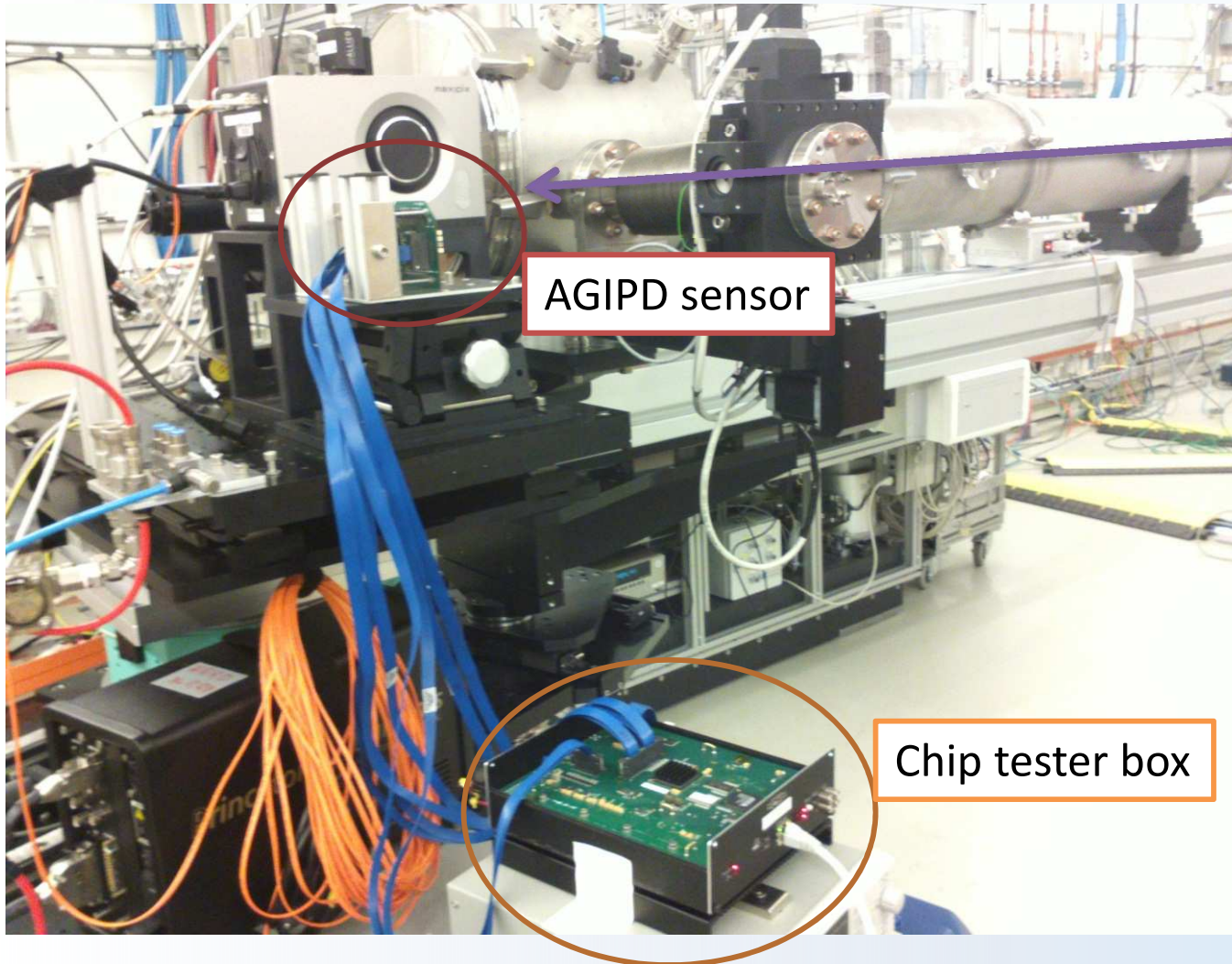# P10 beamtime

Taking a AGIPD0.4 assembly to see some photons

Julian Becker, with a lot of help

P10 beamtime

- Beamtime 26.8. 16:00 to 27.8. 3:00 (11h)

- At Petra beamline P10

  - Energy 7.05 keV
  - ~10^{11} photons/sec, 60 bunch mode (125 ns)
  - 200 ns integration time -> 2 bunches/image
  - Detector <-> Sample distance ~ 5m

- 2 Pre-prepared samples of PMMA spheres suspended in liquid (100 & 250 nm radius)

- Present people: Alexander, Allesandro, Fabian Westermaier (P10), Julian
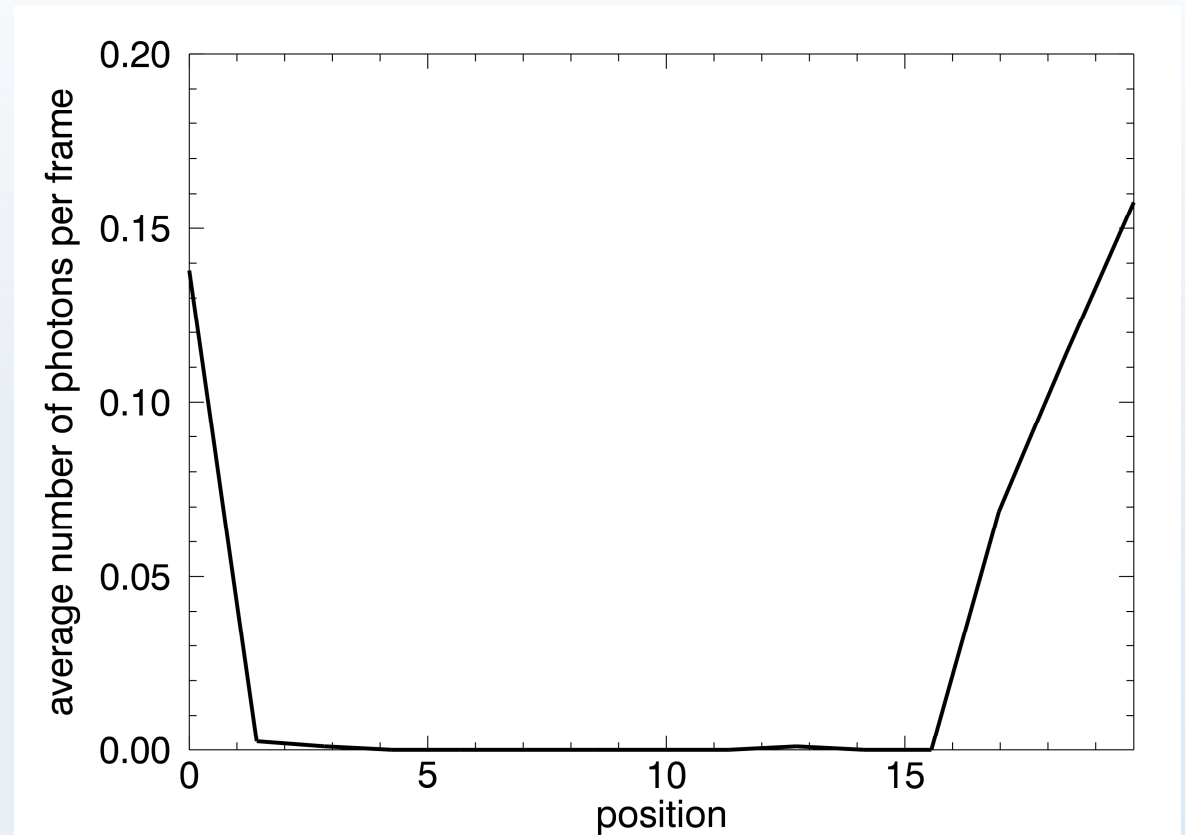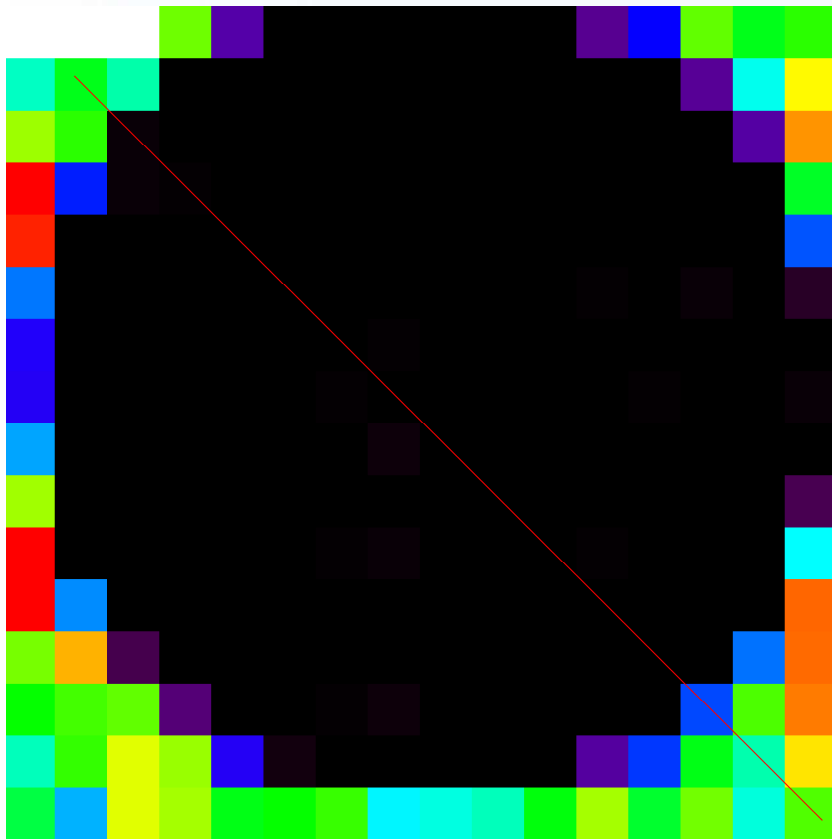
At the P10 beamline

Beam direction

AGIPD sensor

Chip tester box

It took about 1 ½ hours to set up, after about 2 hours we saw the first image
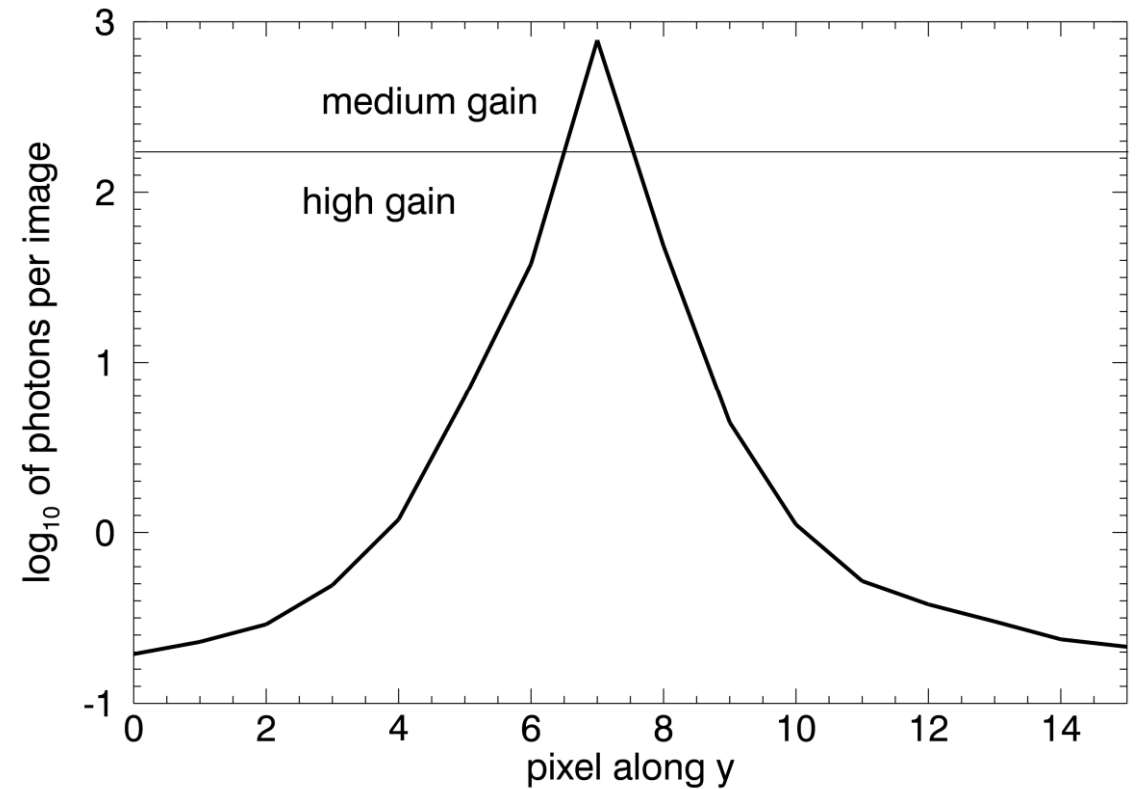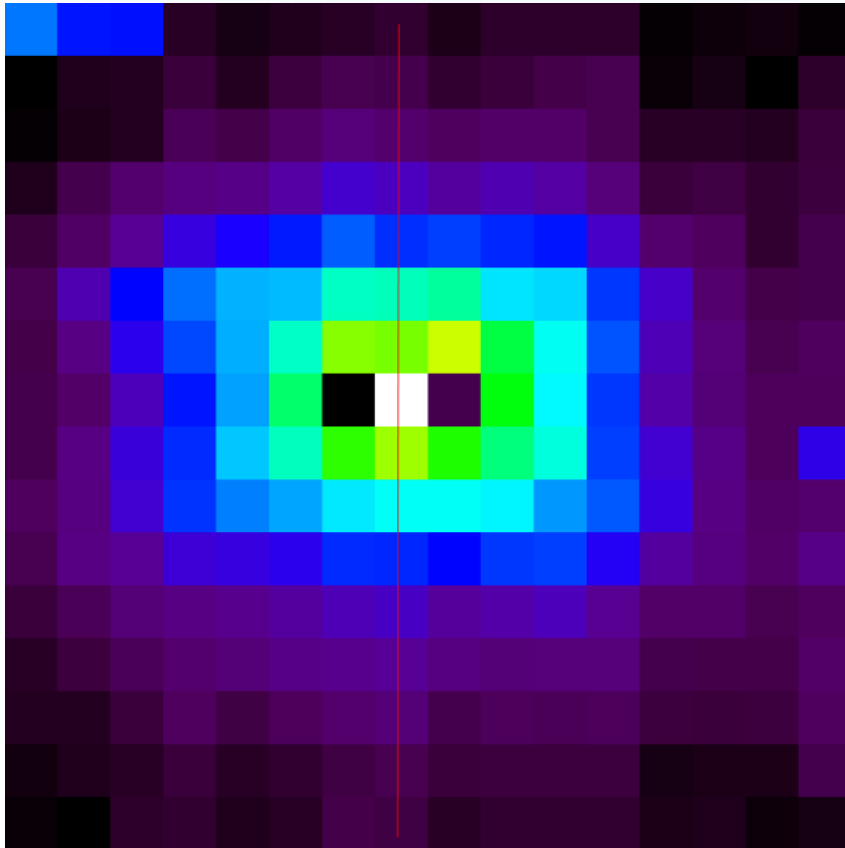
Not in the picture: Alexanders PC

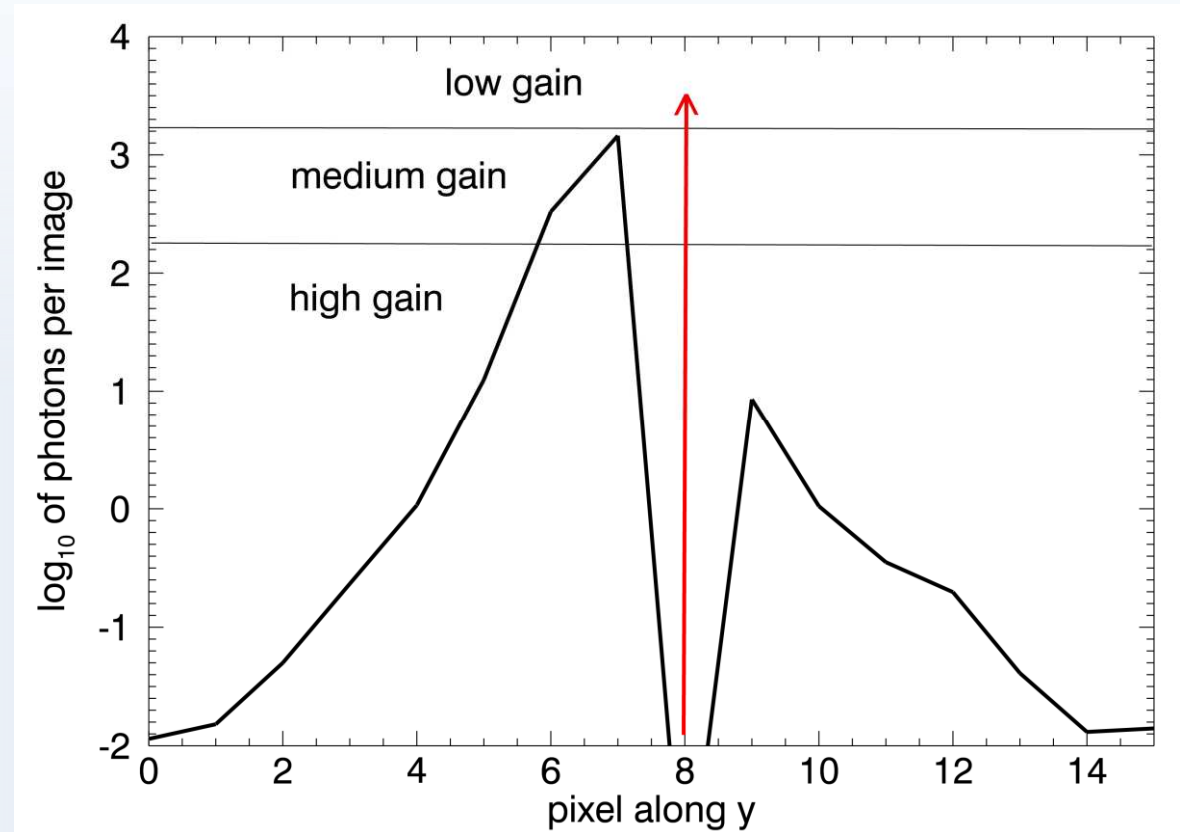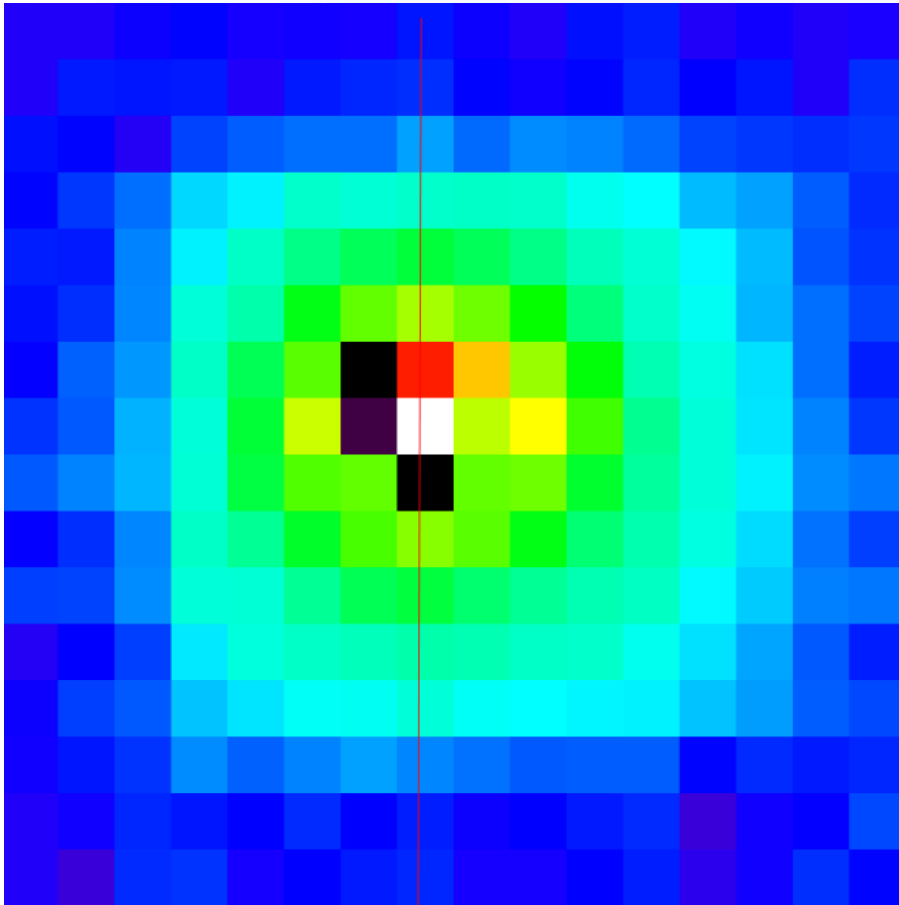# Imaging the beam stop

Everything works nicely, sample inserted

beam stop removed

Everything works nicely, sample inserted
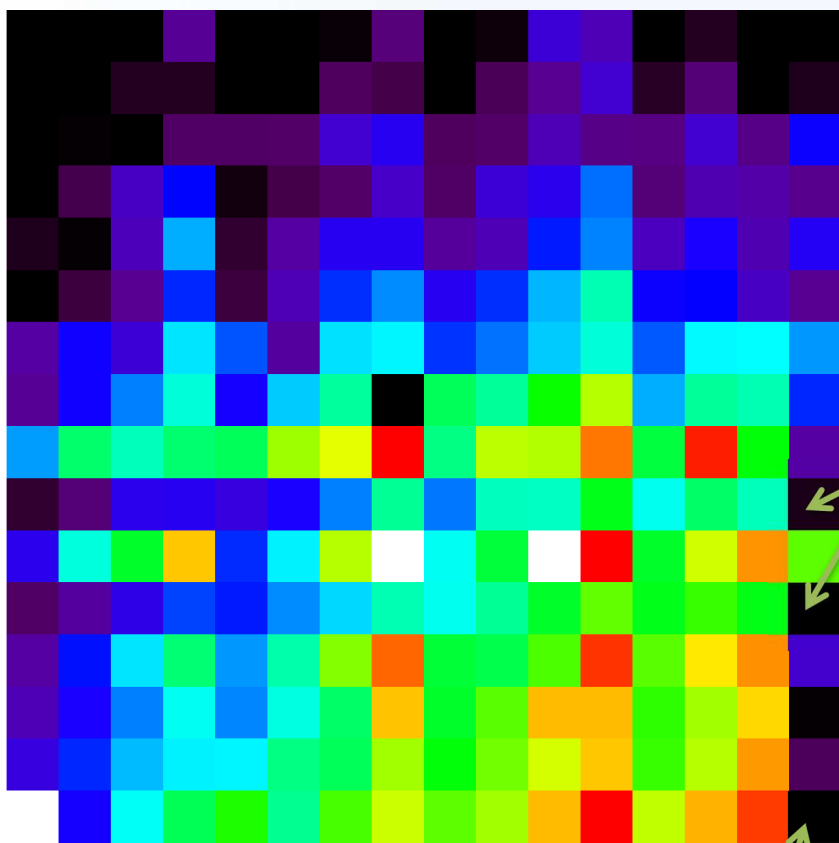
beam stop and sample removed

Detector switches to low gain in central region, but not saturated.
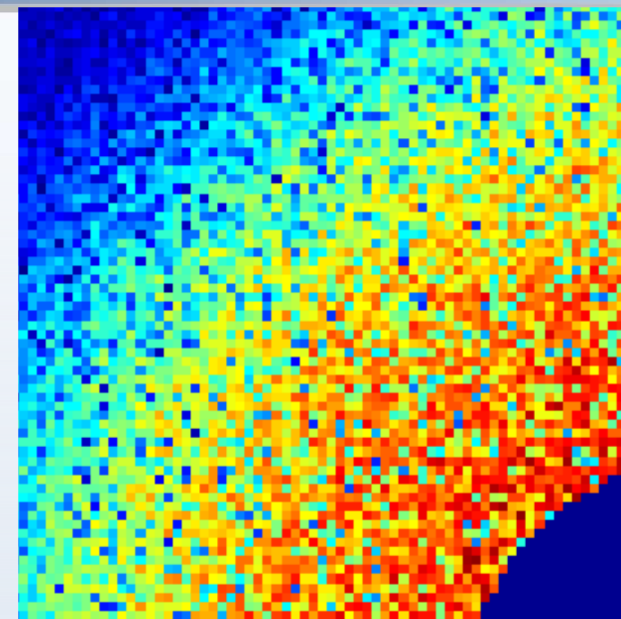Some problems with low gain calibration
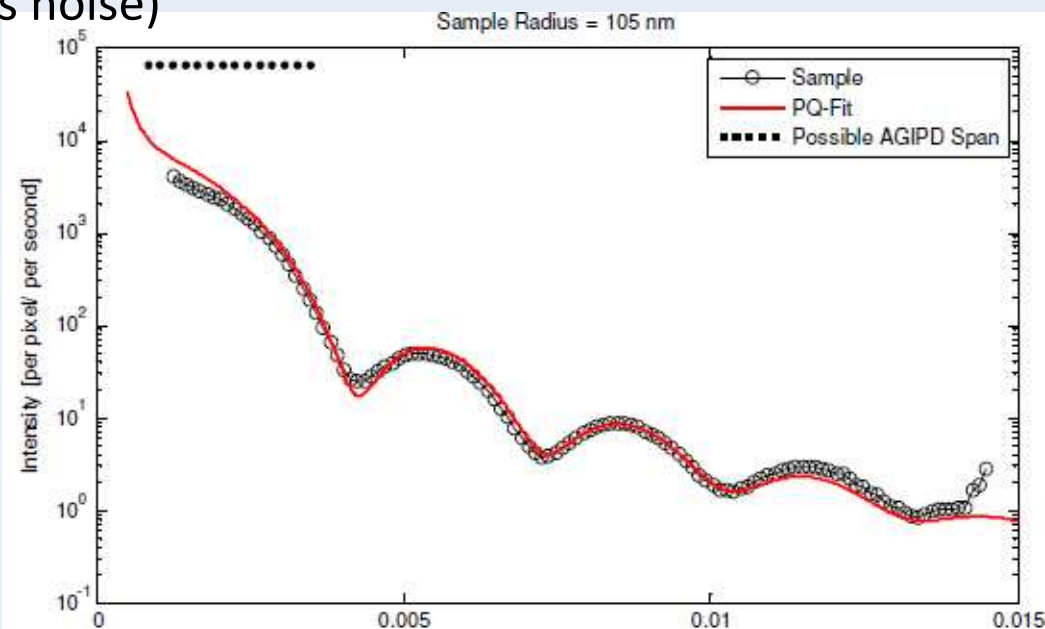Size of direct beam ~ 75x150 μm (HxV) using CRLs

Looking at the first sample

Image taken with MaxiPix det. and approx. same field of view

High gain rows (less noise)

Beam stop holder

Sample Radius = 105 nm

- ○— Sample
- —— PQ-Fit
- ▪▪▪▪ Possible AGIPD Span
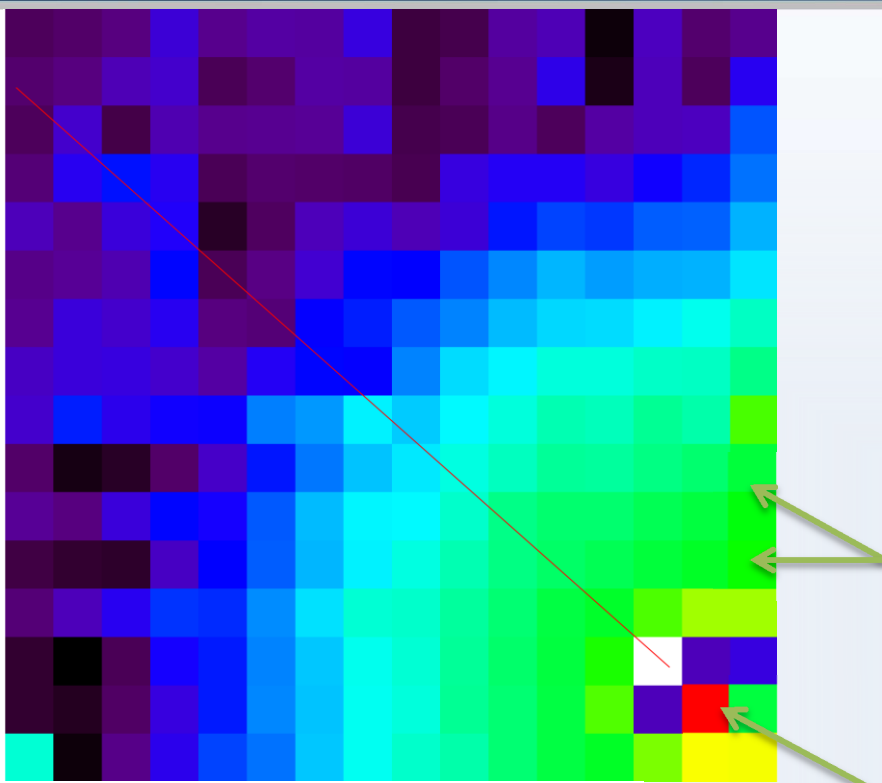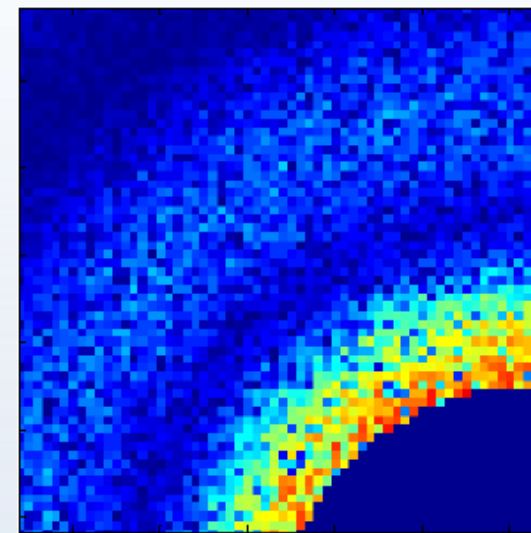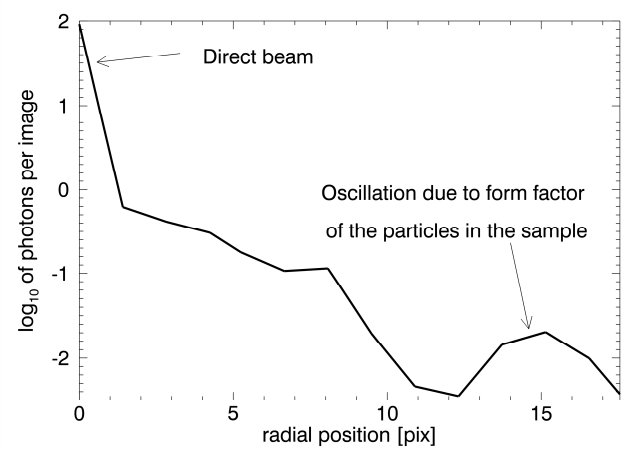
Image taken
with MaxiPix
det. and
approx.
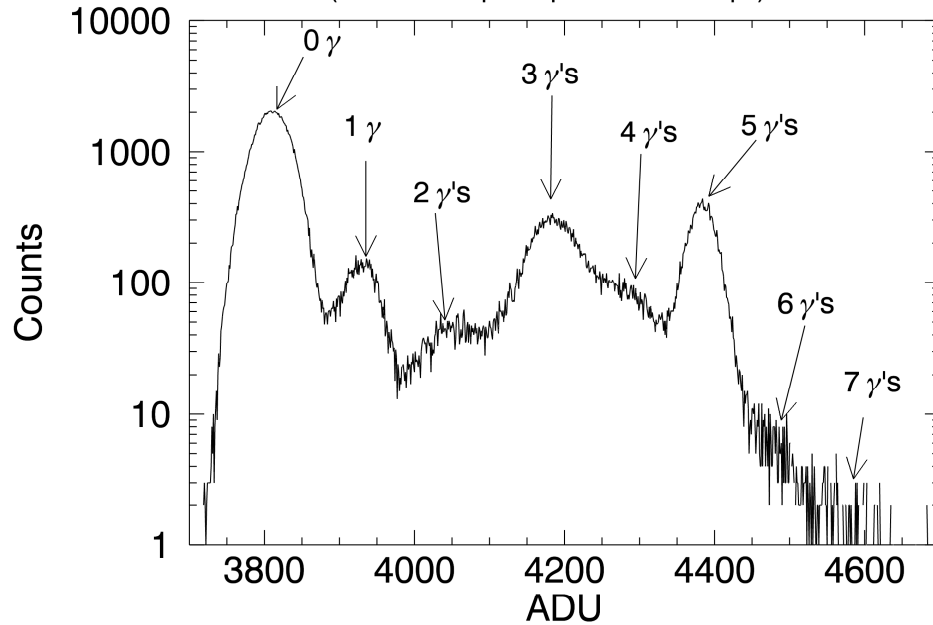same field
of view

High gain rows
(less noise)

Beam stop removed

Direct beam

Oscillation due to form factor
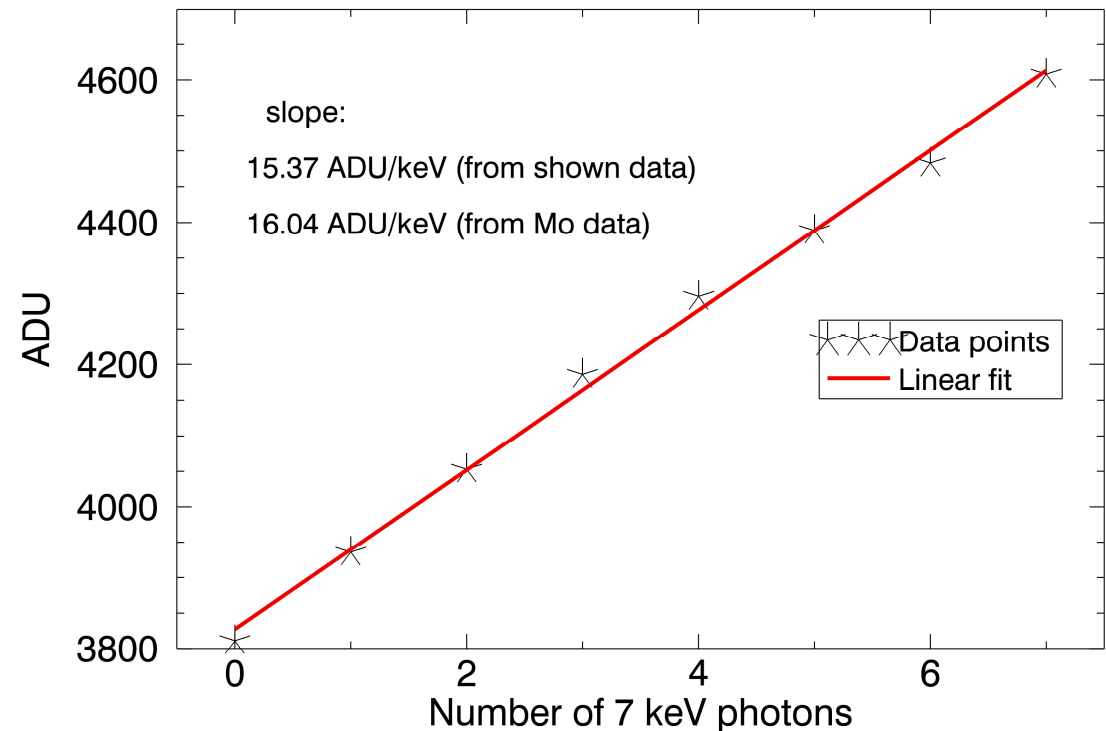of the particles in the sample

$\log_{10}$ of photons per image

radial position [pix]

Sample with R = 245 nm

- Sample
- PQ-Fit
- Possible AGIPD Span

Intensity [per pixel/ per second]

Single photon sensitivity

Low intesity histogram for Pixel r4c1 (high gain)

(data of multiple experimental setups)

Individual photons clearly distinguishable without use of a hole mask
Pixel noise about 320 e

High gain energy calibration of Pixel r4c1 (high gain)

slope:

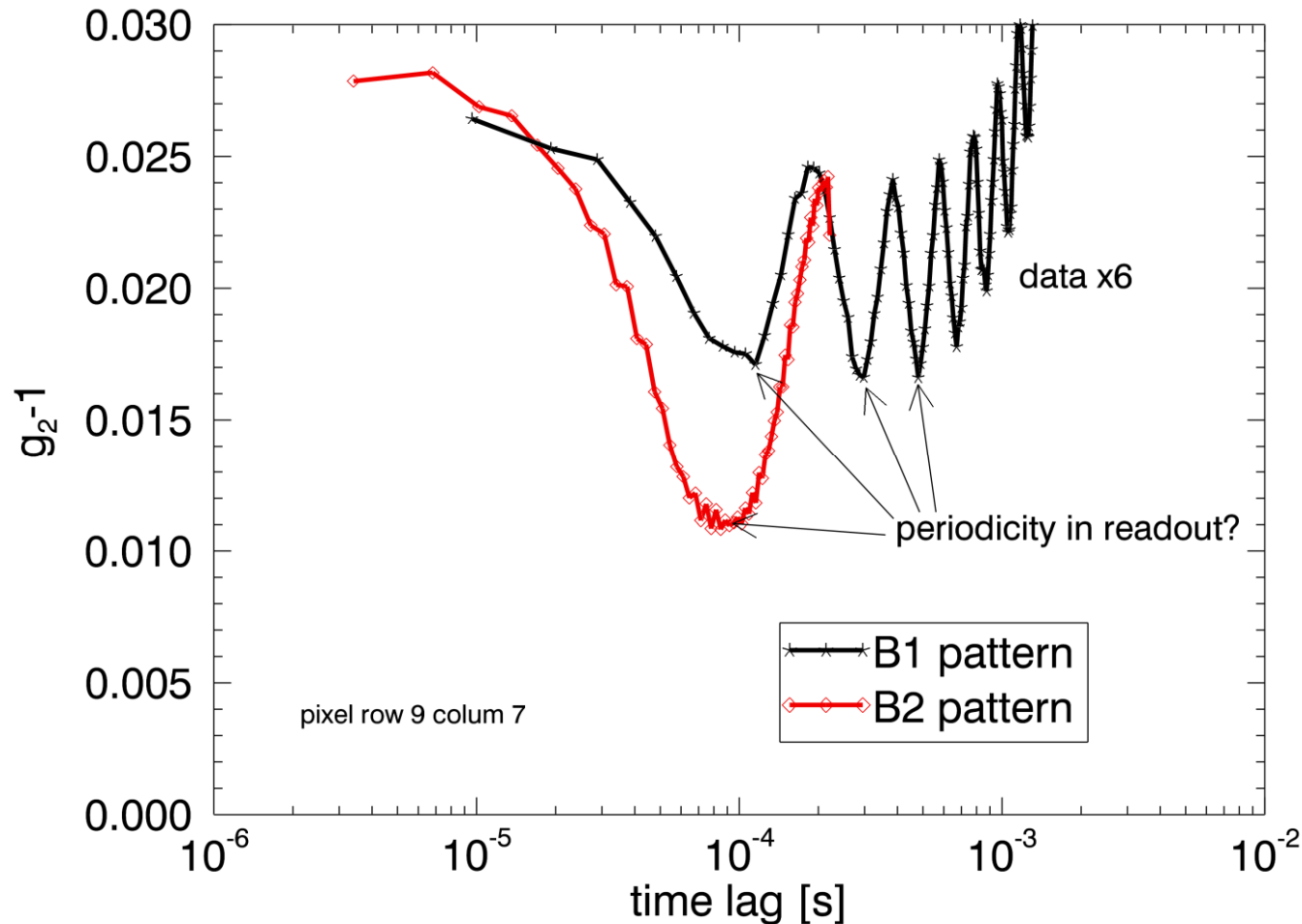15.37 ADU/keV (from shown data)

16.04 ADU/keV (from Mo data)

After peak picking by eye, gain is within 5% of the value obtained with Mo source

Some calibration issues

x=   5, y=   14

Simple 3 parameter (+1 const) fit:
ADC_0: Pedestal
G: Gain
α: Saturation parameter
ADC_{sat}: saturation level (constant)
Q: Charge (independent variable)

Readout scheme optimized for low noise -> saturation issue with CDS (known and fixed for AGIPD1.0)

$$ADC_{out} = ADC_0 + G * \frac{Q}{\left(1 + \left(\frac{G * Q}{ADC_{sat}}\right)^{\alpha}\right)^{1/\alpha}}$$
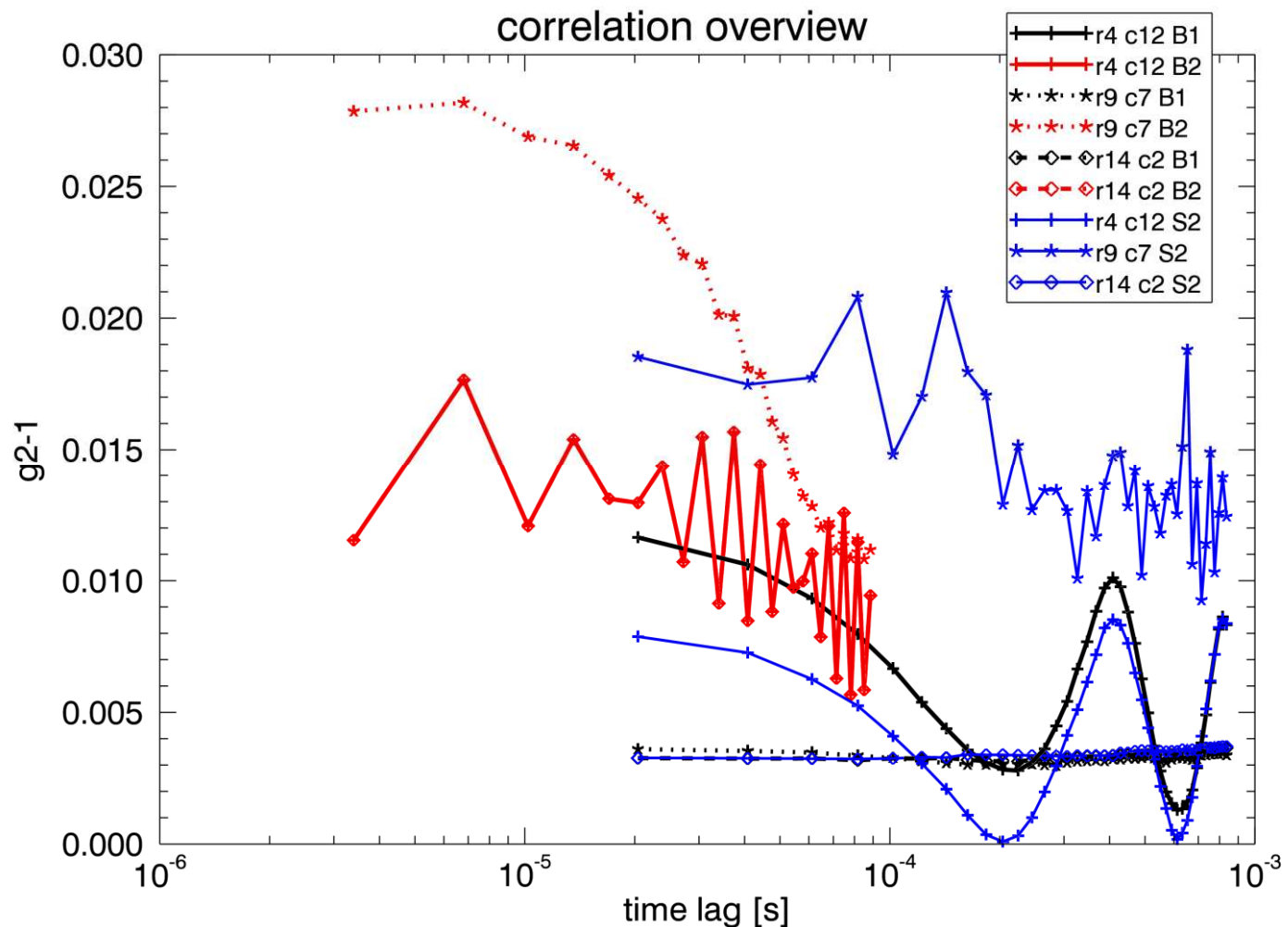
B1 pattern:
sequential write/read
cycles (314)
dt ~ 10 μs

B2 pattern:
Write to memory
(280) / read all
dt ~ 3.4 μs

Only selected example

Backup

J. Becker, AGIPD meeting, Hamburg

XPCS data

B1 pattern:
sequential write/read
cycles (314)
dt ~ 10 µs

B2 pattern:
Write to memory
(280) / read all
dt ~ 3.4 µs

Different pixels at
different radii ->
different lag times