

Geometry converter between psana and CrystFEL

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General remarks

Command `geometry_convert` with parameters executed in [psana environment](#) converts geometry constants between psana and CrystFEL formats forth and back depending on input file name extension. Converter works for a few major composite detectors `cspad`, `pnccd`, `epix10ka`, `jungfrau`.

Forward conversion by default changes coordinate frame from psana (the same frame as in optical metrology) to CrystFEL (LAB frame: z-along photon beam, y-up, x=[yz]). The LAB frame is widely used in crystallography data processing. Backward conversion does not change coordinate frame and generates panels' positions and tilts as is. Pixel coordinates reconstructed in psana from this file will also be defined in the LAB frame.

Conversion commands

Conversion from psana to CrystFEL

Command for "forward" conversion of the detector geometry constants from psana to CrystFEL needs in a couple of parameters for input psana geometry file name (-f) and optionally output CrystFEL geometry file name (-o), for example

```
geometry_convert -f geo-cspad-psana.data -o geo-cspad-crystfel.geom
```

By default converter changes coordinate frame from psana (similar to one in optical metrology) to LAB (usually used in CrystFEL). Parameter `--cframe 0` allows to keep the coordinate frame unchanged.

Forward converter recognizes detectors `epix10ka`, `jungfrau`, `cspad`, `pnccd` from their segment names `EPIX10KA:V1`, `EPIX10KA:V2`, `JUNGFRAU:V1`, `JUNGFRAU:V2`, `SENS2X1:V1`, `PNCCD:V1`, `MTRX:V2:512:512:75:75` loaded from the input geometry file.

Use dataset for z position correction

Since ana-4.0.47-py3 three optional parameters added to apply z-position correction from PV variables.

optional parameters for z-position correction from data

<code>--dsname DSNAME</code>	FOR Z CORRECTION FROM DATA - dataset (str) like exp=<experiment>:run=<run-number>:smd:..., def=None
<code>--zpvname ZPVNAME</code>	FOR Z CORRECTION FROM DATA - z-correction variable name ex: CXI:DS1:MMS:06.RBV or alias ex: DscCsPad_z, def=None
<code>--f_um F_UM</code>	FOR Z CORRECTION FROM DATA - factor for conversion PV value to um, def=1000.000000

To apply z position correction at least `--dsname` parameter should be specified. In this case PV names `CXI:DS1:MMS:06.RBV`, `CXI:DS2:MMS:06.RBV`, `MFx:DET:MMS:04.RBV`, `XPP:ROB:POS:Z`, `AMO:LMP:MMS:10.RBV` are tested for availability.

- if nothing found, the list of all available PV names is printed, correction is not applied,
- if more than one found, specification of one of them is requested in parameter `--zpvname`,
- if one is found - its value is used with factor `--f_um` to apply correction.
- if `--zpvname` is specified incorrectly and not found, the list of all available PV names is printed, correction is not applied.

Example of the command with z position correction:

```
geometry_convert -f geo-jungfrau.data -o geo-jungfrau.geom --dsname exp=cxic00318:run=123:smd --zpvname CXI:DS1:MMS:06.RBV
```

Conversion from CrystFEL to psana

Command for "backward" conversion of the detector geometry constants from CrystFEL to psana needs in a couple of parameters for detector type (-d) and input CrystFEL geometry file name (-f). Optional output file name (-o) for psana geometry is also useful, for example

```
geometry_convert -d epix10ka -f geo-epix10ka2m-crystfel.geom -o geo-epix10ka2m-psana.txt
```

The file name extension *.geom in option -f launches conversion from CrystFEL to psana.

For now, backward converter works for detector types epix10ka, jungfrau, cspad (with quads like in cxi), cspadv2 (without quads like in xpp), pnccd. Information about detector type is missing in the CrystFEL *.geom file, so parameter -d needs to be specified.

Special case of CSPAD detector

ASIC naming convention in CrystFEL are slightly different for cspad with and without moving quads. Appropriate detector type (-d) should be specified explicitly as cspad or cspadv2, respectively, for example

```
geometry_convert -d cspad -f geo-cspad-cxi-crystfel.geom -o geo-cspad-cxi-psana.data
```

```
geometry_convert -d cspadv2 -f geo-cspad-xpp-crystfel.geom -o geo-cspad-xpp-psana.data
```

Command help

More information about command and parameters can be obtained with help option (-h),

```
geometry_convert -h
```

Current result for command geometry_convert -h

```
Converts geometry constants from psana to CrystFEL format and backward (see
--fname).

optional arguments:
  -h, --help            show this help message and exit
  -f FNAME, --fname FNAME
                        input geometry file name. File name extension *.geom
                        launches converter from CrystFEL to psana,
                        def=/reg/g/psdm/detector/data_test/geometry/geo-
                        epix10ka2m-16-segment.data
  -o OFNAME, --ofname OFNAME
                        output file name, def=geo-crystfel.txt
  -l LOGLEV, --loglev LOGLEV
                        logging level name, one of NOTSET, DEBUG, INFO,
                        WARNING, ERROR, CRITICAL, def=INFO
  --cframe CFRAME       coordinate frame 0/1 for psana/LAB, def=1. Works for
                        PSANA->CRYSTFEL conversion ONLY where it selects frame
                        for pixel coordinates. Backward conversion
                        CRYSTFEL->PSANA does not change frame. For test
                        purpose it is assumed that forth and back conversion
                        PSANA->CRYSTFEL->PSANA should not change constants in
                        the geometry file (up to precision lose at conversion)
                        if they are defined for the same coordinate frame. For
                        this type of test parameter should be set to 0 to keep
                        psana frame unchanged.
  -d DETTYPE, --dettype DETTYPE
                        USED FOR CRYSTFEL TO PSANA ONLY -
                        detector type, one of epix10ka, jungfrau, cspad, cspadv2,
                        pnccd, def=epix10ka
```

Reference

- [Geometry converter test](#)
- [Detector Geometry](#)
- [Geometry History](#)
- [EPIX10KA2M References](#)
- [Jungfrau References](#)