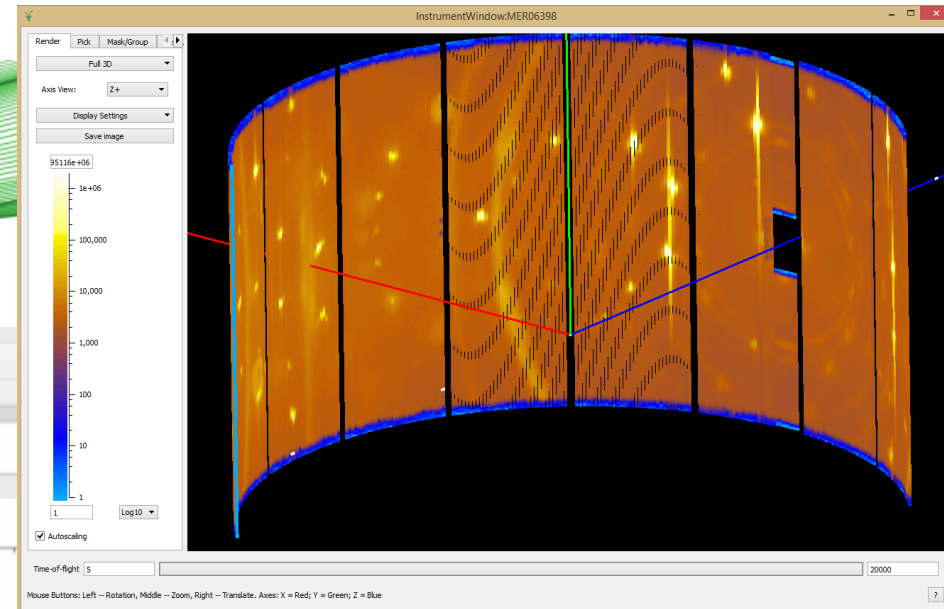
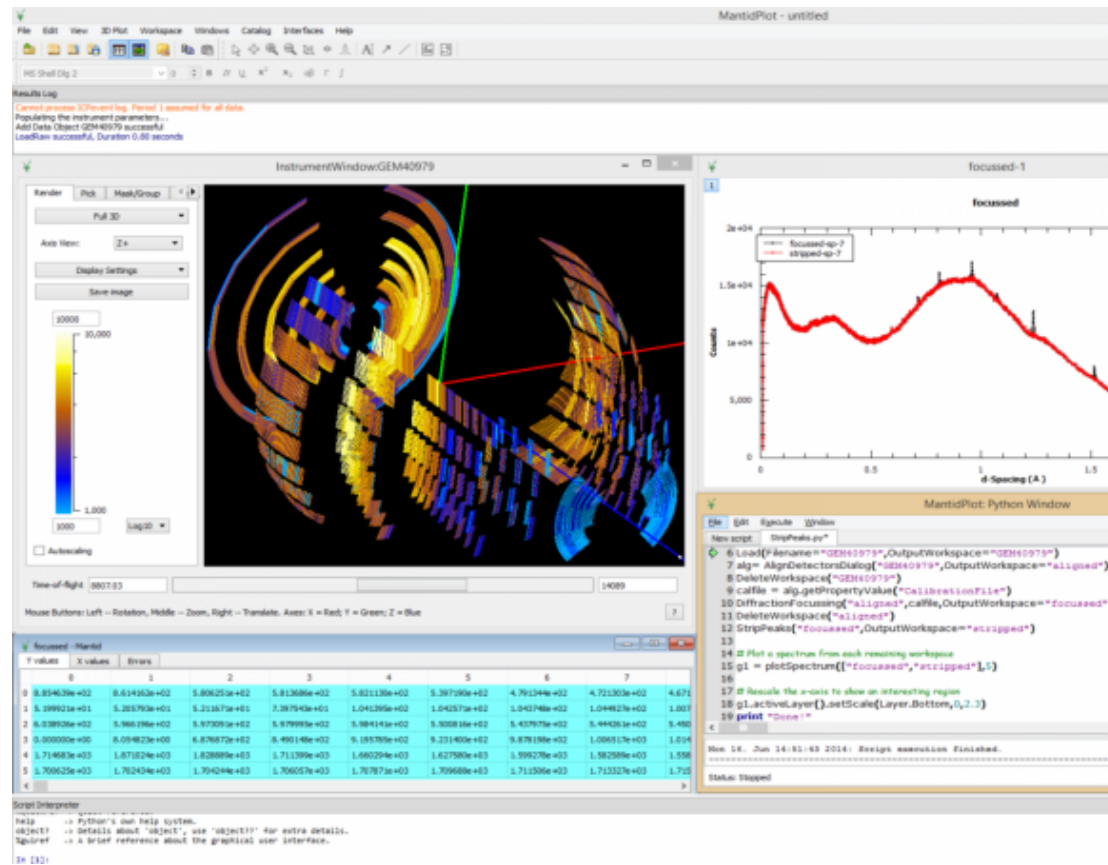
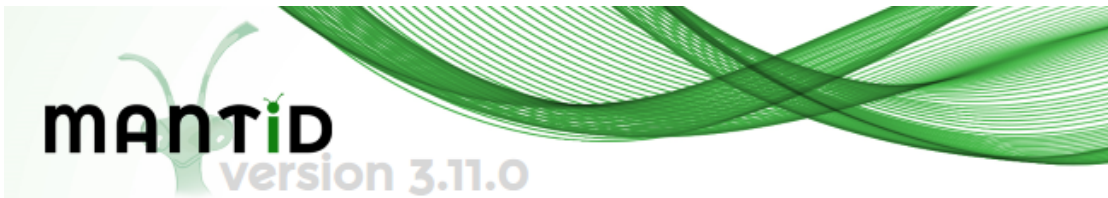


Introduction to neutrons

What happens to data?



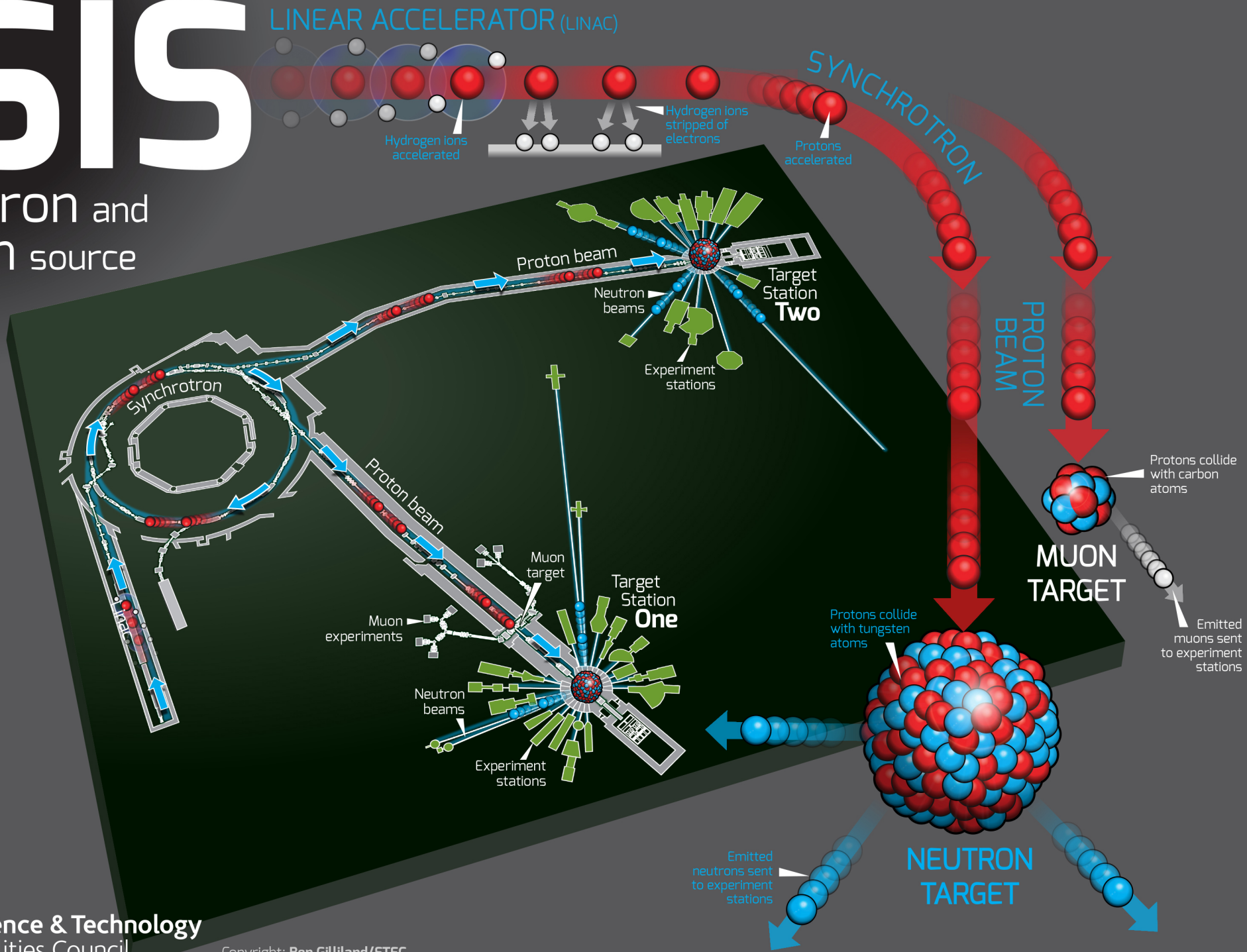
```
File Edit Shell Runspace Window Catalog Interfaces Help
MantiPlot: Python Window
New script StripPeaks.py
6 Load(filename="GEM40079",OutputWorkspace="GEM40079")
7 alg= algDetectorDialog("GEM40079",OutputWorkspace="aligned")
8 DeleteWorkspace("GEM40079")
9 callie = alg.getPropertyValue("CallieBeamFile")
10 DiffractionFocusing("aligned",callie,OutputWorkspace="focused")
11 DeleteWorkspace("aligned")
12 StripPeaks("focused",OutputWorkspace="stripped")
13
14 # Plot a spectrum from each remaining workspace
15 g1 = plotSpectrum(["focused","stripped"],5)
16
17 # Rescale the x-axis to show an interesting region
18 g1.activeLayer().setScale(Layer.Bottom,0.2,3)
19 plot("Done")
Mon 18 Jun 14:01:43 2014: Script execution finished.
Status: Stopped
```

The screenshot shows the Algorithms panel in MantiPlot. It contains a list of algorithms and their descriptions:

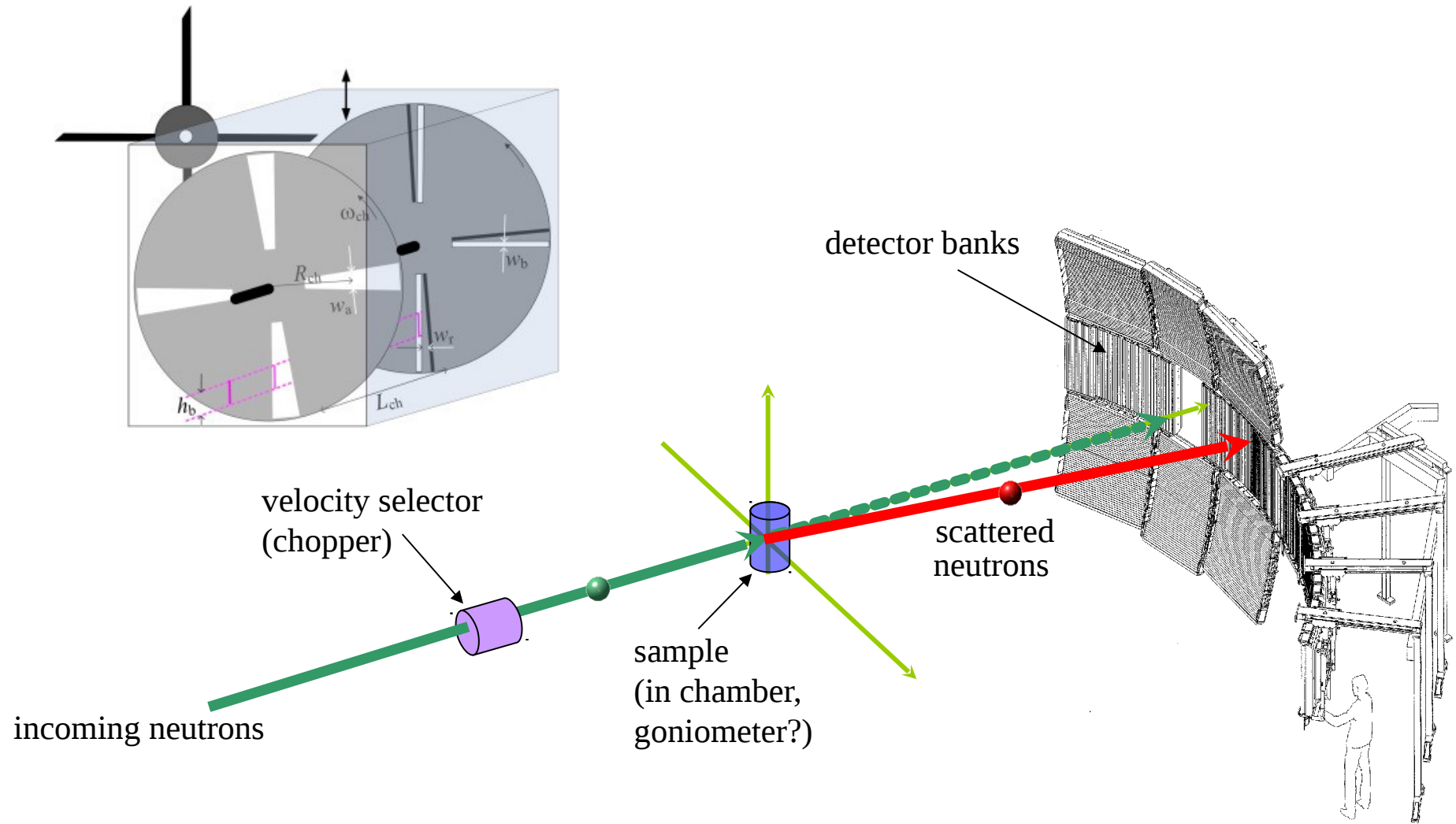
- Arithmetic
- CorrectionFunctions
- Crystal
- DetectorDialog
- Diagnosica
- Diffraction
- Events
- Filtering
- Inelastic
- MCAlgorithms
- Muon
- Optimization
- PythonAlgorithms
- Quantification
- Reflections
- Rescale
- SHQ
- Simple
- Transforms
- Utilities

ISIS

Neutron and Muon source



Instrument



Data

Metadata

User, experiment title

Source

Proton charge

Veto?

Neutron detection events

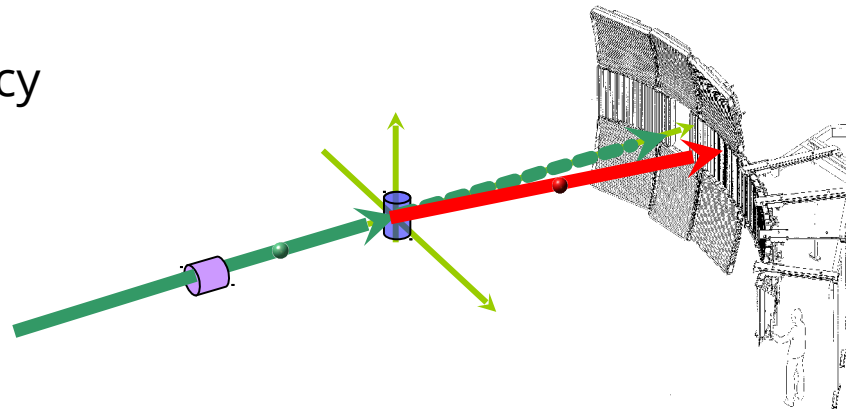
Detector IDs, timestamps

Monitors

Chopper

Phase and frequency

Veto?



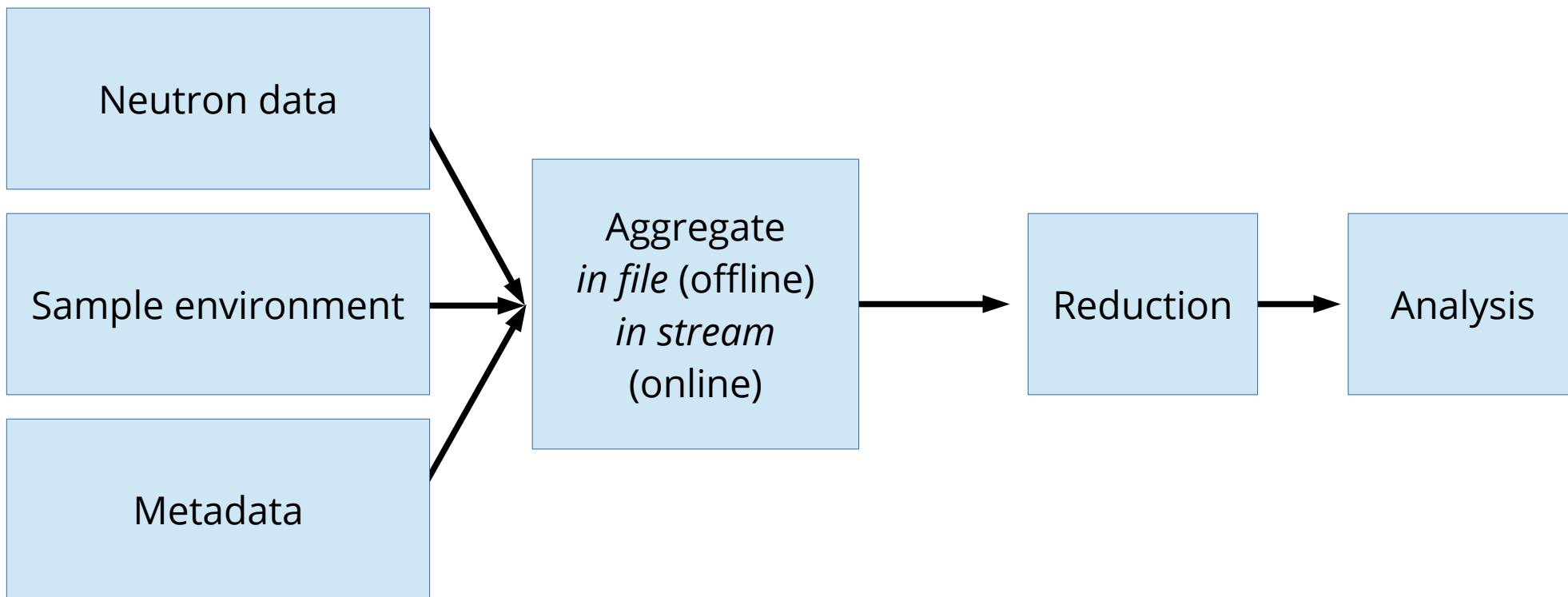
Geometry

Position (translation stages),
angle (goniometers)

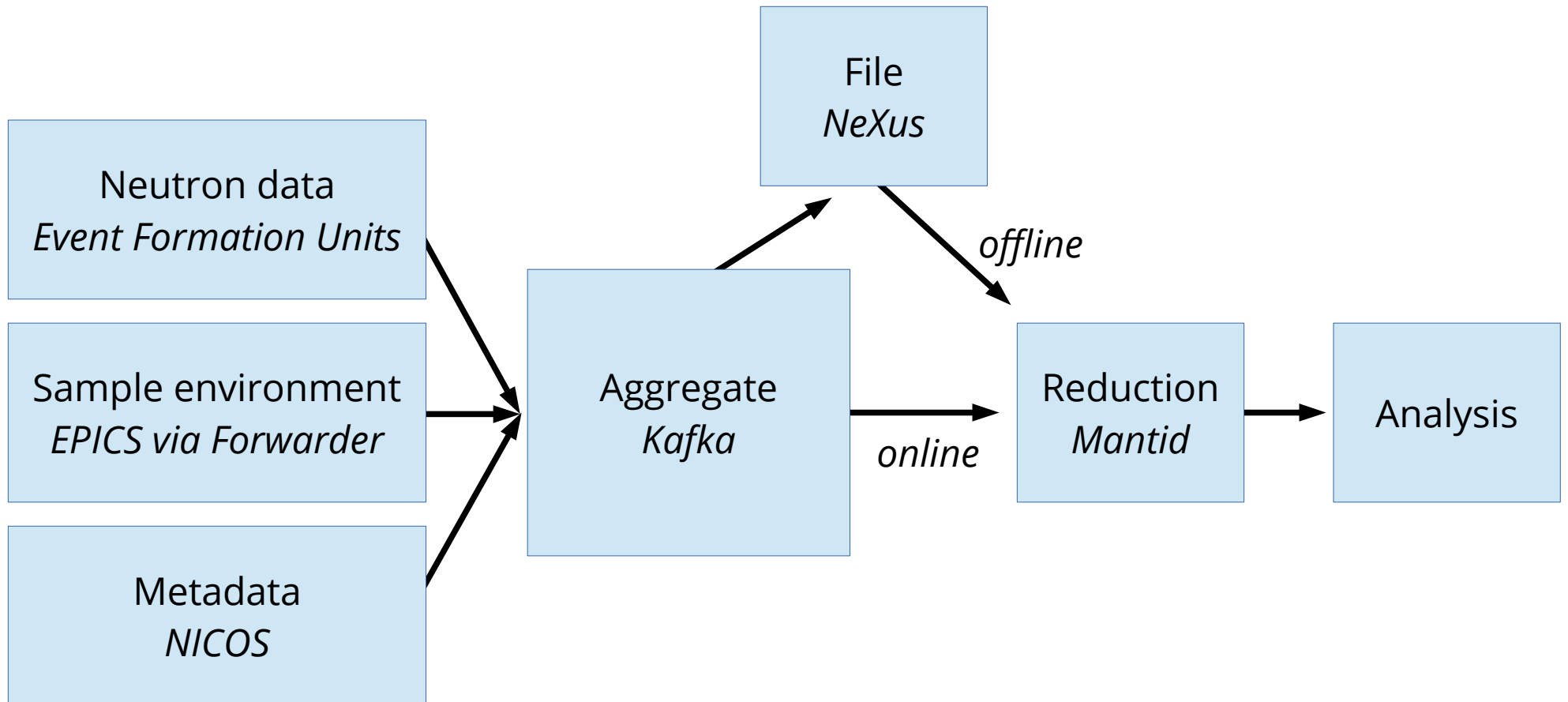
Sample environment

Temperature, pressure, field?

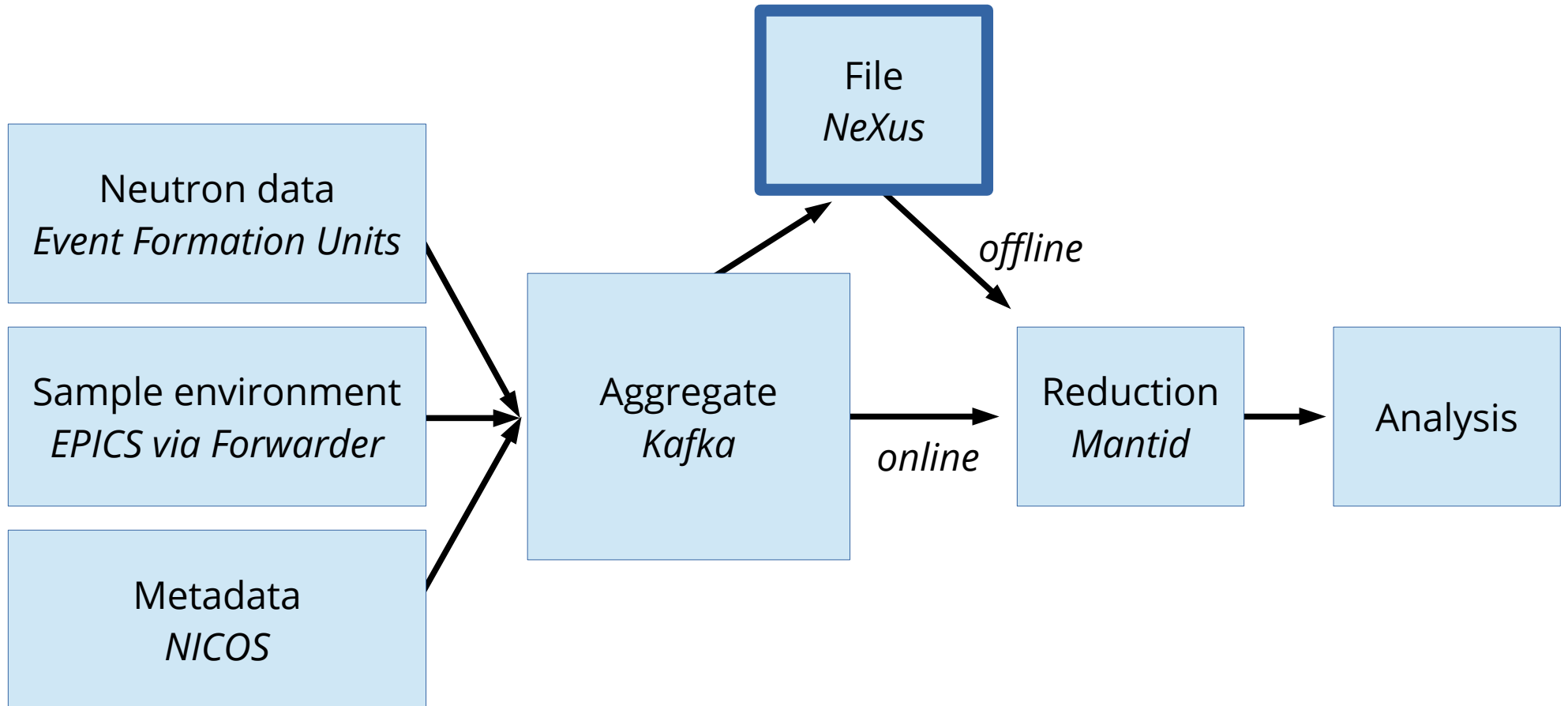
Data Pipeline



Data Pipeline - ESS

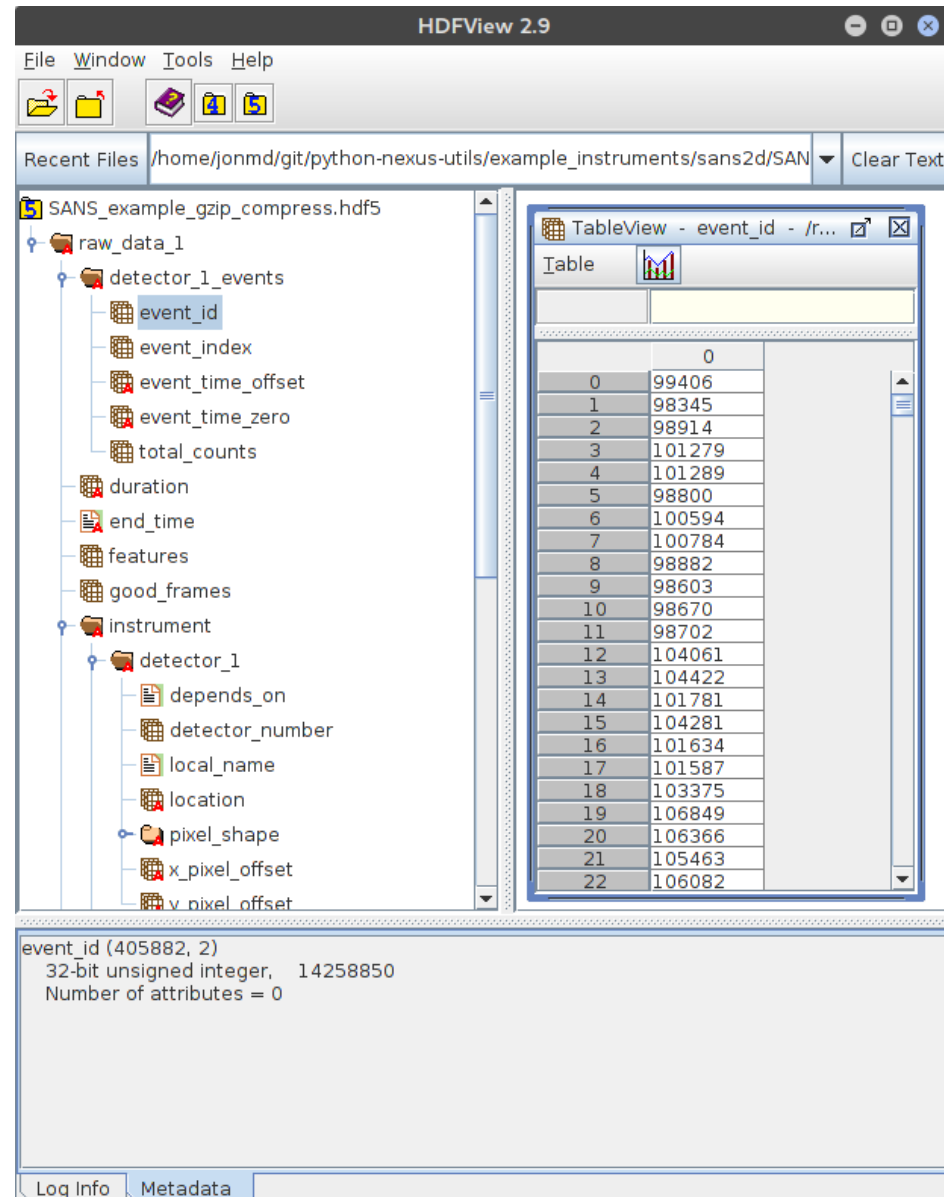


Data Pipeline - ESS



NeXus

- **Hierarchical Data Format**
 - Groups + datasets : directories + files
 - Datasets can have attributes
 - Compression
- NeXus classes for all data: geometry, events, sample env logs, metadata, etc



The screenshot shows the HDFView 2.9 interface. The main window displays a hierarchical tree of data for the file 'SANS_example_gzip_compress.hdf5'. The tree structure is as follows:

- raw_data_1
 - detector_1_events
 - event_id
 - event_index
 - event_time_offset
 - event_time_zero
 - total_counts
 - duration
 - end_time
 - features
 - good_frames
 - instrument
 - detector_1
 - depends_on
 - detector_number
 - local_name
 - location
 - pixel_shape
 - x_pixel_offset
 - y_pixel_offset

A 'TableView' window is open, displaying a table of event IDs. The table has two columns: 'event_id' and 'value'. The data is as follows:

event_id	value
0	99406
1	98345
2	98914
3	101279
4	101289
5	98800
6	100594
7	100784
8	98882
9	98603
10	98670
11	98702
12	104061
13	104422
14	101781
15	104281
16	101634
17	101587
18	103375
19	106849
20	106366
21	105463
22	106082

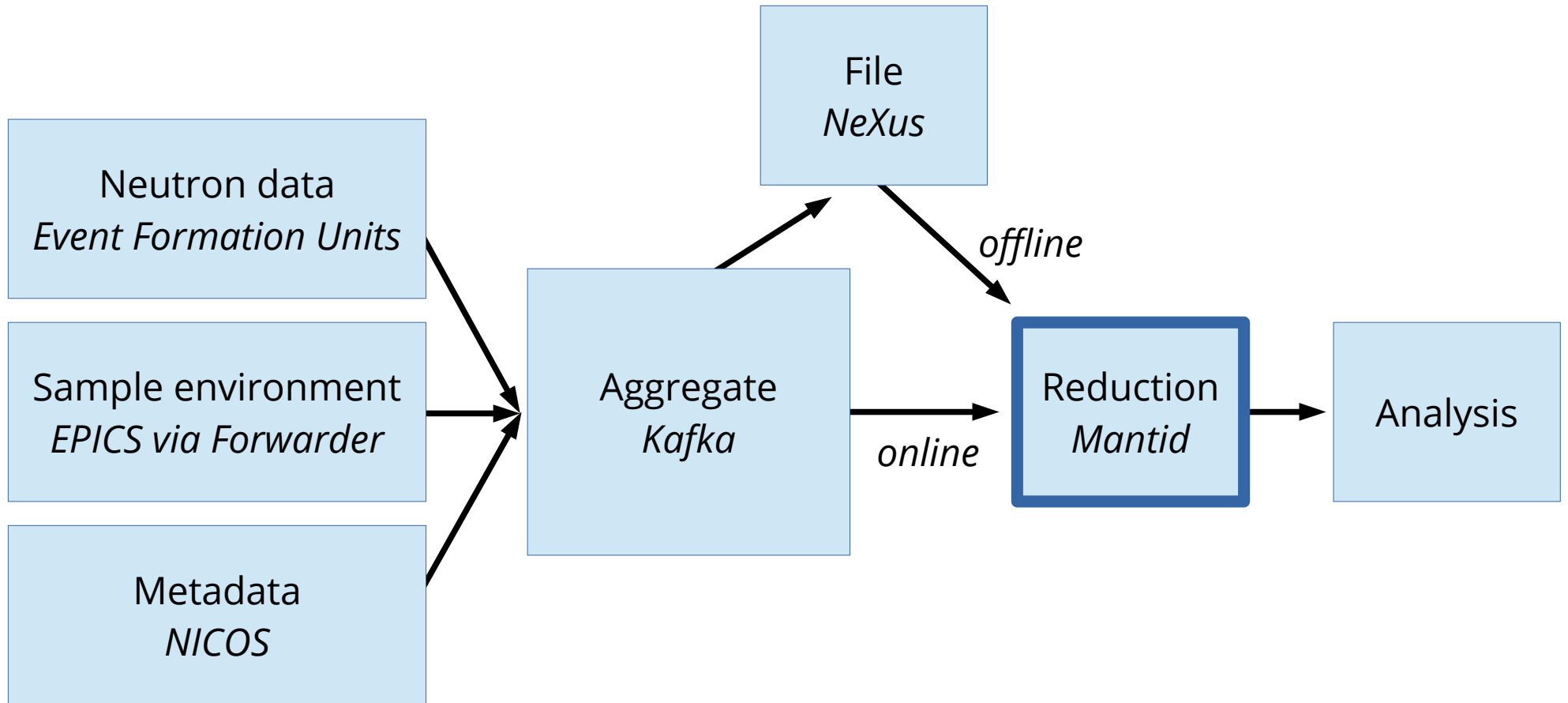
The bottom panel of the window shows the metadata for the selected 'event_id (405882, 2)'. The metadata is as follows:

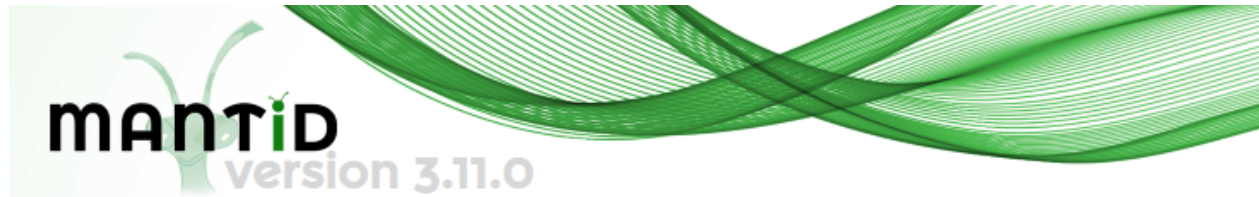
```
event_id (405882, 2)
32-bit unsigned integer, 14258850
Number of attributes = 0
```


NeXus

- Documentation:
http://download.nexusformat.org/sphinx/classes/base_classes/
- Tools (<https://github.com/nexusformat>):
 - Features (example code)
 - Validator
 - API (Python - <https://github.com/nexpy>)

Data Pipeline - ESS





Mantid is a freely redistributable, open source, cross-platform, data reduction and analysis framework for neutron scattering and muon experiments.

Partners:



Contractor:



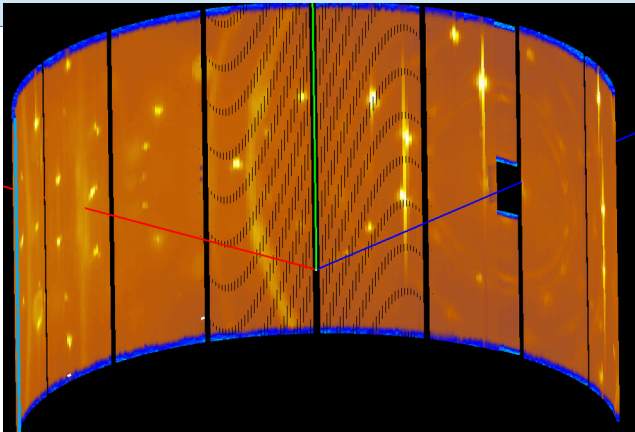
Contributors:



Reduction

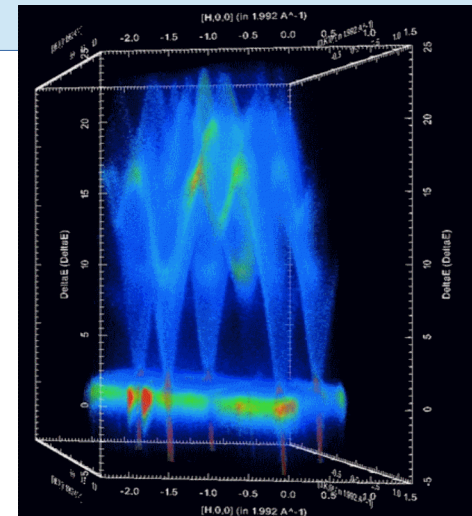
Raw data

- Neutron events (detector IDs and timestamps)
- Sample environment logs
- Metadata
- *Measurement artefacts*



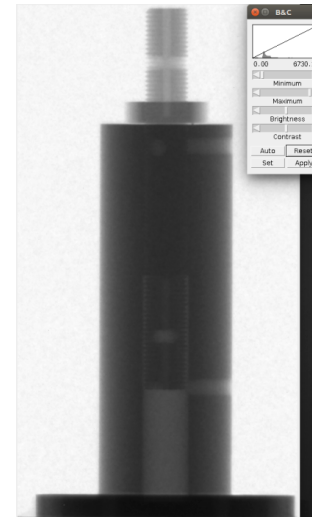
Reduced data

- Parameters space of interest, for example momentum transfer, reciprocal space, etc
- Scientific units
- Cropped to region of interest
- Measurement artefacts removed

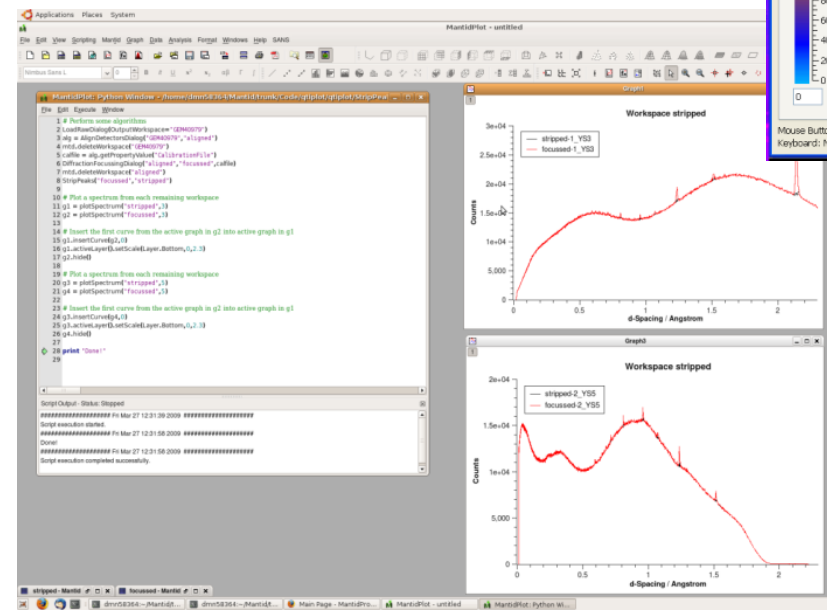
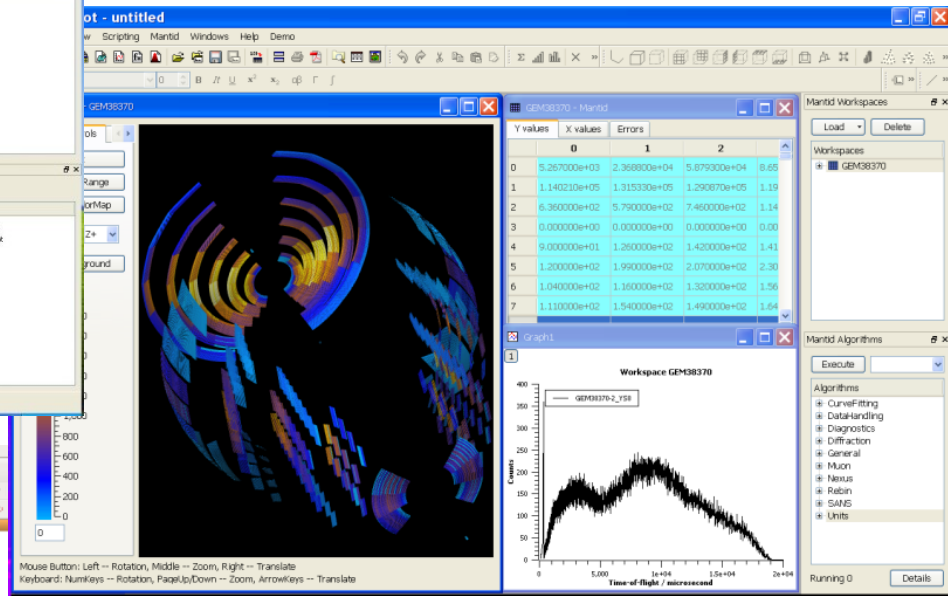
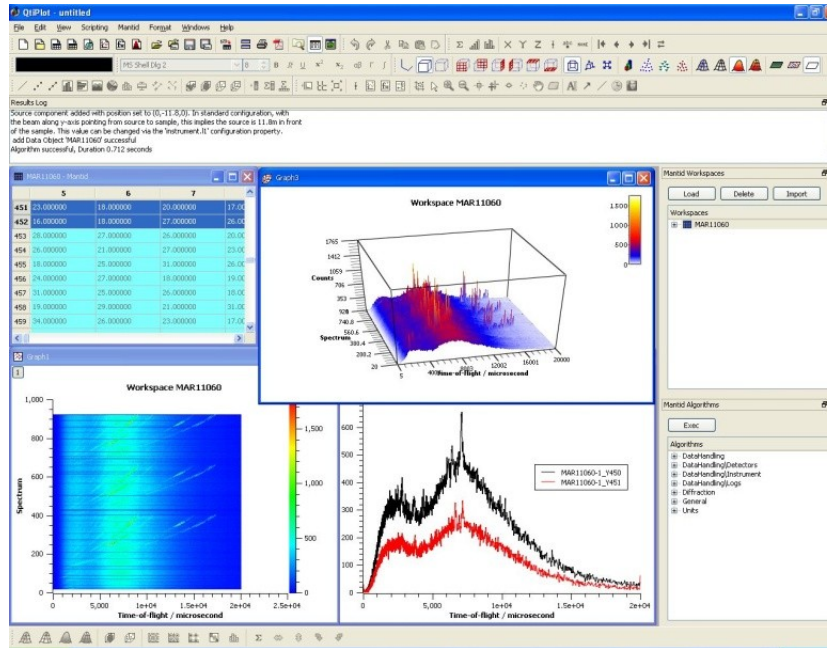


Measurement artefacts

- Normalisation – based on charge or monitor
- Remove background
- Ignore (mask) noisy or dead pixels
- Detector efficiency vs wavelength
- Incident beam vs wavelength



MantidPlot

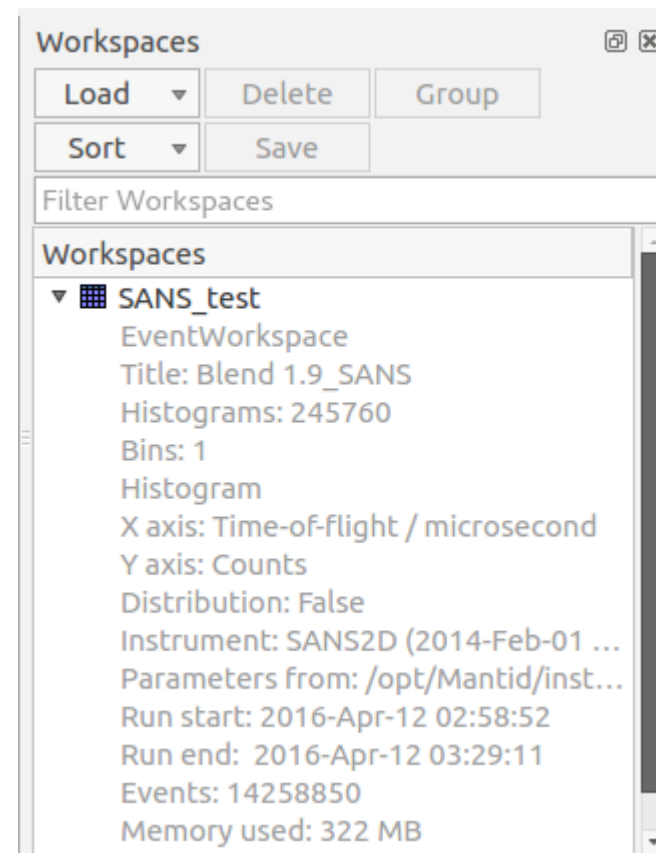


Mouse Button: Left -- Rotation, Middle -- Zoom, Right -- Translate
 Keyboard: NumKeys -- Rotation, PageUp/Down -- Zoom, Arrowkeys -- Translate



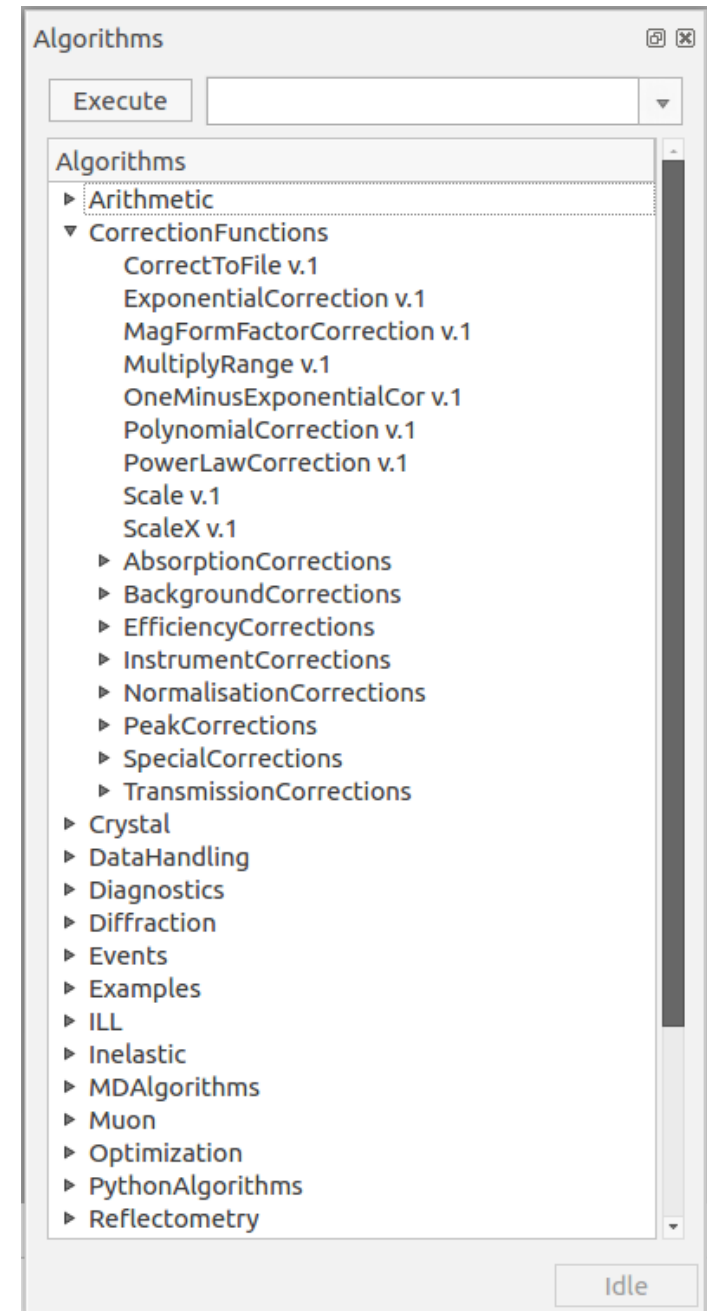
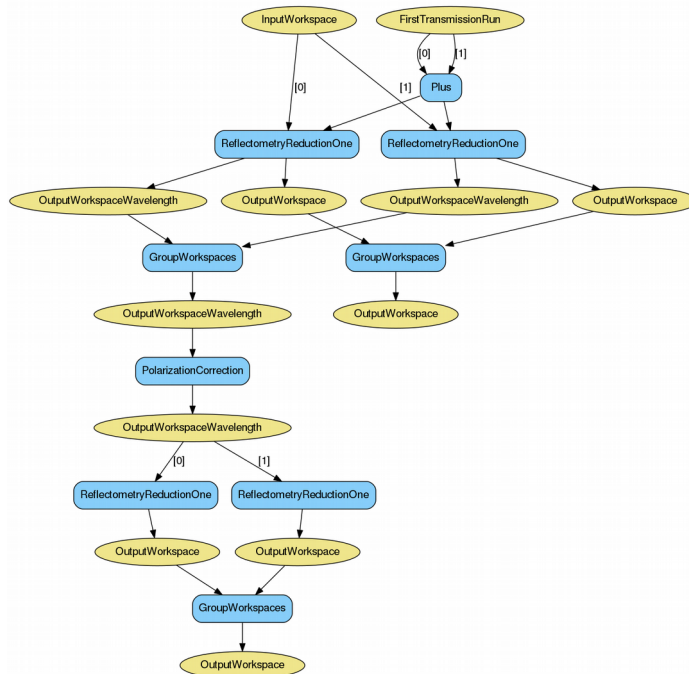
Workspaces

- Data structure for all data required to carry out reduction and analysis
- Different types, for example EventWorkspace
- Workspaces created by:
 - loading data from file,
 - accumulating data from network stream,
 - programmatically, for example from NumPy arrays, algorithms...



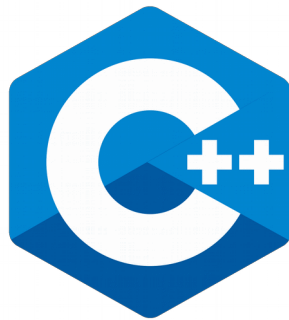
Algorithms

- Input workspace -> output new workspace or in-place
- Workflow algorithms – complete reduction workflow



Python API

- Implemented in C++ with Python interface



- IPython and script editor windows in MantidPlot

```
Script Interpreter
Jupyter QtConsole 4.2.1
Python 2.7.12 (default, Nov 20 2017, 18:23:56)
Type "copyright", "credits" or "license" for more information.

IPython 5.1.0 -- 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]:
```