Common mode correction algorithms for LCLS2 detectors

Median common mode correction

For number of years the same median algorithm is used for epix100, epix10ka, and Jungfrau panels with appropriate variation for bank shapes. This algorithm is migrated to LCLS2 detector interface. This note contains a few examples of this algorithm for recently implemented epix100 detector.

Common mode correction implementation for epix100

For epix100 panel shape=(1, 704, 768). Panel consist of 2x8 banks, bank shape=(352,96), with 352 rows and 96 columns per bank.

Algorithm is controlled by tuple of parameters:

    cmpars (tuple) - common mode parameters.
      [0] - (int) algorithm number - currently this number is void, median algorithm is used everywhere.
      [1] - (uint) mode bitword - 1/2/4 : correction applied in rows per bank / columns per bank / banks.
      [2] - (float) absolute maximal allowed correction. Correction is not applied if exceeds this value.
      [3] - (uint) minimal number of (unmasked) pixels to evaluate correction.

Code example

Code example to account for common mode correction - cmpars=(0,7,100,10)

```
from psana import DataSource
ds = DataSource(exp='tmoc00318',run=10, dir='/cds/data/psdm/prj/public01/xtc')
orun = next(ds.runs())
det = orun.Detector('epix100')
for evt in orun.events():
    arr = det.raw.calib(evt, cmpars=(0,7,100,10))
    add = det.raw._common_mode_increment(evt, cmpars=(0,7,100,10))
```
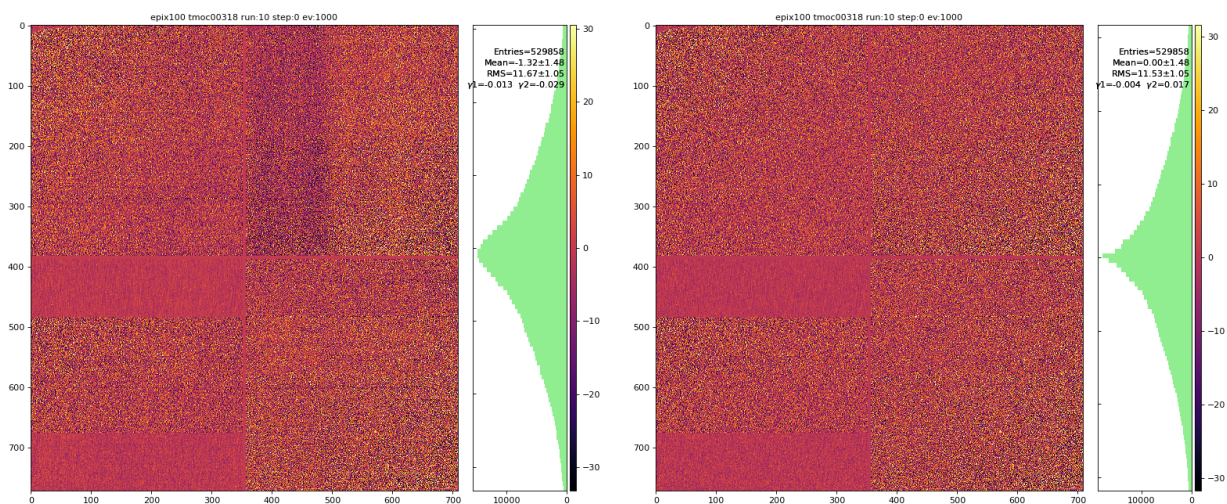
Test images

All intensities are in ADU, gain factor is turned off.

Images are shown in psana frame with rows/columns along Cartesian x/y axes, respectively.
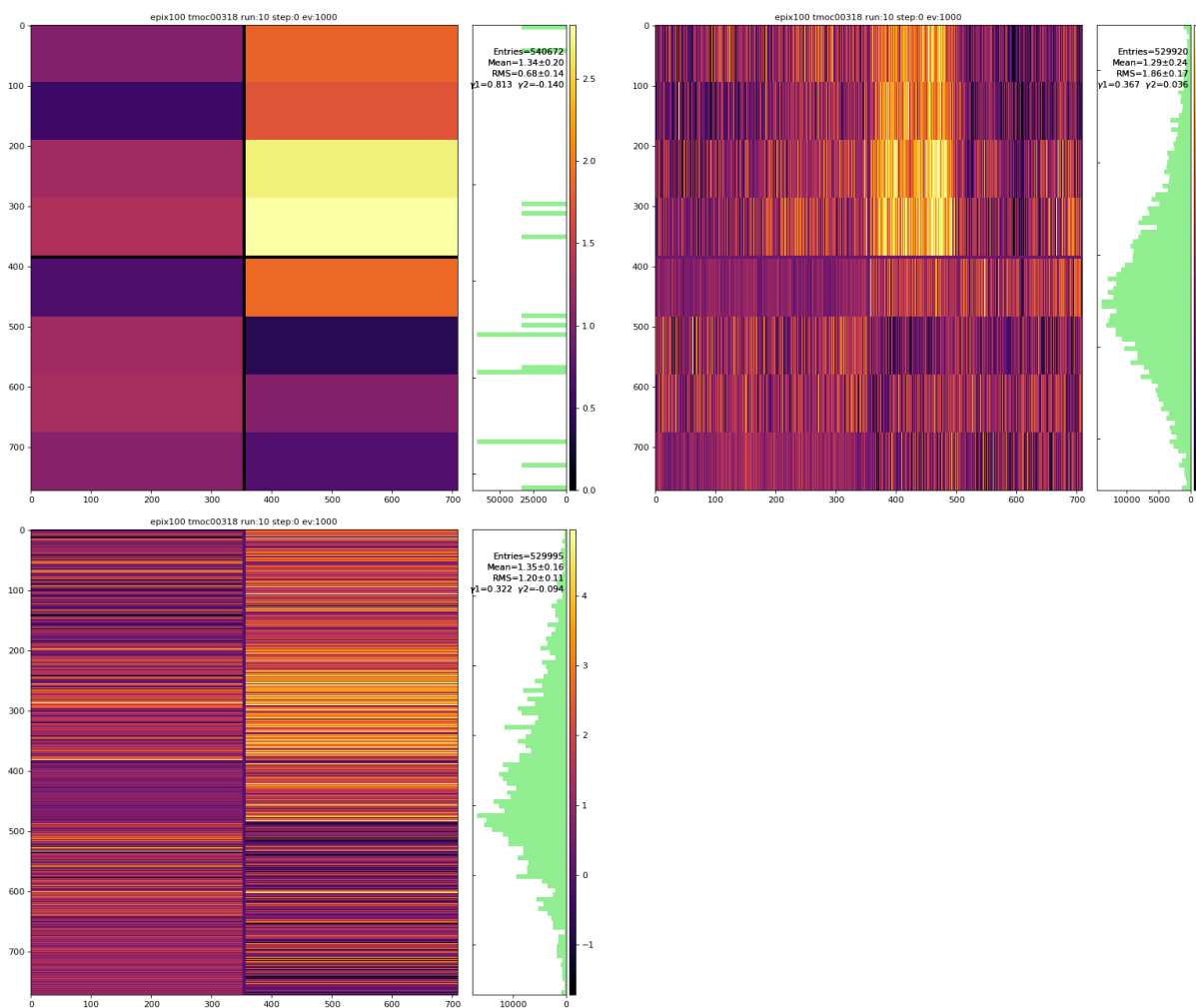
Uncorrected and corrected intensities for raw-peds

raw-peds image uncorrected and corrected with cmpars=(0,7,100,10)

Common mode increment in banks, rows, columns separately

raw-peds images with cmpars=(0,4,100,10)/(0,1,100,10)/(0,2,100,10) correction in 16 banks/rows per bank/columns per bank, respectively.

Common mode increment in banks, rows, columns together

raw-peds images with cmpars=(0,7,100,10) - all common mode corrections applied together

epix100 tmoc00318 run:10 step:0 ev:1000
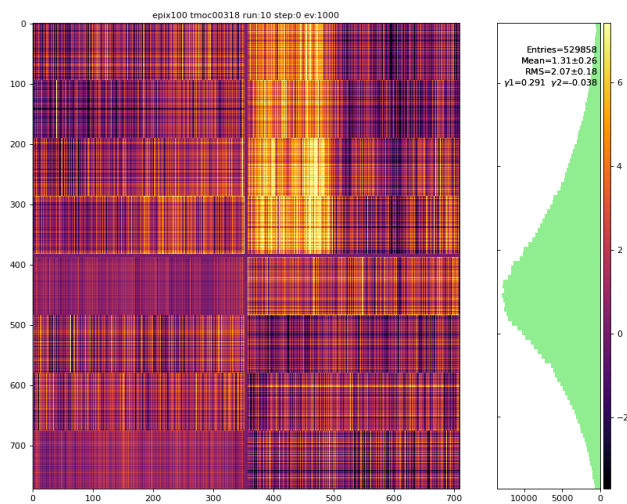
Time consumption

measured on psanagpu111

(cmpars=None or mode=0)/1/2/4/7 : dt=2/36/49/16/90 msec

References

- [EPIX10KA2M References](#)
- [Jungfrau References](#)