

# Method det.calib algorithms

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This note describes raw intensity correction algorithms in the method `Detector.calib` and their variation on detector type.

## LCLS Detector Interface

- Detector interface in LCLS

## Method calib

```
arr = det.calib(evt, cmpars=None, **kwargs)
```

## Regular sequence of applied algorithms

- dark correction - pedestals subtraction using calib/.../pedestals
  - common mode correction depending on cmpars or calib/.../common\_mode or default from `PSCalib.CalibParsBase*V1.py`
  - gain correction factors from calib/.../pixel\_gain. Depending on detector pixel\_gain calibration array may contain per-pixel gain in ADU/keV or gain correction factor gfactor in keV/ADU, where gfactor=1/gain.
  - apply mask depending on \*\*kwargs

## Correction formula

```
(common_mode(raw - peds))/gain * mask(**kwargs)
```

or for gain factors in pixel\_gain:

```
(common_mode(raw - peds))*gfactor * mask(**kwargs)
```

## Mask

To construct the mask use \*\*kwargs and algorithms from method mask\_v2 from [AreaDetector](#).

### **TURN OFF common mode correction**

For cmpars = None - default constants are used

For regular detectors: cmpars = 0 or cmpars[0] = 0 - OFF

For epix10ka and Jungfrau cmpars[1] = 0 - OFF

See also Common mode correction algorithms.

## Detector dependent algorithms

Spreadsheet below contains comments on detector specific application

|           |   |  |                       |   |   |   |   |
|-----------|---|--|-----------------------|---|---|---|---|
| CSPAD     | + | default cmpars = (1, 25, 25, 100)<br>cmpars = 0 or cmpars[0] = 0 - OFF   | gain factor, keV /ADU | *gainmask<br>det.set_gain_mask_factor(gfactor=6.85)                     | + |   | gain map extracted from detector configuration data and applied with gfactor<br>gainmask is applied before regular gain factor                        |
| CSPAD2x2  | + | shape=(185, 388, 2)<br>common_mode shape=(2, 185, 388) back to (185, 388, 2)<br><br>default cmpars = (1,25,25,100)                         | gain factor, keV /ADU | +   | + |   | shape is converted before common mode correction in order to apply regular CSPAD algorithm then it is converted back to daq shape.                    |
| epix100a  | + | default cmpars =(4,6,30,30)  | gain factor, keV /ADU | +   | + |   |   |
| pnCCD     | + | default cmpars =(3,350,350,128)<br><br>or alg #8 (8,5,500)   |                       | +   | + |   |   |
| Andor3d   | + | default cmpars =(2,10,10,cols)   |                       | +   | + |   |   |
| Princeton | + | default cmpars =(1,50,50,100,1,<br>size,1)   |                       | +   | + |   |   |
| Camera    | + | other Cameras default cmpars =<br>(0,0,0,0), cmpars = 0 or cmpars [0] = 0 - OFF  |                       | +   | + |   |   |
| epix10ka  | + | applied for pixels in high gain mode only in combination with mask<br><br>cmpars=None: default (7, 2,10,10)<br><br>(*,0,...) - OFF         | gain, ADU/keV         | pixel_gain constants are used and per event depending on gain range     | + | (common_mod e(raw - peds)/gain * mask)          | UtilsEpix10ka.calib_epix10ka_any(det, evt, cmpars=None, **kwa)<br><br>offsets are already accounted at deployment of pedestals in calib/.../pedestals |
| Jungfrau  | + | applied for pixels in high gain mode only in combination with mask<br><br>cmpars=None: default cmpars = (7,1,100,0)<br><br>(*,0,...) - OFF | gain, ADU/keV         | pixel_gain and pixel_offset are used and per event depend on gain range | + | (common_mod e(raw - peds - offset)/gain * mask) | UtilsJungfrau.calib_jungfrau(det, evt, cmpars=(7,3,200,10), **kwa)  |

## LCLS-II Detector Interface

- Detector interface in LCLS-II

### Method calib

```
arr = det.raw.calib(evt, **kwa)
```

### Regular sequence of applied algorithms

- dark correction - pedestals subtraction using constants of ctype pedestals from DB
- common mode correction depending on cmpars or constants of ctype common\_mode from DB
- gain correction with constants from DB for ctype pixel\_gain. In LCLS-II we intend to always use in pixel\_gain constants the gains in ADU/keV.
- mask is not applied by default (see below)

### Correction formula

common\_mode(raw-peds)/gain

### Mask

In lcls2 mask is derived and applied separately as explained in [Area detector mask examples](#) or [Detector interfase in LCLS-II](#).

### TURN OFF common mode correction

- cmpars=None - use constants from DB
- cmpars[1] = 0 - OFF
- both cmpars=None and common\_mode constants are missing in DB - common mode correction is OFF

### Detector dependent algorithms

Spreadsheet below contains comments on detector specific application

| Detector type | pedestal subtraction | common mode correction | gain | mask | formula | comments |
|---------------|----------------------|------------------------|------|------|---------|----------|
|---------------|----------------------|------------------------|------|------|---------|----------|

| LCLS-II   |   |   |  |   |   |                                       |  |
|-----------|---|---|--|---|---|---------------------------------------|--|
| epix10ka  | + | default cmpars=None - search common_mode pars in DB.<br>Correction is OFF if constants missing in DB.<br><br>ex. (7,2,100,10) |  | + | - | (common_mode<br>(raw - peds)<br>/gain | calib_epix10ka_any(det.raw,<br>evt, cmpars=None, **kwa)<br><br>mask defined by **kwa is used<br>in common_mode_correction<br><br>see <a href="#">UtilsEpix10ka</a> |
| epixhr2x2 | + | + the same as epix10ka  |  | + | - |                                       | the same as epix10ka   |
| epix100a  | + | + the same as epix10ka<br><br>ex. (7,7,100,10)  |  | + | - |                                       | calib_epix100(det.raw, evt,<br>cmpars=None, **kwa)<br><br><a href="#">UtilsEpix100</a>   |
| opal      | + | -   |  | + | - | (raw-peds)/gain                       | <a href="#">opal_base</a>  |
| piranha4  | + | -   |  | + | - | (raw-peds)/gain                       | <a href="#">piranha4_base</a>  |

## References

- [Detector interface in LCLS](#)
- [Detector interface in LCLS-II](#)
- [Area Detector Interface \(LCLS-II\)](#)
- [Area detector mask examples](#)