

EMVA 1288 Datasheet

This datasheet describes the specification according to the standard 1288 Standard for Characterization and Presentation of Specification Data for Image Sensors and Cameras of European Machine Vision Association (EMVA) (See www.standard1288.org).

Vendor	KAYA Instruments	Sensor	GMAX3265
Model	Iron3265-C	Sensor type	CMOS
Camera type	Color	Shutter type	Global
Data type	Single	Overlap capabilities	Overlapping
Sensor type	CMOS	Frame rate	23 Hz
Lens category	F-Mount	Exposure control	by irradiance
Resolution	9344 x 7000 , 12 bits	Exposure time	11000 μ s
Pixel size	3.2 μ m x 3.2 μ m	Illumination	Variable with constant exposure time
Maximum readout rate	31 fps	Irradiation Steps	50
Dark current compensation	No	Irradiation calibration accuracy	-
Interface type	CXP-12	Irradiation measurement error	-
Serial number	1021007	Standart version	3.1
Firmware version	1.5.1.2-2021.2.9	Light source	Integrating Sphere
Sensor diagonal	36.65mm		

International Distributor



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Geisenhausenerstr. 18
81379 Munich, Germany
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Summary Sheet for Operation Point 1 at a Wavelength of 520 nm

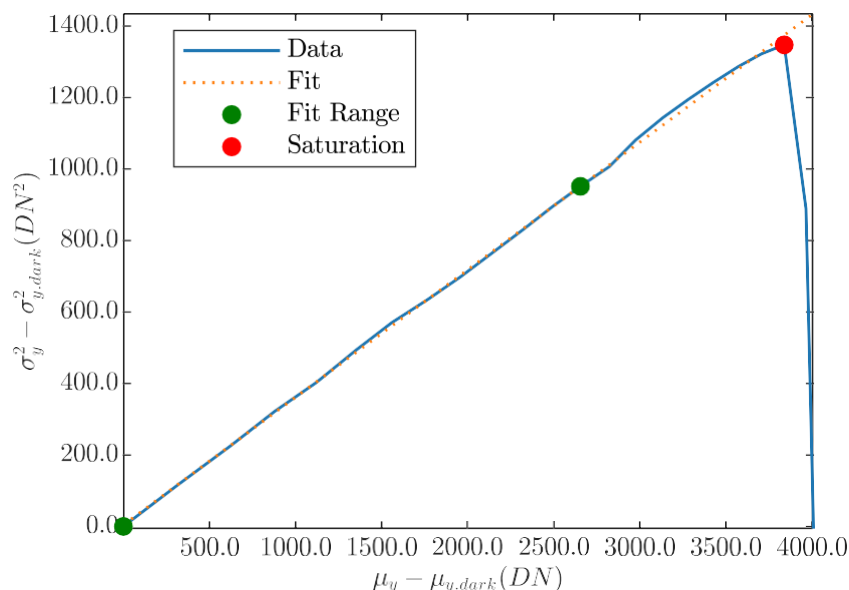
Camera setting

Gain	1.25
Black level	-1250

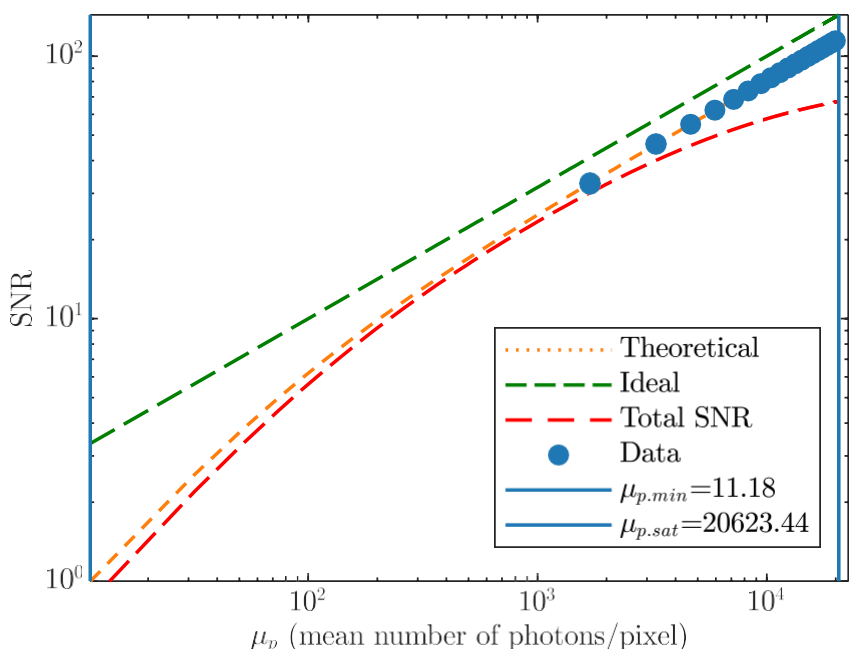
Operation point parameters

Environmental temperature	22.56
Camera body temperature	39
Sensor temperature	52.425
Processor temperature	44

Photon Transfer



Signal-to-Noise Ratio



Performance

Quantum efficiency

η	66.0087	%
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System gain

K	0.28305	DN/e ⁻
1/K	3.5329	e ⁻ /DN

Temporal dark noise

σ_d	6.8066	e ⁻
$\sigma_{y, \text{dark}}$	1.9481	DN

Signal-to-noise ratio

SNR _{max}	116.6759	
	41.3396	dB
	6.8664	bit
1/SNR _{max}	0.85707	%

Absolute sensitivity threshold

$\mu_{p, \text{min}}$	11.1843	p
$\mu_{p, \text{min, area}}$	1.0922	p/ μm^2
$\mu_{e, \text{min}}$	7.3826	e ⁻
$\mu_{e, \text{min, area}}$	0.72096	e ⁻ / μm^2

Saturation capacity

$\mu_{p, \text{sat}}$	20623.4438	p
$\mu_{p, \text{sat, area}}$	2014.0082	p/ μm^2
$\mu_{e, \text{sat}}$	13613.2723	e ⁻
$\mu_{e, \text{sat, area}}$	1329.4211	e ⁻ / μm^2

Dynamic range

DR	1843.9621	
	65.315	dB
	10.8486	bit

Spatial nonuniformities

DSNU ₁₂₈₈	4.8317	e ⁻
	1.3676	DN
PRNU ₁₂₈₈	1.2127	%

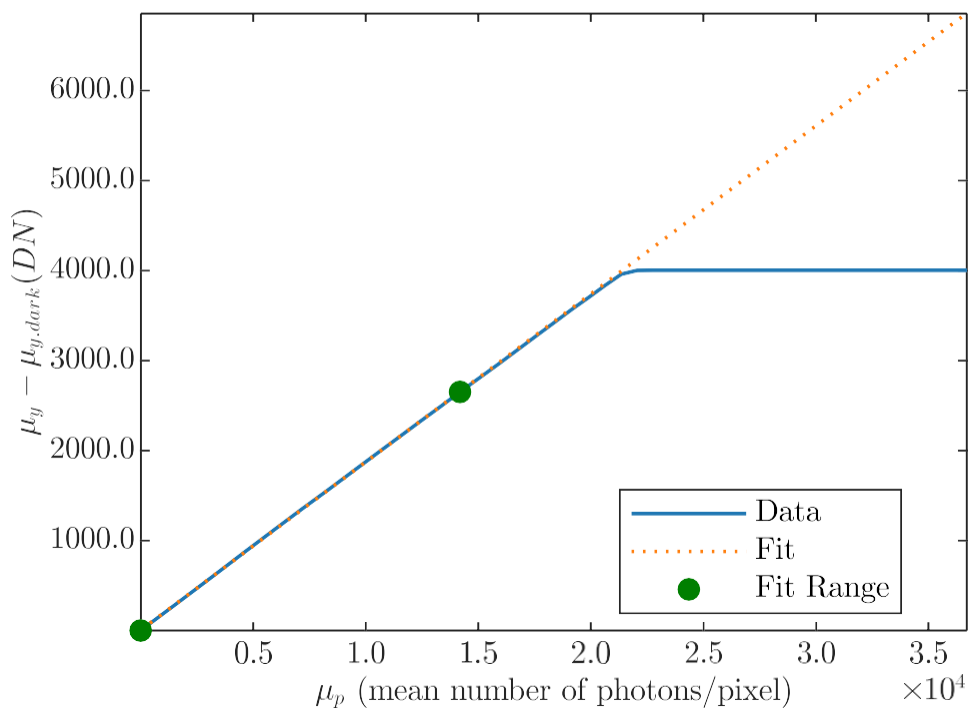
Linearity error

LE _{min}	-0.61545	%
LE _{max}	0.75394	%

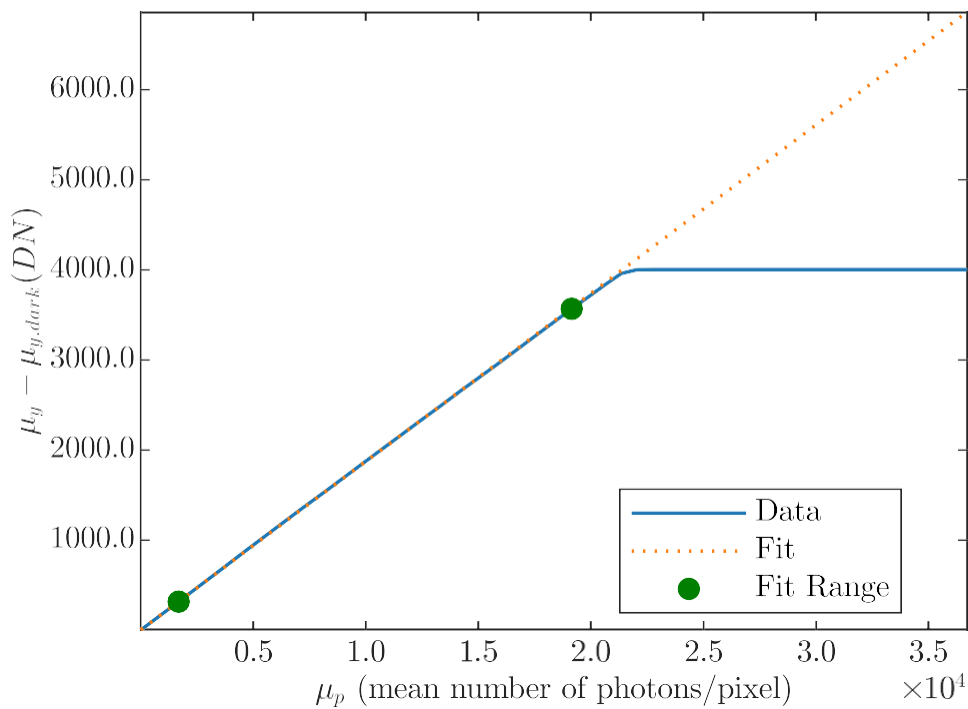
Dark current

$\mu_{l, \text{mean}}$	NaN	e ⁻ /s
	NaN	DN/s
$\mu_{l, \text{var}}$	78.0354	e ⁻ /s
	8.3891	DN/s

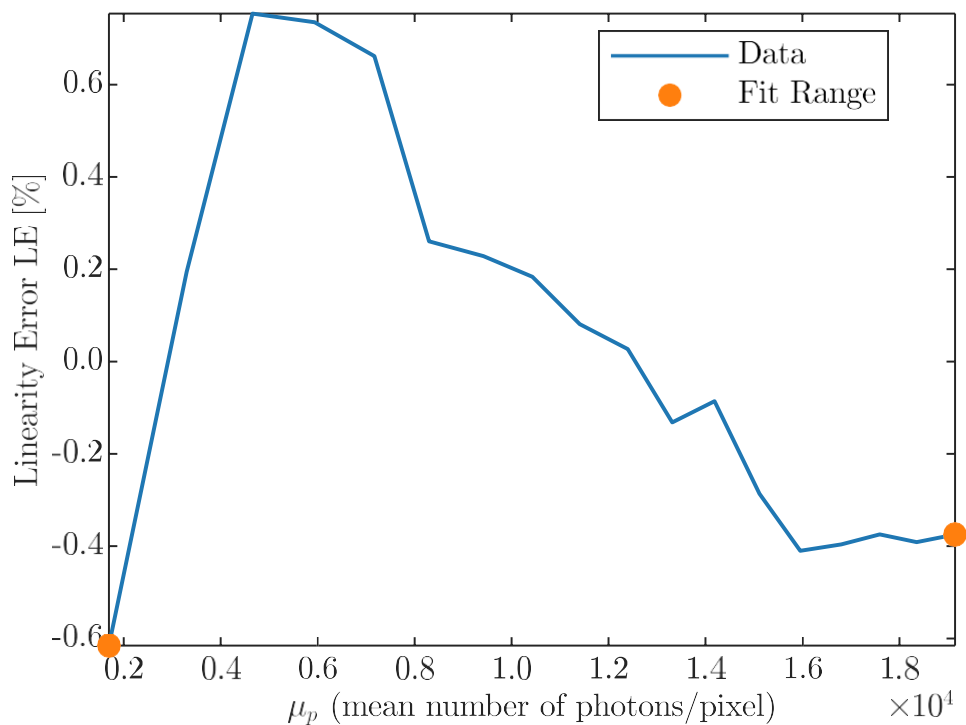
Sensitivity



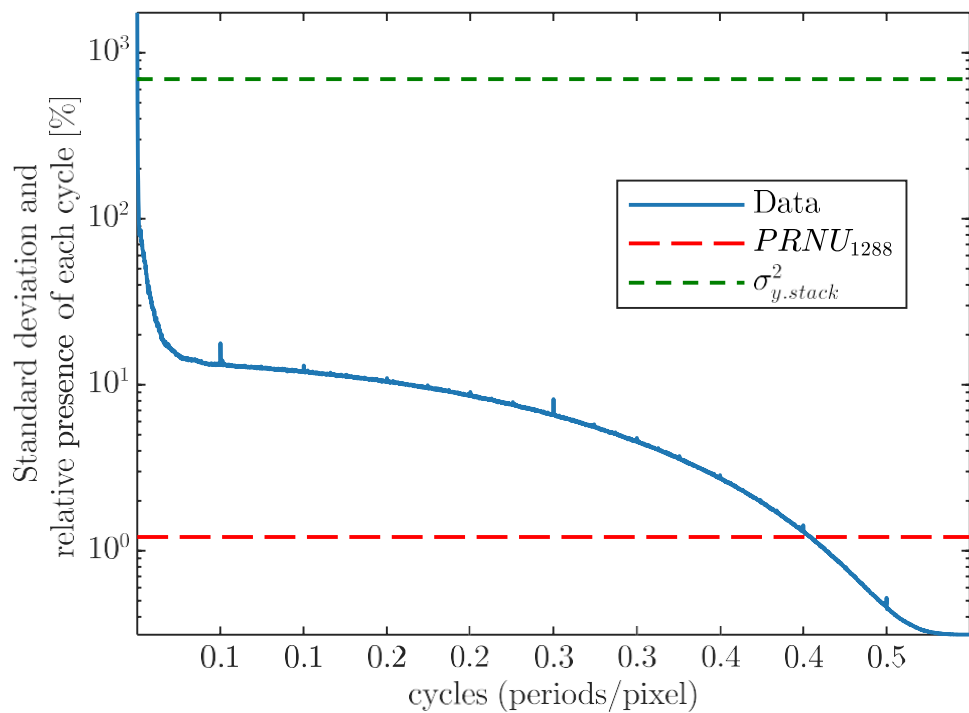
Linearity



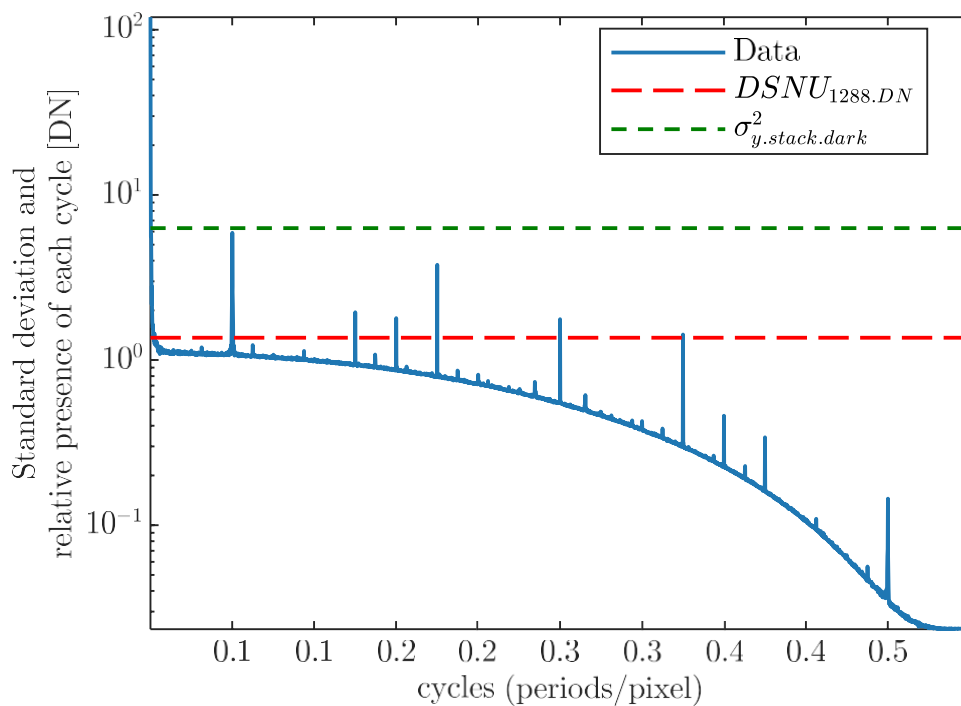
Deviation Linearity



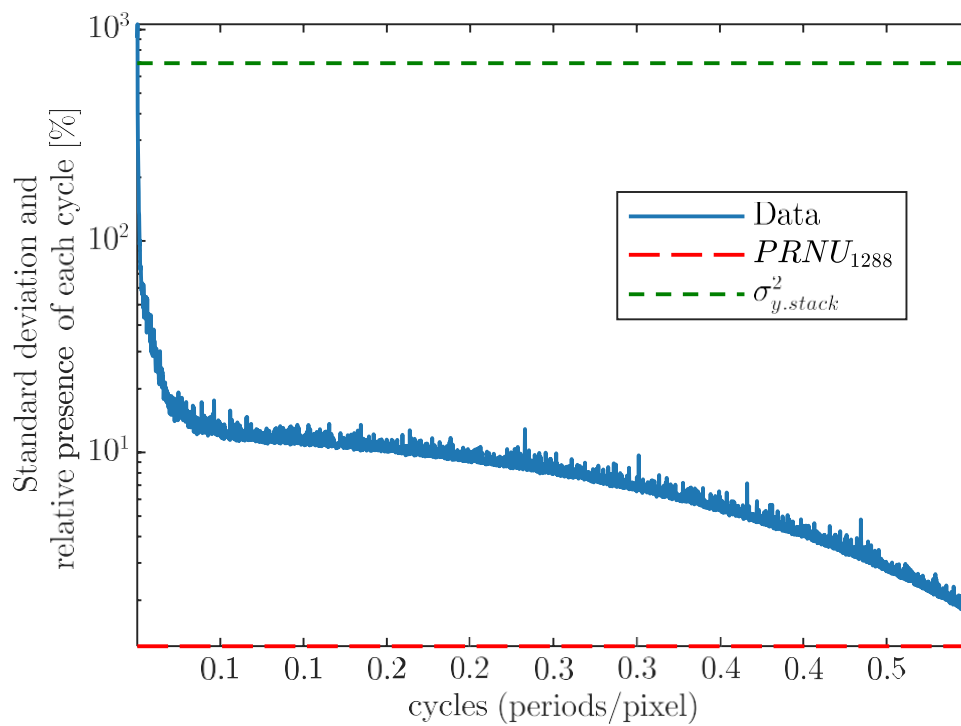
Horizontal Spectrogram PRNU



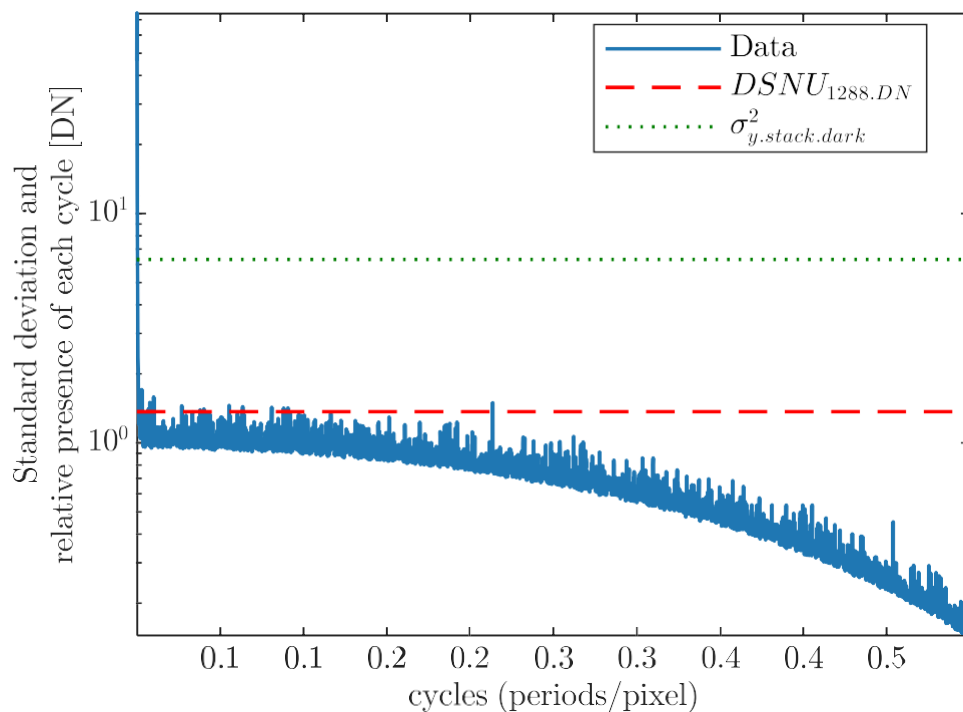
Horizontal Spectrogram DSNU



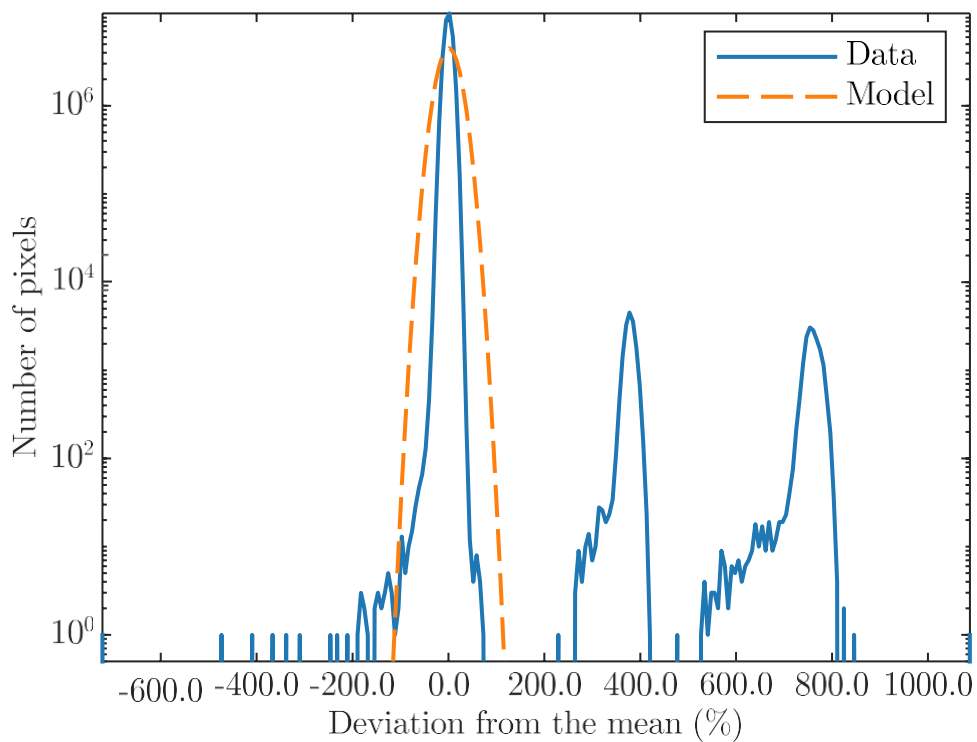
Vertical Spectrogram PRNU



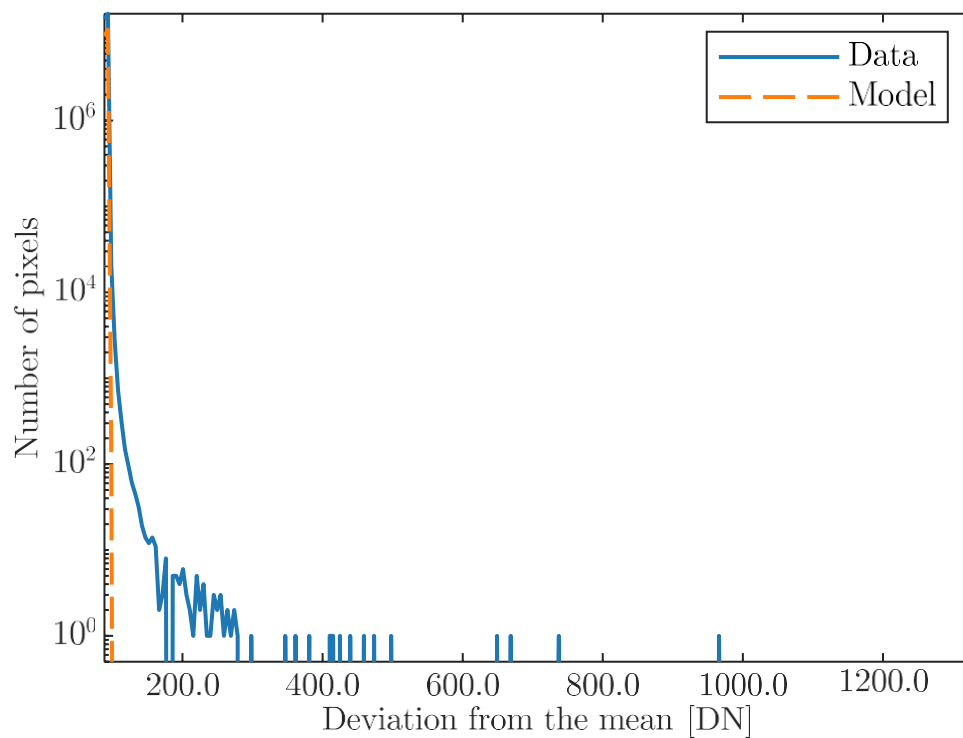
Vertical Spectrogram DSNU



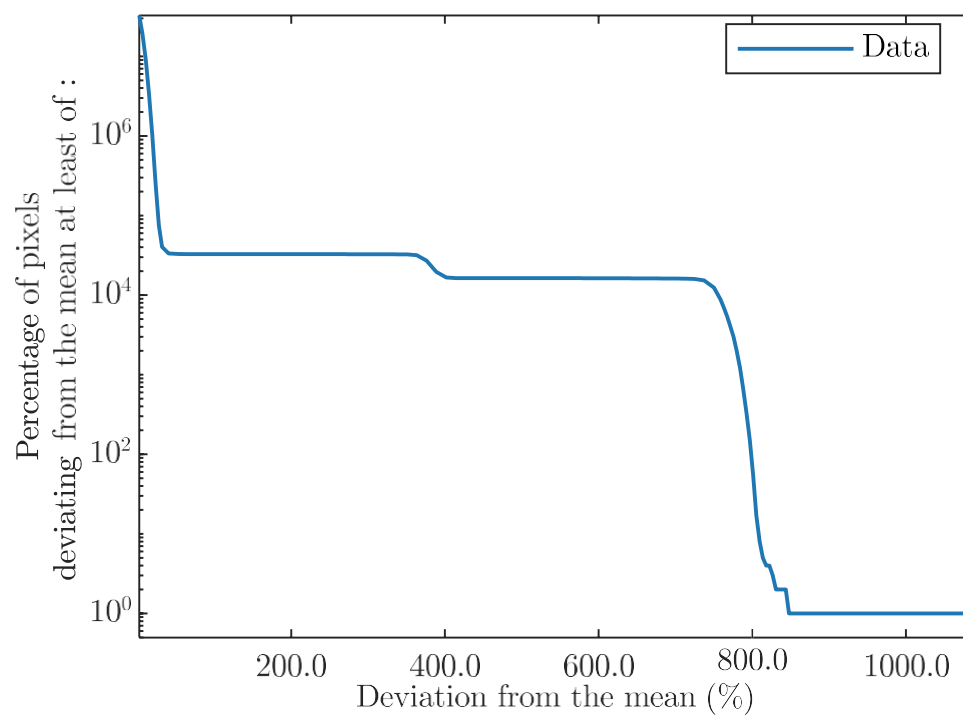
Logarithmic Histogram PRNU



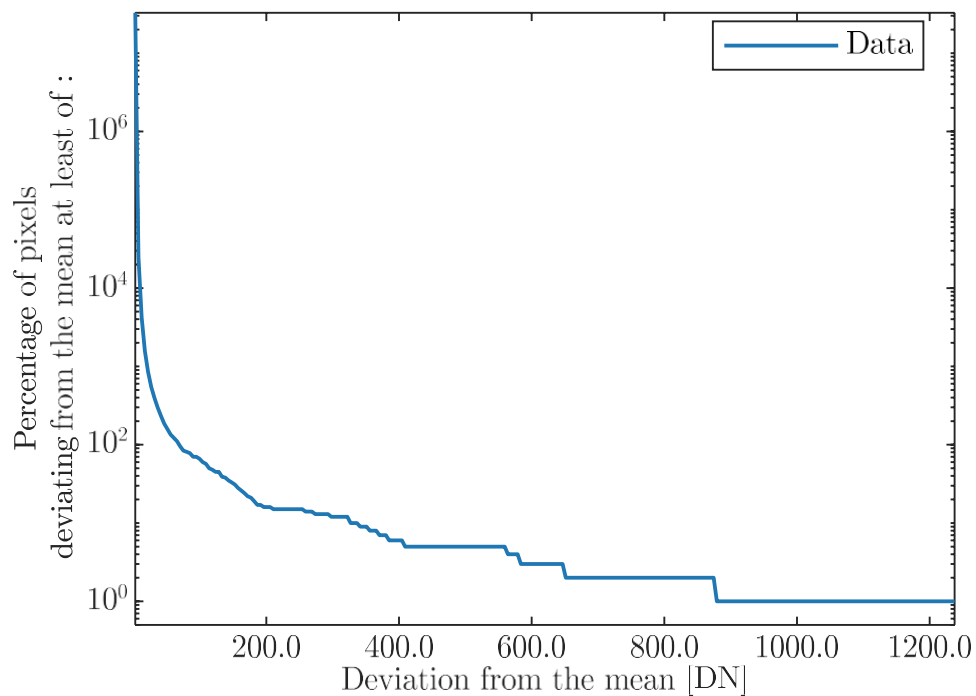
Logarithmic Histogram DSNU



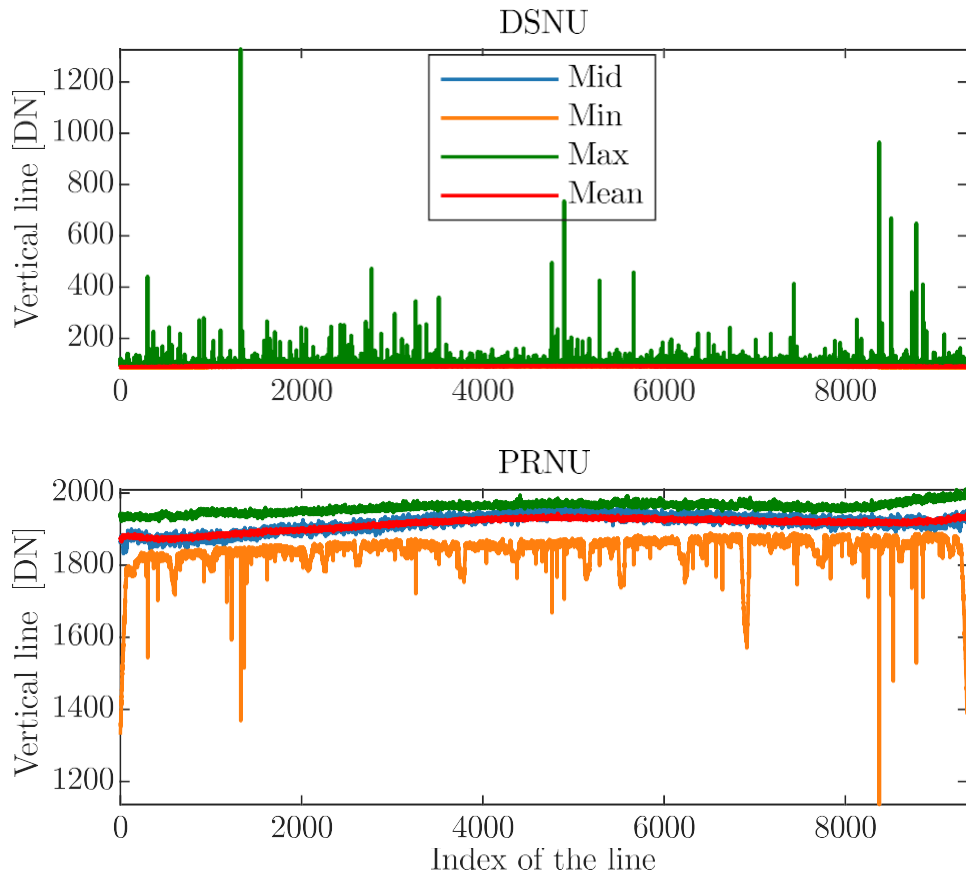
Accumulated Log Histogram PRNU



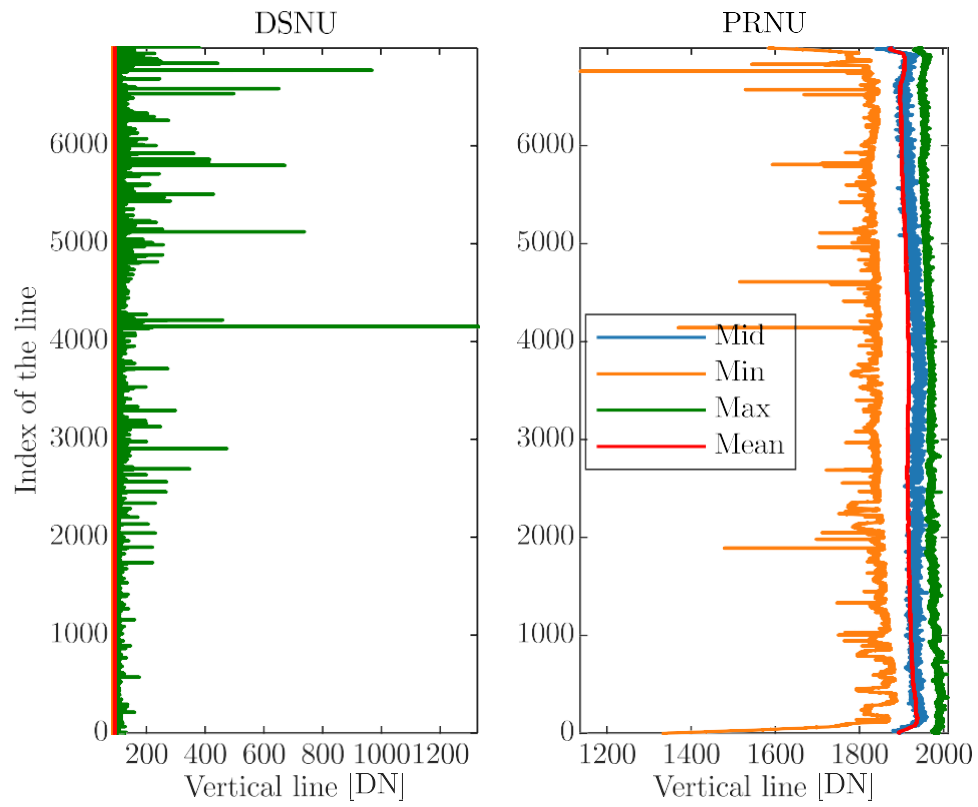
Accumulated Log Histogram DSNU



Horizontal Profile



Vertical Profile



Summary Sheet for Operation Point 2 at a Wavelength of 632 nm

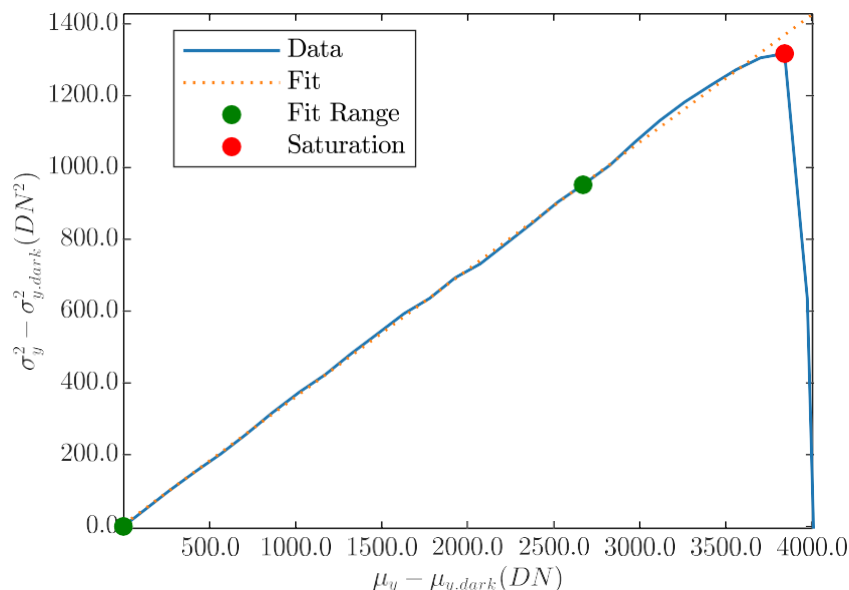
Camera setting

Gain	1.25
Black level	-1250

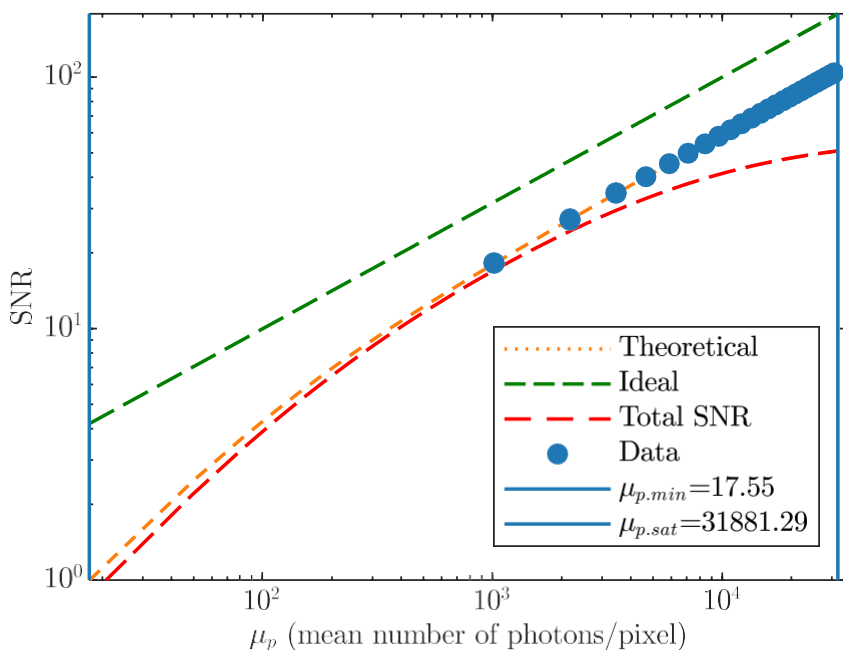
Operation point parameters

Environmental temperature	22.68
Camera body temperature	43
Sensor temperature	56.095
Processor temperature	48

Photon Transfer



Signal-to-Noise Ratio



Performance

Quantum efficiency

η	35.2561	%
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System gain

K	0.34246	DN/e ⁻
1/K	2.9201	e ⁻ /DN

Temporal dark noise

σ_d	5.6259	e ⁻
$\sigma_{y,dark}$	1.9481	DN

Signal-to-noise ratio

SNR _{max}	106.0194	
	40.5077	dB
	6.7282	bit
1/SNR _{max}	0.94322	%

Absolute sensitivity threshold

$\mu_{p,min}$	17.5535	p
$\mu_{p,min,area}$	1.7142	p/μm ²
$\mu_{e,min}$	6.1887	e ⁻
$\mu_{e,min,area}$	0.60436	e ⁻ /μm ²

Saturation capacity

$\mu_{p,sat}$	31881.2922	p
$\mu_{p,sat,area}$	3113.4074	p/μm ²
$\mu_{e,sat}$	11240.1107	e ⁻
$\mu_{e,sat,area}$	1097.6671	e ⁻ /μm ²

Dynamic range

DR	1816.2403	
	65.1835	dB
	10.8267	bit

Spatial nonuniformities

DSNU ₁₂₈₈	3.6626	e ⁻
	1.2543	DN
PRNU ₁₂₈₈	1.723	%

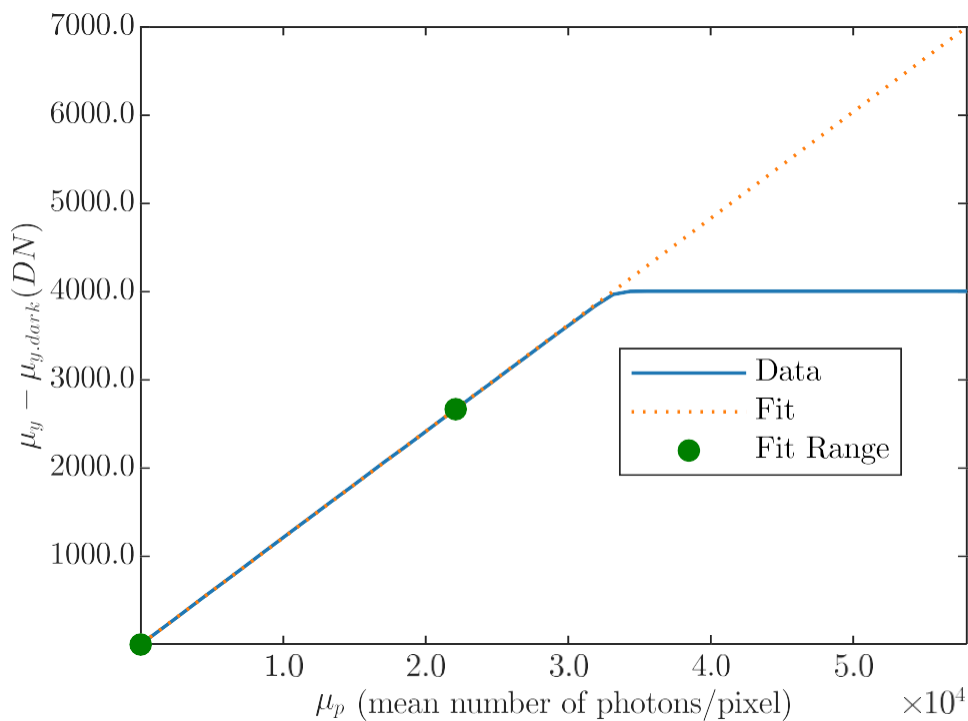
Linearity error

LE _{min}	-0.5424	%
LE _{max}	0.44518	%

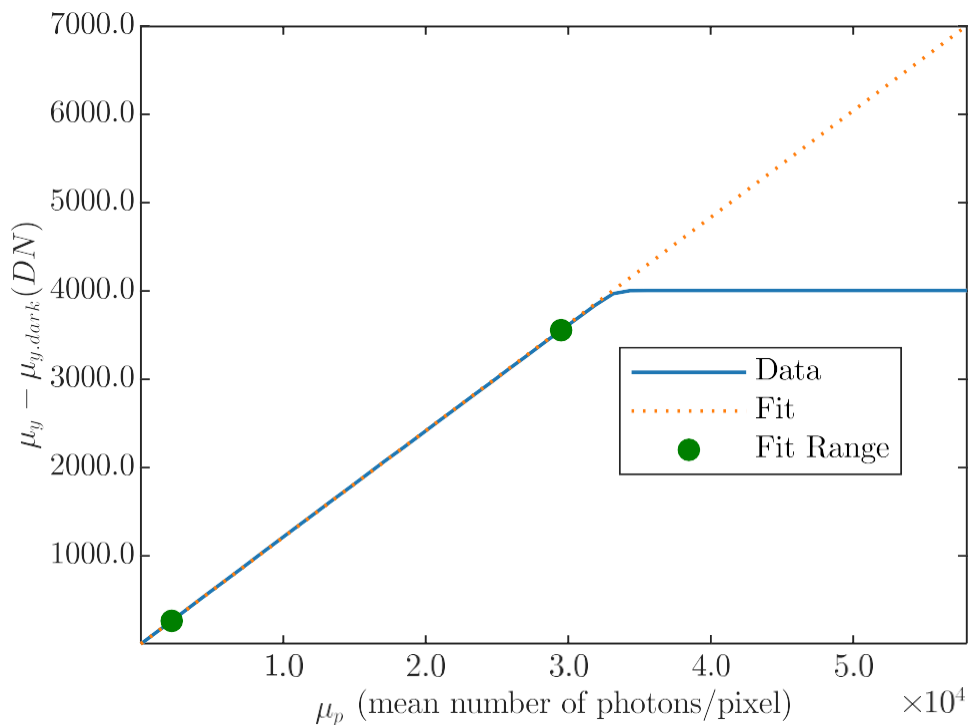
Dark current

$\mu_{l,mean}$	NaN	e ⁻ /s
	NaN	DN/s
$\mu_{l,var}$	78.0354	e ⁻ /s
	8.3891	DN/s

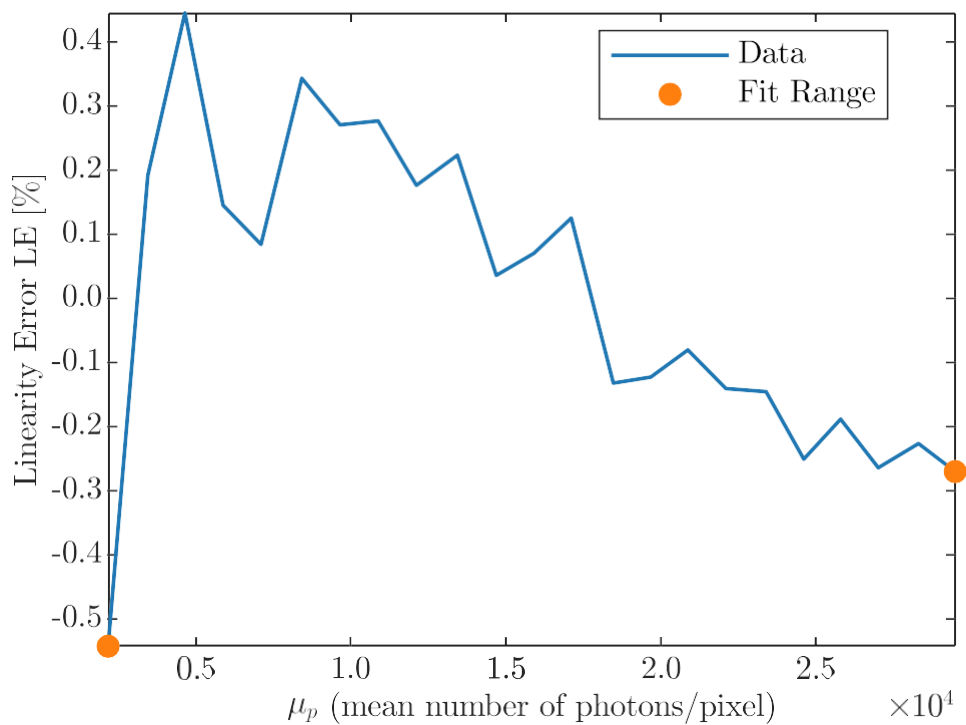
Sensitivity



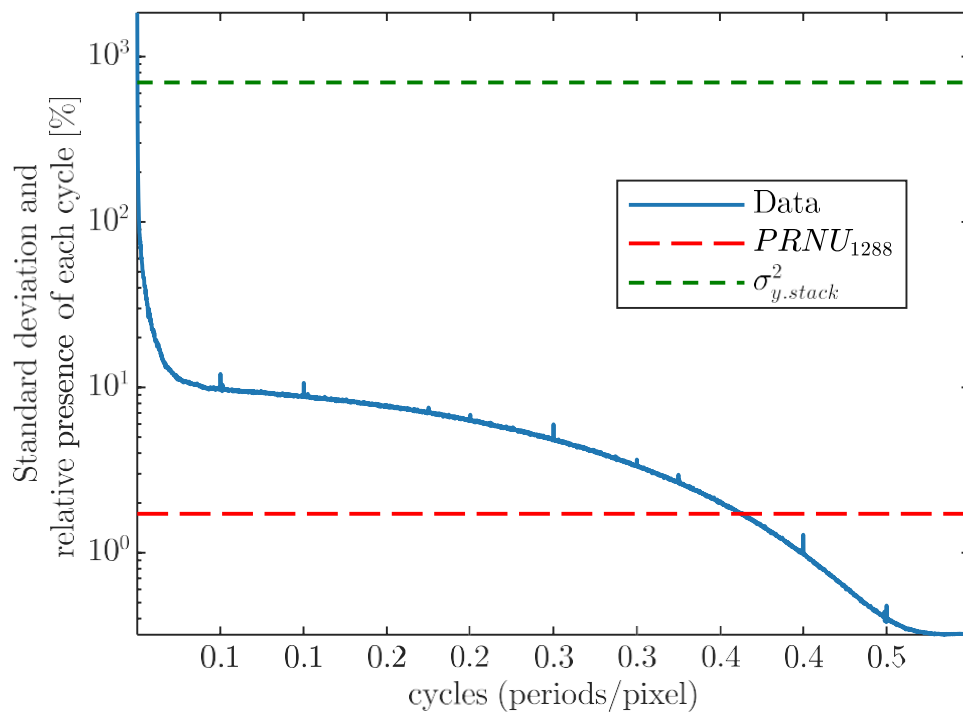
Linearity



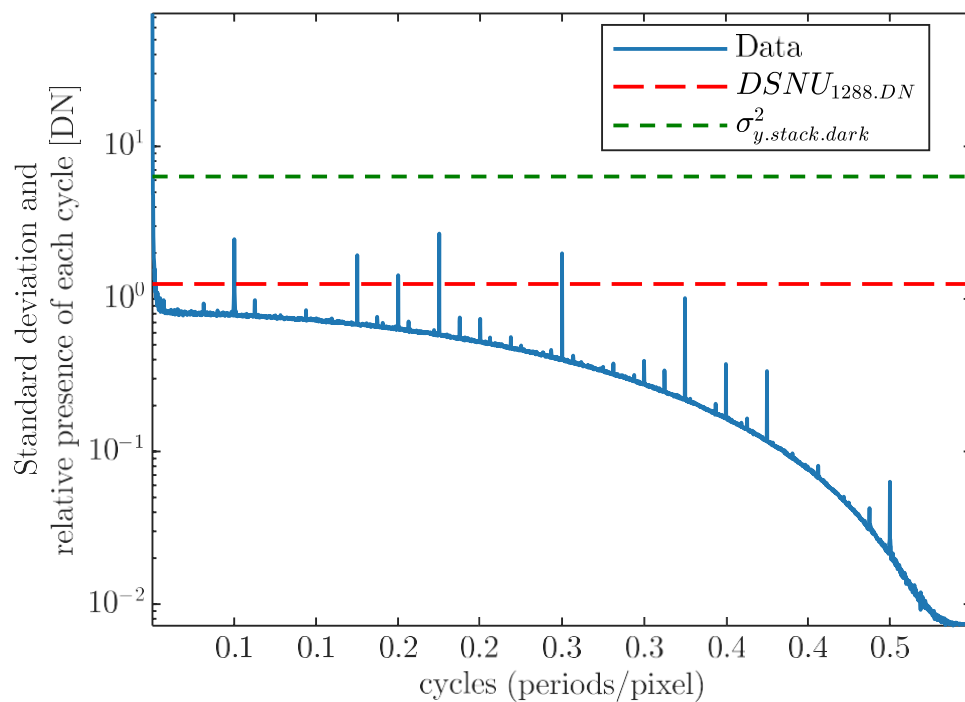
Deviation Linearity



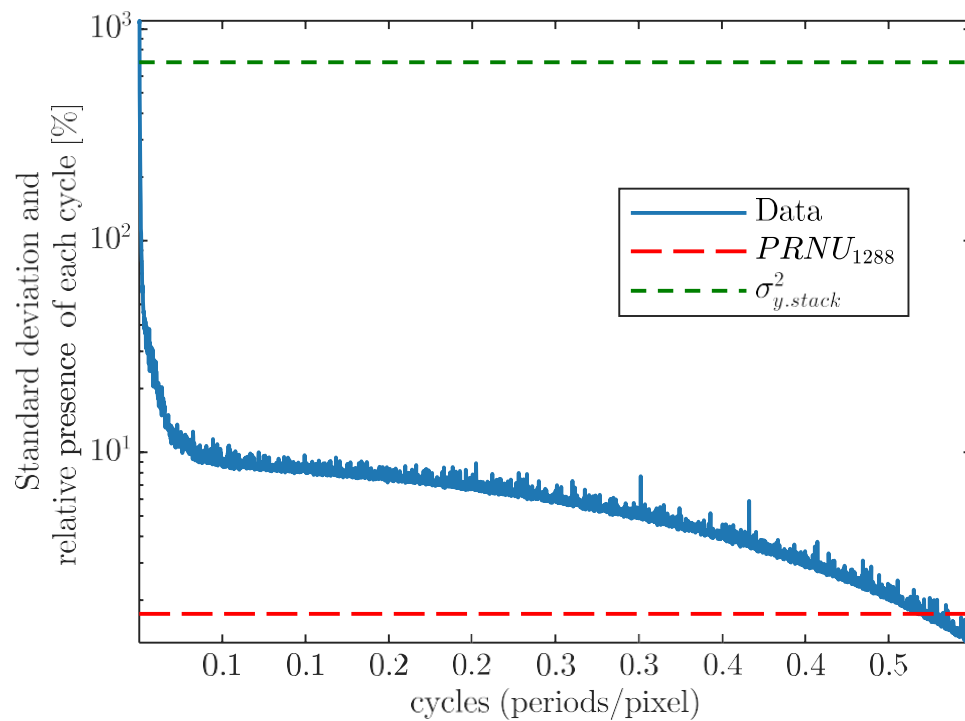
Horizontal Spectrogram PRNU



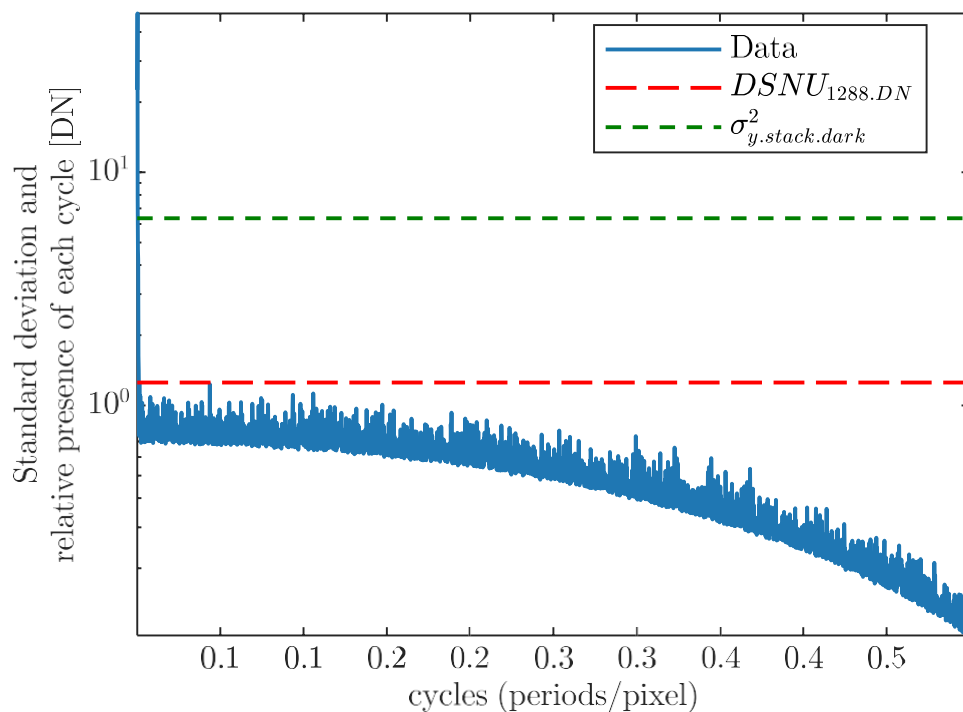
Horizontal Spectrogram DSNU



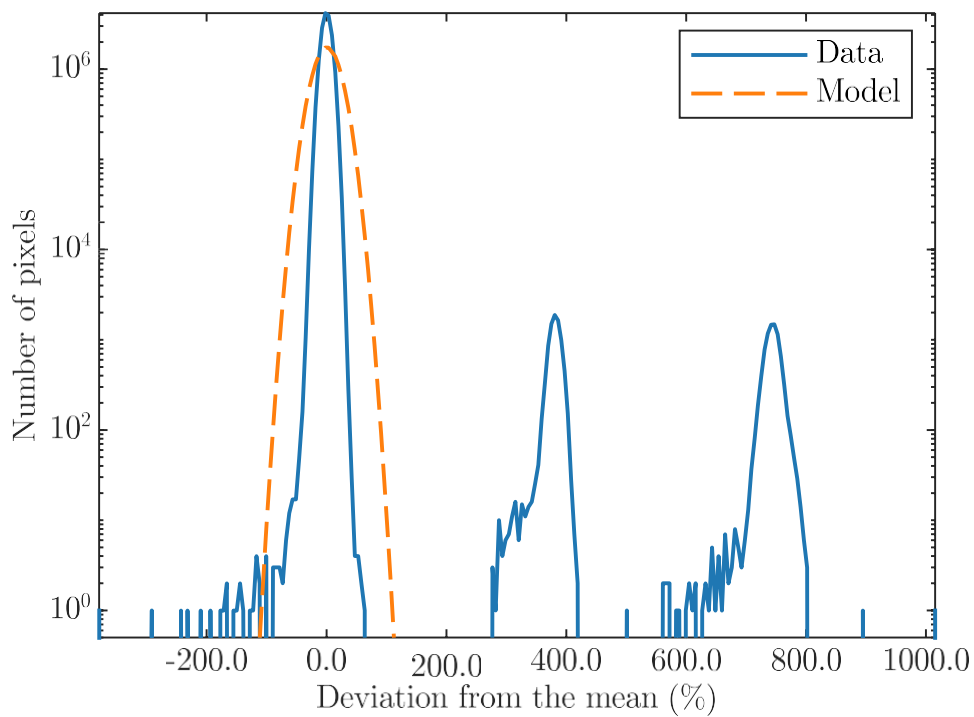
Vertical Spectrogram PRNU



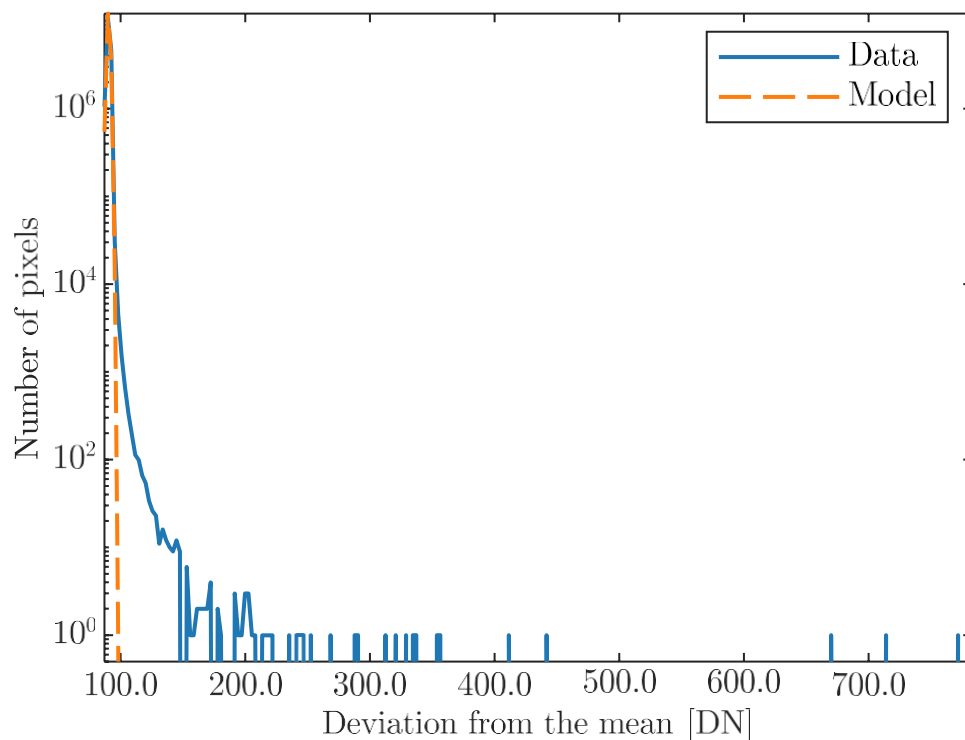
Vertical Spectrogram DSNU



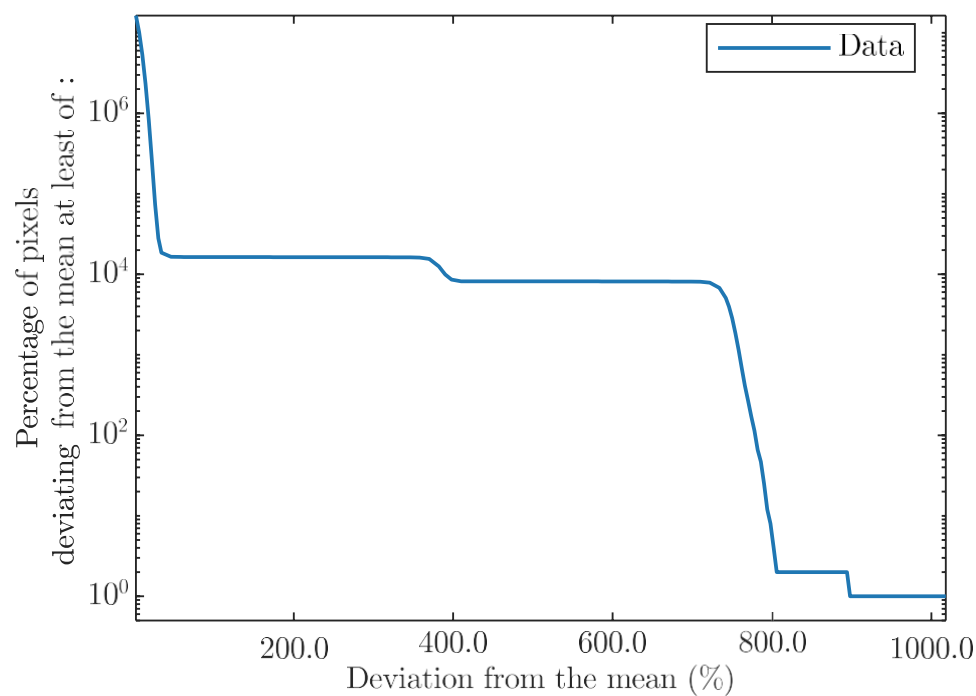
Logarithmic Histogram PRNU



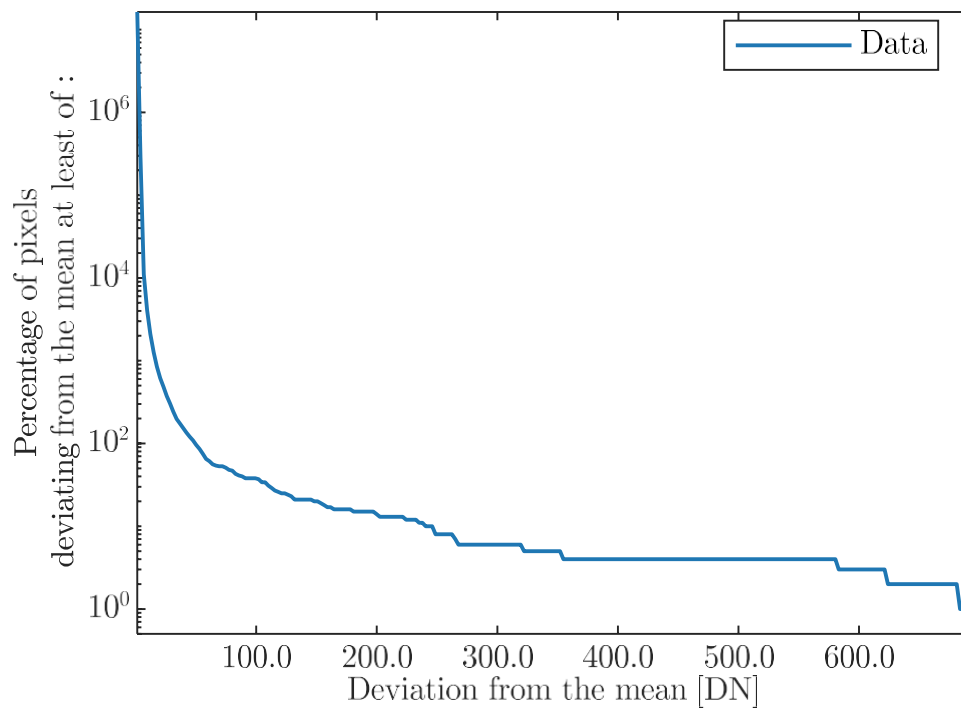
Logarithmic Histogram DSNU



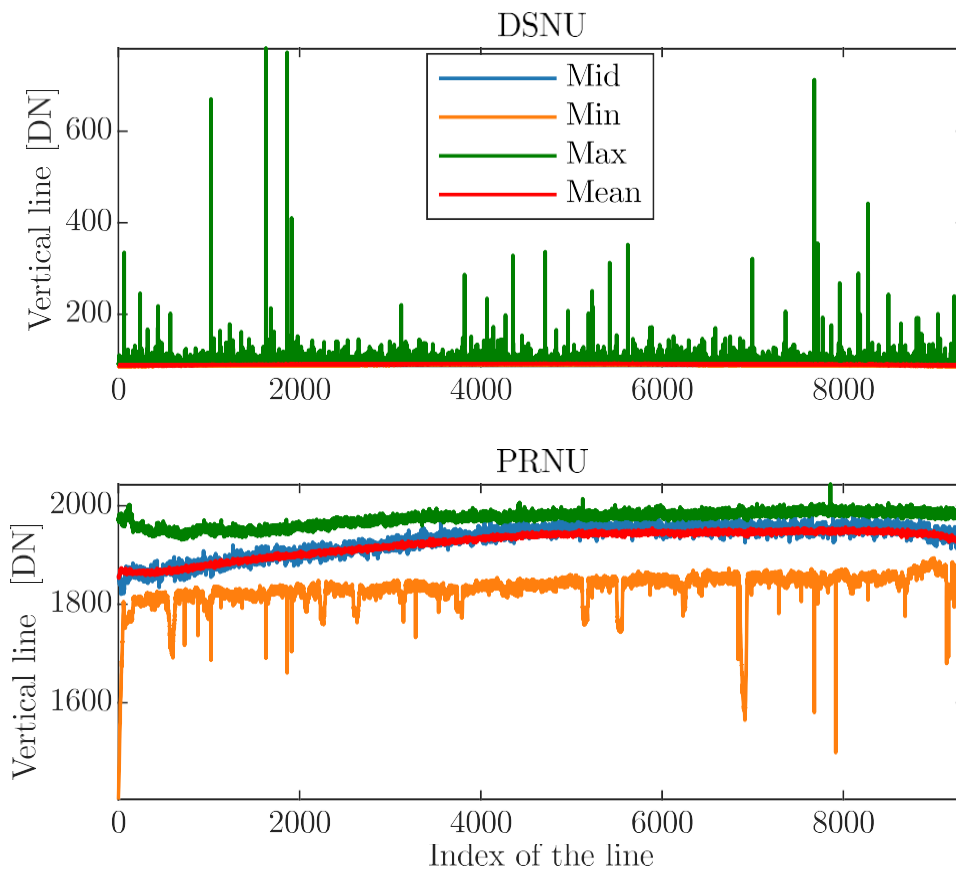
Accumulated Log Histogram PRNU



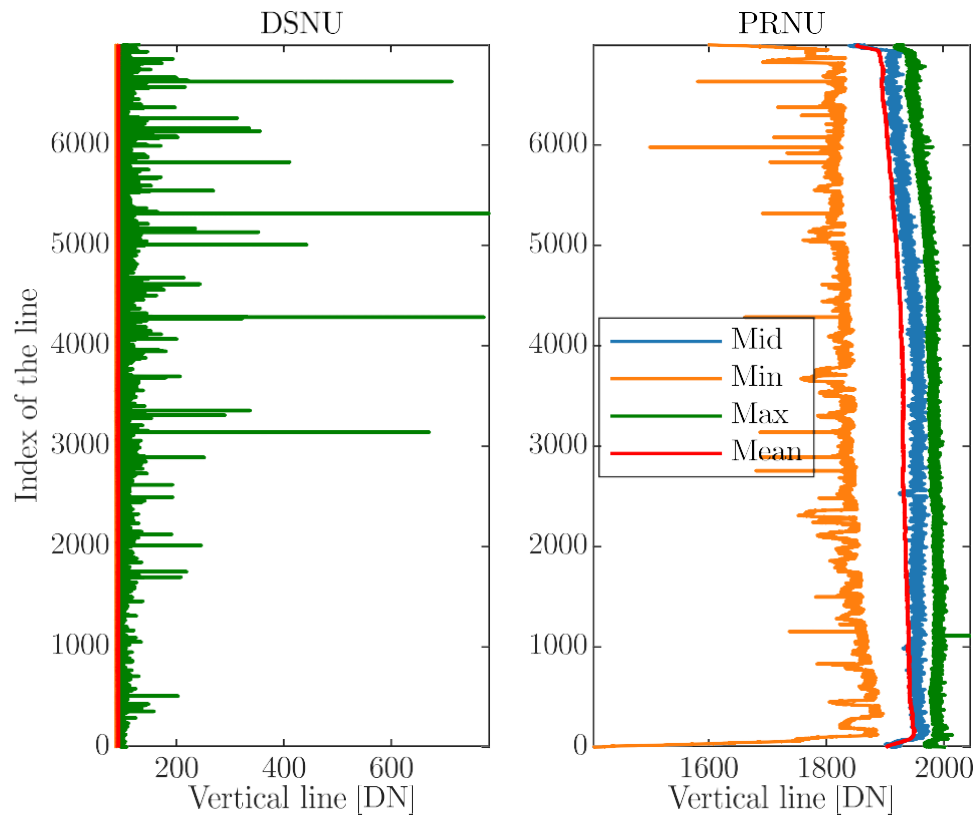
Accumulated Log Histogram DSNU



Horizontal Profile



Vertical Profile



Summary Sheet for Operation Point 3 at a Wavelength of 448 nm

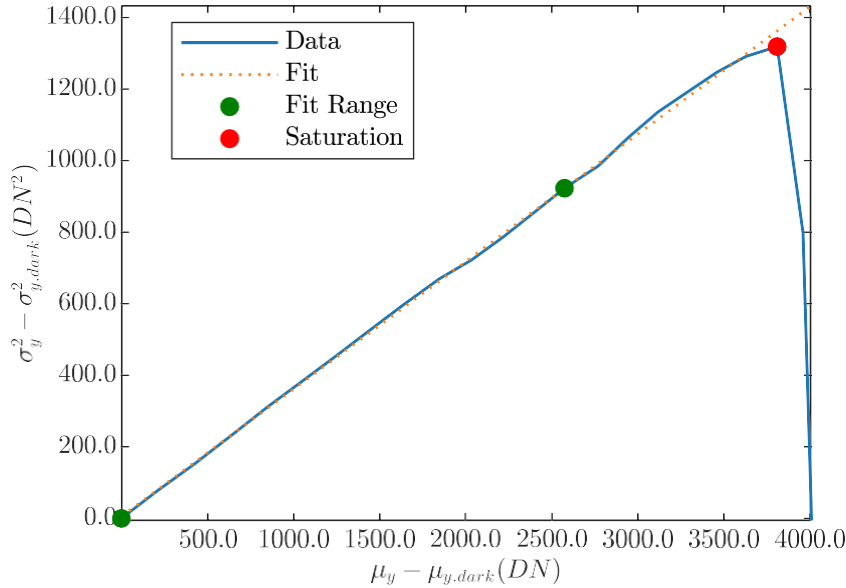
Camera setting

Gain	1.25
Black level	-1250

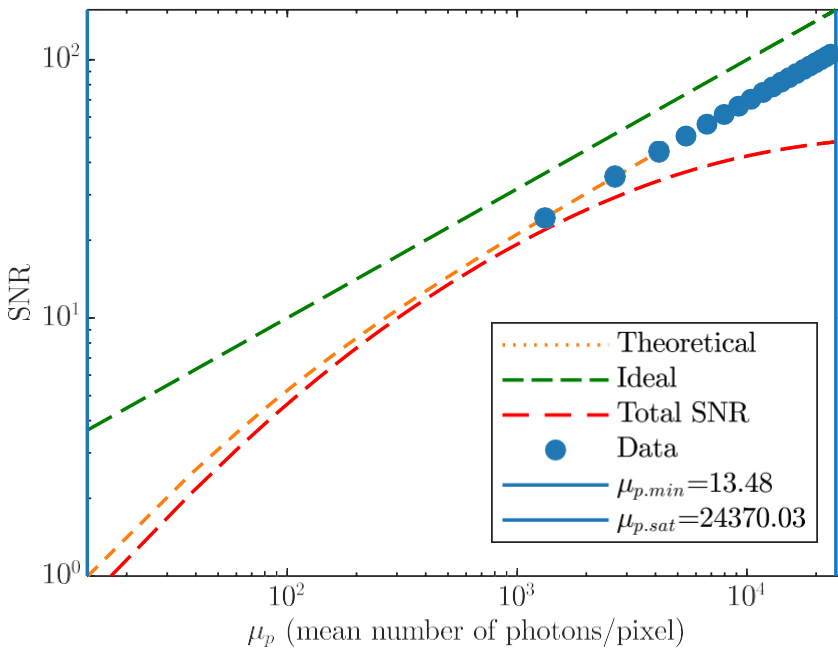
Operation point parameters

Environmental temperature	22.87
Camera body temperature	44
Sensor temperature	57.318
Processor temperature	49

Photon Transfer



Signal-to-Noise Ratio



Performance

Quantum efficiency

η	47.7712	%
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System gain

K	0.32788	DN/e ⁻
1/K	3.0499	e ⁻ /DN

Temporal dark noise

σ_d	5.876	e ⁻
$\sigma_{y,dark}$	1.9481	DN

Signal-to-noise ratio

SNR _{max}	107.8975	
	40.6602	dB
	6.7535	bit
1/SNR _{max}	0.92681	%

Absolute sensitivity threshold

$\mu_{p,min}$	13.4843	p
$\mu_{p,min,area}$	1.3168	p/μm ²
$\mu_{e,min}$	6.4416	e ⁻
$\mu_{e,min,area}$	0.62907	e ⁻ /μm ²

Saturation capacity

$\mu_{p,sat}$	24370.0287	p
$\mu_{p,sat,area}$	2379.8856	p/μm ²
$\mu_{e,sat}$	11641.8661	e ⁻
$\mu_{e,sat,area}$	1136.901	e ⁻ /μm ²

Dynamic range

DR	1807.2861	
	65.1405	dB
	10.8196	bit

Spatial nonuniformities

DSNU ₁₂₈₈	4.7325	e ⁻
	1.5517	DN
PRNU ₁₂₈₈	1.8616	%

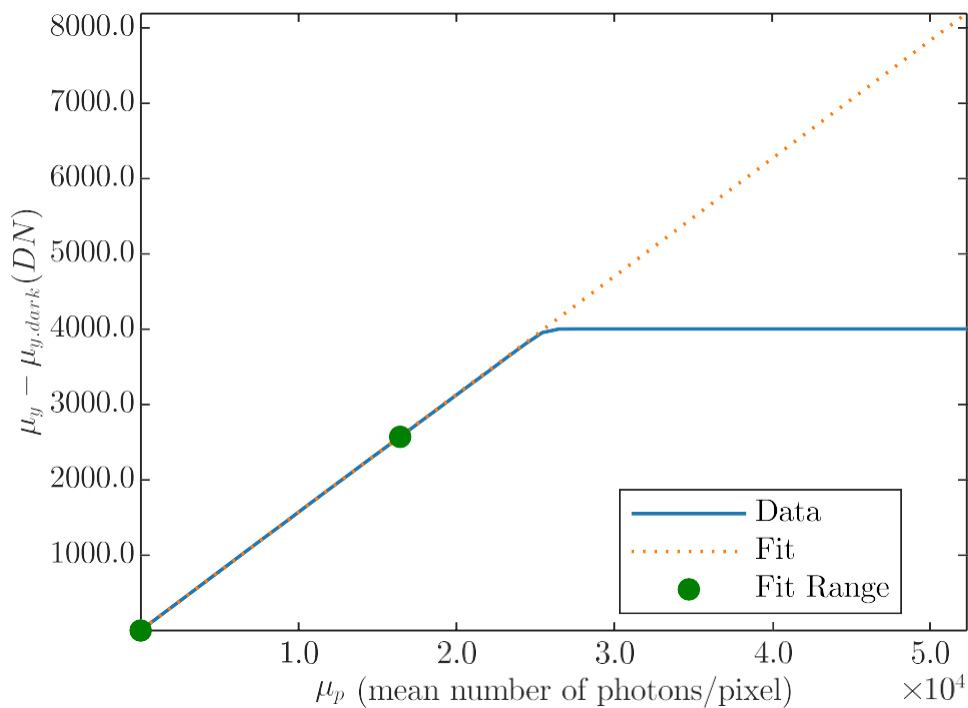
Linearity error

LE _{min}	-0.32858	%
LE _{max}	0.35818	%

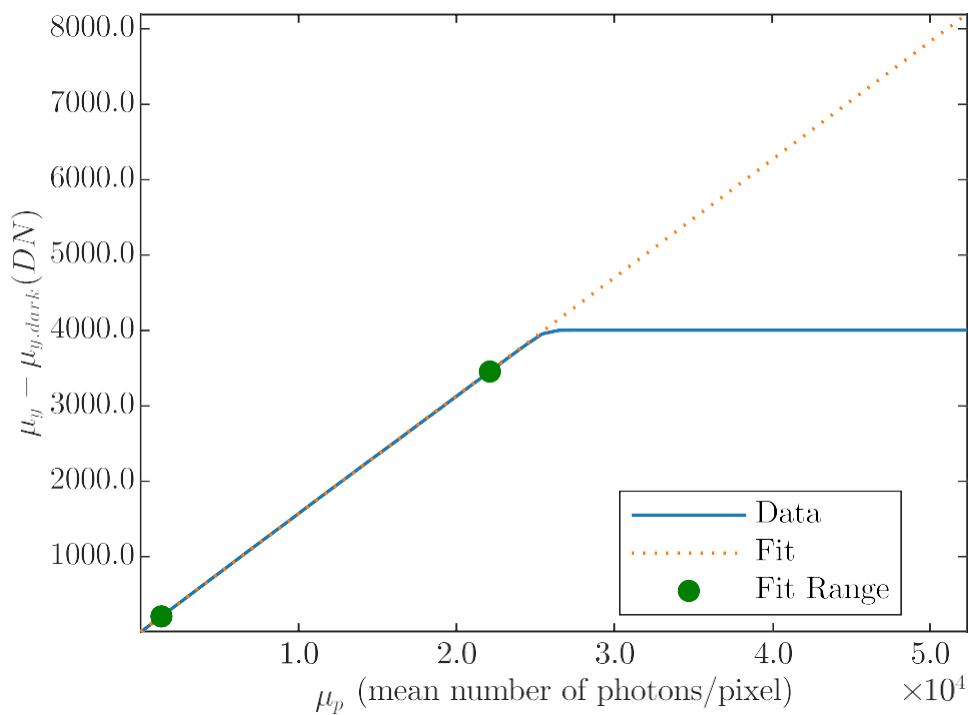
Dark current

$\mu_{l,mean}$	NaN	e ⁻ /s
	NaN	DN/s
$\mu_{l,var}$	78.0354	e ⁻ /s
	8.3891	DN/s

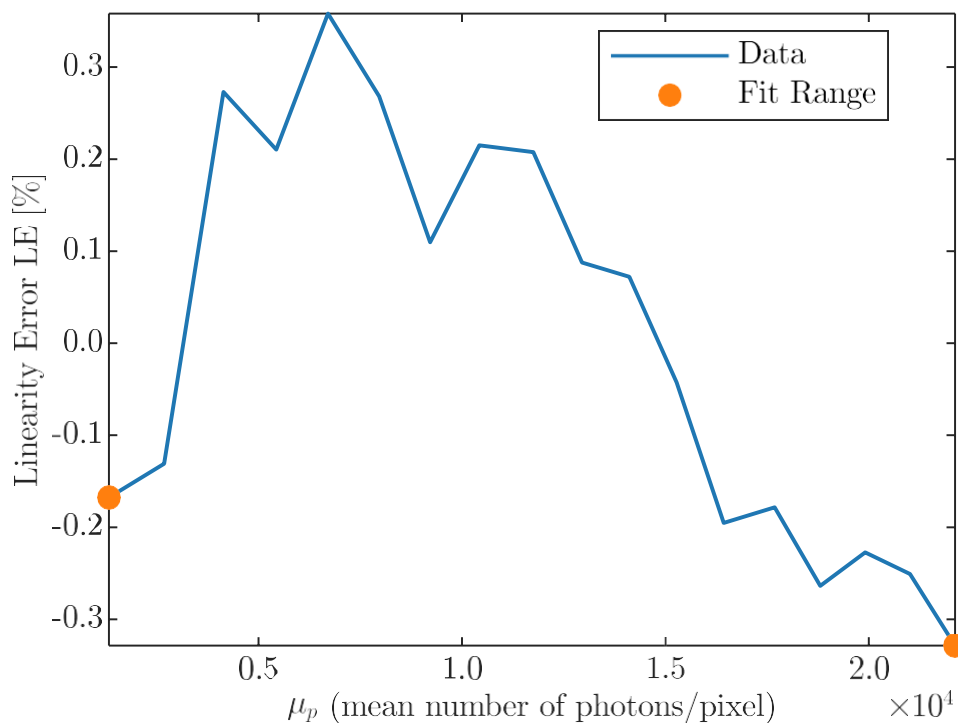
Sensitivity



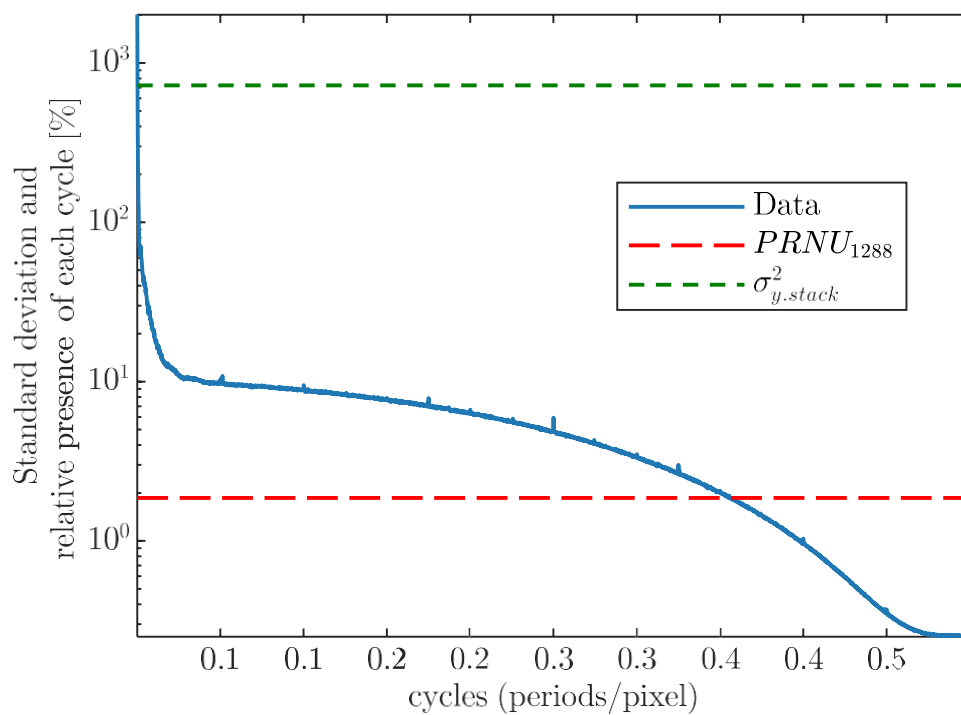
Linearity



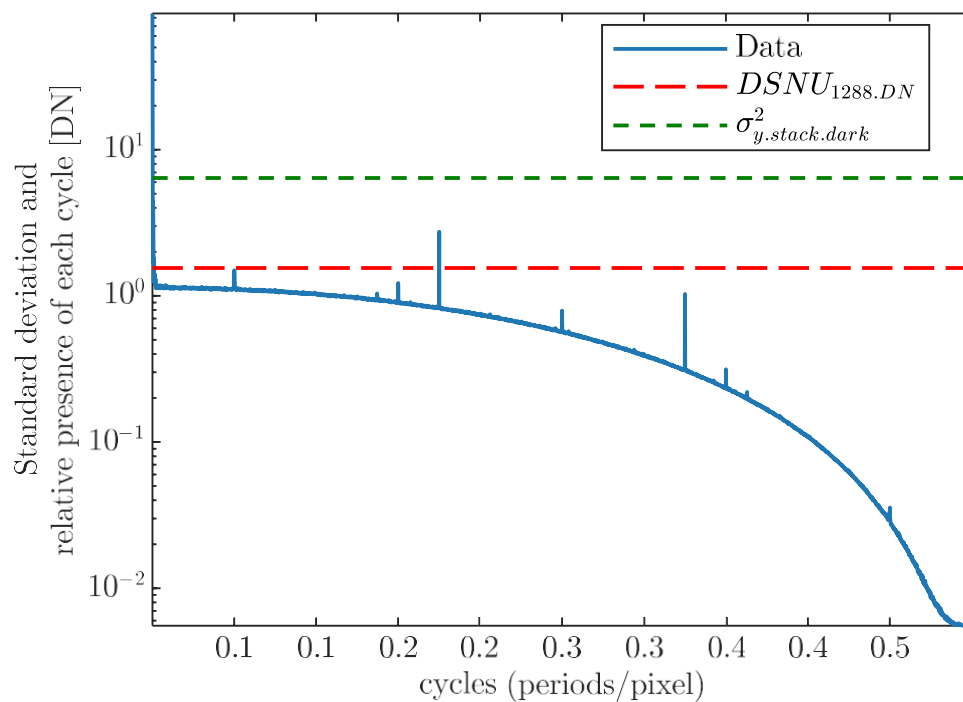
Deviation Linearity



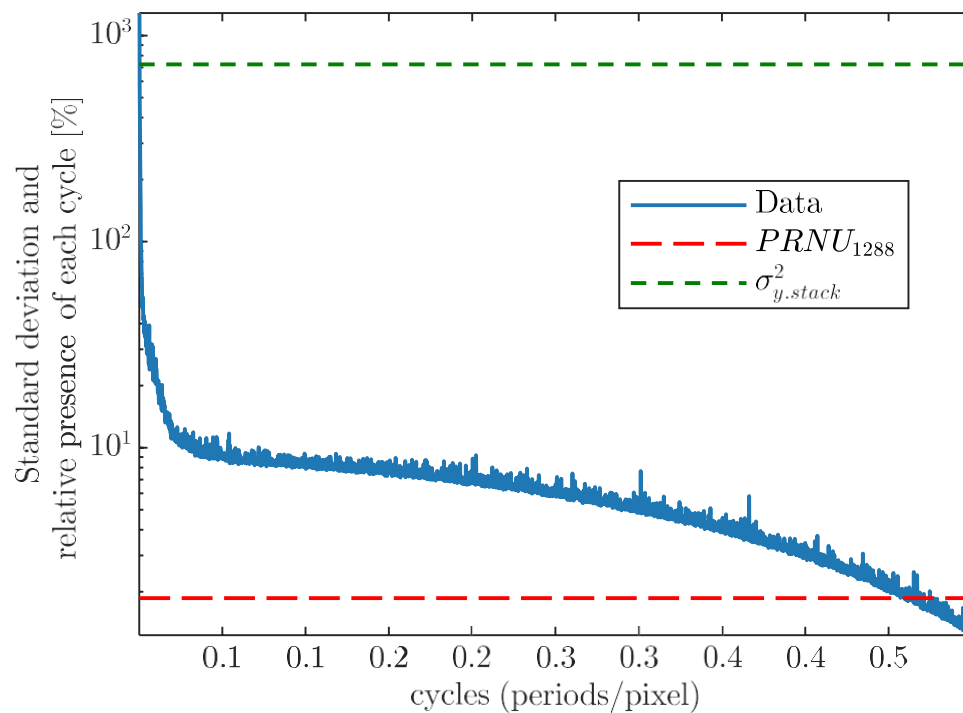
Horizontal Spectrogram PRNU



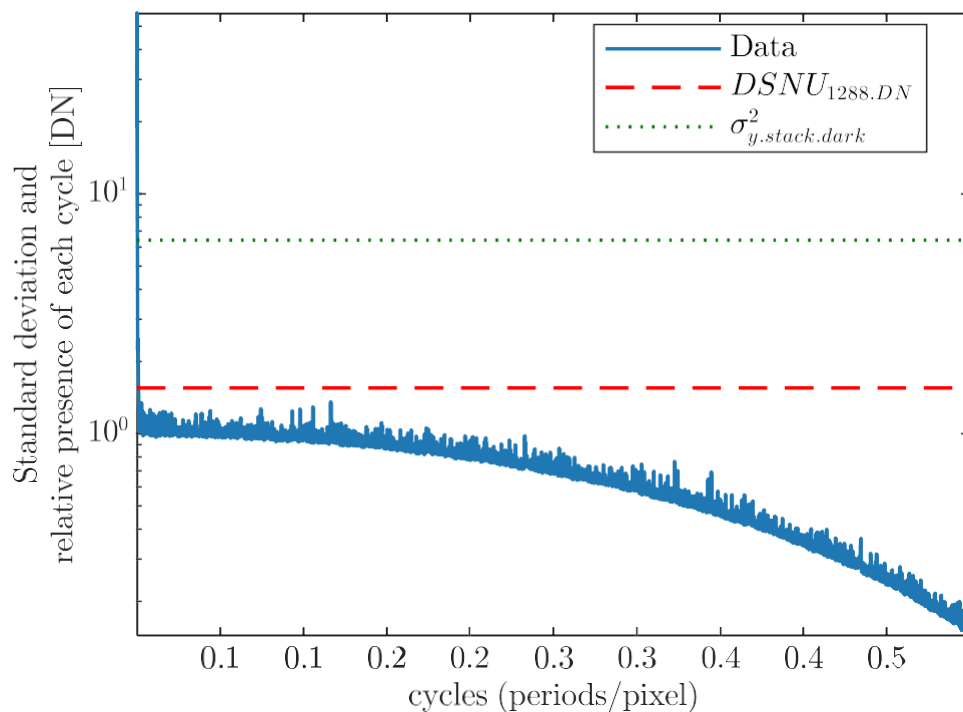
Horizontal Spectrogram DSNU



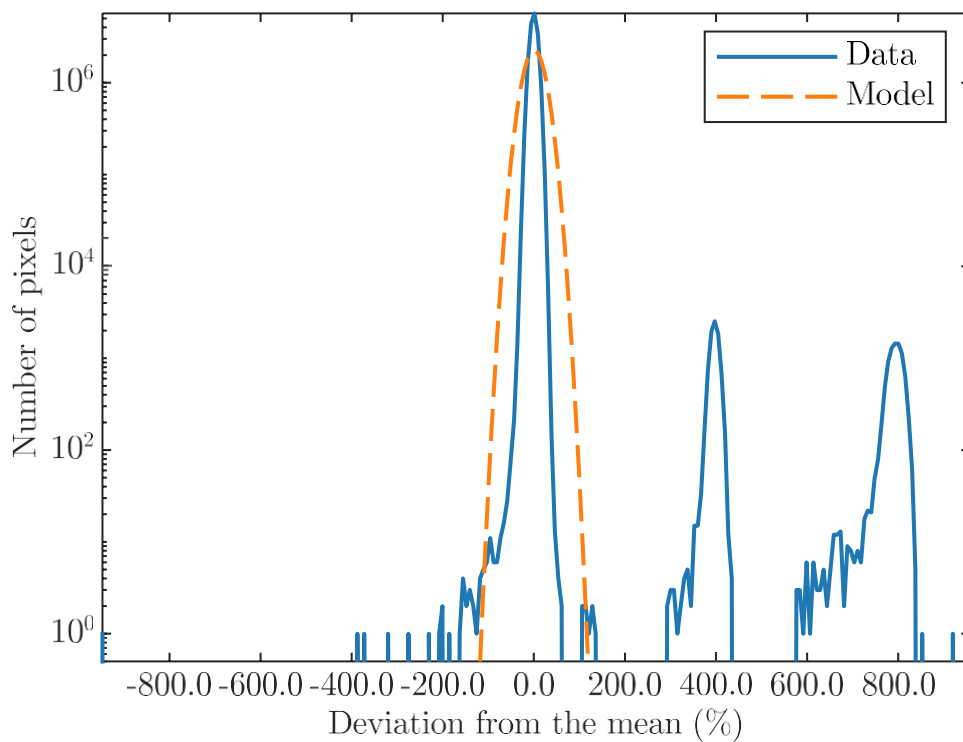
Vertical Spectrogram PRNU



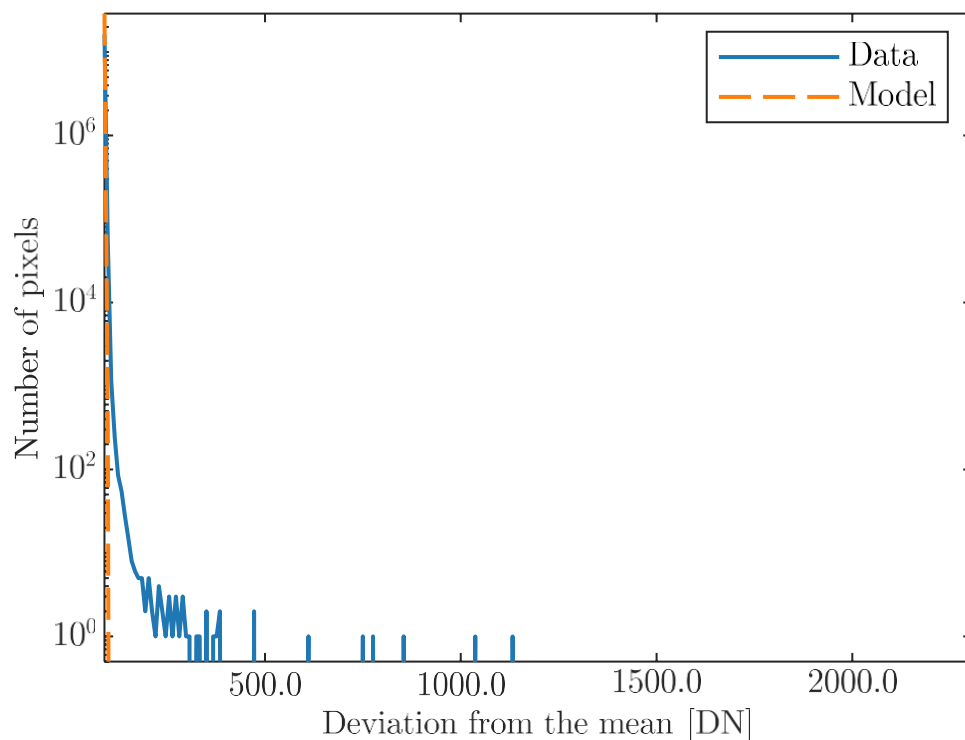
Vertical Spectrogram DSNU



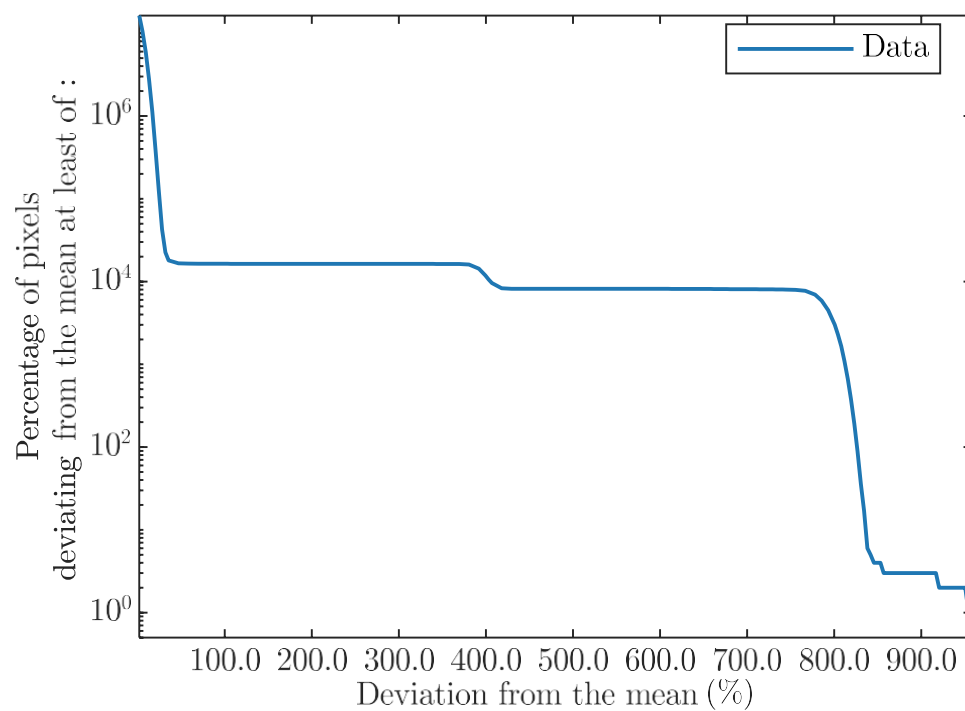
Logarithmic Histogram PRNU



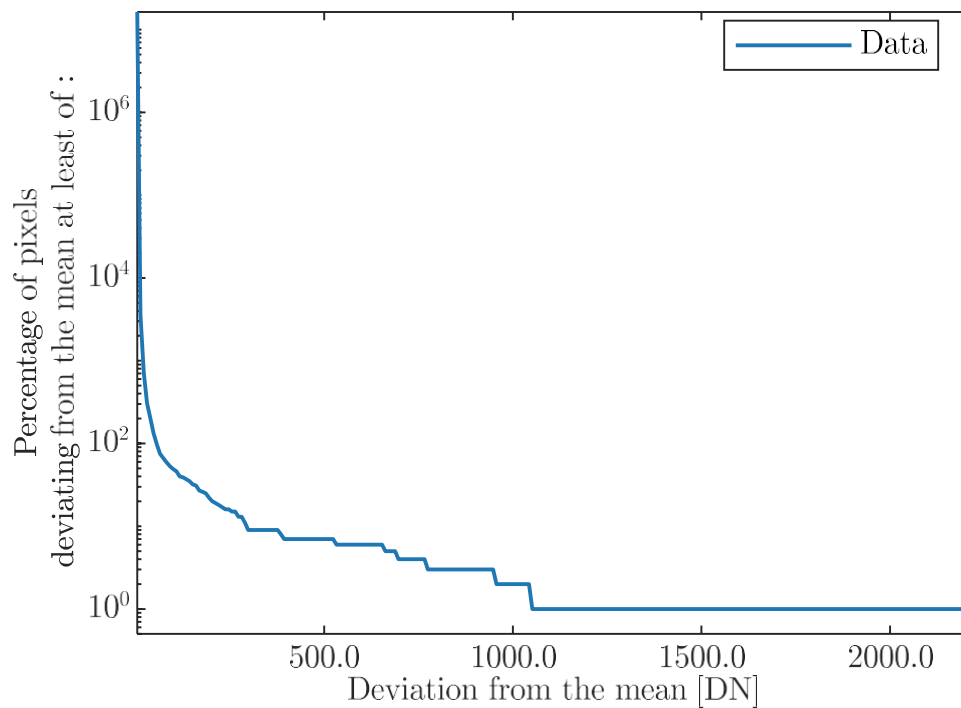
Logarithmic Histogram DSNU



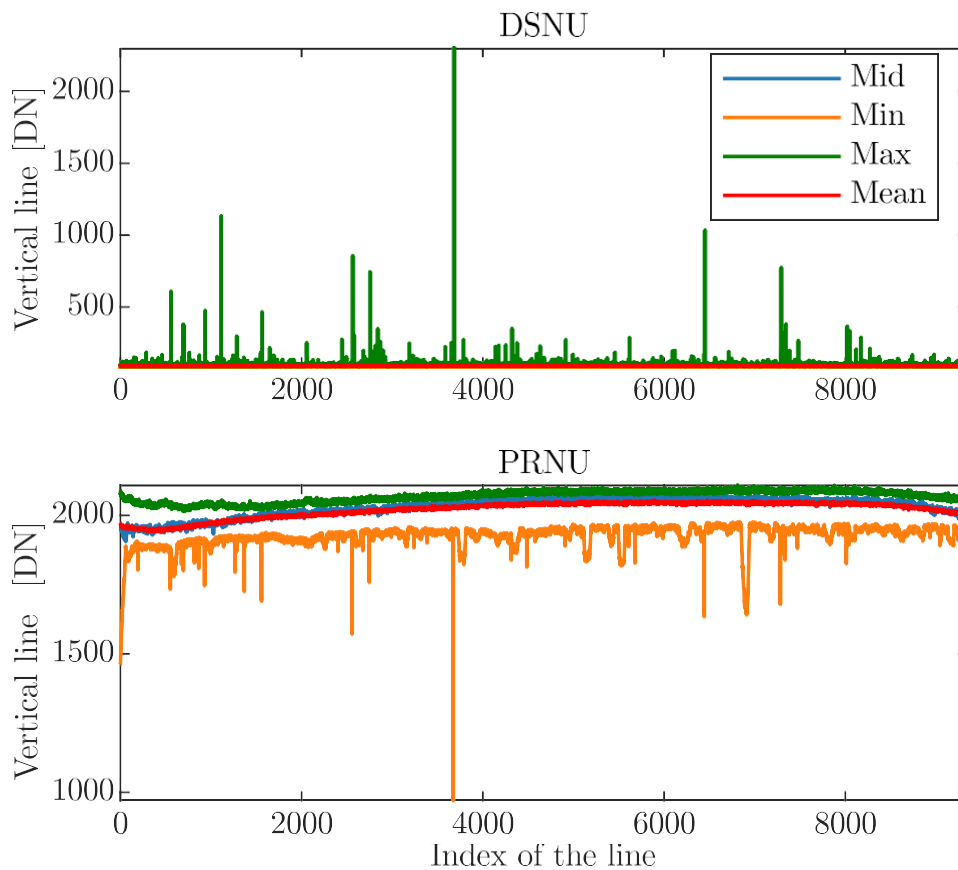
Accumulated Log Histogram PRNU



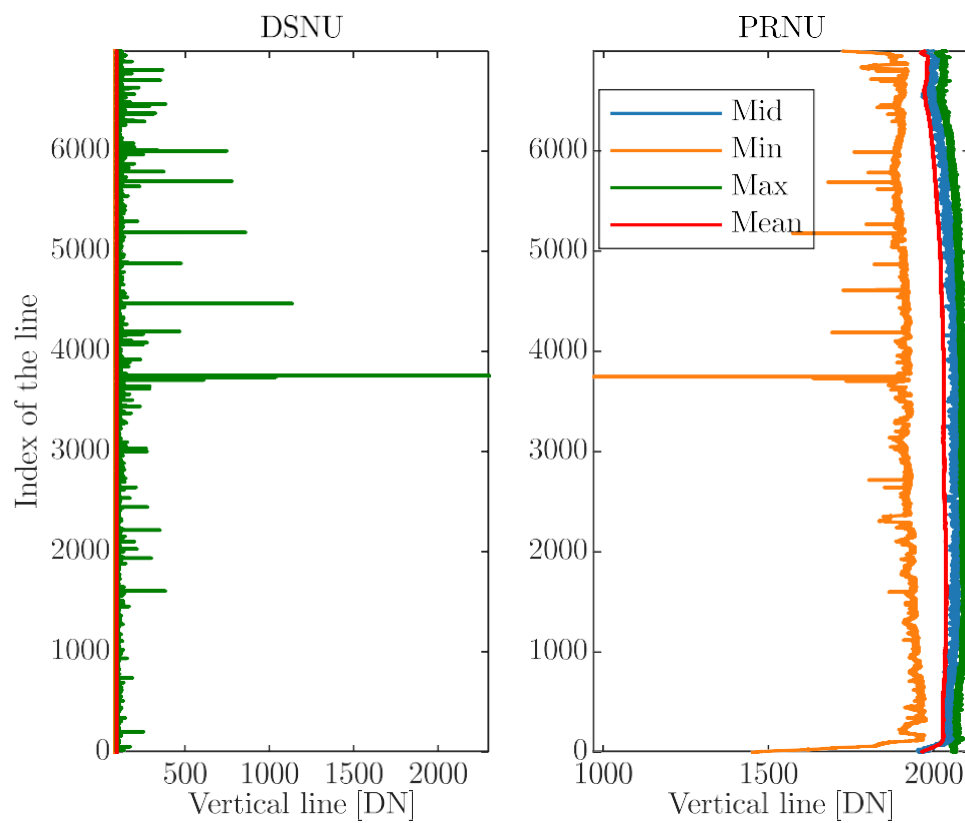
Accumulated Log Histogram DSNU



Horizontal Profile

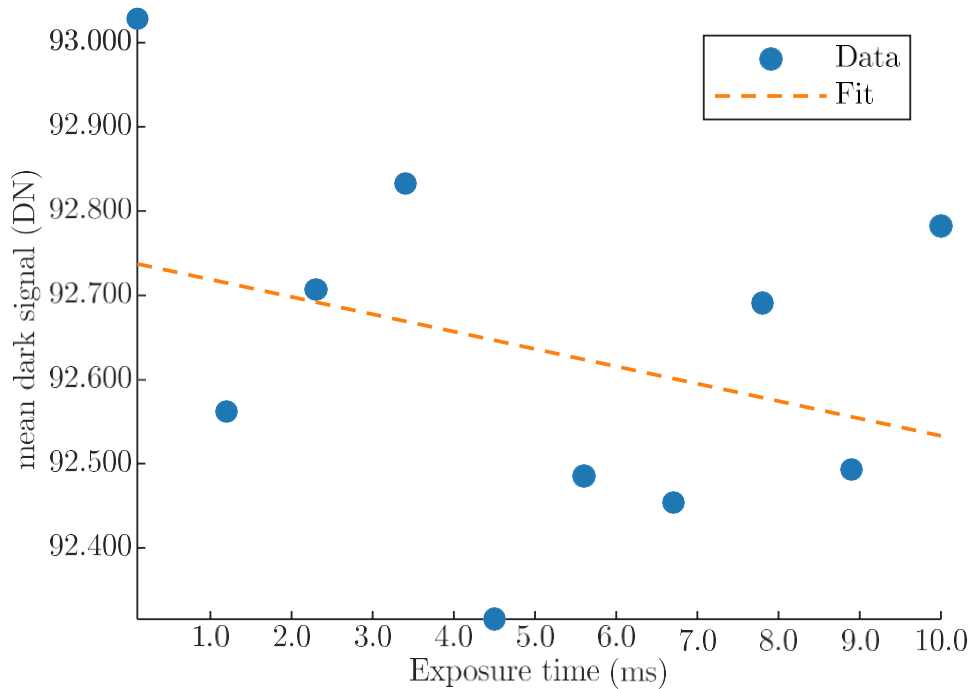


Vertical Profile

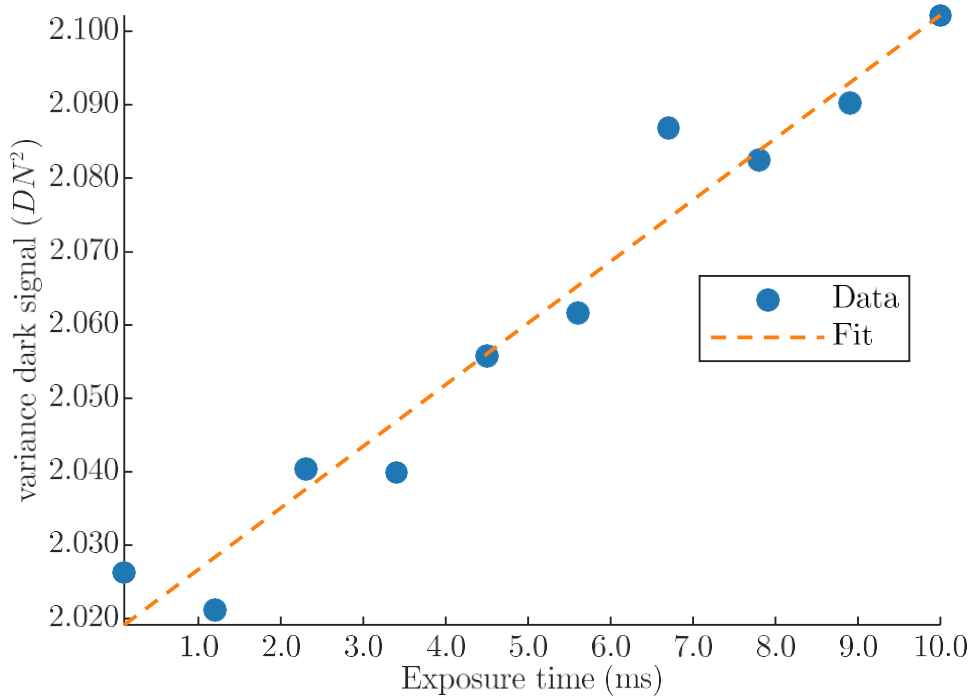


Dark Current

Dark Current from Mean



Dark Current from Variance



Acceptance Test Result (Not part of EMVA1288 standard)

Test Date

05-May-2021 12:00:34

Tester Name

Avi

Table 1: Acceptance test summary (Not part of EMVA1288 standard)

Test Number	Test Name	Test Status	Numeric Value	Margins	Failure Description
1	Dead Pixels	Pass	24	≤ 200	
2	Dead Clusters	Pass	0	≤ 0	
3	QE	Pass	66.0 35.3 47.8	$\geq 60 \geq 34 \geq 45$	
4	SNR	Pass	41.3 40.5 40.7	≥ 38	
5	DR	Pass	65.3 65.2 65.1	≥ 64	
6	Flash	Pass	-	-	
7	Uart	Pass	-	-	
8	SensorControl	Pass	-	-	
9	SensorLVDS	Pass	-	-	
10	Temperature	Pass	-	-	
11	Voltages	Pass	-	-	
12	MACOM	Pass	-	-	
13	GPIO	Pass	-	-	
14	DRAM	Pass	-	-	

Table 2: Dead pixels summary (Not part of EMVA1288 standard)

Number	Column	Row	Deviation from mean DSNU [DN]	Deviation from mean PRNU [%]
1	302	6830	436	-31
2	551	3704	523	-15
3	1022	3139	607	-11
4	1107	4466	1144	-8
5	1329	4141	1528	-36
6	1628	5319	731	-11
7	1862	4285	727	-18
8	2557	5178	773	-18
9	2747	5990	668	-16
10	2774	2896	423	0
11	3673	3746	2218	-51
12	4763	6521	474	-19
13	4898	5110	853	-16
14	5288	5494	438	-7
15	5665	4209	486	-9
16	6443	3732	946	-22
17	7283	5688	690	-23
18	7433	5849	414	-8
19	7680	6633	663	-27
20	8375	6759	1041	-60
21	8507	5787	784	-14
22	8529	1891	-3	-22
23	8784	6572	692	-27
24	9224	4607	161	-30

Summary Sheet for calibration of User Set Factory (Not part of EMVA1288 standard)

Camera setting		Operation point parameters	
Gain	1.25	Environmental temperature	22.56
Black level	-1250	Camera body temperature	22.75
Frame rate	23 Hz	Sensor temperature	52.425
Exposure time	11000 μ s		

Spectrum of Calibration light source

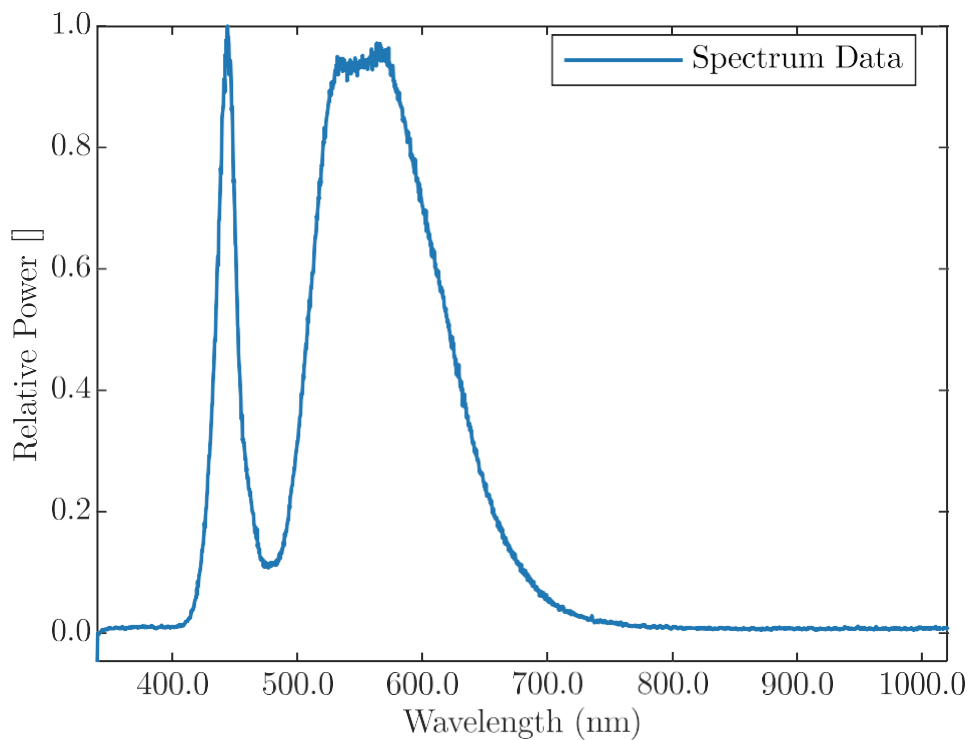


Table 3: Calibrated features summary

Number	Feature	Calibration Status
1	DSNU	Yes
2	PRNU	Yes
3	Bad Pixels	Yes
4	White Balance	Yes

Table 4: White Balance calibrated gains

Gain	Value
Red	1.9609
Green	1
Blue	1.3569

Dead Pixels

Table 5: Dead pixels summary

Number	Column	Row	Deviation from mean DSNU [DN]	Deviation from mean PRNU [%]
1	302	6830	436	-31
2	551	3704	523	-15
3	1022	3139	607	-11
4	1107	4466	1144	-8
5	1329	4141	1528	-36
6	1628	5319	731	-11
7	1862	4285	727	-18
8	2557	5178	773	-18
9	2747	5990	668	-16
10	2774	2896	423	0
11	3673	3746	2218	-51
12	4763	6521	474	-19
13	4898	5110	853	-16
14	5288	5494	438	-7
15	5665	4209	486	-9
16	6443	3732	946	-22
17	7283	5688	690	-23
18	7433	5849	414	-8
19	7680	6633	663	-27
20	8375	6759	1041	-60
21	8507	5787	784	-14
22	8529	1891	-3	-22
23	8784	6572	692	-27
24	9224	4607	161	-30

International Distributor



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