

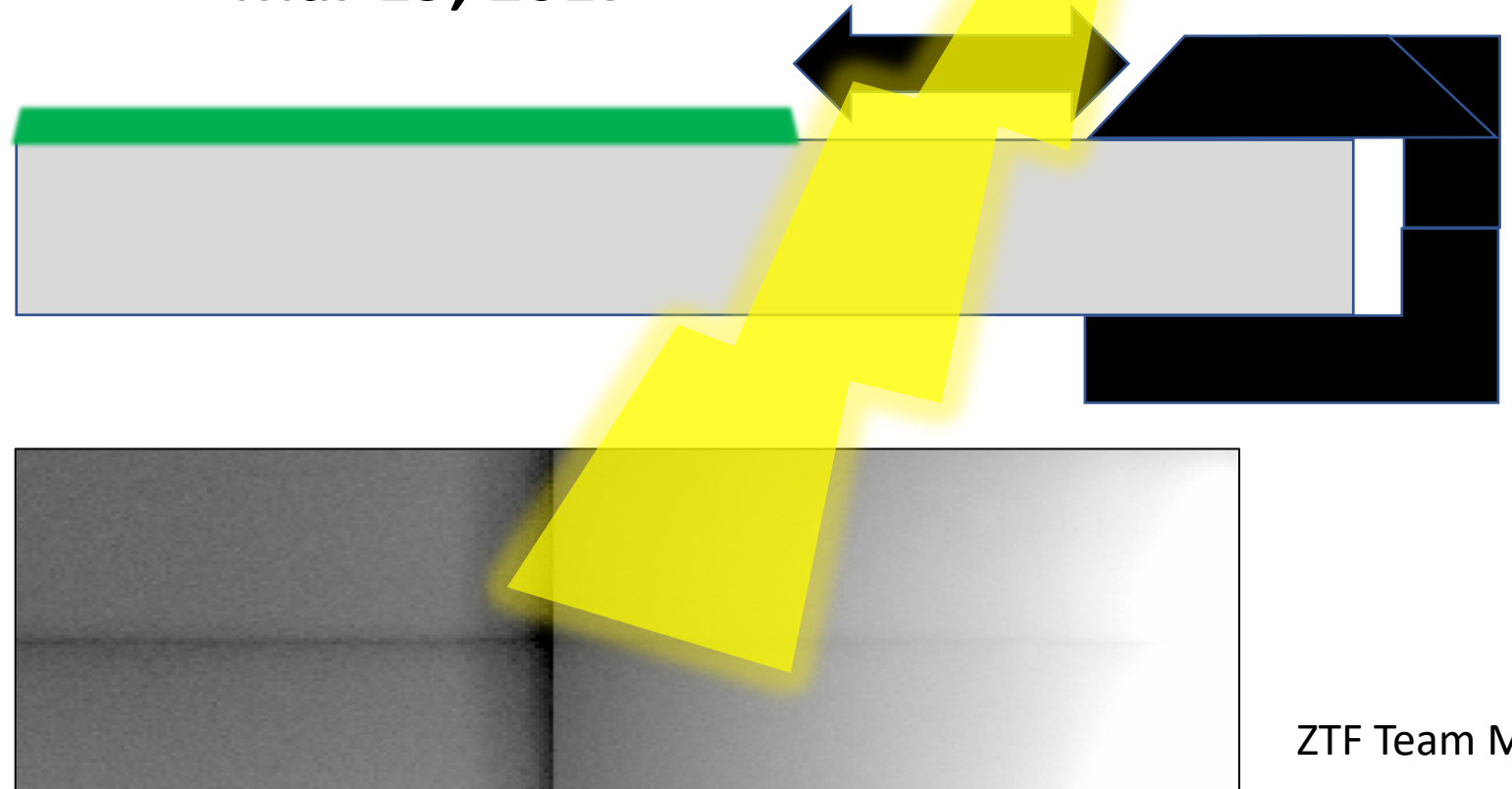
ZTF Engineering Commissioning: Out-of-band Light Leakage

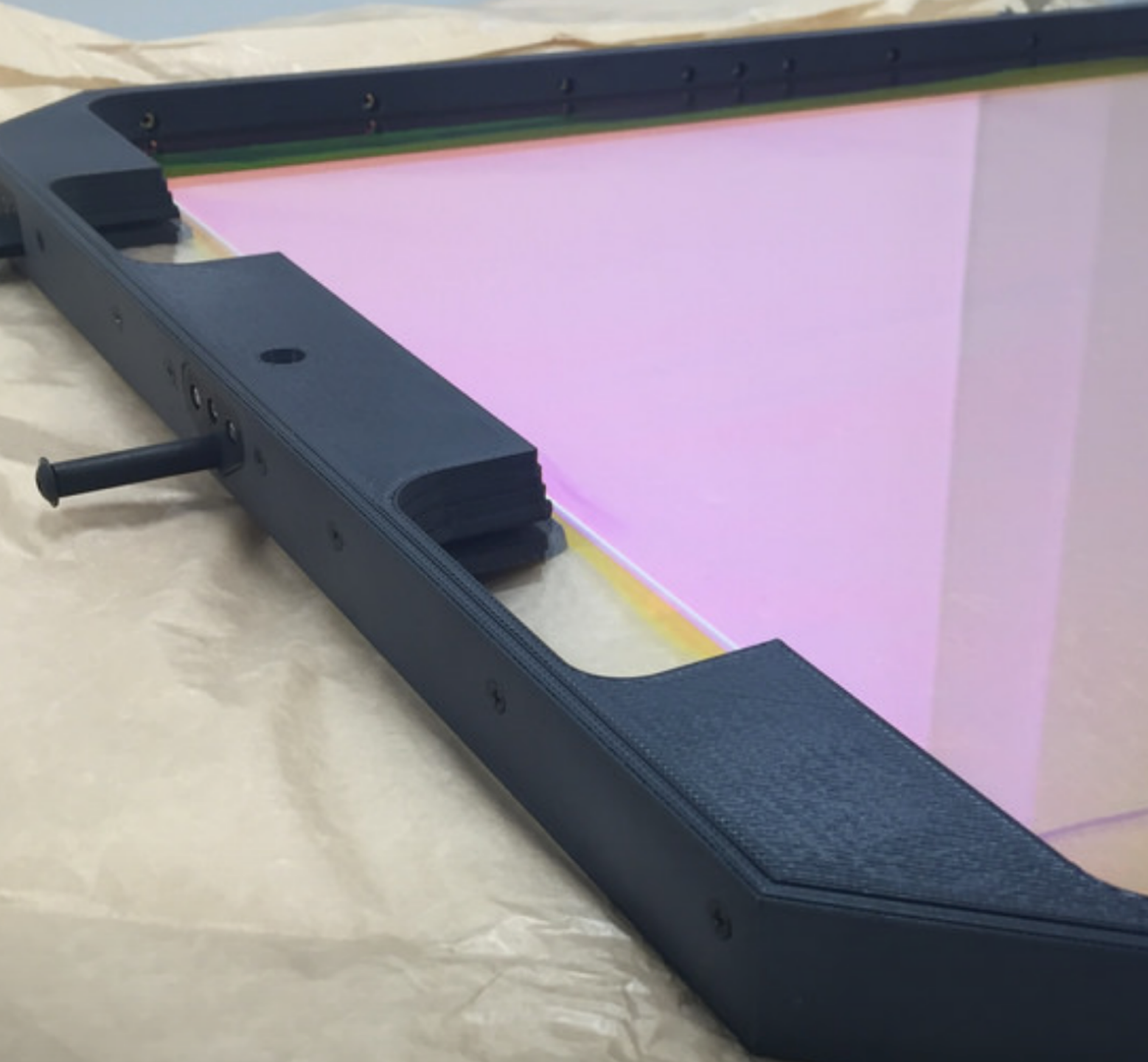
S. Frederick
Mar 19, 2017



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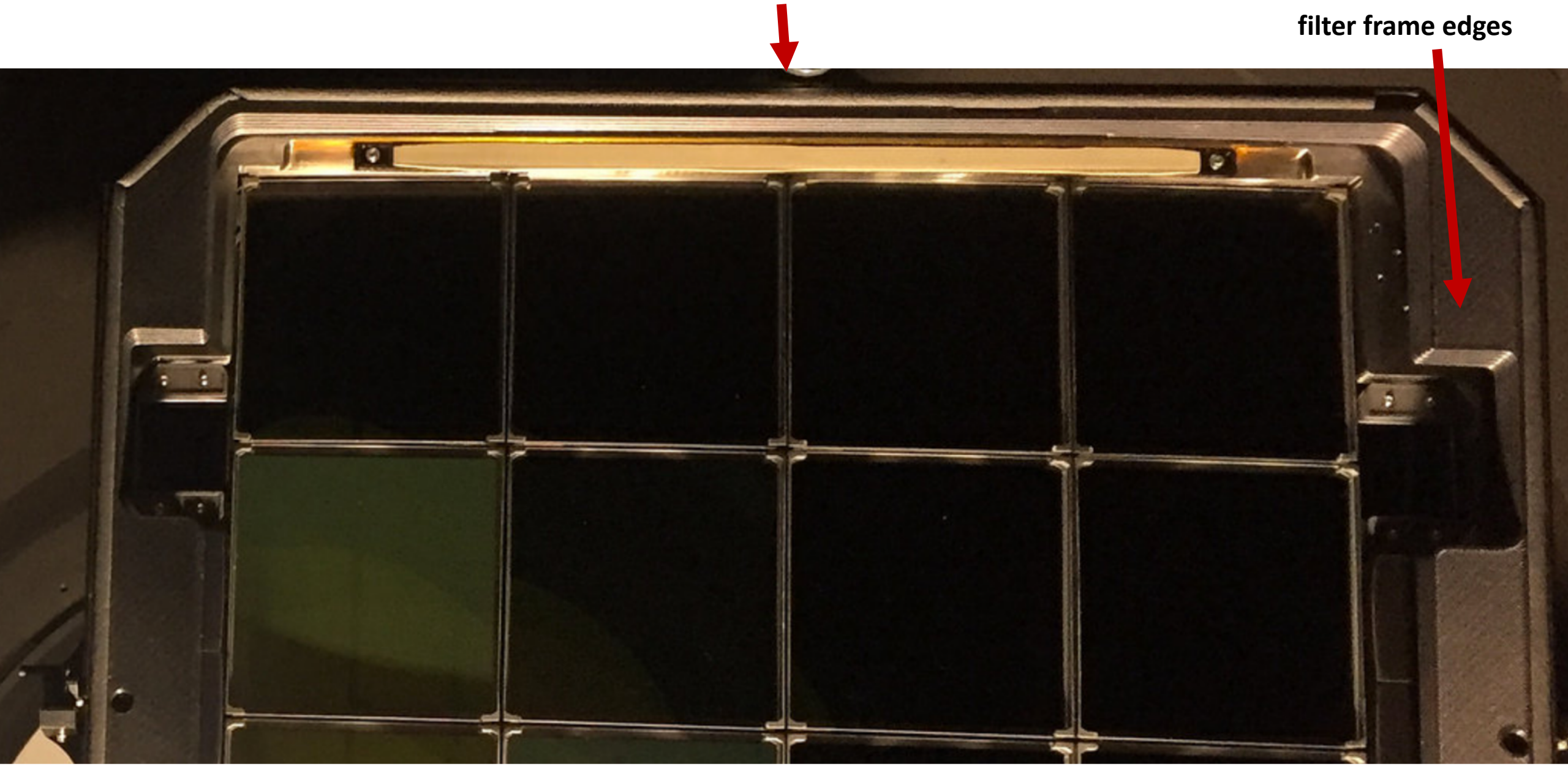




The Problem

- Filter frame backed away from beam to reduce scattering into edge of image, but filter coating was not extended
- **~1mm "crack" of clear glass around filter coating edge**
- Only edge pixels should be affected, (only fraction of the light hitting these pixels is unfiltered)

The Problem: Major sources of scattered light

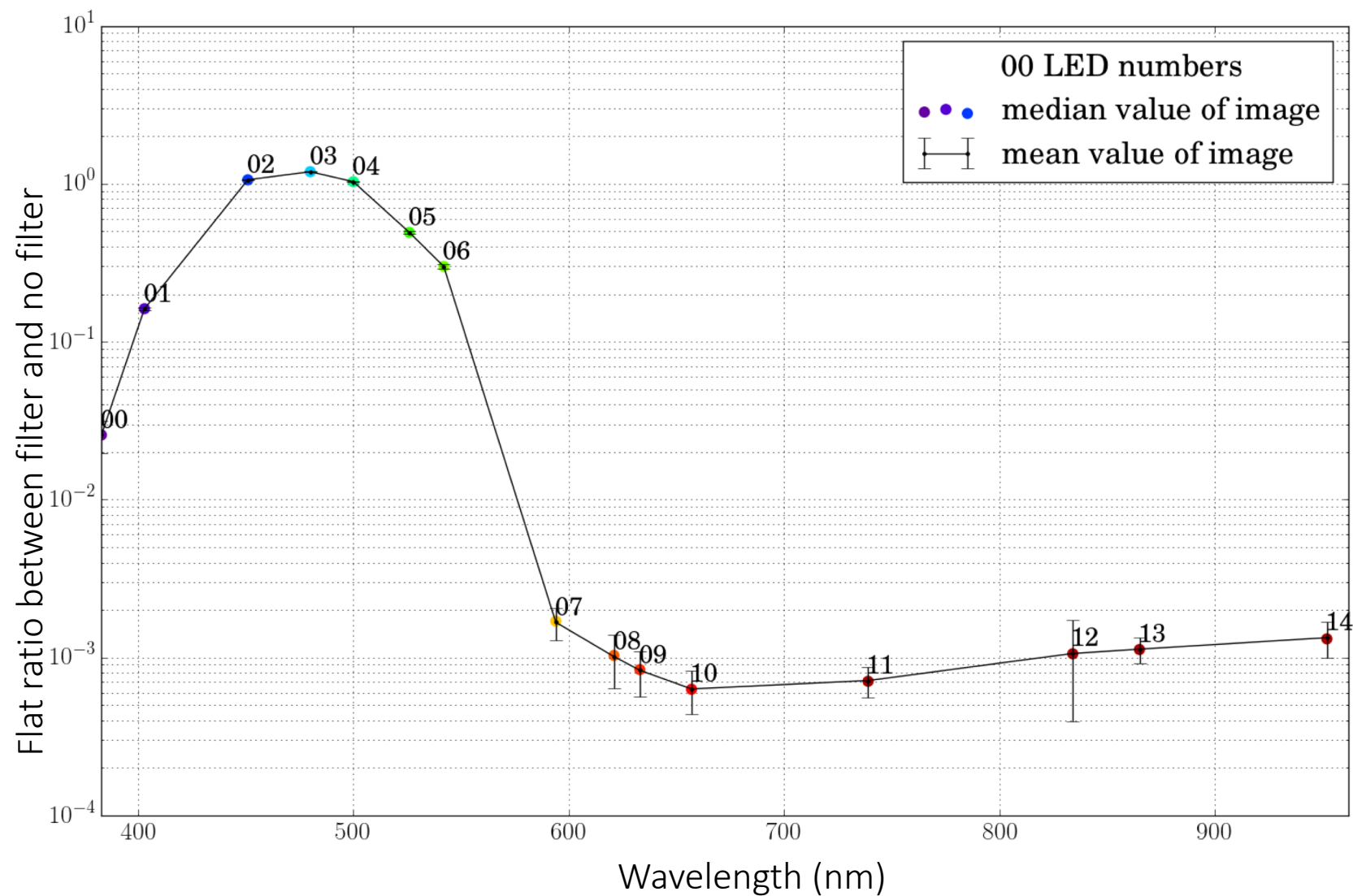


Experimental Design

- Take several flat images with and without filter in place for each monochromatic LED configuration.
- Measure the relative intensity of the image center region vs. multiple edge regions.
- Determine how many pixels are affected by any light leakage as well as the magnitude of the effect.
- **Will the light leakage affect science enough to require fixing this problem?**
 - Yes.

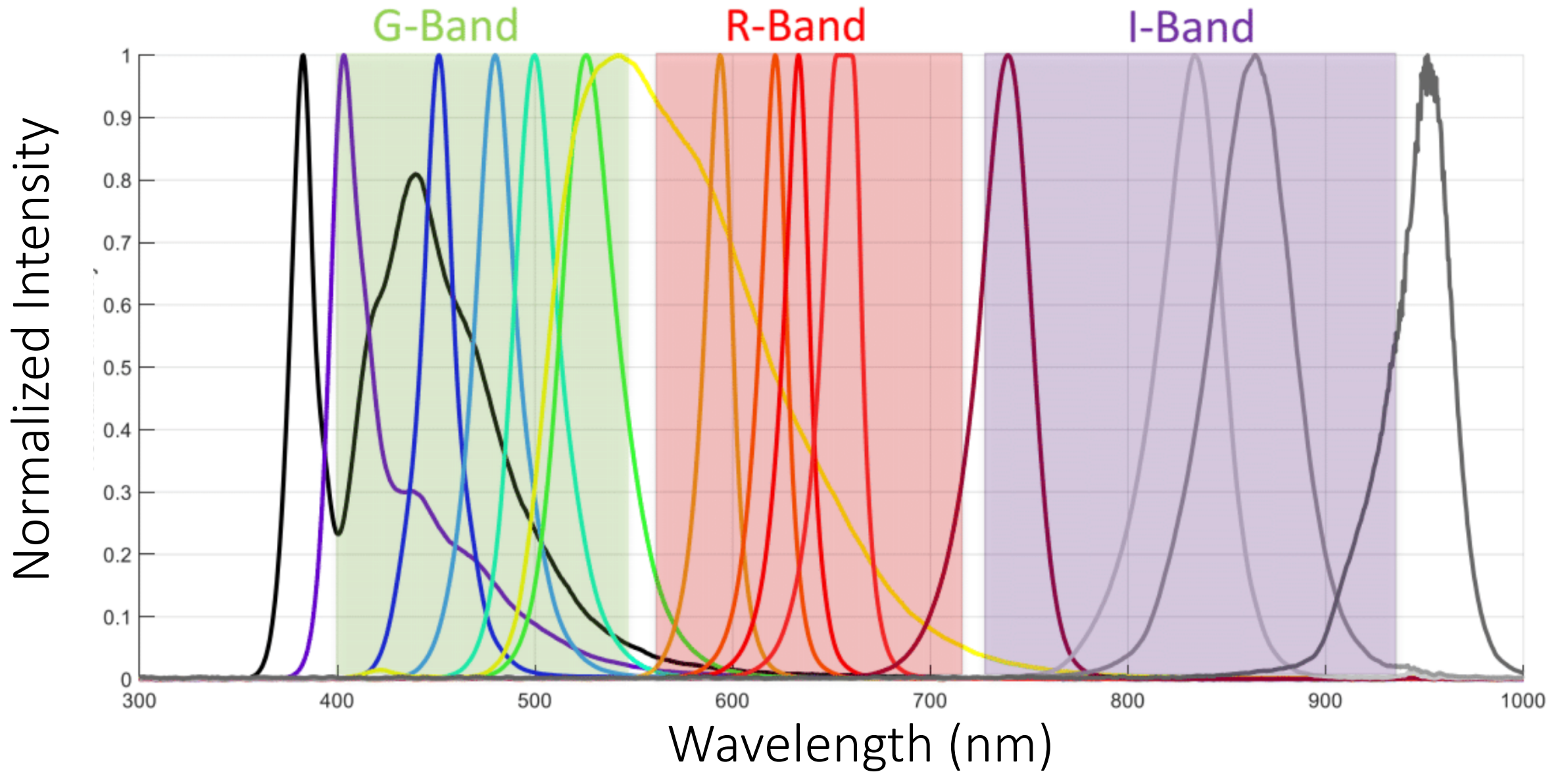
The following images show
Ratio between:
2017-12-19 (g filter)
2017-11-13 (no filter)

Transmission function of filter



 =Regions affected by light leakage

61	60	57	56	53	52	49	48
16		15		14		13	
62	63	58	59	54	55	50	51
45	44	41	40	37	36	33	32
12		11		10		09	
46	47	42	43	38	39	34	35
29	28	25	24	21	20	17	16
08		07		06		05	
30	31	26	27	22	23	18	19
q2	13	09	08	05	04	01	00
04	12	03		02		01	
14	15	10	11	06	07	02	03
q3	q4						



*Filter bands are illustrative

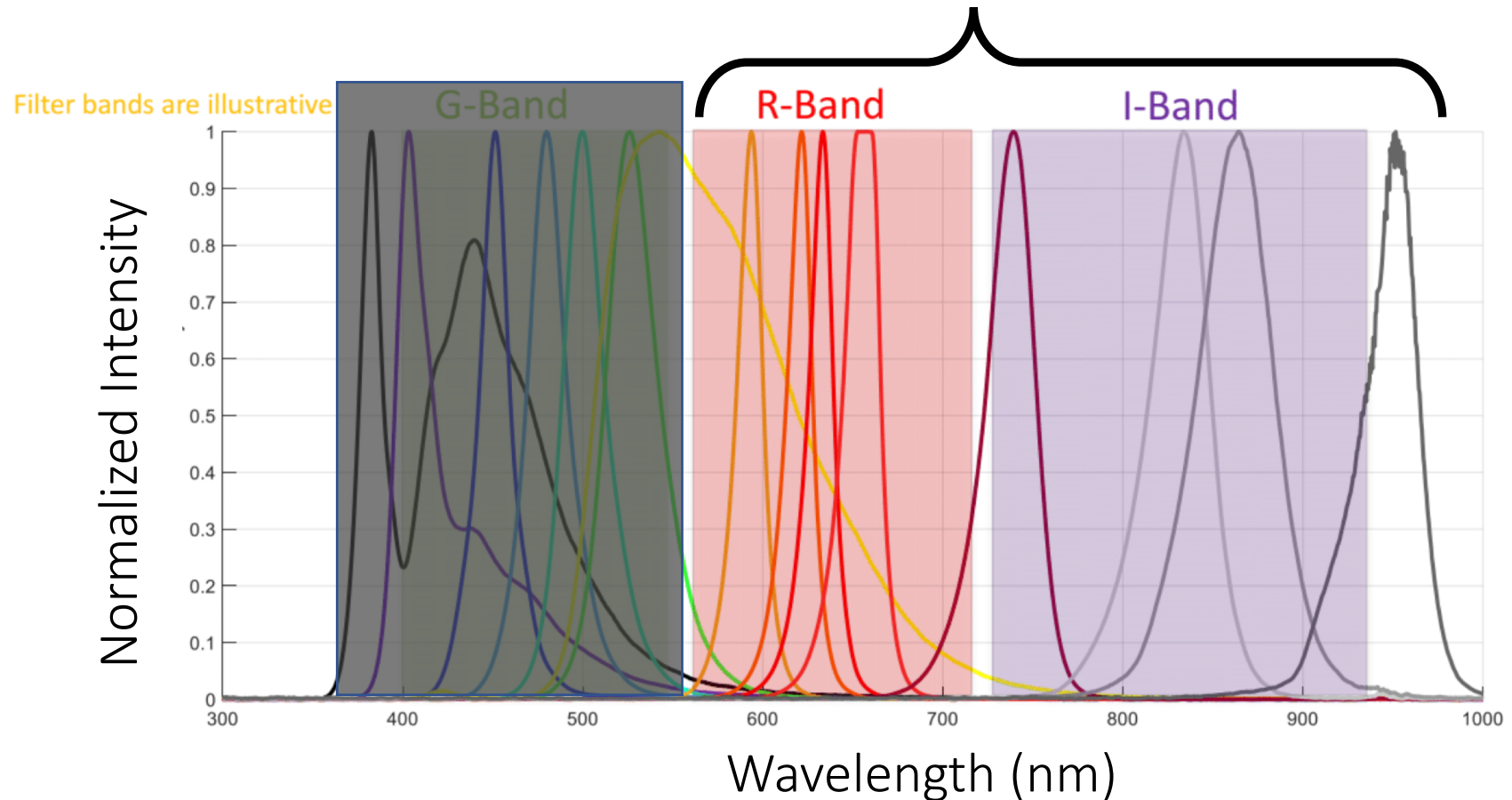
Out-of-band LED Illumination

LEDs:

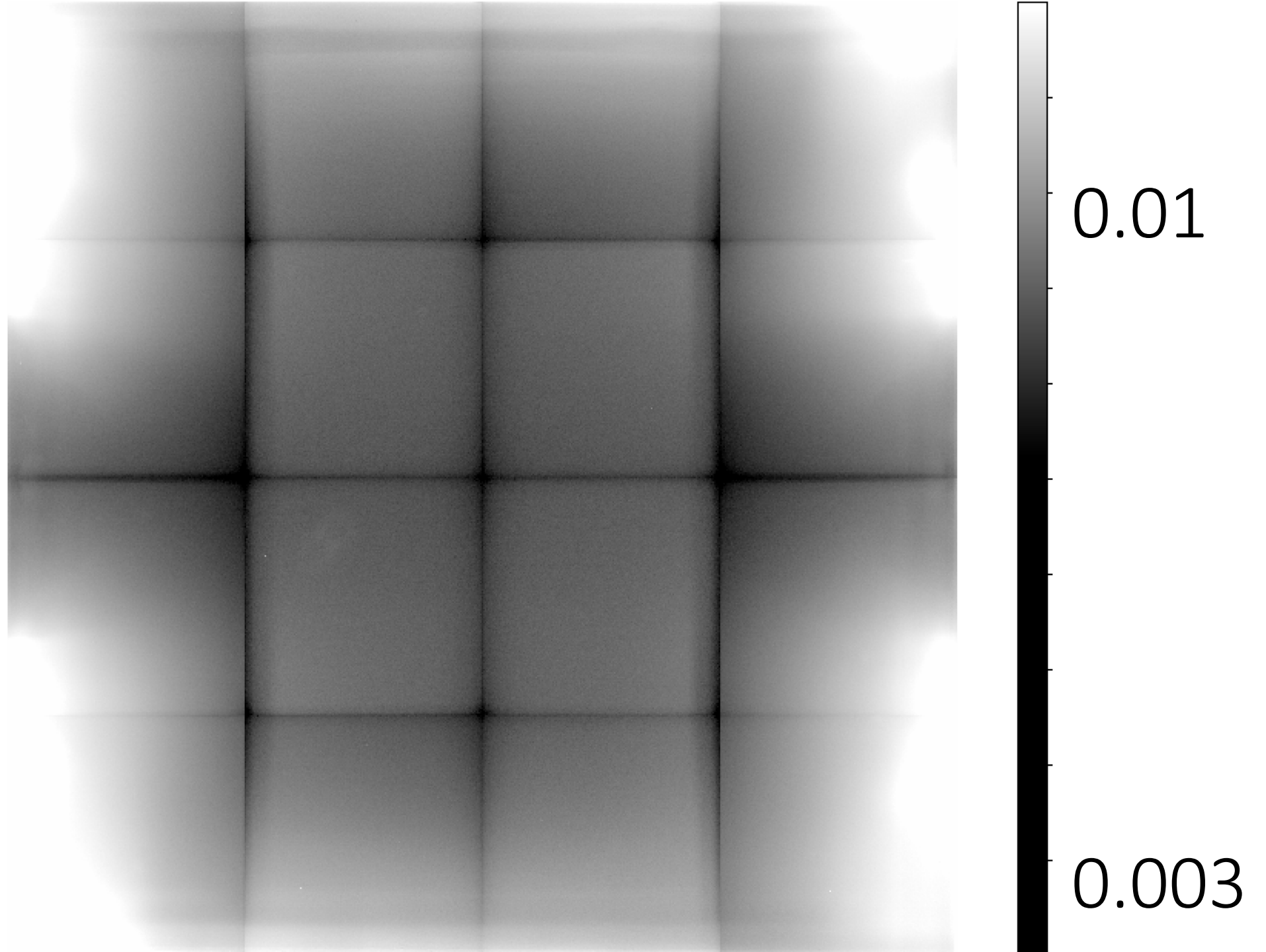
L07 - L14

Central Wavelengths:

594 – 952 nm



Results

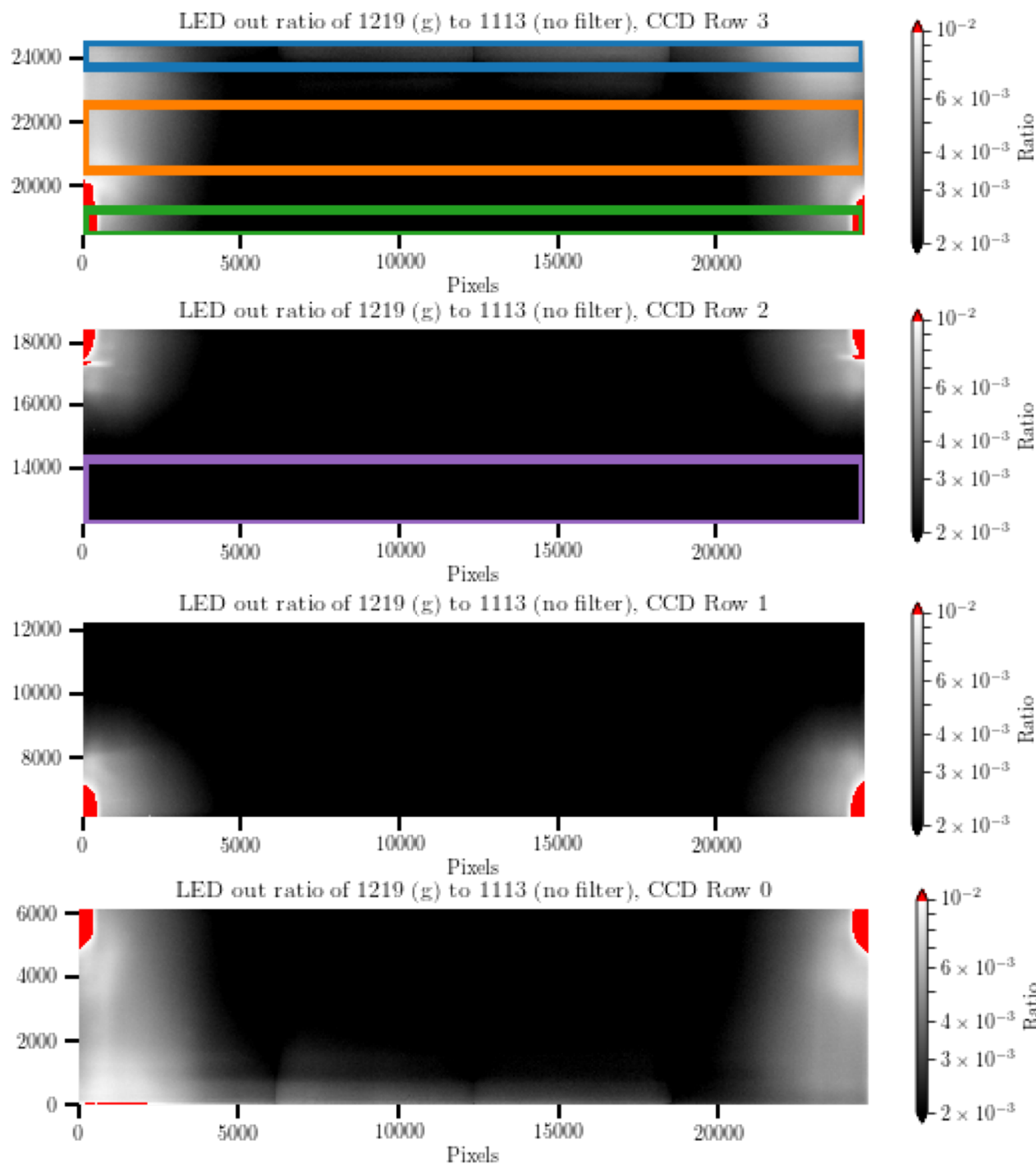


Results

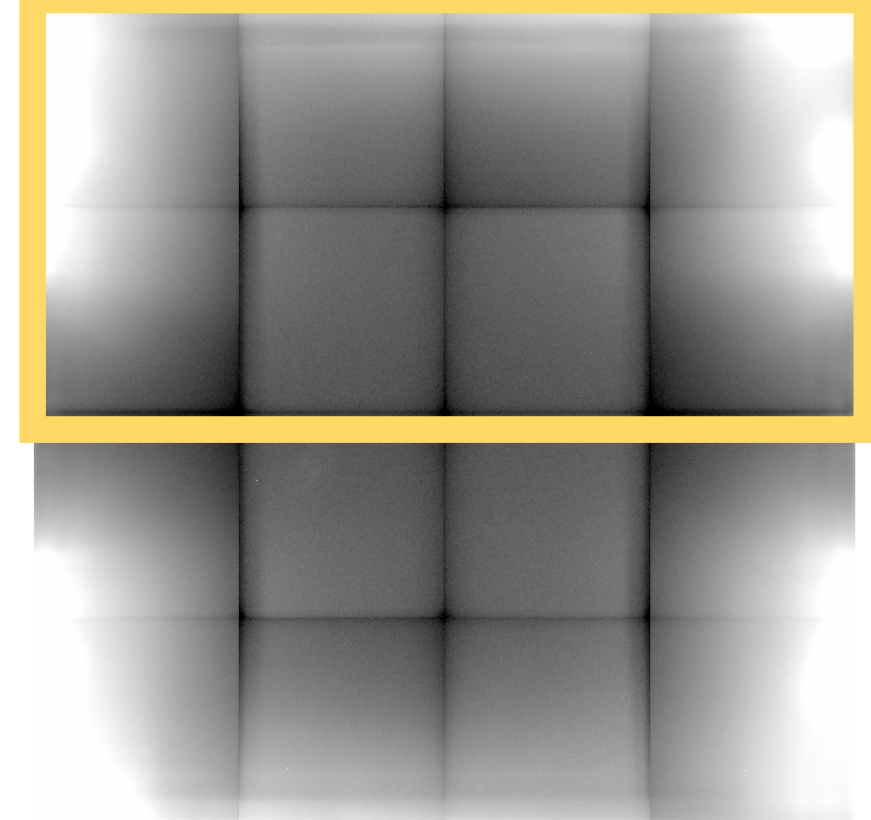
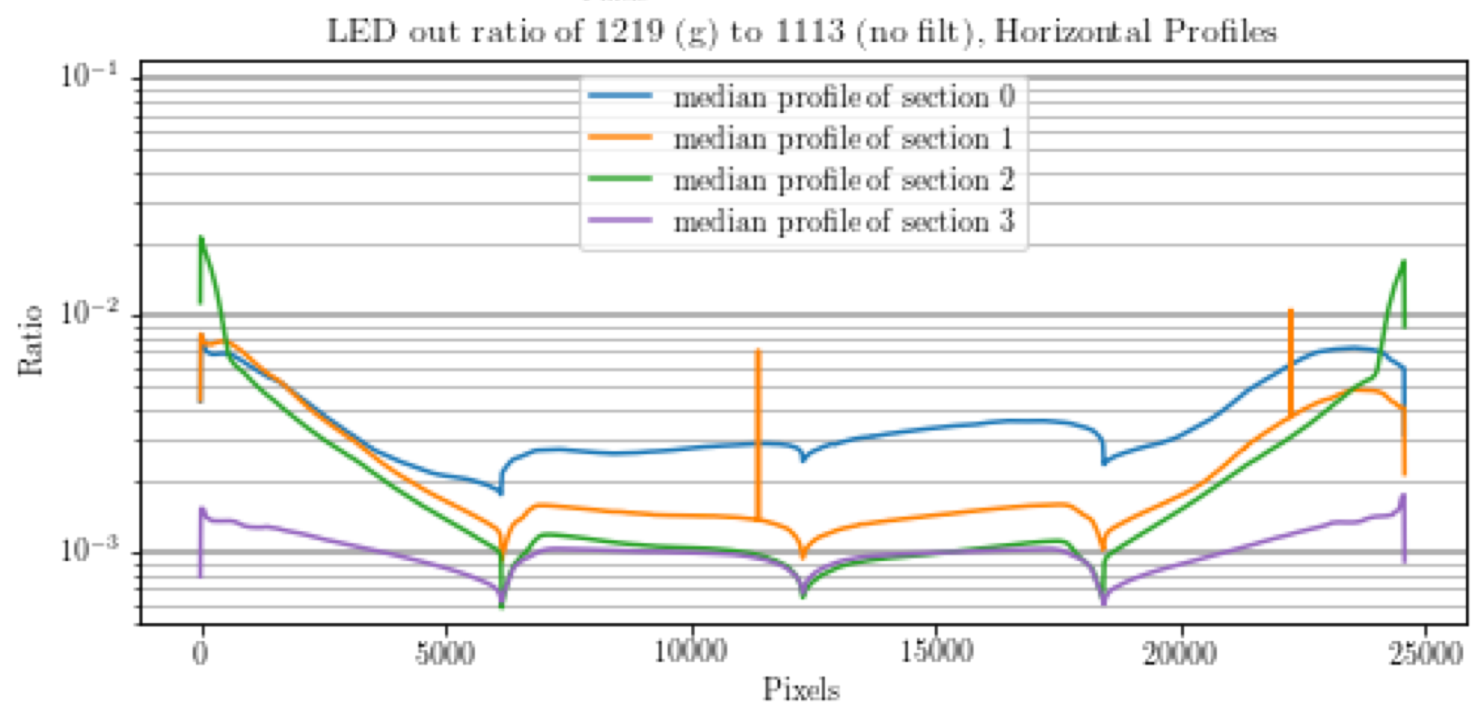
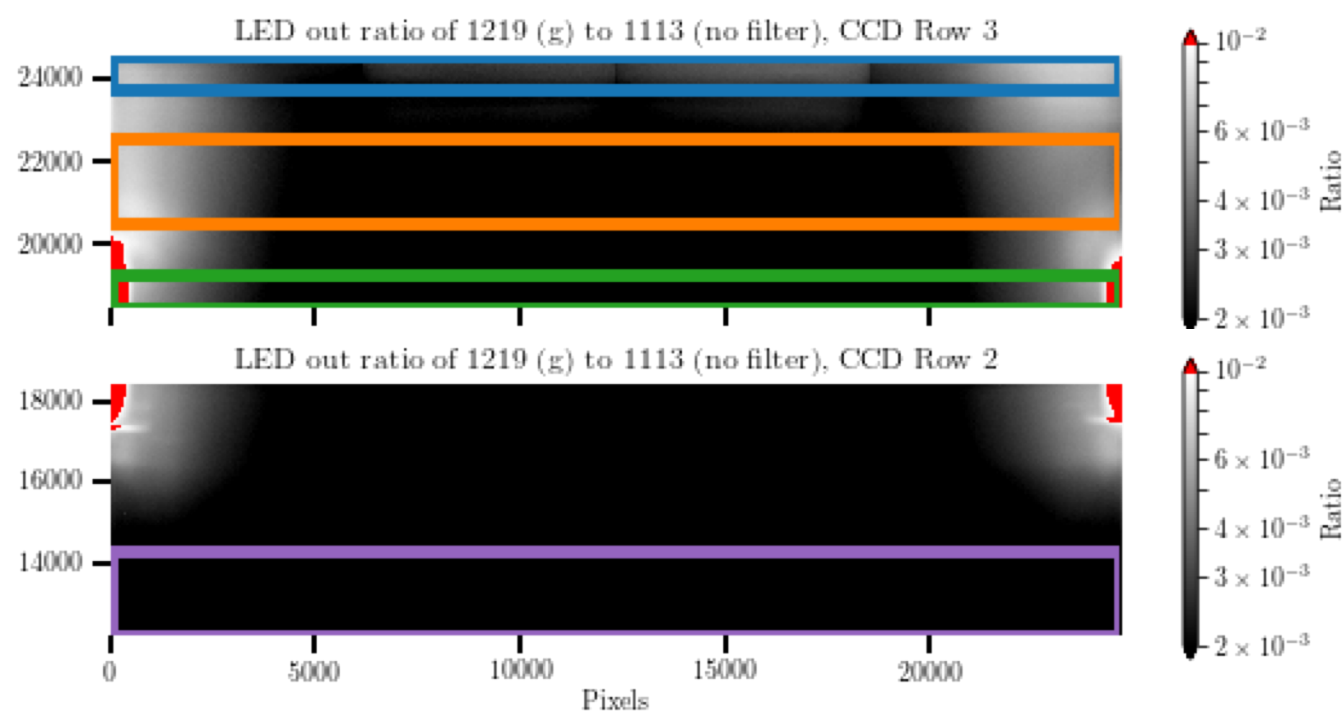


Top
Haze
Edges

Ref

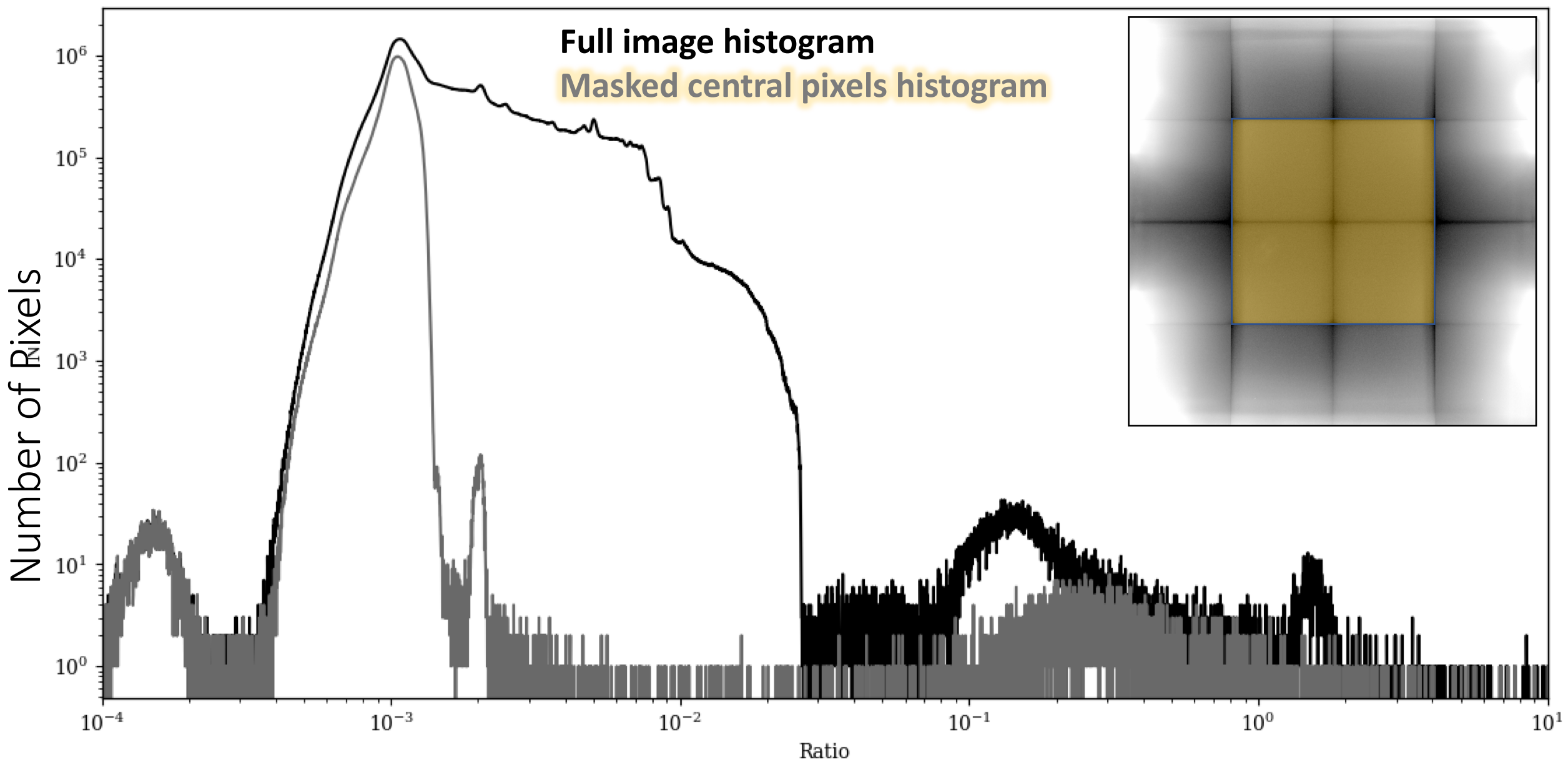


 = 10x
median
value of
central
pixels

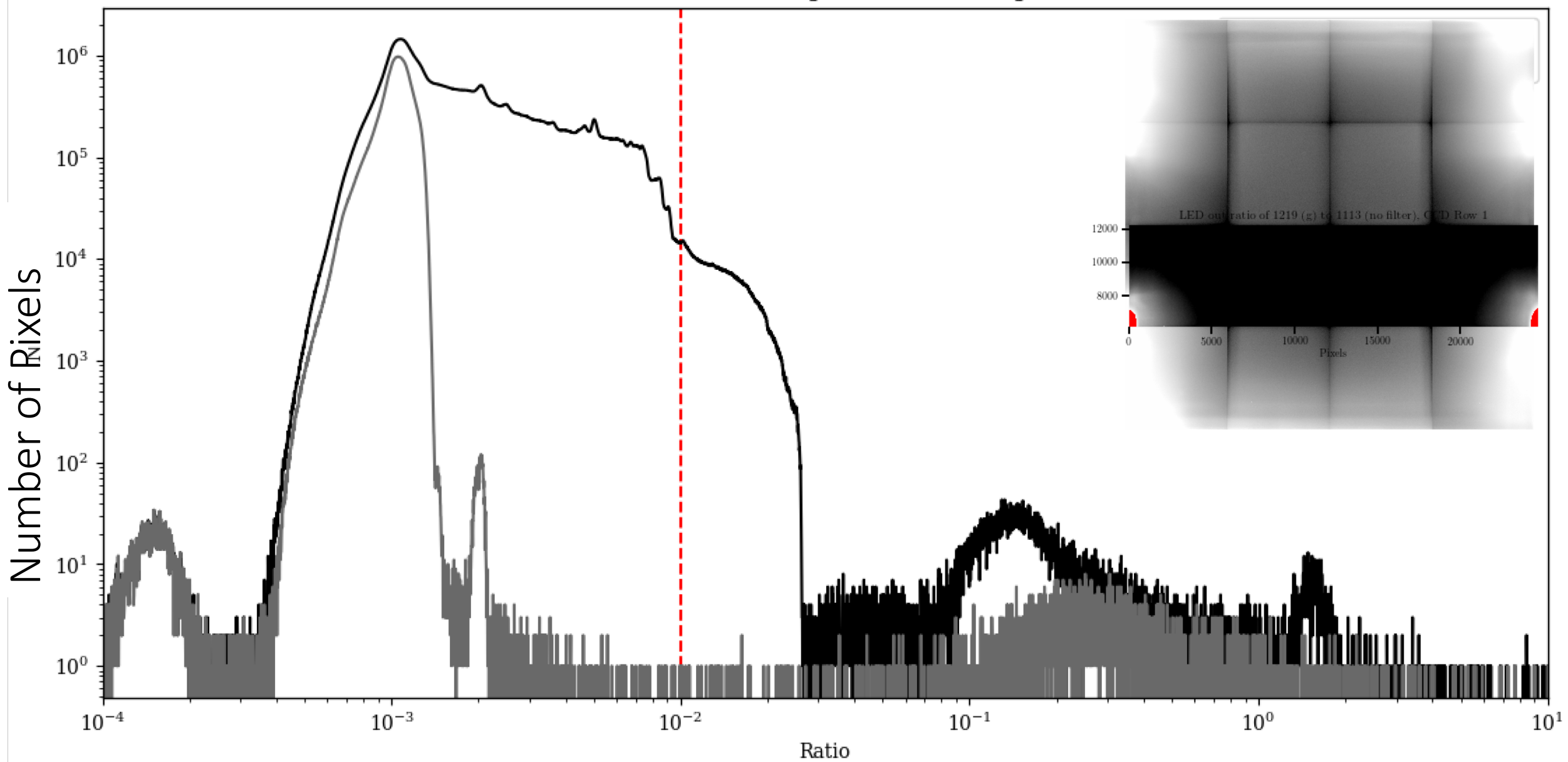


Top
Haze
Edges
Ref

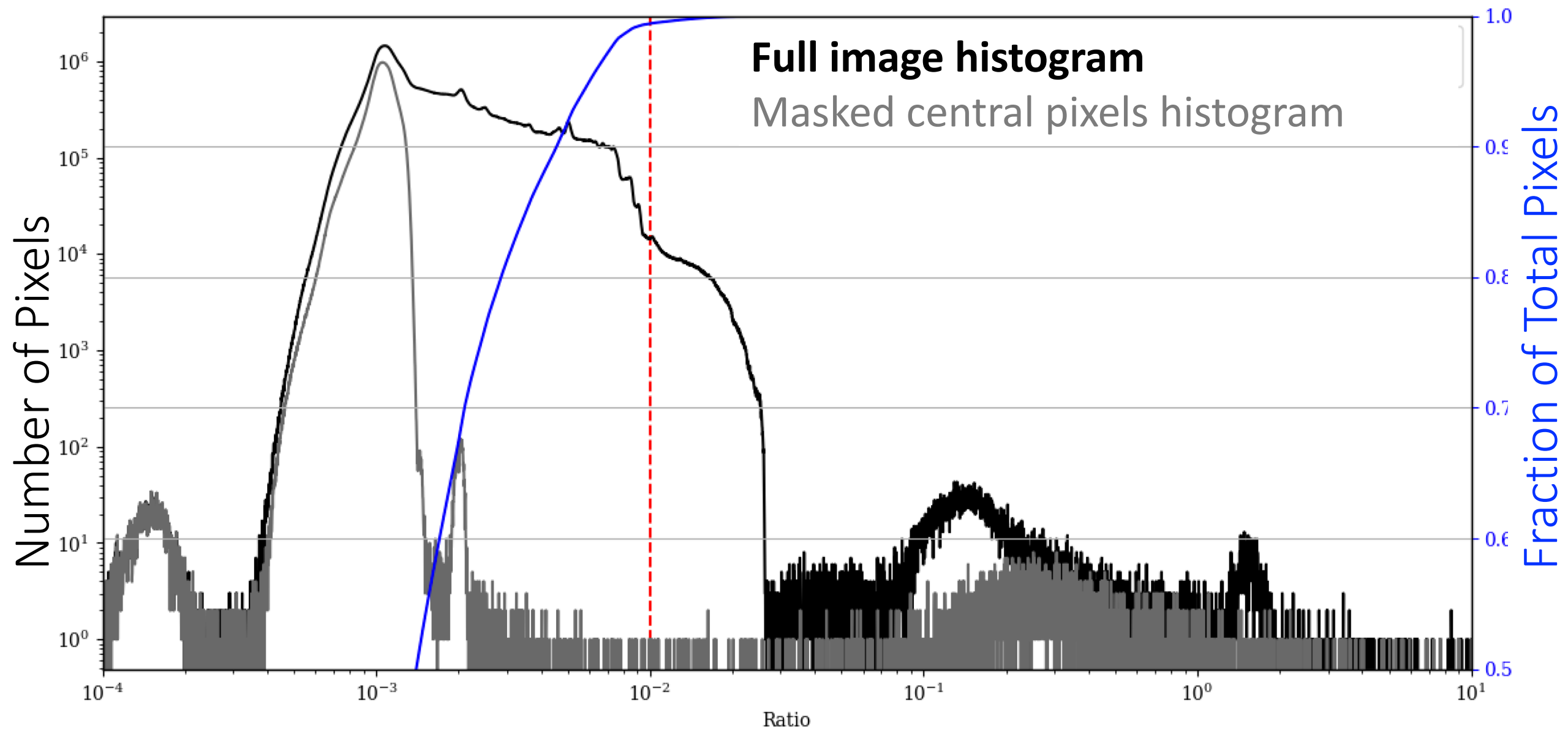
Results



Results



Cumulative Histogram of Entire Flat Ratio Image



Summary

- Light leakage creates a problem for accuracy of color/magnitude measurements of targets (worst at $\sim 1\%$, extending to $\sim 10\%$)
- Scattering from filter frame edges has been addressed during commissioning stage with installment of baffles

Future Directions

- Confirm out-of-band-leakage has been mitigated in most recent monochromatic flat field images