Report on Flatfielding

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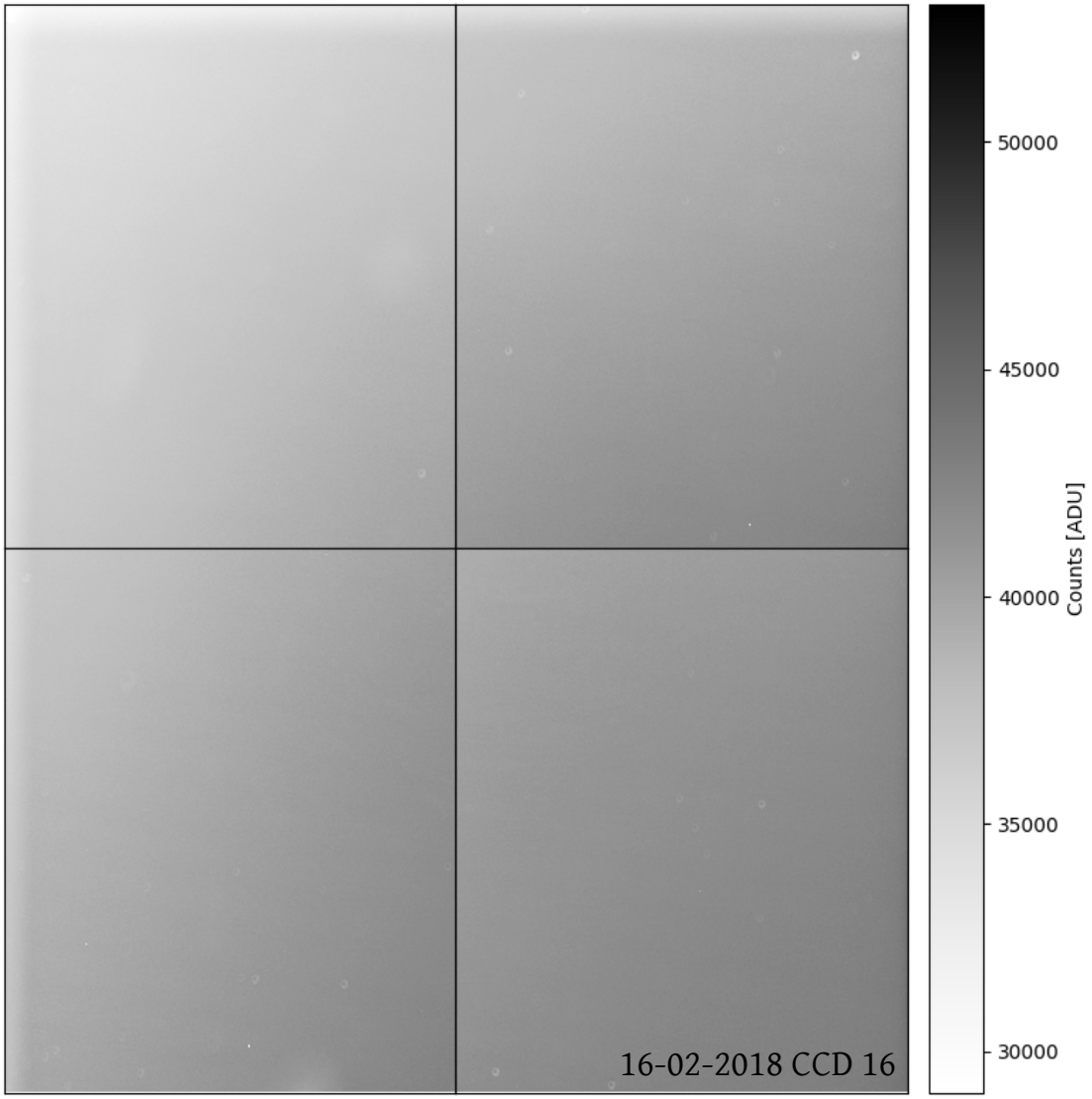
Flatfields

- CCD sensitivity varies from pixel to pixel.

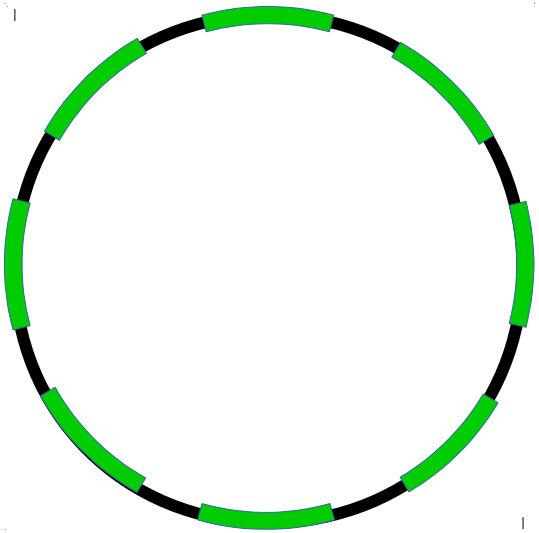
- A flat is a measurement of each pixel's response to a **common** input.

- Is as representative of the relative pixel sensitivity as the input is uniform.

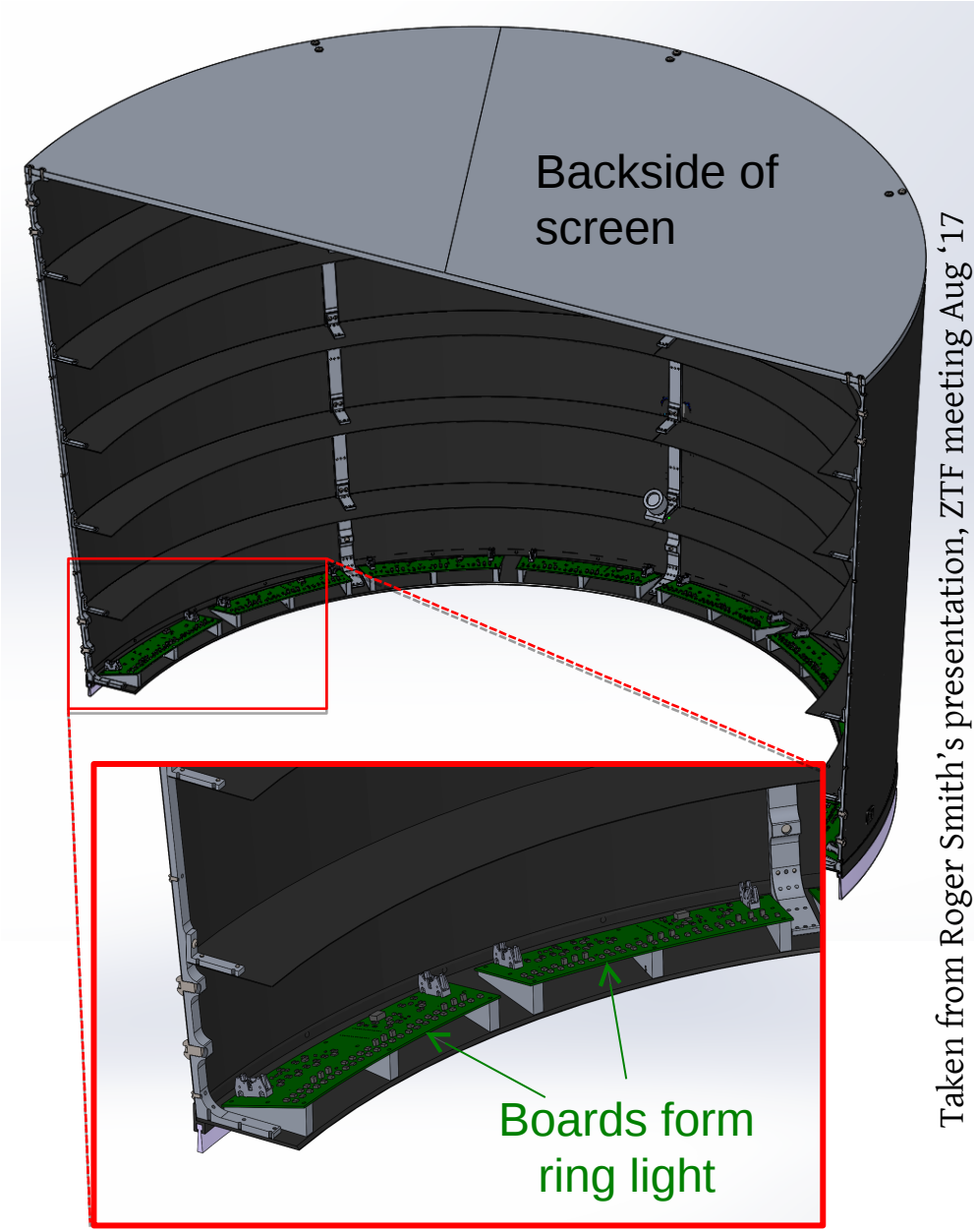


Flatfields pt1: Domeflats

- A diffusing screen illuminated by a set of LEDs:



- Illumination across the large entrance pupil is not perfectly uniform.
- Domeflats measure sensitivity differences at small scales (high-frequency)



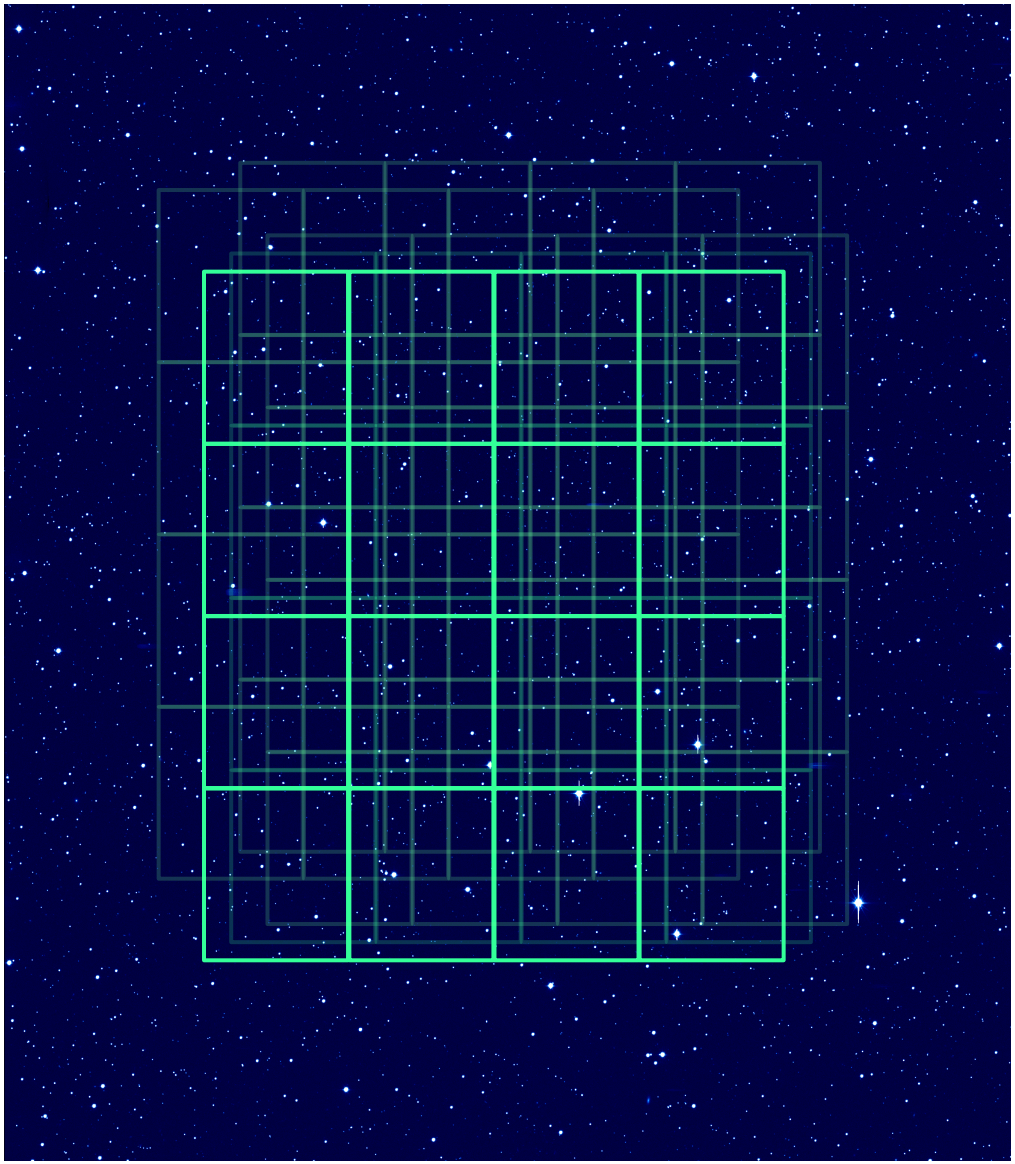
Taken from Roger Smith's presentation, ZTF meeting Aug '17

Flatfields pt2: Starflats

- Dither the pointings so that each star will fall on different pixels.

- On short time scale, and with good seeing, the count differences for the same star are measure of the pixel response.

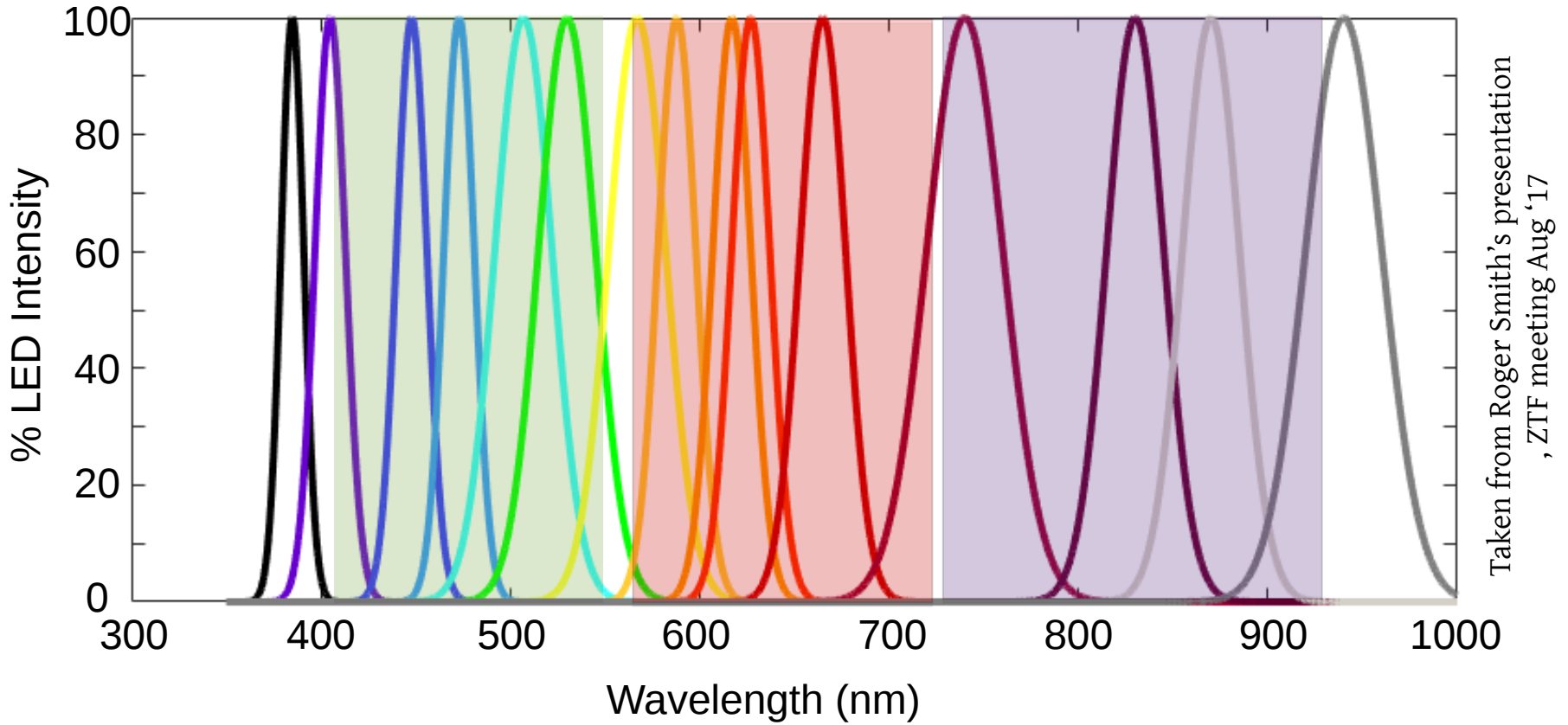
- Provides an anchor to the domeflats at the largest spatial scales (low frequencies).



Domeflats: current setup

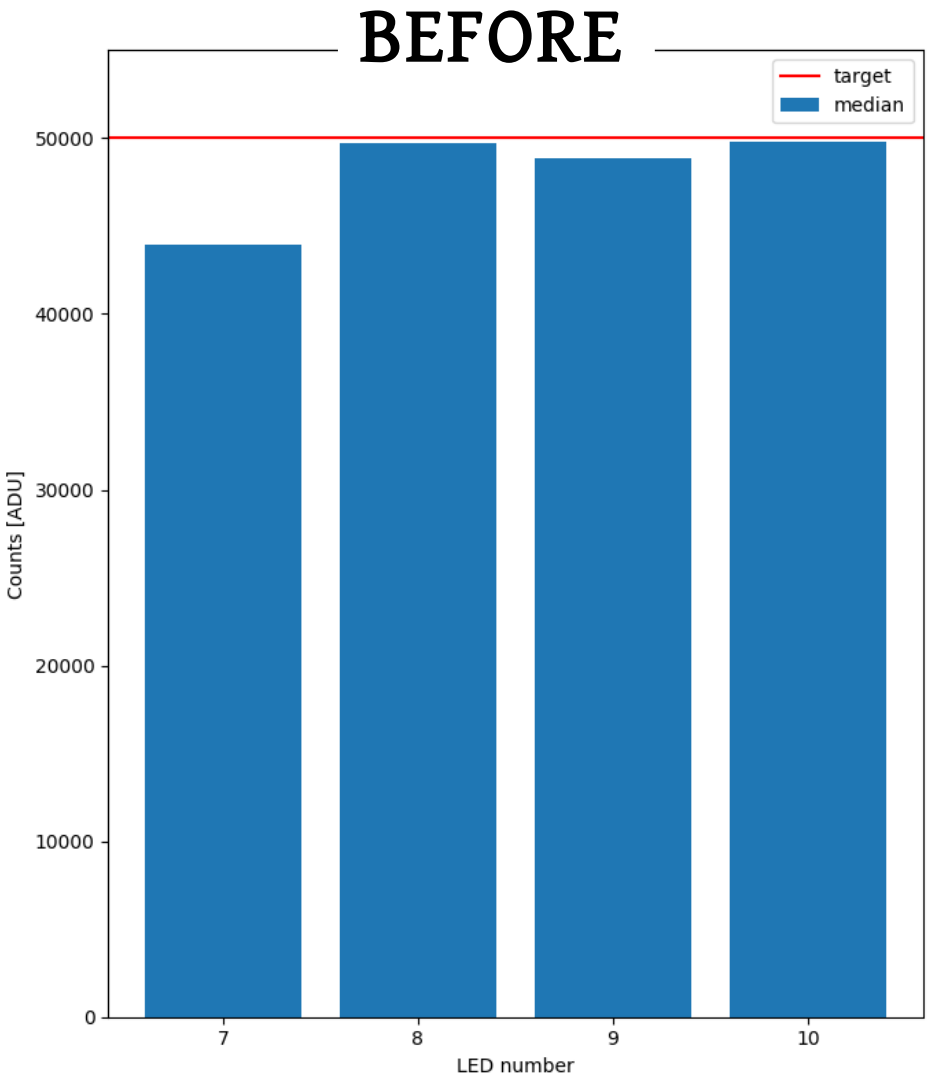
- Flats are taken for each color separately and then combined.
- Weighting can be used to tune domeflats to science object. Currently w(c) = 1.

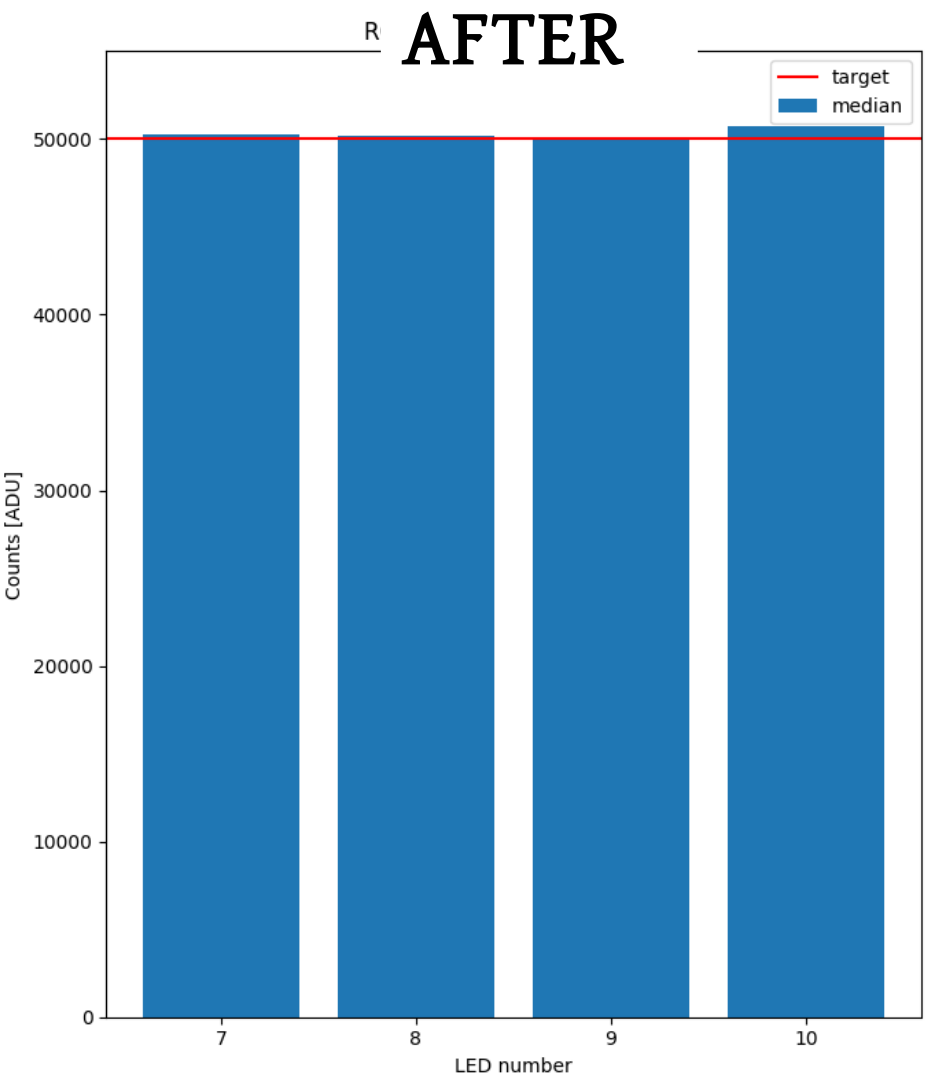
$$F_{BAND} = \frac{\sum_c w(c) F(c)}{\sum_c w(c)}$$



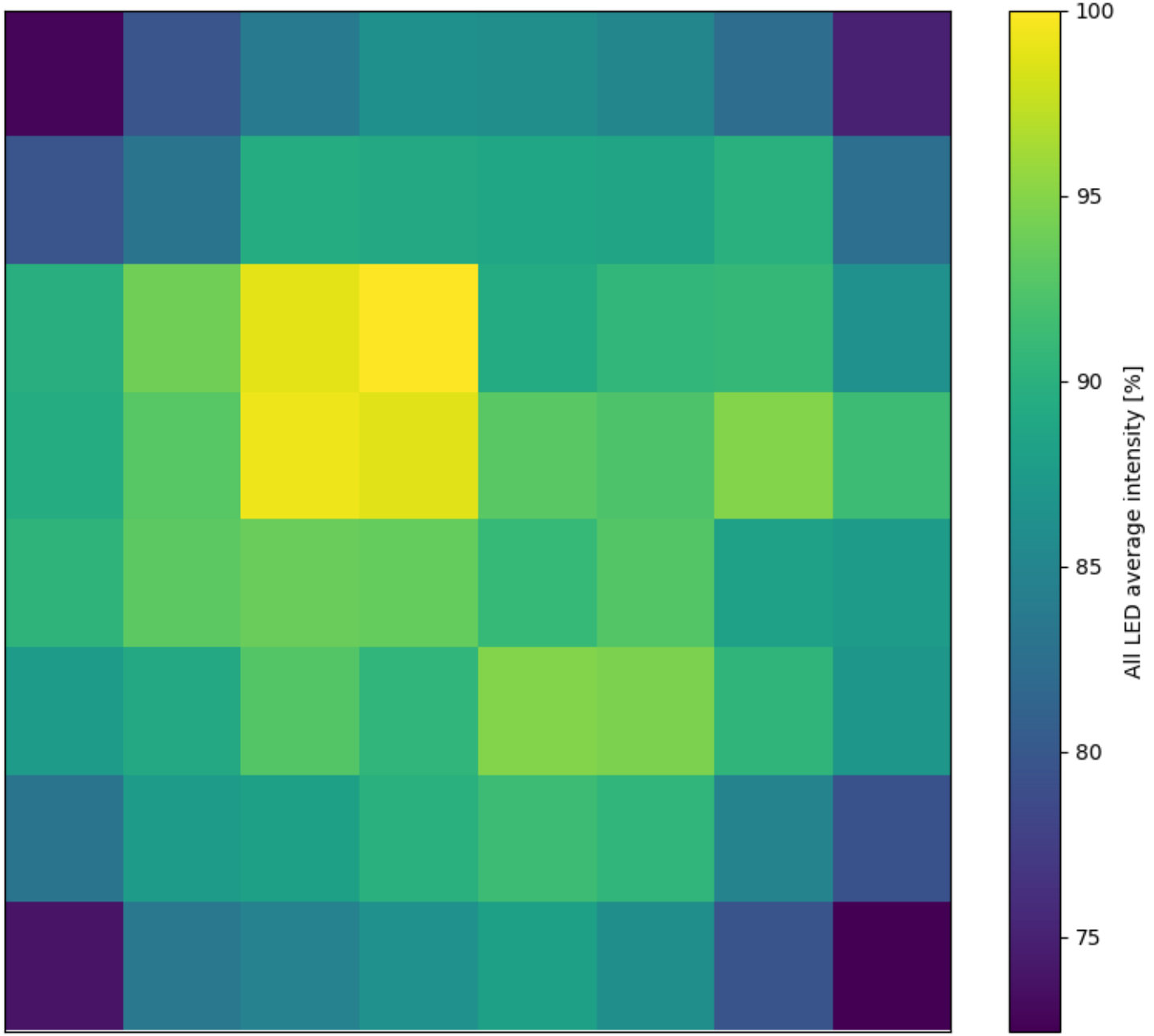
First checks: equalizing LEDs

- Tune LED flash parameters to optimal S/N (50kADU) at the brightest RC.



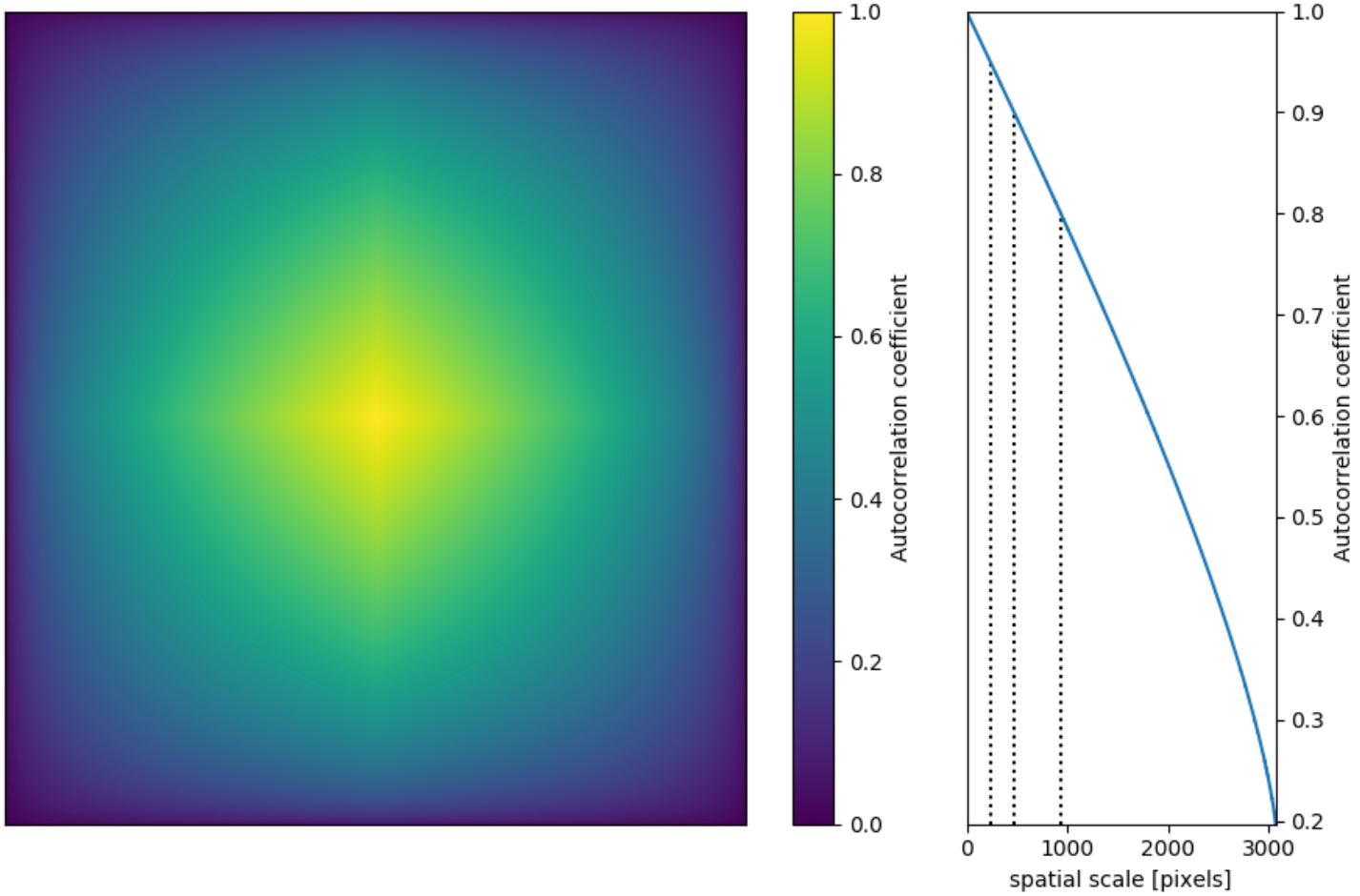


Median-count pattern on the camera



Domeflats uniformity at small scales

- Use autocorrelation to estimate up to which scale flats can be considered uniform.

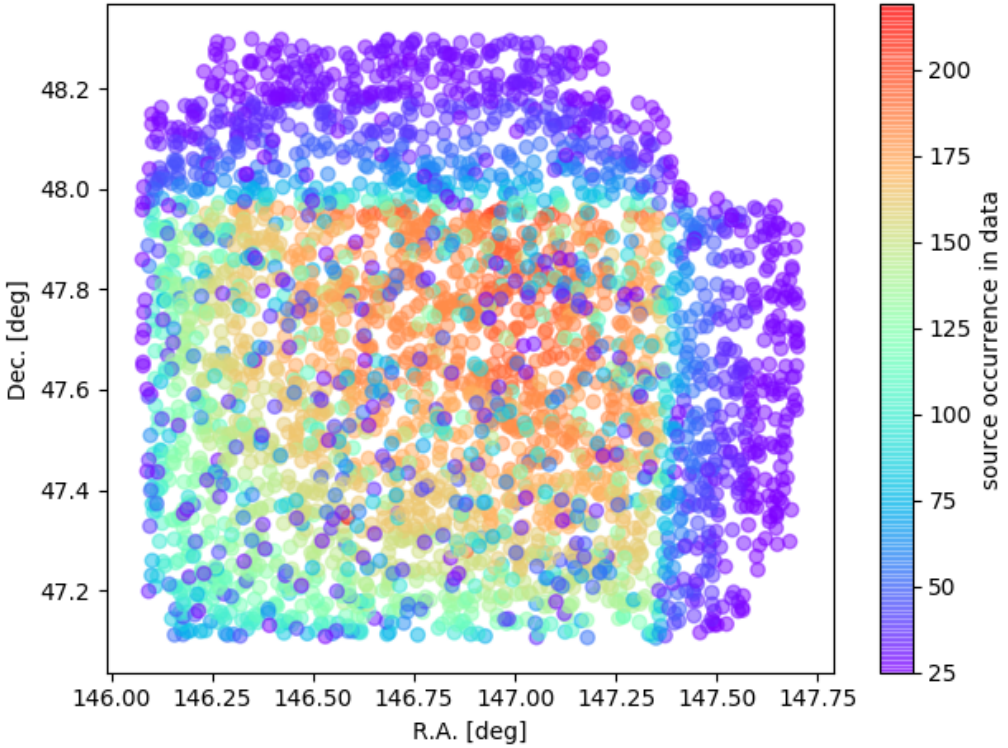


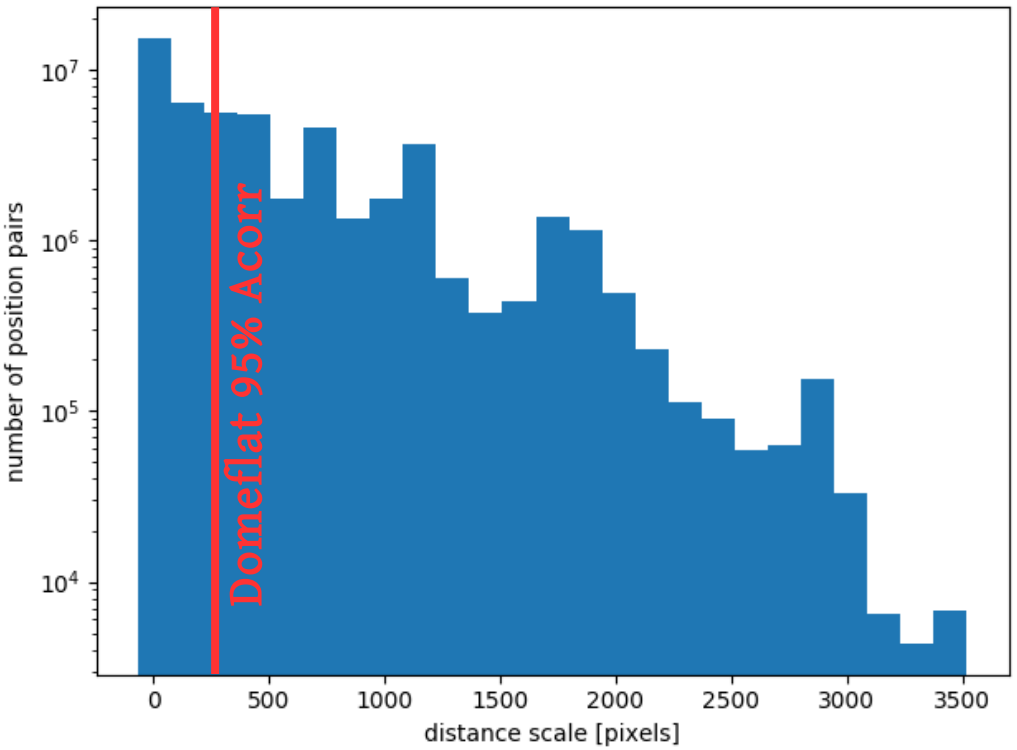
Autocorrelation Coefficient	Scale [pixels]
0.95	235
0.90	470
0.80	940

- Above ~250 pixels starflats seems to be necessary

Starflats

- First starflat observations taken on Feb 21rst
  - 200 pointings testing 2 dithering patterns
  - Cover spatial scales of hundreds to ~ thousand pixels.





Conclusion and outlook

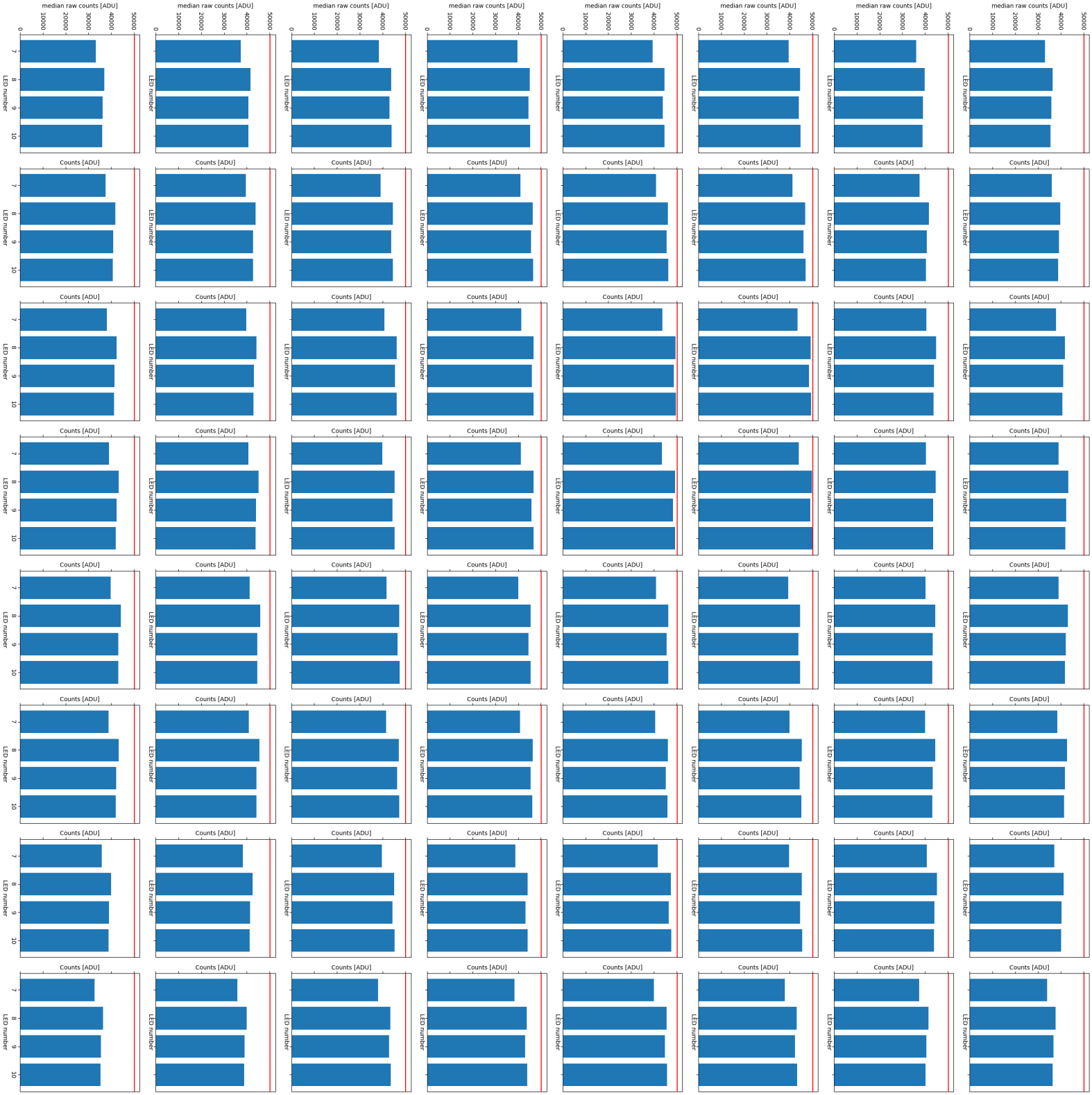
- Domeflats and starflats are necessary and complementary.

- Current domeflat procedure allows to explore and exploit chromatic dependence of the CCD sensitivity.

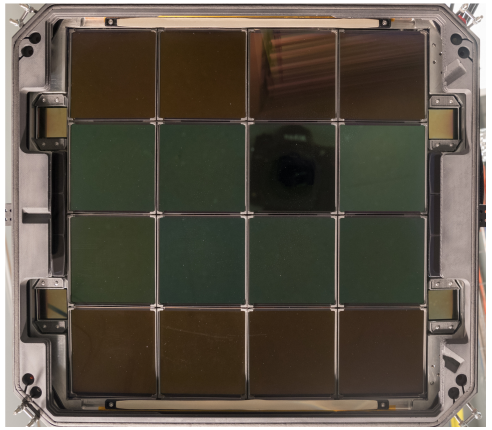
- Fine-tuning LED sequences
- Starflat analysis (Angie)
- Starflat & Domeflat cross validation.

Backups

RC-wise LED median counts



Difference between LED counts:



- Inner CCDs have 2 layers of Anti-Replective (AR)coating.
- Different chromatic dependence.