Flat Field commissioning data

DATA:

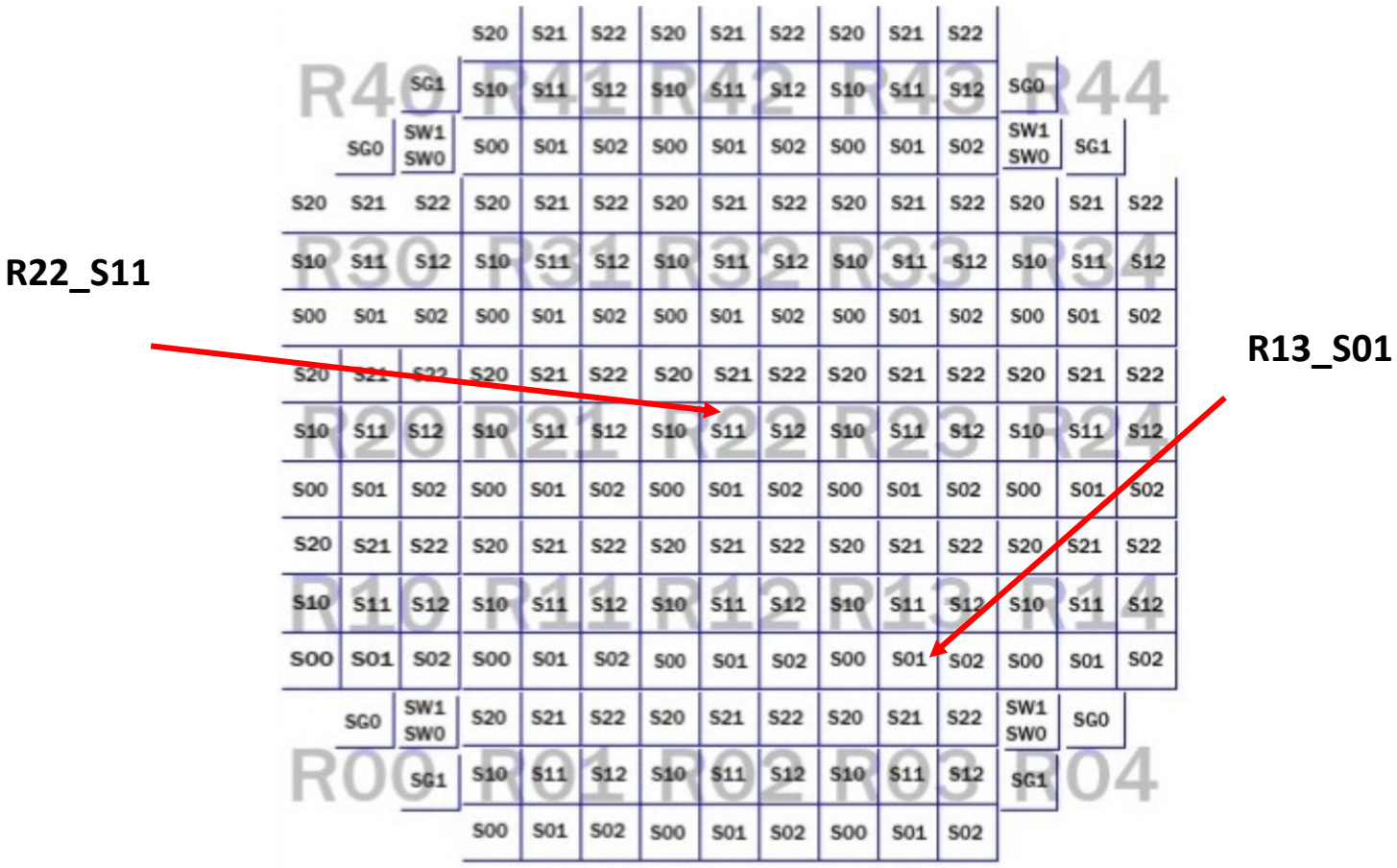
/sps/lsst/groups/FocalPlane/SLAC/run5/**13144**/

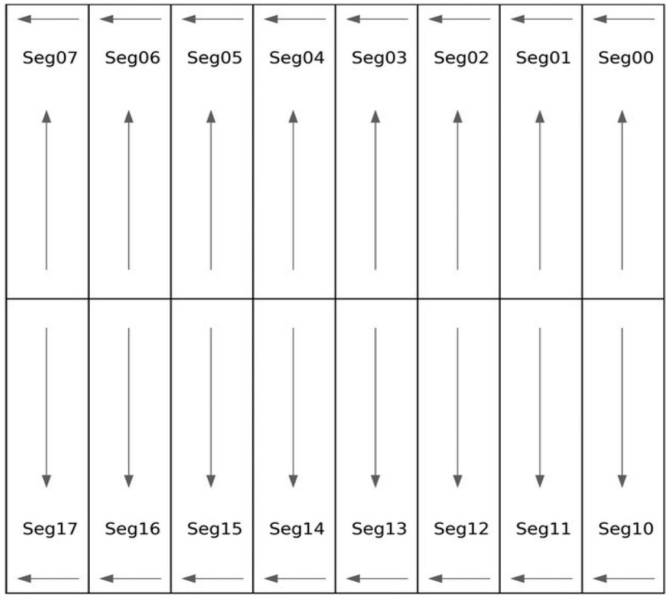
/sps/lsst/groups/FocalPlane/SLAC/run5/**13162**/ (*run PTC, 6 days latter after 13144)*

ANALYSIS:

1. Non-linearity of amplifiers boundary on flat field images (overscan correction and gain correction)
2. Source illumination gradient

2 Mars 2023

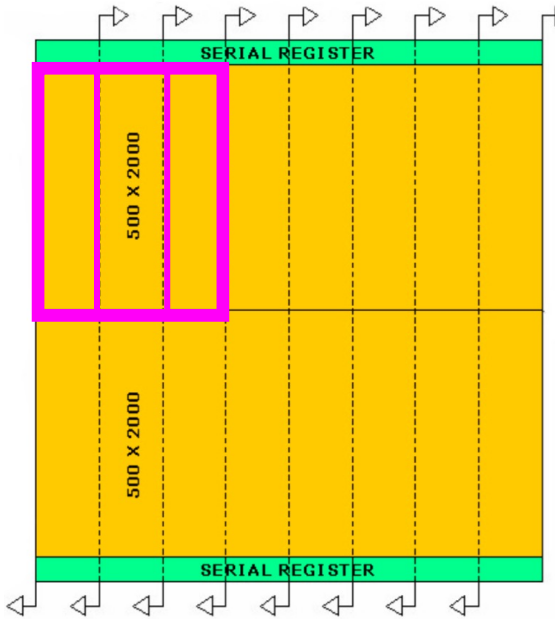


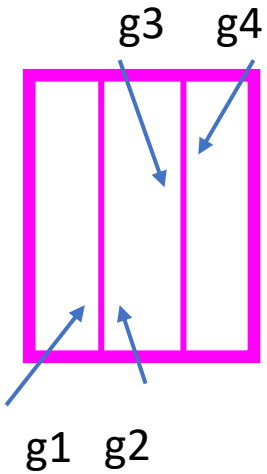


CCD dimensions:
4002*4096 pixels
Amplifier dimension:
512*2002 pixels

2. Non-linearity of amplifiers boundary for flat field images

Estimation of the error step between amplifiers (by considering a small surface, e.g. 4 columns neighboring the border of two amplifiers)





3 amplifiers with gains

Consider flat images with overscan correction and gain correction.
Notations:

- g1,g2,g3 the gains for the three amplifiers

- I1,I2,I3 mean signals of the amplifiers

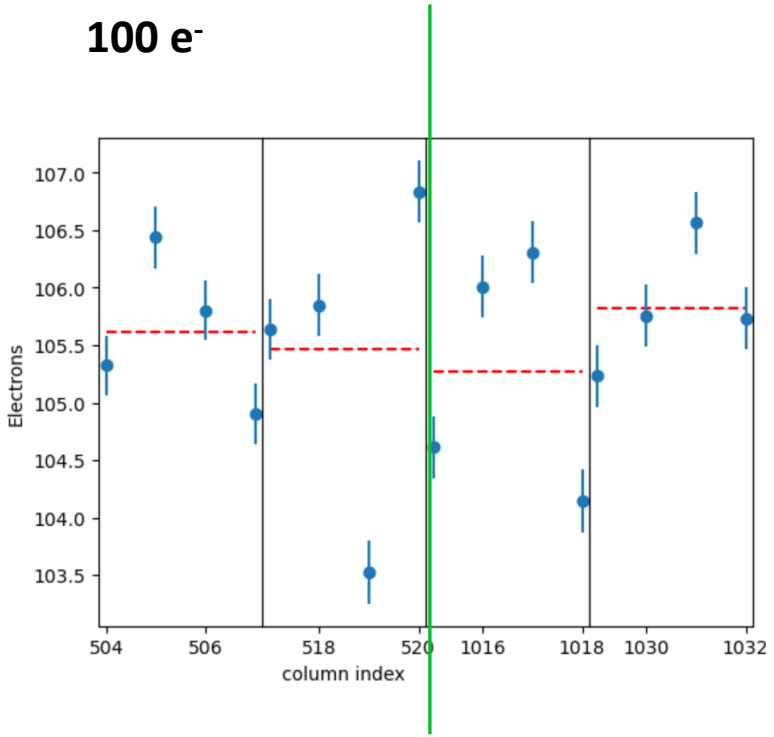
For the border between two amplifiers we may consider:

$$\frac{I1}{I2} = \frac{g1}{g2} \pm \sigma\left(\frac{I1}{I2}\right)$$

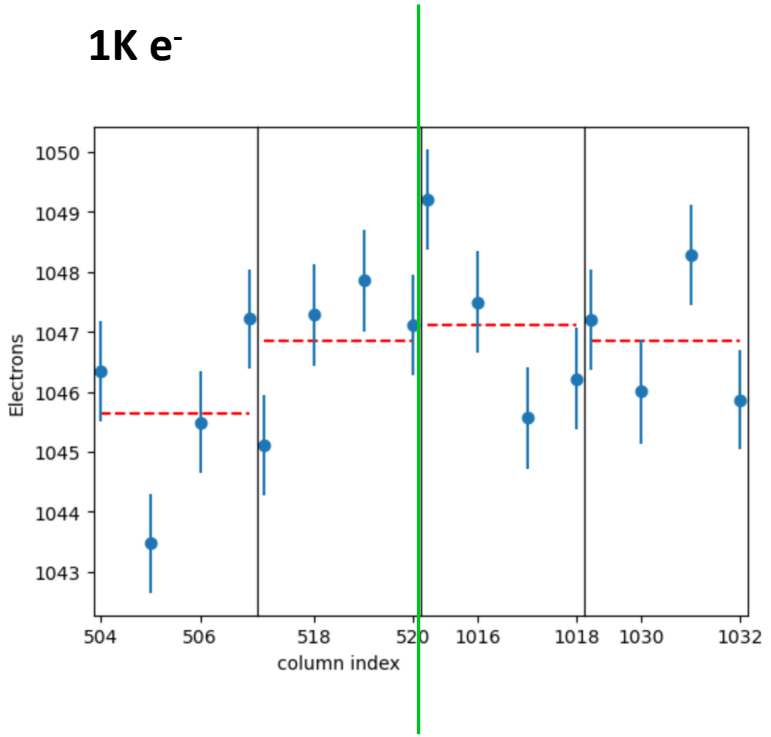
where g1/g2=1 (flat images corrected for gain)

Run 13144, ***R22_S11***

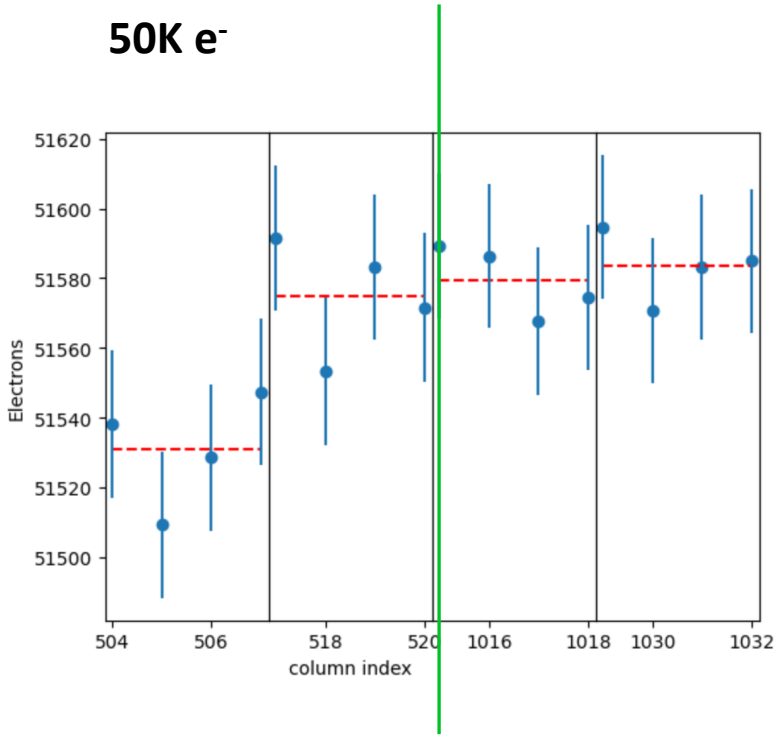
100 e$^-$



1K e$^-$



50K e$^-$



$g1/g2 = 1{,}0014 \pm 1{,}5*10^{-3} \ / \pm 5{,}3*10^{-3}$

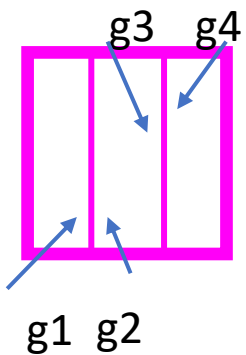
$g3/g4 = 0{,}9947 \pm 1{,}5*10^{-3} \ / \pm 5{,}4*10^{-3}$

$g1/g2 = 0{,}9988 \pm 4{,}8*10^{-4} / \pm 7{,}1*10^{-4}$

$g3/g4 = 1{,}0002 \pm 4{,}8*10^{-4} \ / \pm 7{,}1*10^{-4}$

$g1/g2 = 0{,}9991 \pm 6{,}97*10^{-5} \ / \pm 7{,}05*10^{-5}$

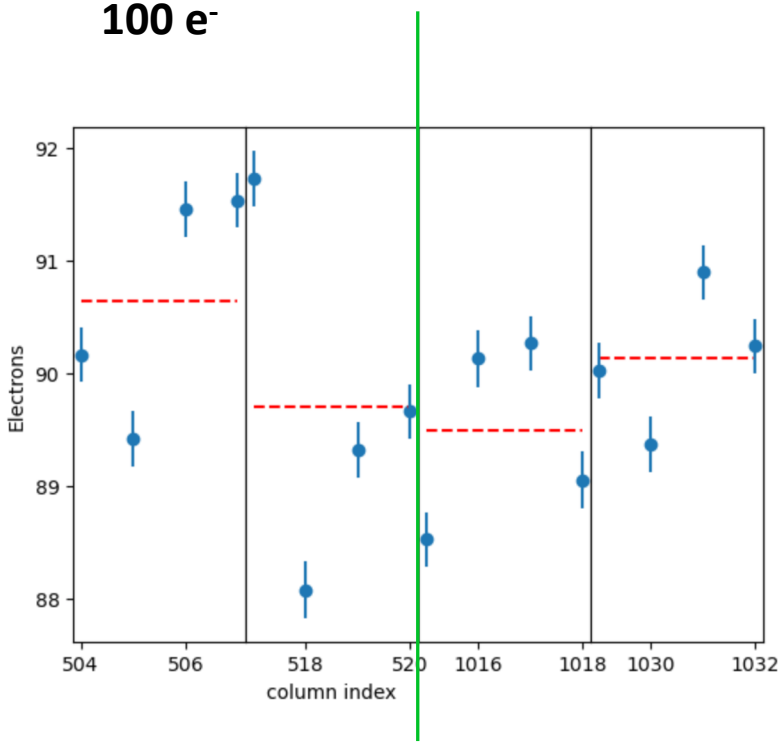
$g3/g4 = 0{,}9999 \pm 6{,}97*10^{-5} \ / \pm 7{,}04*10^{-5}$



Agreement with theory for both runs, 13144 and 13162

Run 13144, ***R13_S01***

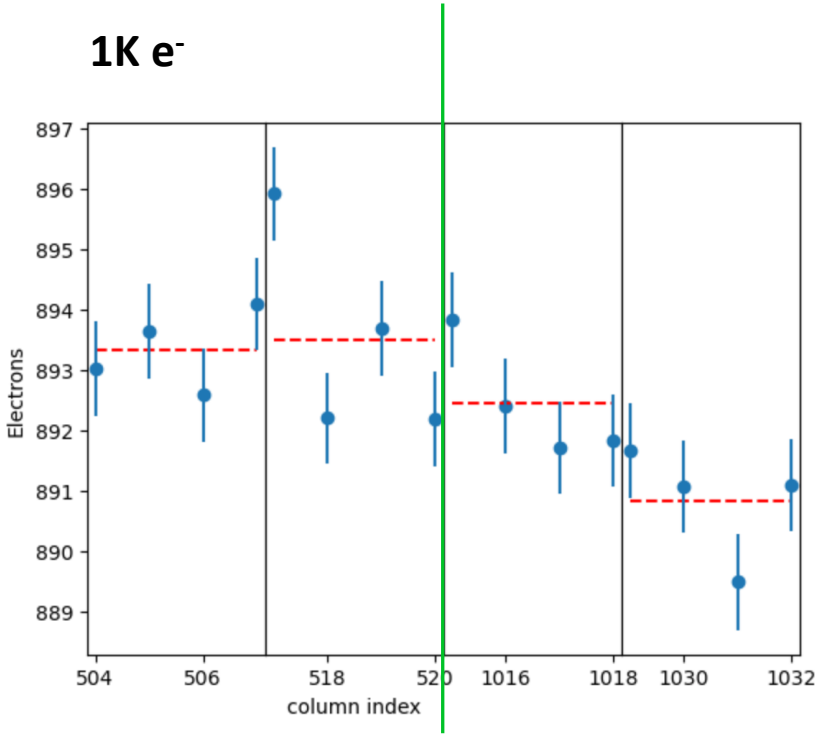
100 e$^-$



g1/g2 = 1,010 ± 1,66*10^{-3} / ± 6,24*10^{-3}

g3/g4 = 0,9929 ± 1,67*10^{-3} / ± 6,31*10^{-3}

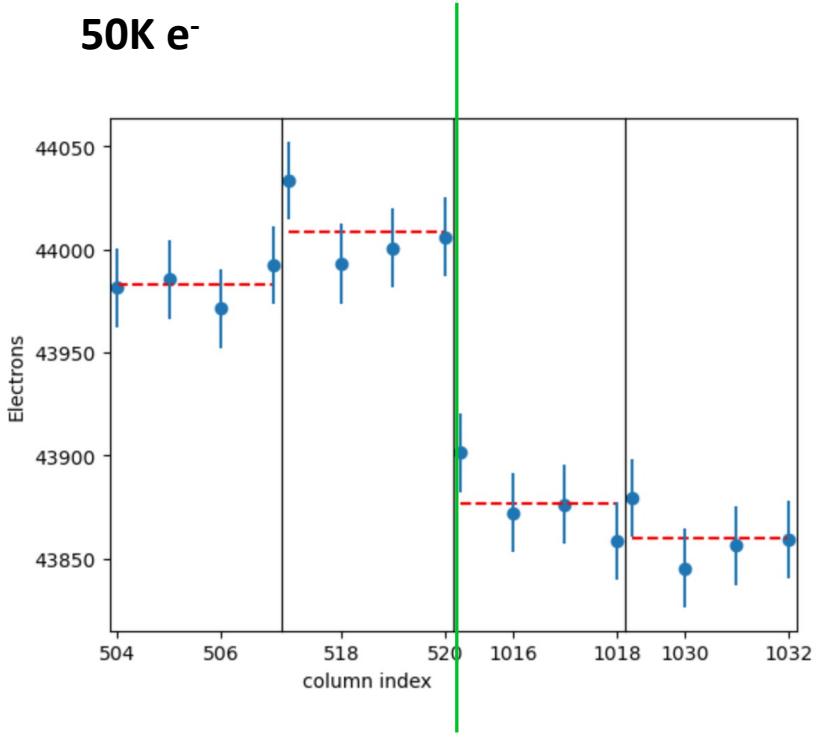
1K e$^-$



g1/g2 = 0,9988 ± 5,3*10^{-4} / ± 8*10^{-4}

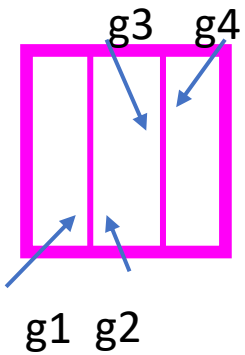
g3/g4 = 1,0002 ± 5,3*10^{-4} / ± 8*10^{-4}

50K e$^-$



g1/g2 = 0,9994 ± 7,53*10^{-5} / ± 7,64*10^{-5}

g3/g4 = 1 ± 7,54*10^{-5} / ± 7,65*10^{-5}



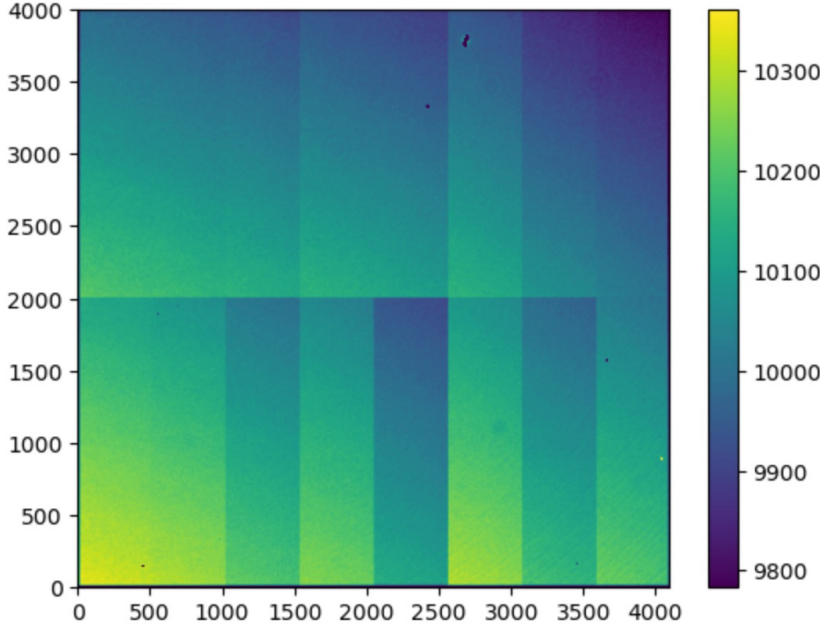
Agreement with theory

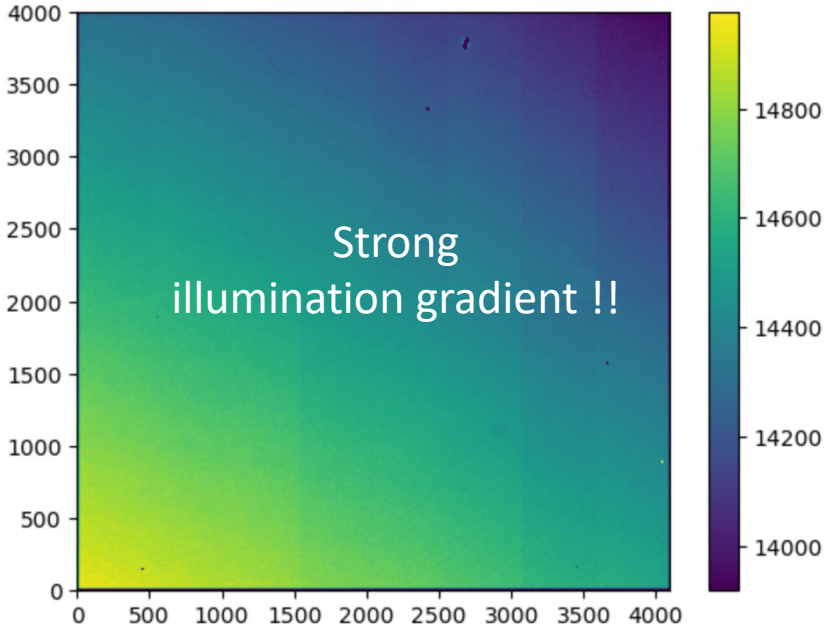
R13_S01, 16K e^-

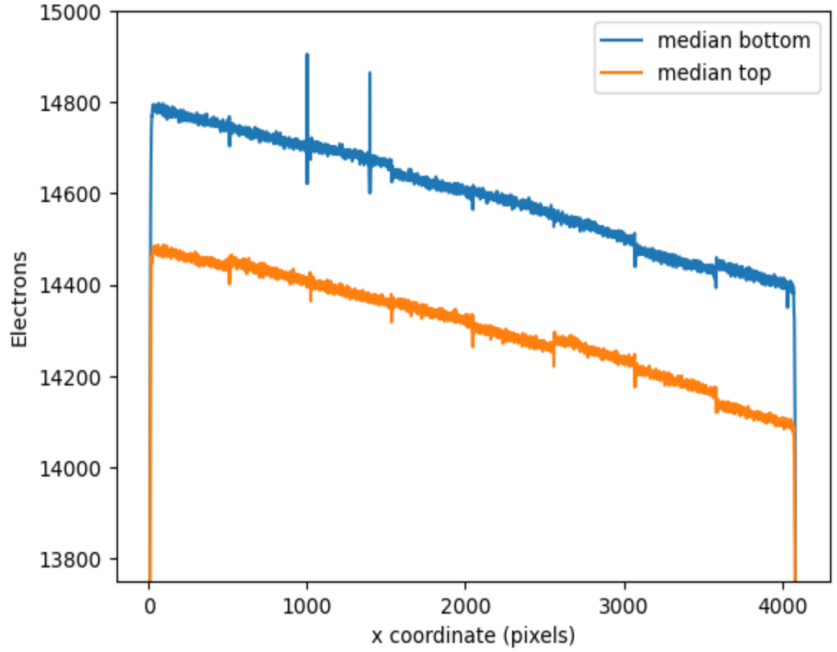
ADU

Gain correction

Electrons



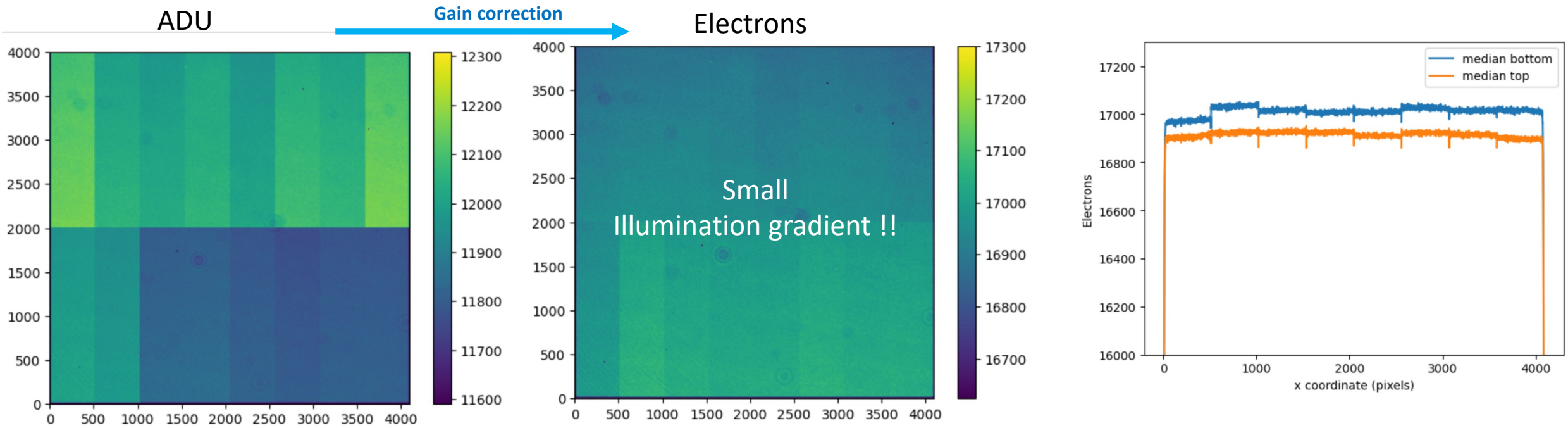




Gain values :
'C00': 1.394506975711689,
'C01': 1.4072849389946436,
'C02': 1.410211569889958,
'C03': 1.4062104346048585,
'C04': 1.4106648494859289,
'C05': 1.403258780265785,
'C06': 1.4053695701448972,
……

Need for gradient illumination correction!!

R22_S11, 16K e^-



The illumination gradient in the BOT was basically radial.