graphics are written from scratch with based on native Qt4 Qgraphs items.
2. Easy to modify or adjust (more transparent than Qub).
3. No need to define hwobj in several places.
4. GraphicsManager takes care of all connections and function calls.

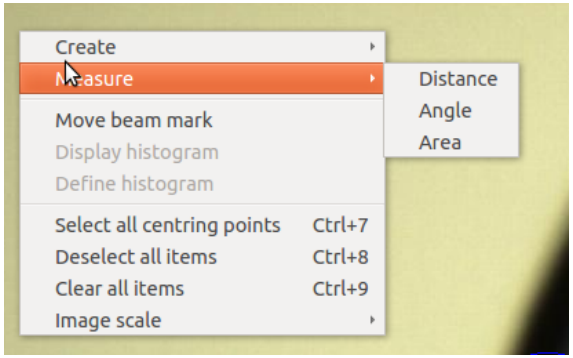
Graphics

- Main functions accessible via different controls.
- Easy way to customize the look.

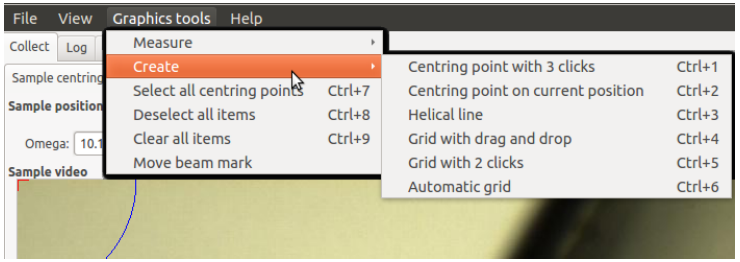
1. HutchMenu



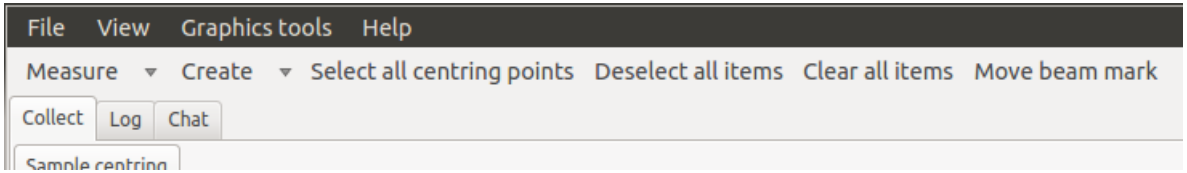
2. Popup menu (right click on the view)



3. Toplevel menu bar



4. Drag and drop toolbar

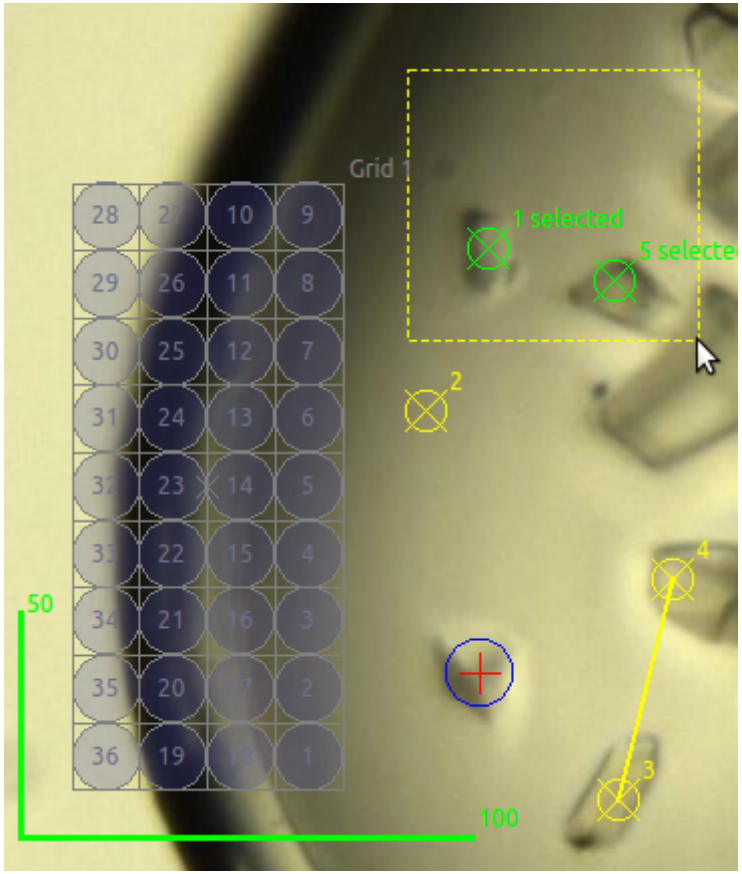


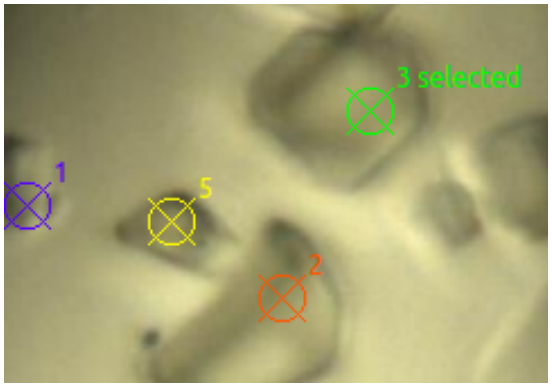
5. Shortcuts:

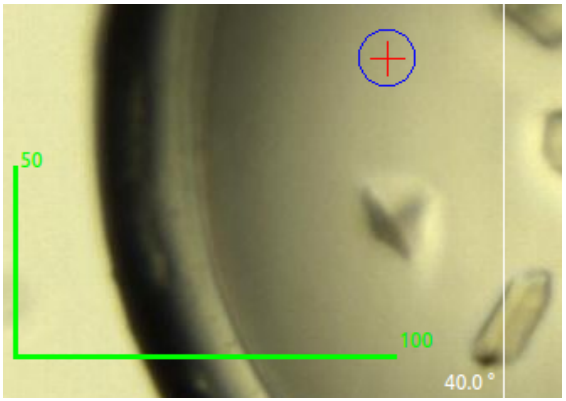
Ctrl+1 - Create centring point with 3 click
Ctrl+2 - Create centring point on current position
Ctrll+3 - Create helical line
…
Esc - cancel command

Graphics

1. Basic graphics items available.
2. Qt4_GraphicsManagerBrick to add, remove and customize items.







X: 579 Y: 588

Graphics items

All shapes

Display Points Lines Grids Display all Hide all Clear all

No.	Type	Visible	Selected	Used for collection
1	Point 1	True	True	False
2	Point 2	True	True	False
3	Line 1	True	True	True
4	Grid 1	True	True	0

Selected: Change color

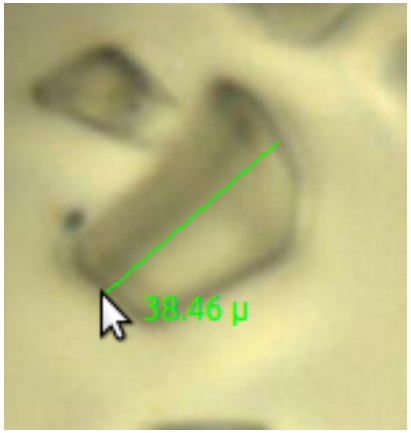
Points

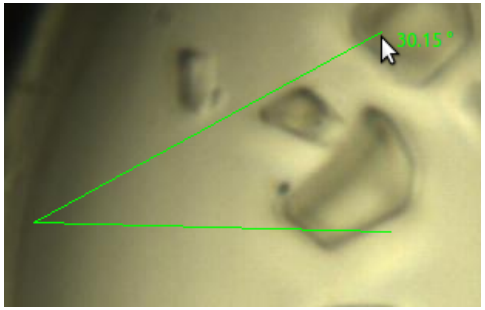
Lines

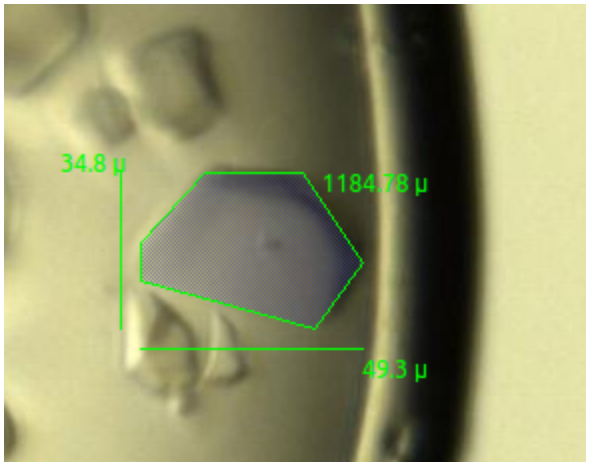
Grids

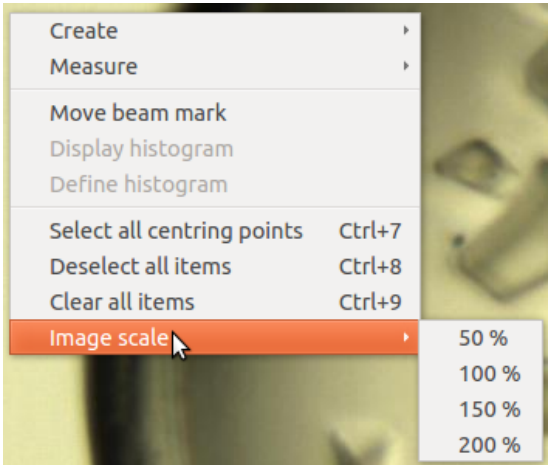
Graphics manager brick

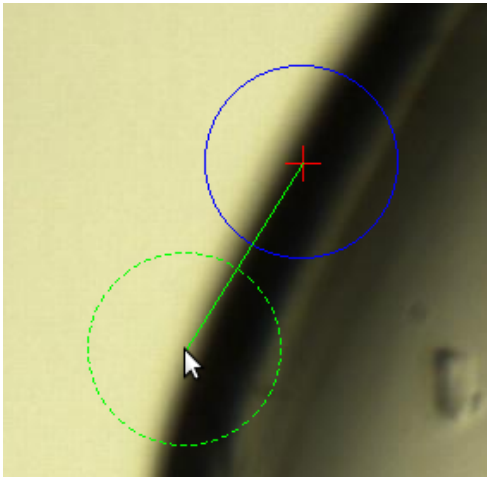
- Measurement tools, image scaling, beam mark move, rotation axis





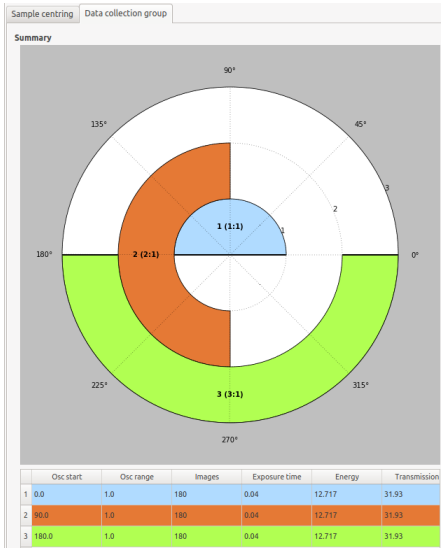


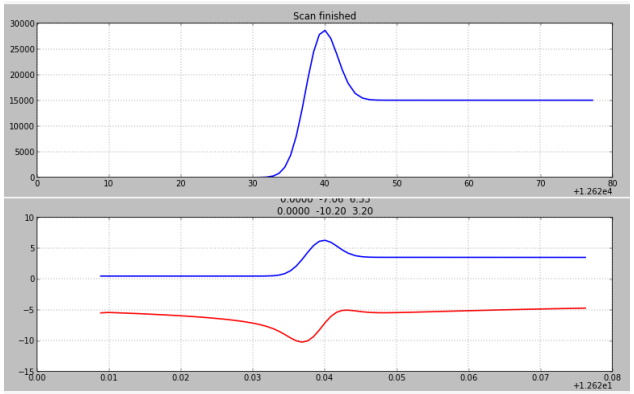


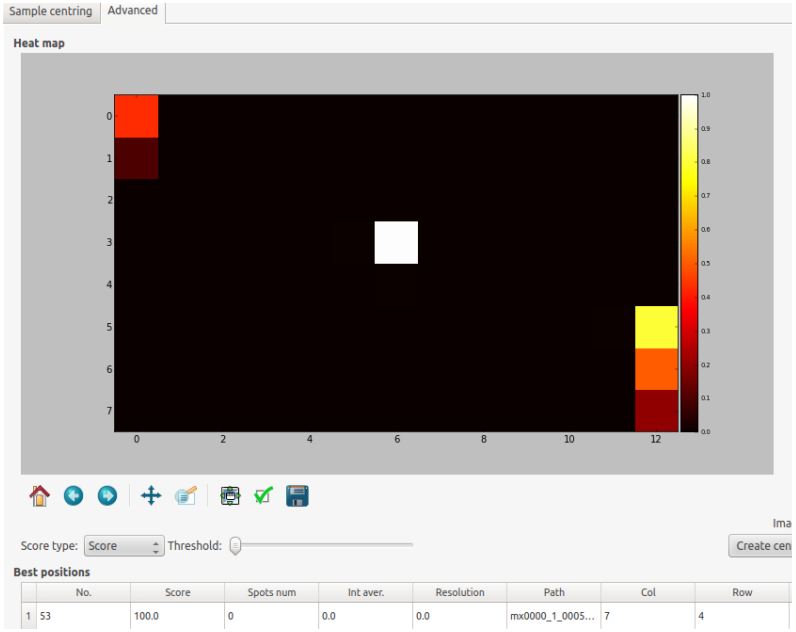


Embedded matplotlib in MXCuBE

1. Well know tool for plotting scientific data.
2. No extra dependencies.
3. Zoom, navigation, image save and other build-in functions.
4. Curves, 2d maps, polar charts and 3D maps.
5. Qt4_matplot_widget.py in progress and will substitute pymca plots.

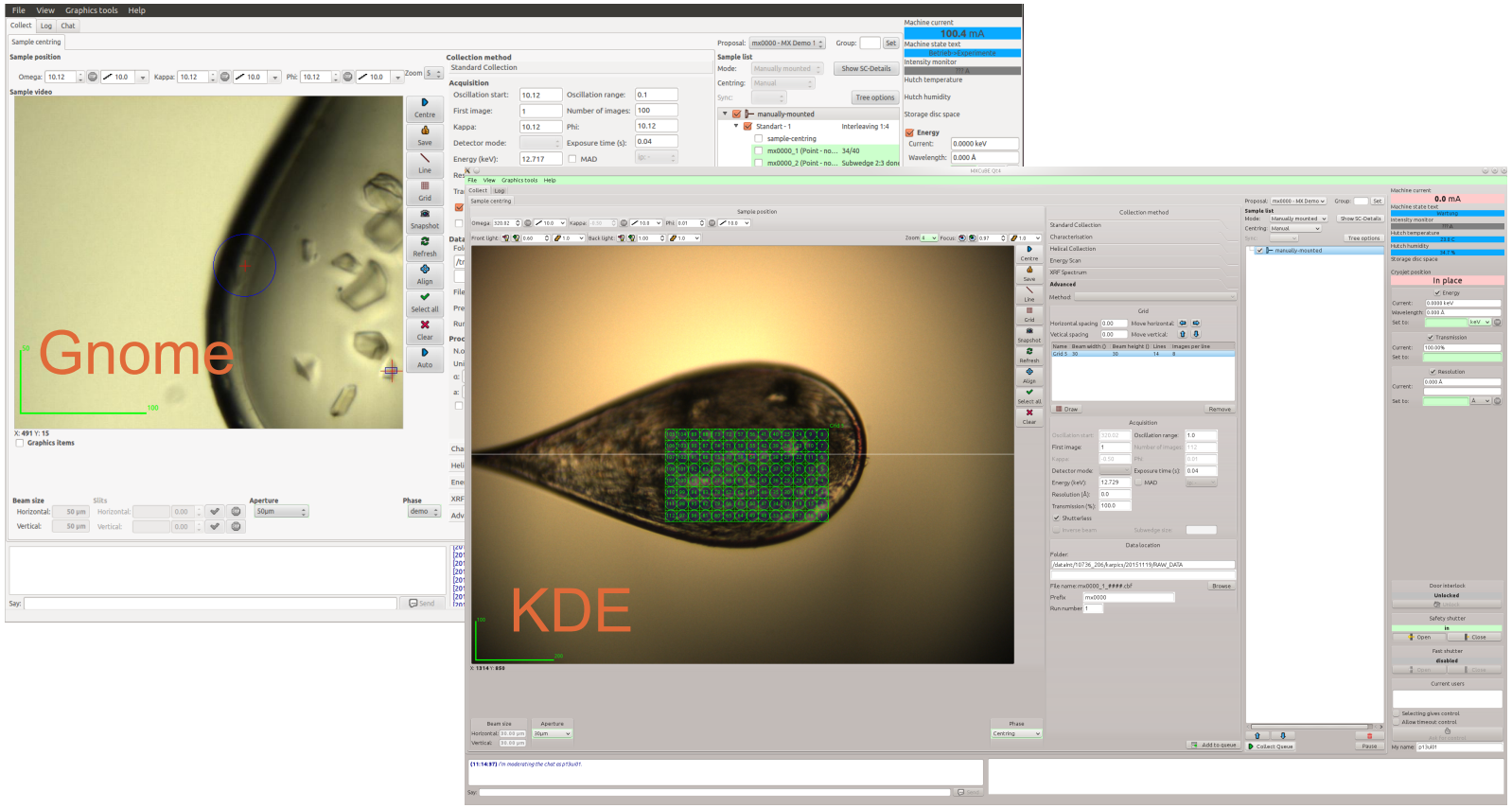






Dependencies

1. ubuntu 12, 14, (15), macos,
2. python and PyQt4 comes with ubuntu
3. sudo apt-get install python-gevent, python-louie, python-suds, python-numpy, python-scipy, python-matplotlib, pymca
5. get code from git and run



Conclusion

1. Qt4 version allows easy to implement new features and advanced methods like interleaved collections, mesh scans, x-ray centring and others.
2. Qt4 is well documented and supported.
3. Reduced list of dependencies comparing Qt3 version.
4. Integrated matplotlib for scientific data plotting.

Future:

1. Full migration to Qt4 has been started.
2. No more new features to Qt3 bricks.
3. Qt4 version as a desktop version and possibly web version for remote access.
4. Running code from and synch with git (lesson learned with 2 reps).
5. Bug reports and feedback are welcome!

Thank you for your attention