

EPIXM

Test data

e-mail exchange with Ric about test data

2/14/2024 4:33 PM

Dubrovin, Mikhail

O'Grady, Paul Christopher

Hi Mikhail,

I have pushed an update to the ePixM detector interface to git (epixm320.py), so I believe it is ready for you to make more real. I recorded some data for run 308 in /reg/neh/operator/tstopr/data/drp/tst/tstx00417/xtc, which is accessible from any NEH DRP host (drp-neh-cmp0*) and also even from psbuild-rhel7. Could you take a look when you have some time? In case it helps, we have a confluence page for the ePixM at <https://confluence.slac.stanford.edu/display/PSDMInternal/EpixM>. Feel free to add to it.

This request can almost certainly wait until Chris gets back, if you prefer.

Thank you,

Ric

Dubrovin, Mikhail

Thu 2/15/2024 2:48 PM

Hi Ric, Thank you, I will check what needs to be done. Mikhail

Claus, Ric

Dubrovin, Mikhail

Thu 2/22/2024 8:40 AM

Hi Ric, Why are you doing this on pcds? Are these data available on sdf? Mikhail

Dubrovin, Mikhail

Thu 2/22/2024 8:44 AM

In /sdf/data/lcls/drpsrcf/ffb/tst/tstx00417/xtc/ I see tstx00417-r0305-s000-c000.xtc2 as a las run. There is no run 308. Mikhail

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3/15/2024 4:54 PM

Dubrovin, Mikhail

O'Grady, Paul Christopher

Hi Mikhail,

I took a short pedestal run with the ePixM. The file is here: /reg/neh/operator/tstopr/data/drp/tst/tstx00417/xtc/tstx00417-r0309-s001-c000.xtc2. As before, you may need to copy this file to a more convenient working space for you as I think the FEE teststand doesnt have access to the more usual file systems.

Since Im not sure that Ive got the code right yet, this run was taken at 1 Hz with 10 events per step. There are 3 steps in which the gain mode changes as per the ePixM confluence pages Pedestal Scans and Charge Injection section. You can find the page here: <https://confluence.slac.stanford.edu/display/PSDMInternal/EpixM>

On Chriss encouragement, Id like to ask to you to take a look at the file and let me know of any issues you find. Once the bugs are sorted out, I can then take a longer run with, say, 2000 events per step at a higher rate for more detailed analysis.

Thanks,

Ric

3/15/2024 5:44 PM

Dubrovin, Mikhail

Claus, Ric

O'Grady, Paul Christopher

Hi Ric,

Thank you for the reference to the file. I will try to check if it works for dark calibration asap.

Mikhail

Claus, Ric

====

```
datinfo -k /reg/neh/operator/tstopr/data/drp/tst/tstx00417/xtc/tstx00417-r0309-s001-c000.xtc2
```

```
(ps-4.6.3) [dubrovin@psanagpul06:~/LCLS/con-lcls2]$ datinfo -k /reg/neh/operator/tstopr/data/drp/tst/tstx00417/xtc/tstx00417-r0309-s001-c000.xtc2 -d tst_epixm
```

```
==== 00 run: 309 exp: tstx00417 detnames: tst_epixm
```

```
run.timestamp LCLS2 int: 4943735348944167 > epoch unix sec: 632303053.357981 > 1990-01-13T23:44:13
tst_epixm detector object
step_docstring detector object is missing
det.raw._seg_geo.shape(): _seg_geo is None

Step 00 metadata: None
Event 00000 t=632303054.942564sec dt=632303054.942564sec/record ndarray from list: segments shape:(1,) size:1
dtype:int64 [0] timing is None, pulseId is N/A
det.raw.raw(evt) shape:(1, 384, 768) size:294912 dtype:uint16 [20241 20020 18446 18837 19347...]
[W] epix_base._cbits_config_segment - MUST BE REIMPLEMENTED - return None
None
Event 00009 raw shape:(1, 384, 768) size:294912 dtype:uint16 [20213 20026 18372 18801 19424...]

Step 01 metadata: None
Event 00000 t=632303064.739798sec dt=9.797234sec/record ndarray from list: segments shape:(1,) size:1 dtype:
int64 [0] timing is None, pulseId is N/A
det.raw.raw(evt) shape:(1, 384, 768) size:294912 dtype:uint16 [45911 49264 43317 47515 46529...]
[W] epix_base._cbits_config_segment - MUST BE REIMPLEMENTED - return None
None
Event 00009 raw shape:(1, 384, 768) size:294912 dtype:uint16 [46034 49268 43426 47506 46702...]

Step 02 metadata: None
Event 00000 t=632303074.537032sec dt=9.797234sec/record ndarray from list: segments shape:(1,) size:1 dtype:
int64 [0] timing is None, pulseId is N/A
det.raw.raw(evt) shape:(1, 384, 768) size:294912 dtype:uint16 [20301 20071 18393 18848 19429...]
[W] epix_base._cbits_config_segment - MUST BE REIMPLEMENTED - return None
None
Event 00009 raw shape:(1, 384, 768) size:294912 dtype:uint16 [20291 20035 18353 18798 19387...]
Problem reading dgram header.
[I] DONE, consumed time 4.192 sec

Event 00009 raw shape:(1, 384, 768) size:294912 dtype:uint16 [20291 20035 18353 18798 19387...]
```

Ric created runs 308-data, 309-dark on

psdm: /reg/neh/operator/tstopr/data/drp/tst/tstx00417/xtc/

s3df: /sdf/data/lcls/drpsrcf/ffb/tst/tstx00417/xtc/ request Wilko to synchronize with psdm?

Data on pslogin > dubrovin@drp-neh-cmp001

```
ssh -Y drp-neh-cmp001
datinfo -k exp=tstx00417,run=324,dir=/drpneh/data/tst/tstx00417/xtc -d epixm
epixm320_dark_proc -k exp=tstx00417,run=324,dir=/drpneh/data/tst/tstx00417/xtc/ -d epixm -o ./work -D
```

Raw shape: (4, 192, 384)

Geometry

Panel geometry

- ASIC shape (192,384)
- epixm panel: raw shape:(4, 384, 768)
- 50um x 50um pixels, no wide pixels

2024-03-18 e-mail exchange about epixm panel geometry

```
O'Grady, Paul Christopher
Tue 3/19/2024 8:46 AM
Good to know ... thanks for the clarification, Chris. chris
Kenney, Christopher J. <kenney@slac.stanford.edu>
O'Grady, Paul Christopher
Alnajjar, Dawood;
Doering, Dionisio;
Claus, Ric;
Dubrovin, Mikhail
```

Hi Chris,
Your assumption has always been correct - until now.
For ePixM each detector is composed of four mechanically separate chip pairs.
These ASIC-"sensor" pairs are significantly more complex and hence risky and may have lower yield. These "sensors" are also limited in size to one lithographic reticle field.
Sorry. But ePixM will need metrology.
Thanks,
Chris
O'Grady, Paul Christopher <cpo@slac.stanford.edu>

Kenney, Christopher J.
Alnajjar, Dawood;
Doering, Dionisio;
Klaus, Ric;
Dubrovin, Mikhail

Hi Chris,
Just to check: I had the impression these units of 4 asics (whether in a square or in a line) should be one solid piece of silicon which shouldn't need metrology. Do I misunderstand?
chris

Kenney, Christopher J. <kenney@slac.stanford.edu>
Alnajjar, Dawood;
O'Grady, Paul Christopher;
Doering, Dionisio
Claus, Ric;
Dubrovin, Mikhail

Hi Mikhail,
I've performed a metrology on a module and will provide you with the file this week.
Thanks,

Chris
Alnajjar, Dawood <dnajjar@slac.stanford.edu>
O'Grady, Paul Christopher;
Kenney, Christopher J.;
Doering, Dionisio
Claus, Ric;
Dubrovin, Mikhail

Hi Mikhail & Chris,
Thanks for reaching out. The Pixel size is 50um x 50um, and we assume no large pixels at this point. Also there are no gaps between pixels.
@Kenney, Christopher J. would you know if there are gap between the ASICs?
Thanks,
Dawood

Alnajjar, Dawood <dnajjar@slac.stanford.edu>
O'Grady, Paul Christopher <cpo@slac.stanford.edu>;
Kenney, Christopher J.;
Doering, Dionisio
Claus, Ric;
Dubrovin, Mikhail

Hi Mikhail & Chris,
The Pixel size is 50um x 50um, and we assume no large pixels at this point. Also there are no gaps between pixels.
@Kenney, Christopher J. would you know the gap between the ASICs?
Thanks,
Dawood

2024-03-18 11:18am
O'Grady, Paul Christopher <cpo@slac.stanford.edu>
Kenney, Christopher J.;
Doering, Dionisio;
Alnajjar, Dawood
Claus, Ric;
Dubrovin, Mikhail

Chris K., Dionisio, Dawood,
Could you send Mikhail the geometry for the 4 asic epixm panel? He needs to know pixel sizes (including things

like "large pixels") and any gaps between pixels/asics.
Thanks!
chris

Gain

Configuration info for gain (from Lorenzo Rota gain modes) for AHL, FH, SM

| Mode | CompTH_ePixM | Precharge_DAC_ePixM | |
|------------|--------------|---------------------|--|
| Auto-gain | 12 | 45 | |
| Fixed High | 0 | 45 | |
| Soft Low | 63 | 50 | |

Gain and data bits

15 data bits: 0x7fff or 0o77777

16-th gain bit: 0x8000 or 0o100000

gain bit: 0/1 - high/low gain mode

Calibration constants

Geometry deployment

| current version of the default geometry, orientation of ASICs is not guaranteed | | | | | | | | | | | | | | |
|---|-----|--------|-----|--------------|-----|--------|--------|--------|-------|-------|-------|---------|---------|---------|
| # | HDR | PARENT | IND | OBJECT | IND | X0[um] | Y0[um] | Z0[um] | ROT-Z | ROT-Y | ROT-X | TILT-Z | TILT-Y | TILT-X |
| SEGMENT | | | 0 | EPIXMASIC:V1 | 0 | -9600 | 4800 | 0 | 180 | 0 | 0 | 0.00000 | 0.00000 | 0.00000 |
| SEGMENT | | | 0 | EPIXMASIC:V1 | 1 | 9600 | 4800 | 0 | 180 | 0 | 0 | 0.00000 | 0.00000 | 0.00000 |
| SEGMENT | | | 0 | EPIXMASIC:V1 | 2 | 9600 | -4800 | 0 | 0 | 0 | 0 | 0.00000 | 0.00000 | 0.00000 |
| SEGMENT | | | 0 | EPIXMASIC:V1 | 3 | -9600 | -4800 | 0 | 0 | 0 | 0 | 0.00000 | 0.00000 | 0.00000 |
| IP | | | 0 | SEGMENT | 0 | 0 | 0 | 10000 | 90 | 0 | 0 | 0.00000 | 0.00000 | 0.00000 |

- by default: lcls2/psana/psana/pscalib/geometry/data/geometry-def-epixm320.data
- cdb add -e tstx00417 -d epixm320_0016777984-4294967295-4294967295-4032267777-3204448280-0177427457-3053453334 -c geometry -r 309 -f geometry-def-epixm320.data -i txt

Dark processing and deployment

- epixm320_dark_proc -k exp=tstx00417,run=324,dir=/drpneh/data/tst/tstx00417/xtc/ -d epixm -o ./work -D
- dark run should have 3 steps for gains SH, SL, AHL
- raw (4-ASIC) panel shape: (4, 192, 384)
- constants are saved in repository (see location using command epixm320_dark_proc -h) per panel per gain range
- -D option combines gain ranges constants for pedestals, pixel_status, pixel_rms, pixel_min, pixel_max in shape (3, 4, 192, 384) and deploys them in the DB

Gain from charge injection

- TBD

References

- [EPIX10KA2M References](#)
- [EpixM](#) - by Ric and Chris
- [ePixM: gain modes](#) - by Lorenzo Rota

- [DOERING - ePixHRM320k- A detector system for soft x-ray imaging - abstract 2023.pdf](#)