

Weekly progress of the IDPE project for TCE

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Weekly progress of the Integrated Data Processing Environment (IDPE) for Time Correlation Experiments (TCE)

2012-11-05 – 2012-11-11 Week progress

A src/PsanaConfigFileGenerator.py
A src/FileNameManager.py
A src/BatchJobPedestals.py
A src/AppDataPath.py
A src/ConfigFileGenerator.py
A src/GUIDark.py
A src/ImgSpeButtons.py
A src/ImgSpeNavToolBar.py
A src/ImgSpeWidget.py
A src/ImgSpeWithGUI.py
A data/scripts/psana-pedestals.cfg
A data/scripts/psana-tahometer.cfg

2012-11-12 – 2012-11-18 Week progress

A src/GUIFileBrowser.py - file browser for text files of this project.

A src/GUIHelp.py - pop-up box with message as a widget.

A src/GUIWorkResDirs.py - separate widget for setting of work and result output directory and common prefix file name.

In src/GUILogger.py and src/Logger.py - now messages are accumulated in 2d tuple. Add filtration by the message type "debug", "info", "warning", etc.

src/GUIFiles.py is significantly re-organized; now it is GUI with tabs.

All significant fields are moved in GUIs like src/GUIDark.py (GUIData, GUIFlat).

src/GUIDark.py - is re-organized.

In the interactive plot:

- In src/ImgSpeWithGUI.py the src/ImgSpeNavToolBar.py - is deprecated
- src/ImgSpeButtons.py - re-organized: add save, reset, and menu buttons, log check-box.
- In src/ImgSpeWidget.py - the log functionality needs to be implemented...

2012-11-19 – 2012-11-25 Week progress

Suggestions from Marcin:

- Time(sec) - should be the averaged time between frame time-stamps.
- Spectral plot: log-scale for X-axis only.
- Flat field and Blamish files will be provided from external apps. No need to evaluate them now. Needs to be selected by the path.
- Substitute the start and end events after the scan.

Progress:

- Restructurization: `tahometer` replaced by `peds_scan`.
- update the start and end fields after scan.
- remove psana log files before job submission in batch.
- the start and end fields are set from `config.pars`, if the scan log-file is available, they are updated from this file.
- reset fields to default if the input xtc file is changed.
- A src/GUIFlatField.py - file selection, plot, browse file
- A src/GUIBlamish.py
- A src/GUIMainTB.py - try different view for composite window
- A src/GUIMainSplit.py - try different view for composite window
- Add psana module: `ImgAlgos::ImgTimeStampList` - creates the time-stamp list and evaluates the mean time between frames and its RMS.
- in GUIDark.py use variables produced by the `ImgAlgos::ImgTimeStampList`.

2012-11-26 – 2012-12-02 Week progress

Suggestions from Marcin:

- Marcin prefers layout with separated GUILogger window, like in GUIMainTB.py
- Need in a tool reporting problems in time-stamp sequence.
- In GUIDark.py - until the total number of events is unknown, use end "-1" and generate a warning if it is submitted in batch for pedestals.
- Add check-box showing if the Blamish and Flat-field files will be applied
- Marcin returned the paper-copy of GUIs with comments about titles and parameters.
- The list of variables for intensity monitor:
 - IPM2 [CH0,...,CH3]
 - IPMMON0 [...]
 - IPM4 [...]
 - IPM5 [...]
 - GASDET [...]
- Needs in separate GUI for intensity monitors for normalization and veto.

Progress:

- In GUIBlamish.py and src/GUIFlatField.py add check-boxes.
- Apply Marcin's comments to GUIs with System, Setup etc. parameters, GUICCDCorrectionSettings.py is removed..
- In src/GUIMainTB.py optimized the GUI sizes.
- Changed names from GUIBatch... to GUISystem...
- New psana module [Psana Module Catalog - Old#Module](#) `ImgAlgos::IntensityMonitorsData`, which gets data for equivalent HDF5 variables:

```
/Configure:0000/Run:0000/CalibCycle:0000/Bld::BldDataFEEGasDetEnergy/FEEGasDetEnergy
/Configure:0000/Run:0000/CalibCycle:0000/Bld::BldDataIpimbV1/XCS-IPM-02
/Configure:0000/Run:0000/CalibCycle:0000/Bld::BldDataIpimbV1/XCS-IPM-mono
/Configure:0000/Run:0000/CalibCycle:0000/Ipimb::DataV2/XcsBeamline.1:Ipimb.4
/Configure:0000/Run:0000/CalibCycle:0000/Ipimb::DataV2/XcsBeamline.1:Ipimb.5
```

in psana they can be accessed as:

```

m_srcFEEGasDetE = configStr("feeSource", "BldInfo(FEEGasDetEnergy)");
m_srcIPM2       = configStr("ipm2", "BldInfo(XCS-IPM-02)");
m_srcIPMMono    = configStr("ipmmmono", "BldInfo(XCS-IPM-mono)");
m_srcIPM4       = configStr("ipm4", "DetInfo(XcsBeamline.1:Ipimb.4)");
m_srcIPM5       = configStr("ipm5", "DetInfo(XcsBeamline.1:Ipimb.5)");

```

and share pointers:

```

shared_ptr<Psana::Bld::BldDataFEEGasDetEnergy> fee = evt.get(m_srcFEEGasDetE);
shared_ptr<Psana::Ipimb::DataV2> data2 = evt.get(m_src); // for m_srcIPM4 and m_srcIPM5
shared_ptr<Psana::Bld::BldDataIpimbV1> ipimb1 = evt.get(m_src_ipimb); // for m_srcIPM2 and m_srcIPMMono

```

- In GUISystemPars: add total number of events and dt+-rms to GUISystemPars.
- In GUIDark: add check-box and file-browser button with complete functionality.
- In GUIDark: add protection for pedestal job submission in batch with default number of events.
- In BatchJobPedestals: add protection against duplicated job submission in batch using timeout (now 100 sec) or until the previous job is DONE.
- In ImgSpeWidget: implemented the log-scale plot with full functionality and protections...

2012-12-03 – 2012-12-09 Week progress

No meeting this week due to experiments in xcs hatch.

Progress:



- In GUIFileBrowser: add one more parameters after the list of files, the file to start browser
- GUIData is implemented with full functionality including
 - check box to activate/protect buttons
 - "File" button and info field - selects the xtc file
 - "Scan" button - submits scanner job in batch which
 1. counts events,
 2. saves in file the time records and evaluate an average interval between frames
 3. saves in file the intensity monitor data
 - "Average" button - submits job in batch for averaging image for the specified range of events
 - "Check status" button - checks the status of both batch jobs, check if the file with averaged image is available, update the info fields for number of events and averaged time between frames
 - "Check files" button - prints the list of work files for data and check their availability
 - "Browse" button - open the file browser with a list of work files for data
 - "img-Plot" button - plots the averaged image from file
 - "t-Plot" button - shows the plot for time records saved in file
 - "Remove" button - removes all work files from the work directory
- GUIIntensityMonitors: GUI for Intensity monitors
- PlotArray.py, PlotArrayButtons.py, PlotArrayWidget.py - plot for array presentation
- PlotTime.py, PlotTimeWidget.py - plot for time records presentation

2012-12-10 – 2012-12-16 Week progress









Q&A Marcin:

- Q: XcsBeamline.2 - is it used simultaneously with XcsBeamline.1 ?
 - A: XcsBeamline.1
- Q: What control parameters should be added for intensity monitors?
 - A: should be added:
 1. radio button for normalization or no-normalization
 2. filter data check box
 3. low-upper amplitude range
- Q: Layout of GUIMainTB.py with variable height, is it ok?
 - A: Looks fine.
- Q: Layout variation for check-box - disappearance of buttons, is it ok?
 - A: Change color of button-titles.
- Q: What image buttons are used as a mask editor etc.
 - A: GUIAnalysisSettings:
 - "MaskPolygon" button - for polygon editor on data image
 - "Show Mask & Partitions" button - shows the mask and partitions on data image

Suggestions from Marcin:

-  Add button to all plots and gui to submit them in ELog.
-  Change log presentation for image histogram - log for vertical scale only.

Progress

-  GUIDark and GUIData - inappropriate change of style for "end" field is fixed
-  GUIDark, GUIData, GUIBlamish, GUIFlatField - have changed behavior for non-active buttons:
 - for now it is set to default - frame of buttons disappeared for non-active
 - GUIFlatField has an example of how to set a dynamic style-sheet for non-default behavior styles
-  PlotImgSpeWidget.py - change log scale from x to y
-  GUIIntensityMonitors.py - add more fields:
 - radio buttons for normalization
 - check boxes for selection
 - edit fields for lmin and lmax values with changing behavior and style depending on radio and check box status. Check them for equity to default and lmin >= lmax
-  Check move window coordinates for plots... Some of them opens in unexpected places.
-  GUILogPostingDialog, GUILogPostingFields, PlotArrayButtons, PlotImgSpeButtons, and GlobalUtils: submission of message with attached plots in ELog
-  Add icons to some of frequently used buttons.
-  Add button for some of GUIs and plots to submit them in ELog.

2012-12-17 – 2012-12-23 Week progress

Q&A Marcin:

- Discuss layout of fields in
 - GUIIntensityMonitors - Is it necessary to use lmax/lmin for normalization?
 - GUILogPostingDialog, GUILogPostingFields - is it consistent with what you want?
- Layout of buttons
 - GUIMainTB - it is possible to change the "buttons with icons and text" -> "buttons with icons" -> "icons". Which style is preferred?
 - GUIDark.py, GUIData.py, etc. - style for active/non-active buttons - just default or add more colors, like in GUIFlatField ?

Progress

- GUIDark and GUIData - add check box for parameters cp.use_dark_xtc_all and cp.use_data_xtc_all with appropriate behavior for check box but_path and edi_path fields. Now, the name of the file for batch job is taken from fnm.path_dark_xtc_cond() and fnm.path_data_xtc_cond(), respectively.
- FileNameManager - fixed a few typos in the file name methods: "dark"->"data"

2012-12-24 – 2013-01-06 Week progress (winter break)

Progress

- GUIRun, GUIRunInfo, GUIRunSplit - new style GUI for the splitting procedure.




2013-01-07 – 2013-01-13 Week progress

Progress

- GUIRunProc, BatchJobCorAna, GlobalUtils

2013-01-14 – 2013-01-20 Week progress

Q&A Marcin:

-  Add lock for ELog submission dialog box
-  Add lock for nparts field in GUIRunInput
-  GUIIntensityMonitors:

- change response on radio button
- short intensity monitor names

Progress

- GUIRunInfo change name to GUIRunInput
- GUIRunProc - is completed
- GUIRunMerge
- GUIRunAuto
- GUILogPostingDialog, GUILogPostingFields - add lock, restructorization for editable fields.
- GUIIntensityMonitors - (1) remove the selection fields style change for radio button, (2) use a list of short intensity monitor names.

2013-01-21 – 2013-02-03 Week progress

Q&A Marcin:

-  Reorganize GUISetupInfoLeft.py for CCD position input in modes: Beam Zero, Specular, and Data

Progress

- ✓ Fixed image partitioning, processing, and merging in `ImgAlgos/src/ImgVsTimeSplitInFiles.cpp`, `CorAnaData.cpp`, and `CorAnaMergeFiles.cpp`
- ✓ Add CCD orientation in `GUICCDSettings`

- CCD is always displayed as a matrix of (row,col) with origin in the top left corner.
- CCD orientation is assumed as entire world is rotated w.r.t. CCD

Work on

- `GUIViewControl.py`
- `GUIViewResults.py`
- `ViewResults.py`
- g2 Normalization - need to use parameters from `GUISetupInfo` etc.
Map evaluation speed in `ViewResults.py` for 1300x1340 img
- x,y maps = 0.02sec
- r map = 0.05sec
- theta map = 0.12sec
- q map = 0.4sec

2013-02-04 – 2013-02-10 Week progress

Progress

Work in progress on

- `GUIViewControl.py`
- `ViewResults.py`
- `PlotG2*.py`

✓ Currently available plots for:

- Raw data maps (tau): $\langle I_p \rangle$, $\langle I_f \rangle$, $\langle I_p * I_f \rangle$, g2-raw
- Geometry maps: X, Y, R, Phi, Q **for direct beam mode**
- Partitioning maps: Phi, Q, Q-Phi maps for *static* and *dynamic* partitions
- Masks: Image limits, blemish, hot pixels, good regions, total
- Calculated maps (tau): **total mask as applied at normalization and for maps**
 - normalization factors $1/\langle I_p \rangle$, $1/\langle I_f \rangle$ for static bins,
 - g2 as a map
 - g2 averaged over dynamic bins
 - g2 for dynamic bins vs tau as a 2D histogram
 - g2(tau) plot for dynamic bins as a set of graphic

Q to Marcin:

- How to calculate angle and Q in reflective geometry?
- Presentation of CCD image and detector orientation issues.

2013-02-11 – 2013-02-17 Week progress

Progress

Work on mask editor application:

- `All Drag*.py`
- `MaskEditor.py`, `MaskEditorButtons.py`

2013-02-18 – 2013-02-24 Week progress

Progress

✓ Mask Editor is completed at 1st approximation. Can be executed as an embedded and standalone application.

- `DragPolyline.py` is added
- Status "button" is added
- finger-pointer for sensitive objects is added
- I/O features are extended to: Load image, Load forms, Save forms, Clear forms, Print forms, Save mask, save Inv-M(mask).
- standalone application `med` is added with a bunch of optional parameters.

2013-02-25 – 2013-03-03 Week progress

Progress

+ Frame orientation in lab x-y coordinates
Use parameters: `cp.y_is_flip.value()` (True) and `cp.ccd_orient.value()`

- Image plot in `PlotImgSpeWidget.on_draw(...)`: flip Y axis in image plot and add rotation
- Mask calculation for figures defined in lab x-y frame: `MaskEditorButtons.get_mask_total()`

- Pixel maps generation in `ViewResults.ccd_pixel_coordinates(sp)`

Q: Is it ok?

- Partition limits for q and ϕ ? Use beam x_0, y_0 and mask total.
- Will use 0-th bin for everything outside the allowed binning area from q
- In Setup Info CCD Image Size: use rows cols, not x, y
- Hot pixel and saturated pixel masks are always on?

2013-03-04 – 2013-03-10 Week progress

Progress

- `GUIViewControl.py` - hide/show more result buttons
- `ImgAlgos::ImgMaskEvaluation` - evaluate hot and saturated pixel masks
- Integrate `ImgMaskEvaluation` module in configuration file
- `ImgAlgos::ImgCalib`, `ConfigFileGenerator.py`, `ImgAlgos::ImgParametersV1`
 - subtraction of pedestals
 - apply threshold in $N \cdot \text{RMS}$ or constant

2013-03-11 – 2013-03-17 Week progress

Q to Marcin:

- `map_image_refl()` in `q_functions.txt` does not work for reasonable set of parameters...
- `wavelength = (1.236)/energy` - should be: 1.23984 ?
- Need in PV variables for
 - photon beam energy (from electron beam energy `Bld.ebeamL3Energy()`?)
 - (x, y) detector position for direct beam, specular, and data
 - detector orientation
 - selection of geometry - transition or specular
- Comparison for
 - `/reg/data/anal2/xcs/xcsi0112/xtc/el67-r0015-s00-c00.xtc` - data,
 - `/reg/data/anal2/xcs/xcsi0112/xtc/el67-r0020-s00-c00.xtc` - dark

Progress

- Reflected beam geometry is implemented in `ViewResults.py` in `get_q_map_for_rb(sp)`, `get_theta_map_for_rb(sp)`, `get_reflecte`
`d_beam_geometry_pars(sp)` modules.
Currently the switch between the direct and reflected beam geometry is used from tab status variable: `cp.exp_setup_geom.value()`
- + If the PV variable will be used, then the switch should be changed in `ViewResults.get_q_map(sp)` module.
- ✓ Add evaluation of the hot pixel mask in `ImgAlgos::ImgAverage`
- ✓ Now the hot pixel mask is evaluated in the dark run averaging, using threshold on RMS. The threshold value and on/off check-box are implemented in the `GUICCDSettings.py`

2013-MM-DD Results on g2 form Marcin

tau [s]		g2
8.088564	1	0.940090
16.177129	2	0.988138
24.265693	3	0.898162
32.354258	4	0.929917
40.442822	5	0.951261
48.531386	6	0.931970
56.619951	7	1.020013
64.708515	8	0.924233
72.797079	9	0.927870
80.885644	10	0.922541
97.062773	12	0.933188
113.239901	14	0.903078
129.417030	16	0.926915
161.771288	20	0.894087

Q to Marcin

- Presuming that for each value of τ we have averaged over time (events) per-pixel values of I_i , I_f , and $I_2 = \langle I_i \cdot I_f \rangle$. In calculation of normalization factors $\langle I_i \rangle$ and $\langle I_f \rangle$ for q -static bins:
 - Do you count in average pixels where $I_i=0$, $I_f=0$?
For example, $\langle I_i \rangle = \text{Sum_over_pixels } I_i / \text{number_of_pixels}$,
what stands here for `number_of_pixels`;
(1) all pixels in static bin, or
(2) all pixels in static bin where $I_i > 0$?

- Do you apply any lower/upper threshold on I_i and I_f ?
- Then we have per-pixel value of $R = I_2 / (I_i * I_f)$.
In calculation of $g_2 = \langle R \rangle$ as an average over pixels of the dynamic bins:
 - Do you count in average pixels where $R=0$?
 - Do you apply any lower/upper threshold on $R=0$?

2013-03-18 – 2013-03-24 Week progress

Progress

- ✓ Develop psana module `ImgAlgos::ImgIntMonCorr` to normalize image on intensity monotor data.
- ✓ Include `ImgAlgos::ImgIntMonCorr` in data-flow processing in `CorAna/data/scripts/psana-cora-split.cfg` and `ConfigFileGenerator.py` etc.
- ✓ Review of psana algorithms for data processing chain. Change data types for processing and inter-module exchange stages. Everything looks fine!
- ✓ Submission of messages with attachments to ELog using response ID and Igor's new interface: [Python module for posting message into ELog](#)
- ✓ Add protection against Split/Process/Merge job submission if Auto-processing is already active.

2013-03-25 – 2013-03-31 Week progress

Q&A with Marcin on 2013-03-28:

Comparison of data processing and results

- How do you process
 - `/reg/data/ana12/xcs/xcsi0112/xtc/e167-r0015-s00-c00.xtc` – data,
 - `/reg/data/ana12/xcs/xcsi0112/xtc/e167-r0020-s00-c00.xtc` – dark
 - Hot pixel mask threshold : 10 ADU
 - Saturated pixel mask threshold : 65000 ADU
 - LLD threshold : const 20-30 ADU
 - ROI mask
 - Blemish mask
 - List of tau : add to Analysis Settings
 - sample-to-detector distance : 7.5m
- Partitioning
 - phi: 1
 - q: 100-static, 18-dynamic

Danial works on these variables:

- E-gamma variable
- Geometry variable
- Beam center

Q map for reflected beam geometry

- chart with angles
- evaluation of cos for non-right triangle
- qx and qy projections. Why does qz is not accounted like in transmission geometry?

Progress

- minor improvements and extra protections in many places
- do not rotate `g2_vs_tau` plot
- add `src/GUIFilesStatusTable.py`
- add files' status tables `GUIFilesStatusTable.py` in `GUIData` and `GUIDark`
- add `GUIListOfTau.py` to select/create the file with tau indexes
- in `GUIFileBrowser.py` add edit and save options
- in `PlotImgSpe.py` and `PlotImgSpeButtons.py` add option to select and load image from txt file
- Fix binning at the boarder; in `ViewResults.valueToIndexMasked(V, VRange, mask=None)` : add protection for $V=V_{max}$

2013-04-01 – 2013-04-07 Week progress

Q to Marcin

In order to proceed with this project I need in your feedback;

- comparison of processing results for runs

```
/reg/data/ana12/xcs/xcsi0112/xtc/e167-r0015-s00-c00.xtc  data,
/reg/data/ana12/xcs/xcsi0112/xtc/e167-r0020-s00-c00.xtc  dark
```

- EPICS variables for automatic initialization
- We need to discuss what results and how should be presented/saved.

Q map for reflection geometry

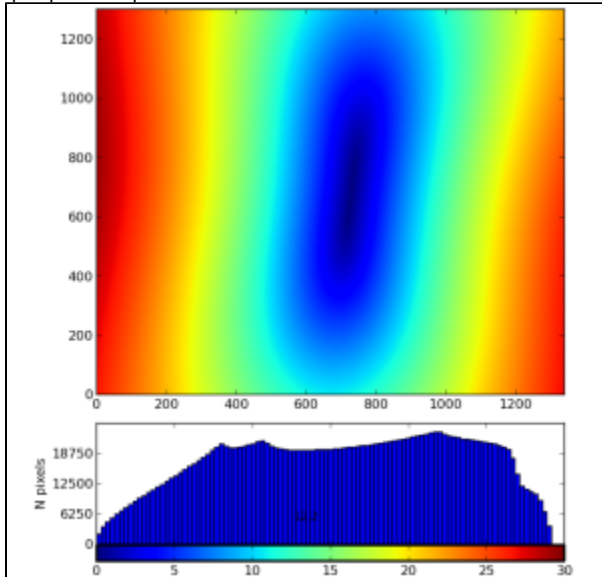
- for transmission geometry $q = 4\pi/\text{wavelength} \times \dots$
for reflection geometry $q = 2\pi/\text{wavelength} \times \dots$ Is it correct ?
- wavelength = 1.23984/sp.photon_energy # 1.23984 ? nm
in stead of 1.236

Progress

- Add print button/method for $\langle g_2 \rangle(\tau, \langle q \rangle)$ table of results
- q map for reflected beam - use the last portion of Marcin's code

Reflective geometry

q map for comparison:



is obtained for parameters:

- Pixel size = 0.02 mm
- CCD position: (x,y) = (0,0) in all cases
- Beam zero: (x,y) = (722,632) pix
- Specular: (x,y) = (732,732) pix
- sample-to-detector distance = 15 mm
- Egamma = 7.654 keV

2013-04-08 – 2013-04-14 Week progress

Mtg with Marcin:

1. Have to get the same results for $g_2(\tau)$ function
 2. Need more plots for results
- $g_2(\tau)$ for q-dynamic
 - Average intensity and Intensity(q-static)
 - Intensity(q-static, t)
 - Histogram for intensity monitor

Fit results for function $g_2(\tau|\text{pars}) = C \cdot \exp[-(2\tau/\tau_0)^{\text{beta}}] + B$

- plot for all fits with beta=1 and float,
- τ_0 vs q-dynamic
- C vs q-dynamic
- B vs q-dynamic
- beta vs q-dynamic

Progress

- implemented new psana module: `ImgAlgos.ImgIntForBins`, which
 - takes the (image size) map of bin numbers from file `fname_map_bins`,
 - evaluates average intensity for each bin,
 - saves results in the file `fname_int_bins` for the lower number_of_bins.
- implemented new classes `PlotGraph.py`, `PlotGraphWidget.py` for plots
 - Intensity(q-static)
 - Intensity(q-static, t)

2013-04-15 – 2013-04-21 Week progress

Work on [LogBookGrabber](#) project.

2013-04-22 – 2013-04-28 Week progress

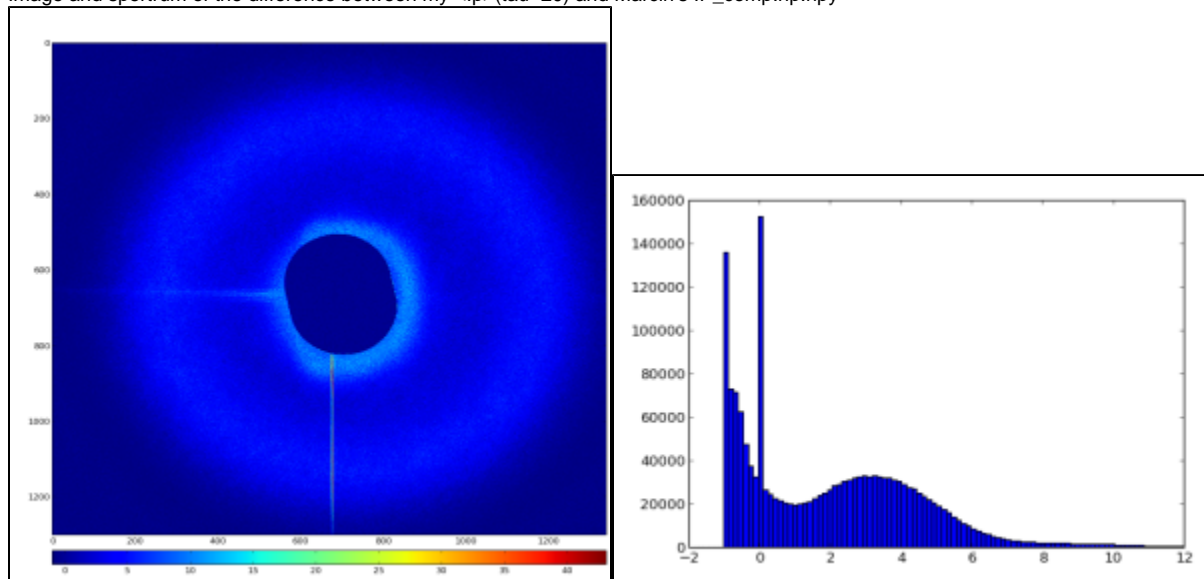
- Add protection with popping-up warning message box if the file for Intensity(q-static,t) is not available.
- Search for a reason of the difference in results

2013-04-29 – 2013-05-05 Week progress

- Marcin is busy on shifts

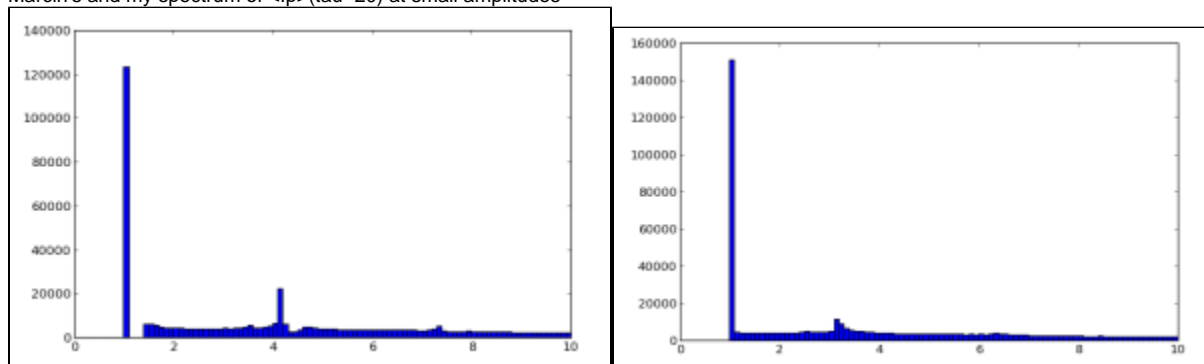
2013-04-06 – 2013-05-12 Week progress

Image and spectrum of the difference between my $\langle I_p \rangle(\tau=20)$ and Marcin's IP_comp.npy.npy



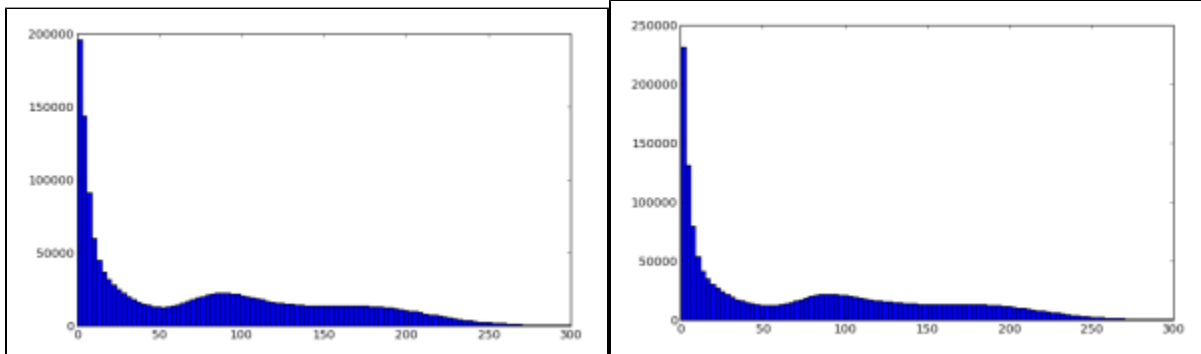
- I do not apply any vertical-strip mask
- Spectrum of difference:
 - peak at 0 (images are equal) is due to 0 amplitude bins in center and edges
 - peak at -1
 - peak at 3

Marcin's and my spectrum of $\langle I_p \rangle(\tau=20)$ at small amplitudes



- Beside the protection `notzero=1` Marcin's spectrum has a threshold 1.4
- Spectra have presumably the same structure in different amplitude at 3.xx and 4.xx

Marcin's and my spectrum of $\langle l_p \rangle (\tau=20)$



- Large scale spectral shape is about the same

New document: [Algorithms for Time Correlation Experiments](#)

2013-05-27 – 2013-06-22 Week progress

New results from Marcin

- Directory with scripts:

```
/reg/neh/homel/sikorski/scripts/  
                                run_correlator.py  
/reg/neh/homel/sikorski/scripts/correlator/  
                                xcs_correlator.py
```

- Pyana module for data pre-processing: `/reg/neh/homel/sikorski/xcs_pyana_current/xcs_timepix_pkg/src/import_data.py`
- Pyana configuration file: `/reg/neh/homel/sikorski/xcs_pyana_current/pyana.cfg`

Reduced data files:

`/reg/neh/homel/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-04-03-10-39-22-734268/*.npz`

Marcin's code description

- [Note on XCS code from Marcin](#)

Qs about code of `import_data.py`

Assume that `import_data.py` is intended to get data from xtc file, split image for 10x10 parts, and save them for ALL events in files like `/reg/neh/homel/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-04-03-10-39-22-734268/e167-r0015-s00-c00_data_520_268.npy`

Open one file per (130,134) image segment and other files:

```
def beginjob( self, evt, env ) :  
    ...  
    for i in range(0,self.frame_size[0],self.step_x):  
        for j in range(0,self.frame_size[1],self.step_y):  
            fina = path + '/' +fina_gen + '_data_' + str(i) + '_' +str(j) + '.npy'  
            self.f_id.append(open(fina, 'w'))  
  
            fina = path + '/' +fina_gen + '_avg_img' + '.txt'  
            self.f_id_avg = open(fina, 'w')  
            ...
```

Get image from data, and saves its parrrts in the SAME !!! file...
The last event is actually saved.

```

def event( self, evt, env ) :
    ...
    if self.detector == 1:
        PI = evt.get(xtc.TypeId.Type.Id_PrincetonFrame)
        frame = np.array(PI.data()[self.R1:self.R2,self.C1:self.C2], dtype = np.float64)
        a = np.where(frame >= self.saturation)
        self.saturated_pixels[a] = 0
        np.subtract(frame, self.dark, frame)
        frame[frame < self.LLD] = self.not_zero
    ...

# NOT QUITE CLEAR, WHAT ARE YOU DOING HERE????
# In this job self.bin[0]=1 and self.bin[1]=1
    if self.flag_bin == 1:
        np.multiply(self.frame_binned, self.zeros, self.frame_binned)
        for b1 in range(self.bin[0]):
            for b2 in range(self.bin[1]):
                np.add(self.frame_binned, frame[b1:self.bin[0], b2:self.bin[1]],self.
frame_binned)

        frame = self.frame_binned

    np.add(self.avg_img, frame , self.avg_img)
    counter = 0
    for i in range(0,self.frame_size[0],self.step_x):
        for j in range(0,self.frame_size[1],self.step_y):
            np.save(self.f_id[counter], frame[i:i+self.step_x,j:j+self.step_y])
            counter += 1
    ...

```

- frame is LOCAL variable in if and for scopes...

Check for results of data pre-processing

- pedestal files coincides:

```

/reg/neh/homel/sikorski/xcs_pyana_current/e167-r0020-s00-c00/2013-04-03-09-43-06-939033/e167-r0020-s00-
c00_dark_img.txt
and mine: work/t1-xcsi0112-r0020-peds-ave.txt

```

- averaged images coincides if pedestal is not subtracted in pyana

```

In import_data_test.py, if pedestals are not subtracted:
PYANA/e167-r0015-s00-c00/e167-r0015-s00-c00_avg_img_raw.txt
and mine: work/t1-xcsi0112-r0015-data-ave.txt

```

- averaged images coincides if LLD=20 is not applied in pyana !

```

Marcin subtracts pedestals from raw image and apply LLD:
/reg/neh/homel/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-04-03-10-39-22-734268/e167-r0015-s00-
c00_avg_img.txt
In import_data_test.py, if I do the same but do not apply LLD:
../PYANA/e167-r0015-s00-c00/e167-r0015-s00-c00_avg_img_wo_lld.txt'
coincides with
difference between:
work/t1-xcsi0112-r0015-data-ave.txt
work/t1-xcsi0112-r0020-peds-ave.txt

```

Qs about code of xcs_correlator.py

```

/reg/neh/homel/sikorski/scripts/correlator/xcs_correlator.py

```

```

class img_correlator:
    def __init__ (self,path):
        # path to the data reduced using pyana "import_data.py" code
        self.path = path
        self.LLD = 200 !!!!!!!!!!!
        self.notzero = 1

    def set_LLD(self, LLD): <--- IS NOT CALLED
        self.LLD = LLD

```

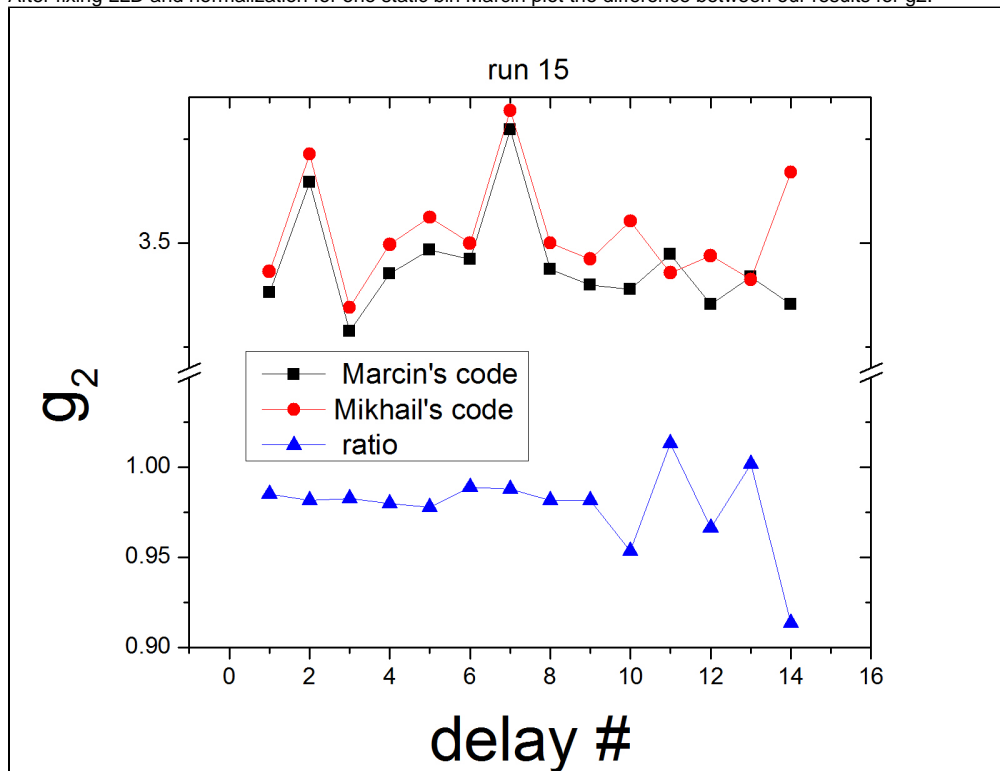
```

def correlator_2D(self, fina):
    data[:, :, i][data[:, :, i] < (self.LLD)] = self.notzero

```

2013-08-27 New results from Marcin

After fixing LLD and normalization for one static bin Marcin plot the difference between our results for g2:



Marcin's results on g2 from file: /reg/neh/homel/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-08-27-14-28-40-303177
 /results_2013-08-27-15-07-34-961055/g2

tau [s]	g2	g2
8.088564	0.021423	3.380312
16.177129	0.021402	3.645404
24.265693	0.020048	3.287331
32.354258	0.019998	3.425617
40.442822	0.020130	3.482928
48.531386	0.019919	3.460162
56.619951	0.022181	3.771666
64.708515	0.019538	3.435755
72.797079	0.019489	3.398190
80.885644	0.020371	3.387679
97.062773	0.019899	3.473071
113.239901	0.020628	3.352052
129.417030	0.019564	3.417886
161.771288	0.018648	3.352710

2013-08-30 results for run 11 (dark 20) of xcsi0112

```
<g2> for dynamic bins vs tau
=====
tau      tau[s] \ <q> | 0.052
-----
 1         8.088406 | 3.558
 2        16.176812 | 3.151
 3        24.265218 | 3.447
 4        32.353624 | 3.356
 5        40.442030 | 3.311
 6        48.530436 | 3.413
 7        56.618842 | 3.155
 8        64.707248 | 3.355
 9        72.795654 | 3.291
10        80.884060 | 3.160
12        97.060872 | 3.252
14       113.237684 | 3.275
16       129.414496 | 3.320
20       161.768120 | 3.473
```

2013-10-08 Comparison of results for xcsi0112, run15 (dark20)

Conditions

1. dark run: /reg/d/ana12/xcs/xcsi0112/xtc/e167-r0020-s00-c00.xtc use all 75 events
2. data run: /reg/d/ana12/xcs/xcsi0112/xtc/e167-r0015-s00-c00.xtc use all 500 events
3. do not use any intensity monitor selection or correction
4. do not use any mask including hot pixel, saturation, blemish, ROI, and restriction on the image size
5. use LLD as a constant ADU threshold = 20
6. use a single q-phi static bin
7. use a single q-phi dynamic bin
8. q value is not an issue for current comparison, so geometry does not matter

Dark image

Marcin's dark file:

/reg/neh/home1/sikorski/xcs_pyana_current/e167-r0020-s00-c00/2013-04-03-09-43-06-939033/e167-r0020-s00-c00_dark_img.txt:

```
# Job name: e167-r0020-s00-c00
# Array shape: 1300 x 1340
278.826667      298.640000      304.880000      298.200000      300.106667      298.453333 ...
```



Has precision of 6 digits after decimal dot.

My dark file, evaluated in [Pedestals averaging](#)

```
278.827 298.64 304.88 298.2 300.107 298.453 ...
```

is adjusted to the same precision:

/reg/neh/home1/dubrovin/LCLS/PSANA-V01/work/t1-xcsi0112-r0020-peds-ave.txt

```
278.826667 298.64 304.88 298.2 300.106667 298.453333 ...
```

Exactly coincides after adjustment.

Mask of saturated pixels

Marcin's mask, evaluated in [import_data](#),

/reg/neh/home1/sikorski/xcs_pyana_current/xcs_timepix_pkg/src/import_data.py:

/reg/neh/home1/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-08-27-14-28-40-303177/e167-r0015-s00-c00_avg_img.txt

My mask, evaluated in [Data averaging](#): /reg/neh/home1/dubrovin/LCLS/PSANA-V01/work/t1-xcsi0112-r0015-satpix-mask-level-65000ADU.txt

For run 15 both masks are ones for entire image.

Averaged data image before splitting

Marcin's averaged data image, evaluated in [import_data](#), /reg/neh/home1/sikorski/xcs_pyana_current/xcs_timepix_pkg/src/import_data.py:

/reg/neh/home1/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-08-27-14-28-40-303177/e167-r0015-s00-c00_avg_img.txt

```
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 0.000000
0.000000 0.000000 0.000000 0.000000 0.000000 0.000000 2.098667
0.561573 0.000000 0.000000 0.000000 0.000000 3.539360 2.335520
```

My averaged data image, evaluated in [Splitting](#):

/reg/neh/home1/dubrovin/LCLS/PSANA-V01/work/t1-xcsi0112-r0015-data-ave.txt



- DO NOT COINCIDE YET!
- This file is obtained at data averaging, where pedestals are not subtracted.
- For direct comparison averaging need to be done at splitting stage.

2013-12-02 my new results for run 15 (dark 20) of xcsi0112

Direct evaluation of averaged image with subtracted pedestals is done in the psana script for image splitting.

```
1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 1e-09 2.09866669 0.561573365 1e-09 1e-
09 1e-09 1e-09 3.53936005 2.33552002
```

- now precision exceeds 6 digits after decimal dot,
- zeros are already substituted by the minimal value 1e-9.

Results for g2

```

<g2> for dynamic bins vs tau
=====
tau      tau[s] \ <q> | 0.052
-----
1         8.088413 | 3.380
2        16.176826 | 3.645
3        24.265239 | 3.287
4        32.353652 | 3.426
5        40.442065 | 3.483
6        48.530478 | 3.460
7        56.618891 | 3.772
8        64.707304 | 3.436
9        72.795717 | 3.398
10       80.884130 | 3.388
12       97.060956 | 3.473
14      113.237782 | 3.352
16      129.414608 | 3.418
20      161.768260 | 3.353

```

- My new results on g2 coincides with 2-nd column of Marcin's calculation in `/reg/neh/home1/sikorski/xcs_pyana_current/e167-r0015-s00-c00/2013-08-27-14-28-40-303177/results_2013-08-27-15-07-34-961055/g2`

2013-12-06 Mtg with Marcin

- Demonstration of how `tcmt` works from scratches
- Marcin need to switch between imaging devices (`cspad`, `pnccd`, `princeton`, `opal`, `epix`, etc.)
- How to run it for current version

```

sit_setup ana-0.10.6
tcmt

```

2014-01-20 Runs with CSPAD data

Run 196(dark) and run 185(data) from xcs84213.
Marcin

References

1. [Data Processing for Time Correlation](#) - project description and status
2. [Algorithms for Time Correlation Experiments](#) - algorithms used in this project
3. [Note on XCS code from Marcin](#) - notes about Marcin's code and algorithms