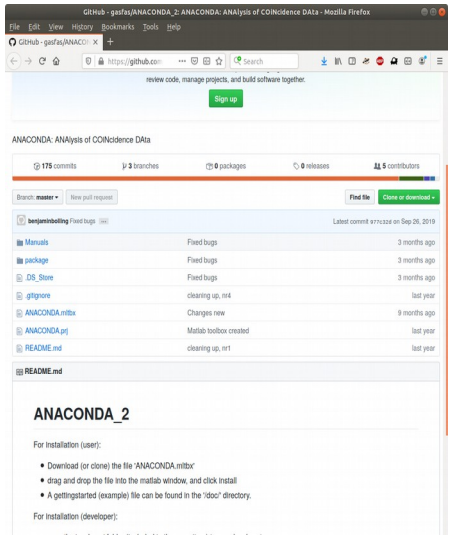
Short tutorial on ANACONDA, v2

- Installation
- Step-to-step through routines
- future merging with HDF5/MAX IV

Installation (as user)

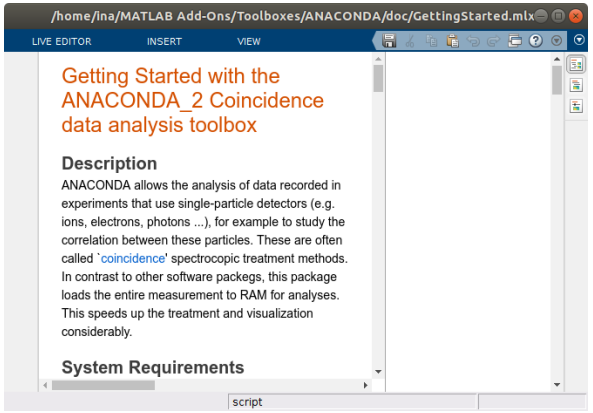
- **Download (clone) from GitHub:**

https://github.com/gasfas/ANACONDA_2



- **D&D in MATLAB cmd window**

- **Open ‘GettingStarted.mlx’,**
  or ‘GettingStarted_plain.m’

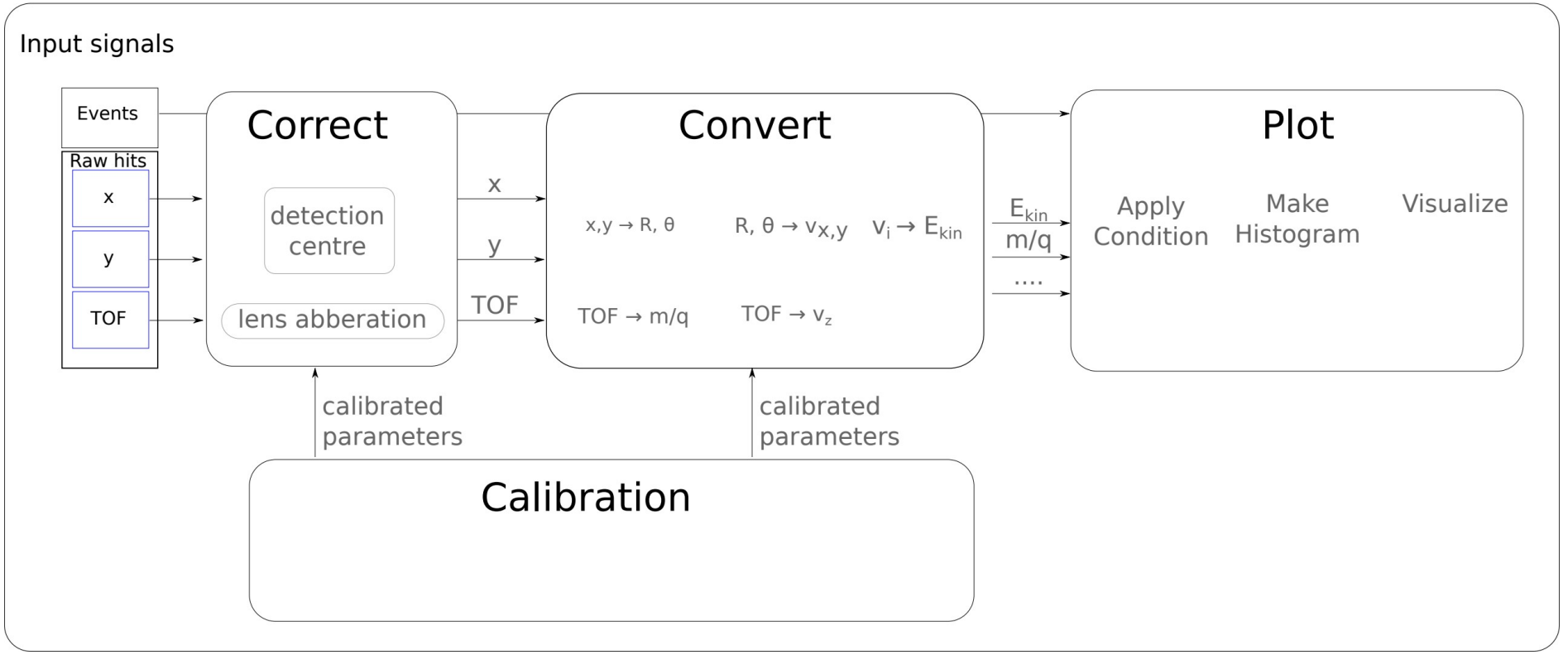


- **Run it, enjoy the errors…**

Installation (as dev)

- Install github desktop
- Clone from repository
- Request developer permissions

Data analysis structure



Macro: function that executes subroutines.
One macro for each step: Correct, convert, plot, etc.

Importing (meta) data

Load data:

data = IO.import_raw('full data filename')

And metadata:

mdata = IO.import_metadata('full metadata filename')

If you have no data at hand, use an example:

data = IO.COBOLD.import_example();

If metadata is not yet defined: default metadata is defined in the toolbox for each setup. e.g.:

mdata = metadata.defaults.exp.CIEL.md_all_defaults

Quick visualization of imported data

Make histogram of X,Y:

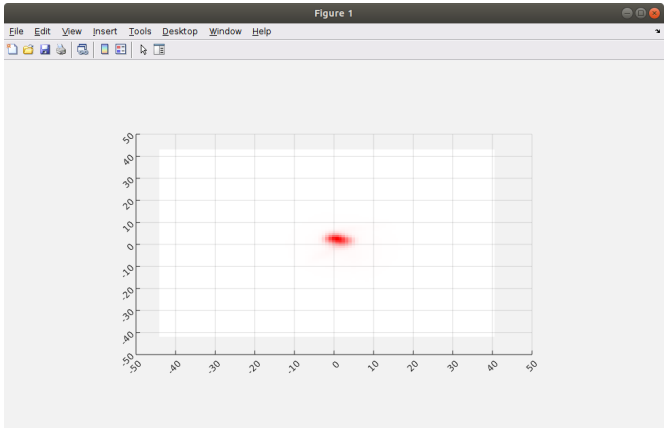
plot.quickhist(data.h.det1.raw(:,1:2))

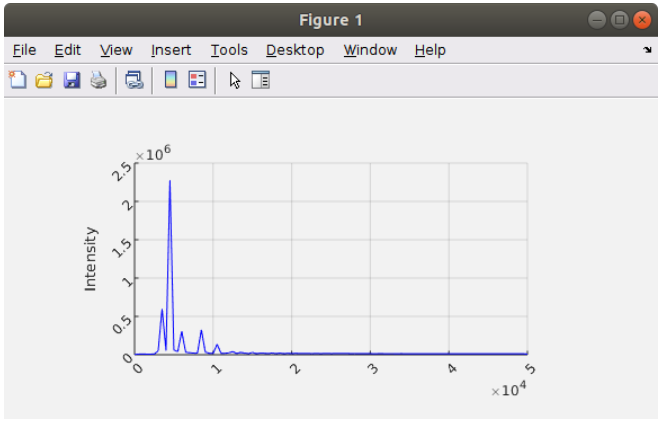
Make histogram of TOF:

plot.quickhist(data.h.det1.raw(:,3))

Inspect any function:

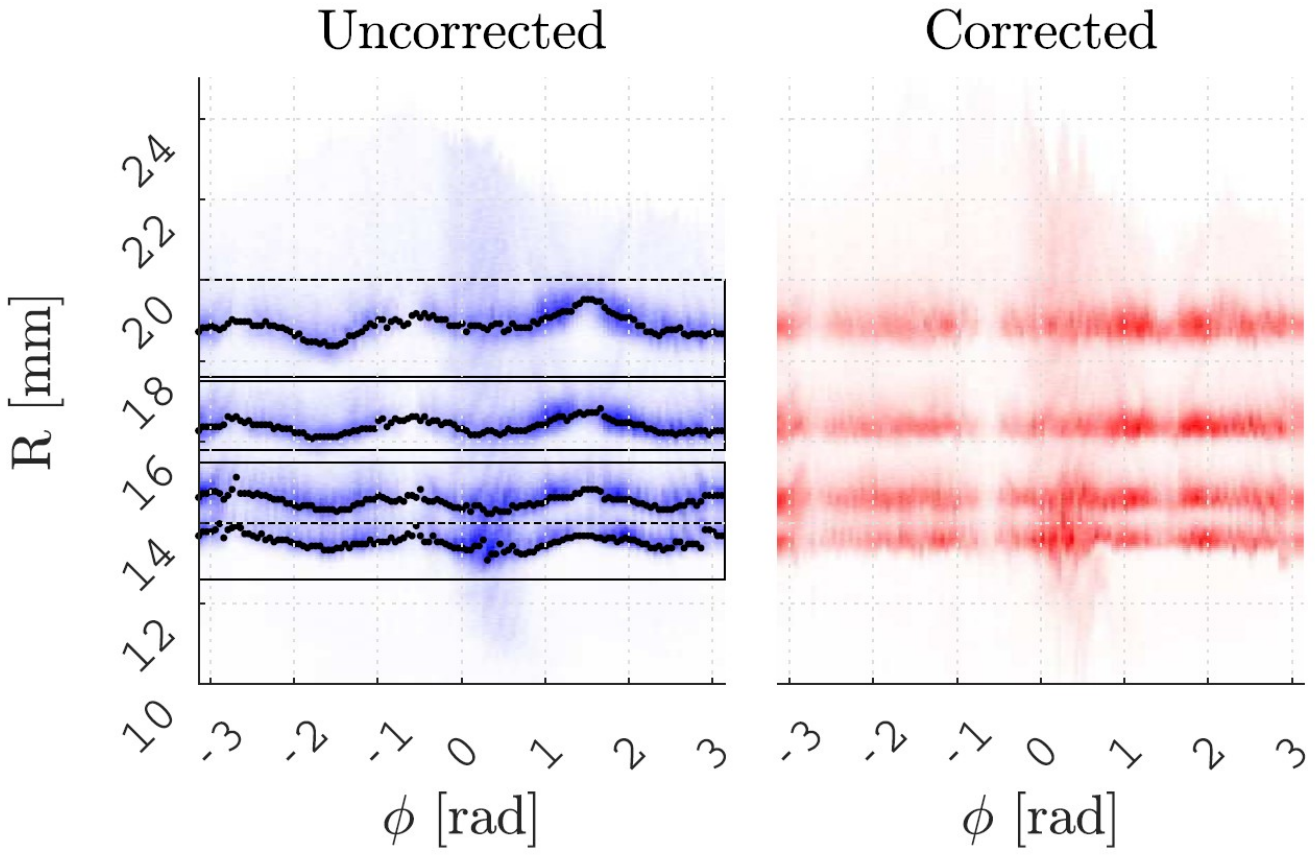
edit *macro.calibrate.TOF_2_m2q*





Correct data (t_0, abberations, etc.)

To handle alignment or artefacts issues



Correct data (t_0, abberations, etc.)

To handle alignment or artefacts issues

Calibration needed to determine the correction values (as defined in metadata)

For example to centre detector:

data_correct = macro.correct.dXdY(data, mdata, ‘det1’);

Or to deal with a spectrometer abberation:

data_correct = macro.correct.lensadd(data, mdata, ‘det1’)

On/off ‘flags’

Corrections can be turned on or off in metadata:

/home/ina/Documents/Lund/ANACONDA_2_git/ANACONDA_2/package/+metadata/+defaults/+exp/+Laksman_TOF_e_XY/corr....

EDITOR PUBLISH VIEW

```
1   function [ exp_md ] = corr ( exp_md )
2   % This convenience funciton lists the default correction metadata, and can be
3   % read by other experiment-specific metadata files.
4   %% Correction parameters:
5   % Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1
6   % Which corrections should be performed on the data:
7   exp_md.corr.det1.ifdo.dXdY          = true;% Does this data need detector image translation correction?
8   exp_md.corr.det1.ifdo.dTheta        = true;%; % Does this data need detector image rotation correction?
9   exp_md.corr.det1.ifdo.dTOF          = true;% Does this data need detector absolute TOF correction?
10  exp_md.corr.det1.ifdo.R_circle      = true;% is there non-roundness in the cylindrically symmetric data?
11
12  % The detector image translation parameters:
13  exp_md.corr.det1.dX                 = 0.0;   %[mm] distance the center of detection is displaced left of the or
14  exp_md.corr.det1.dY                 = 0.0;   %[mm] distance the center of detection is displaced up the origin
15  % The detector image rotation parameters:
16  exp_md.corr.det1.dTheta             = 0;   %[deg] rotation of hits around the raw image centre (anticlockwise);
17  % The TOF deadtime correction parameter:
18  exp_md.corr.det1.dTOF               = 0;% [ns] The difference between signal propagation times of trigger and h
19
20  exp_md.corr.det1.R_circle           = load(fullfile(fileparts(mfilename('fullpath')), 'R_circle_param.mat'));
21
22  % Detector 2 %% Detector 2 %% Detector 2 %% Detector 2 %% Detector 2 %% Detector 2 %% Detector 2 %% Detector 2
23
24  % Which corrections should be performed on the data:
25  exp_md.corr.det2.ifdo.dXdY      = true;% Does this data need detector image translation correction?
26  exp_md.corr.det2.ifdo.dTheta        = true;%; % Does this data need detector image rotation correction?
```

corr Ln 5 Col 7

On/off ‘ifdo’ flags

These flags exist for the macros:

- Correct
- Convert
- Plot
- Filter

Convert (X, Y, TOF, etc.) to (m, p_x, etc.)

/home/ina/Documents/Lund/ANACONDA_2_git/ANACONDA_2/package/+metadata/+defaults/+exp/+Laksman_TOF_e_XY/conv.m

EDITOR PUBLISH VIEW

```
1  function [ exp_md ] = conv ( exp_md )
2  % This convenience funciton lists the default conversion metadata, and can be
3  % read by other experiment-specific metadata files.
4
5  %% Conversion factors:
6  % Which conversions should be performed on the data:
7
8  exp_md.conv.det2.ifdo.m2q                    = true;% Does the user want to convert to mass-over-charge?
9  exp_md.conv.det2.ifdo.m2q_label              = true; % Does the user want to convert to mass-2-charge labels
10 exp_md.conv.det2.ifdo.m2q_group_label        = true; % Does the user want to convert to mass-2-charge groups
11 exp_md.conv.det2.ifdo.cluster_size           = false;% Does the user want to convert to cluster size?
12 exp_md.conv.det2.ifdo.momentum               = true;% Does the user want to convert to momentum?
13 exp_md.conv.det2.ifdo.KER                    = true;% Does the user want to convert to Kinetic energy?
14 exp_md.conv.det2.ifdo.R_theta                = true;% Does the user want to convert to R-theta coordinates?
15 exp_md.conv.det2.ifdo.angle_p_corr_C2        = true;% Does the user want to calculate mutual momentum angles
16 exp_md.conv.det2.ifdo.angle_p_corr_C3        = true;% Does the user want to calculate mutual momentum angles
17 exp_md.conv.det2.ifdo.q_label                = false;% Does the user want to convert to have q-labels define
18 exp_md.conv.det2.ifdo.CSD                    = false;% Does the user want to convert to CSD?
19 % Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1 %% Detector 1
20
21 % Time Of Flight to Mass to Charge calibration
22 exp_md.conv.det2.m2q.factor         = 962.3;%Conversion factor from mass 2 charge to TOF
23 exp_md.conv.det2.m2q.t0             = 20.5;%[ns] dead time correction
24
25 % Mass to charge to Mass to Charge labels
```

Ln 1 Col 1

Filter on hits:

Filters are formed from *conditions*. e.g.:

```
cond.oil.data_pointer                    = 'h.det1.m2q_l';
```

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```
cond.oil.data_pointer          = 'h.det1.m2q_l';
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cond.oil.value                 = [72; 73];
```

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```
cond.oil.data_pointer          = 'h.det1.m2q_l';
cond.oil.type                  = 'discrete';
cond.oil.value                 = [72; 73];
cond.oil.translate_condition   = 'AND';
```

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```
cond.oil.data_pointer          = 'h.det1.m2q_l';
cond.oil.type                  = 'discrete';
cond.oil.value                 = [72; 73];
cond.oil.translate_condition   = 'AND';
cond.oil.invert_filter         = true;
```

Filter on hits:

Data pointer could be any MATLAB expression:

```
cond.m2q.data_pointer    = 'h.det1.m2q_l.*h.det1.TOF+1';
cond.m2q.type            = 'discrete';
cond.m2q.value           = [72; 73];
cond.m2q.translate_condition = 'AND';
cond.m2q.invert_filter   = true;
```

Filter on hits:

The 1st and/or 2nd and/or 3rd hit can be selected:

```
cond.m2q.data_pointer    = 'h.det1.m2q_l.*h.det1.TOF+1';
cond.m2q.type            = 'discrete';
cond.m2q.value           = [72; 73];
cond.m2q.translate_condition = 'AND';
cond.m2q.invert_filter   = true;
cond.m2q.hitselect       = [1, 3];
```

Filter on events:

Total Kinetic energy:

```
KER_sum.type         =  'continuous';
KER_sum.data_pointer = 'e.det1.KER_sum';
KER_sum.value        = [0; 80]; % [eV]
```

Merging of conditions:

When merging filters, operators can be defined:

```
cond.combined.m2q       = m2q
cond.combined.oil       = oil;
cond.combined.KER_sum   = KER_sum;
cond.combined.operators = {'AND', 'OR'};
```

Making Plots

Metadata separated in categories:

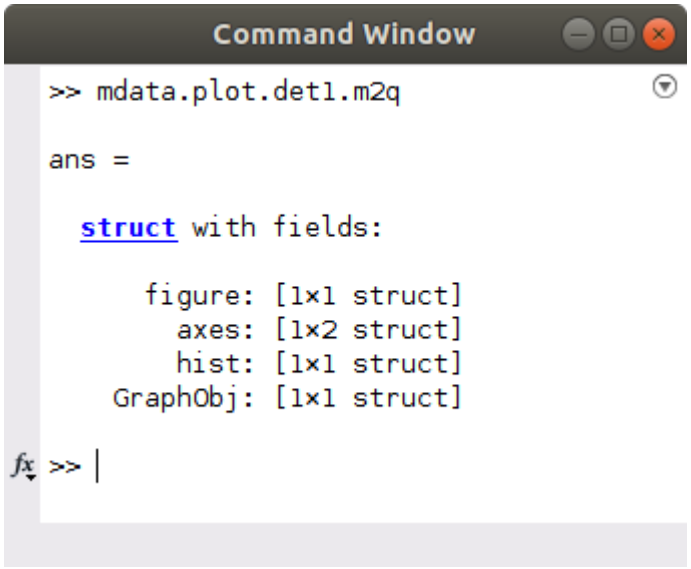
figure: Figure handle properties

axes: Axes handle properties

hist: Histogram metadata

GraphObj: Graphical Object handle

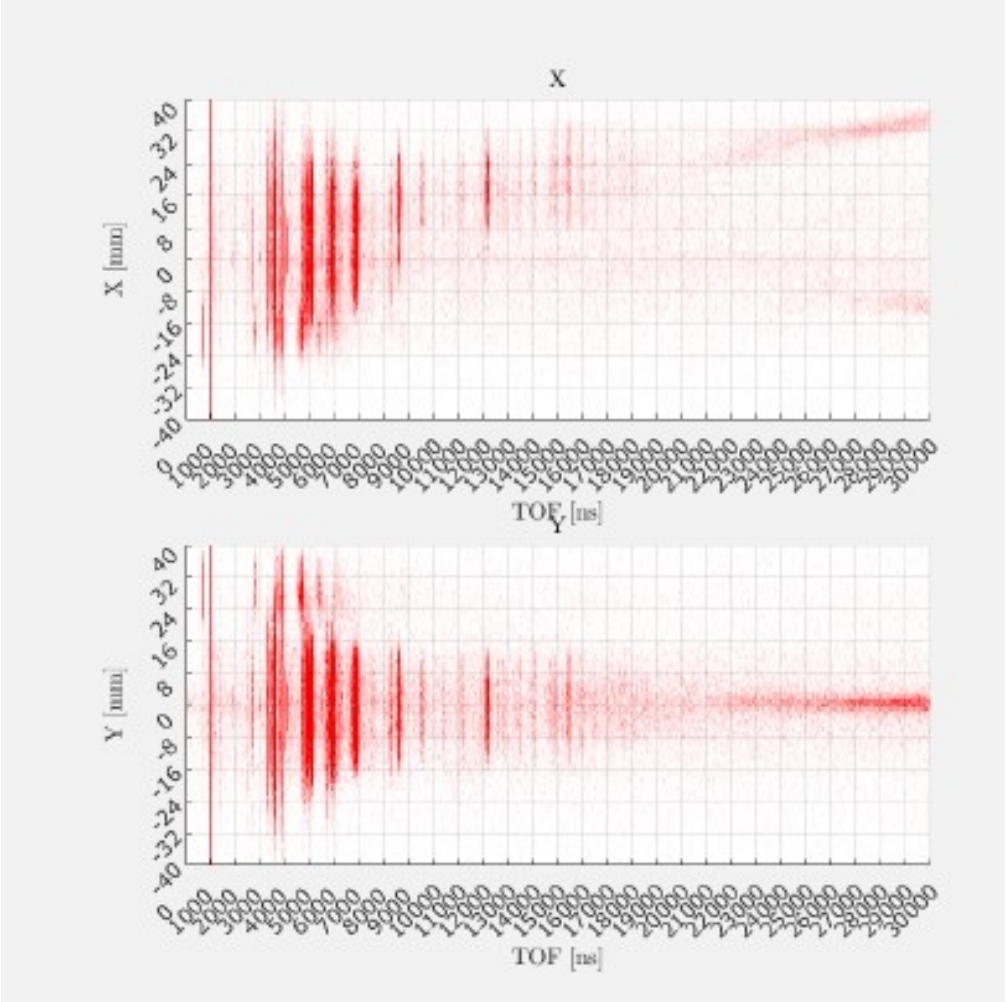
Cond: (optional) plot condition



What are handles?

Calibration

All correction and conversion parameters need calibration.

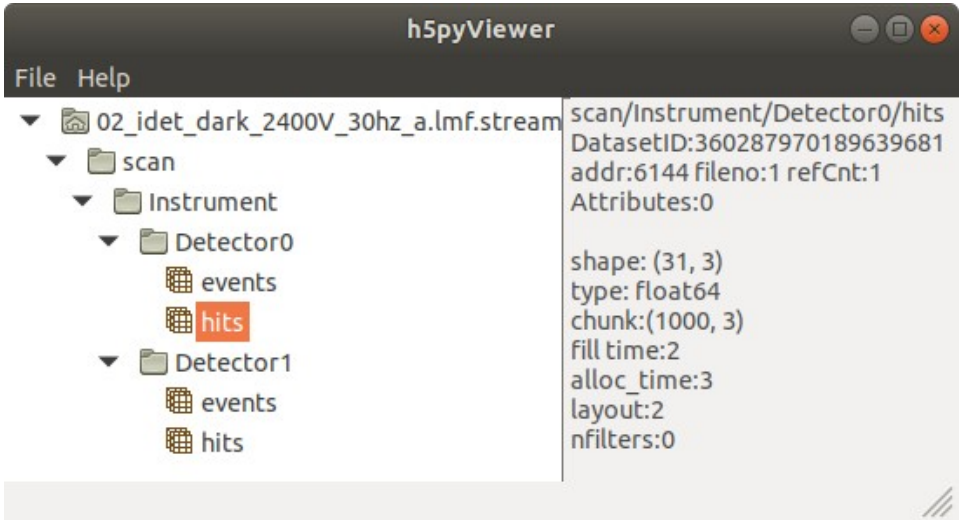


Calibration

Metadata calibration:

macro.calibrate.momentum(data, 1, mdata)

HDF5 dummy file



HDFGridView: events

Edit

	0	1	2
0	1	16374549200	0
1	2	33498408400	1
2	3	36610398800	2
3	4	59108469200	3
4	5	66322050000	4
5	6	75185074000	5
6	7	111851582800	6
7	8	124355662800	7
8	9	127945448400	8
9	10	171710728400	9
10	11	177175048400	10
11	12	187283429200	11
12	13	197100491600	12
13	14	205114933200	13
14	15	212016181200	14
15	16	226913973200	15
16	17	227703774800	16
17	18	228904549200	17
18	19	235725400400	18
19	20	246668731600	19
20	21	291957614800	20
21	22	312806562000	21
22	23	351951115600	22
23	24	358964443600	23
24	25	371575765200	24
25	26	374717800400	25
26	27	397279154000	26
27	28	410704558800	28
28	29	413822053200	29
29	30	434146174800	30

HDFGridView: hits

Edit

	0	1	2
0	14.2357106652	-15.4965712688	0.0
1	-16.4575149984	27.3239613508	0.0
2	25.0500673308	7.32857051426	0.0
3	-9.79397966569	15.1760362528	0.0
4	32.8930096634	9.36751911842	0.0
5	-3.31633399967	9.43021992748	0.0
6	0.0753693333258	0.628233227764	0.0
7	2.53150399975	-0.448619580562	0.0
8	-24.4167613309	16.6469022824	0.0
9	-6.00801666607	-3.63881314366	0.0
10	-37.3707653296	5.99655316627	0.0
11	-1.24335199988	20.8794635264	0.0
12	-8.7081016658	32.1184159752	0.0
13	-34.4201596632	-15.870497322	0.0
14	22.0428933311	20.6355353763	0.0
15	27.5718726639	9.11326621472	0.0
16	24.8353279975	18.8851342777	0.0
17	-22.7428959977	12.1271300985	0.0
18	8.06141733253	-4.75173763778	0.0
19	-29.2130559971	13.5742699217	0.0
20	26.8788703306	20.2742174968	0.0
21	-34.6499339965	-3.2473743269	0.0
22	6.51179566602	26.8627670829	0.0
23	28.4108796638	-7.21351097026	0.0
24	-10.209241999	24.7262613061	0.0
25	20.6262159979	22.4102821781	0.0
26	23.3811866643	-25.7729360194	0.0
27	22.5126859977	-25.8592602666	147.938
28	-23.1197886644	11.7732248183	0.0
29	12.3361506654	-3.3943642237	0.0
30	-31.8734816635	2.03217744101	0.0