

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	IMX250
Model	Iron250C	Sensor type	CMOS
Camera type	Color	Shutter type	Global
Data type	Single	Overlap capabilities	Overlapping
Sensor type	CMOS	Frame rate	50 Hz
Lens category	C-Mount	Exposure control	by irradiance
Resolution	2448 x 2048 , 12 bits	Exposure time	6000.7266 μ s
Pixel size	3.45 μ m x 3.45 μ m	Illumination	Variable with constant exposure time
Maximum readout rate	88 fps	Irradiation Steps	50
Dark current compensation	No	Irradiation calibration accuracy	-
Interface type	CXP-12	Irradiation measurement error	-
Serial number	1320052	Standart version	3.1
Firmware version	3.1-2020.4.13	Light source	Integrating Sphere
Sensor diagonal	16.1mm		

International Distributor



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Summary Sheet for Operation Point 1 at a Wavelength of 520 nm

Camera setting

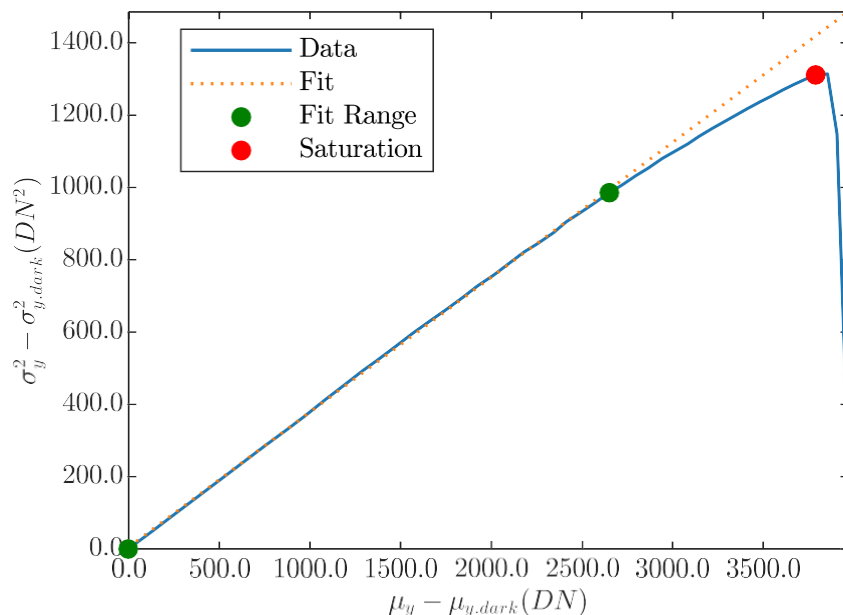
Gain
Black level

GainLevelx1
128

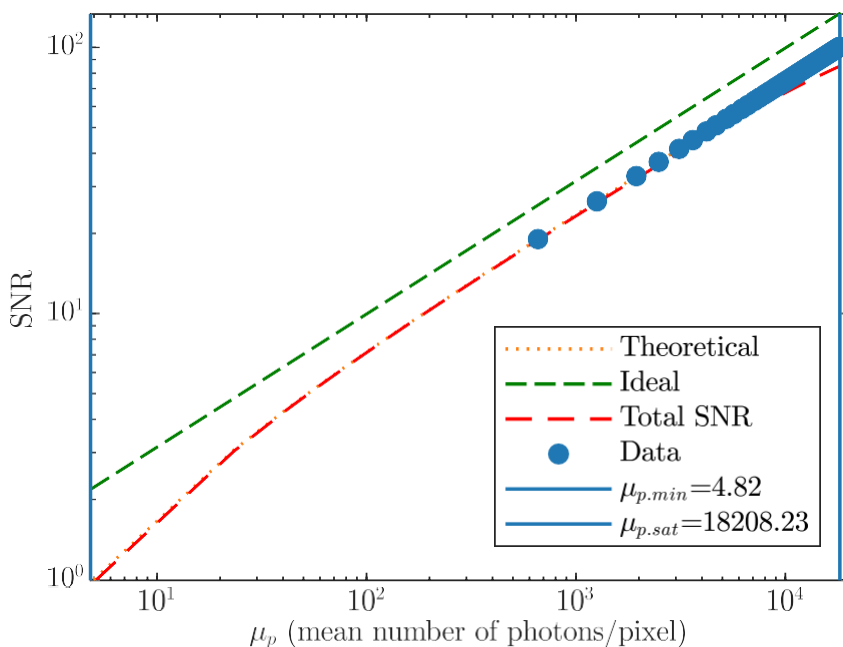
Operation point parameters

Environmental temperature 2.75
Camera body temperature 29
Sensor temperature 35.032
Processor temperature 34

Photon Transfer



Signal-to-Noise Ratio



Performance

Quantum efficiency

η 56.3063 %

System gain

K 0.37361 DN/e⁻
 $1/K$ 2.6766 e⁻/DN

Temporal dark noise

σ_d 2.072 e⁻
 $\sigma_{y,dark}$ 0.82619 DN

Signal-to-noise ratio

SNR_{max} 101.2541
40.1083 dB
6.6618 bit
 $1/SNR_{max}$ 0.98761 %

Absolute sensitivity threshold

$\mu_{p,min}$ 4.8154 p
 $\mu_{p,min,area}$ 0.40457 p/μm²
 $\mu_{e,min}$ 2.7114 e⁻
 $\mu_{e,min,area}$ 0.2278 e⁻/μm²

Saturation capacity

$\mu_{p,sat}$ 18208.2322 p
 $\mu_{p,sat,area}$ 1529.7822 p/μm²
 $\mu_{e,sat}$ 10252.3898 e⁻
 $\mu_{e,sat,area}$ 861.3644 e⁻/μm²

Dynamic range

DR 3781.2383
71.5527 dB
11.8846 bit

Spatial nonuniformities

DSNU₁₂₈₈ 0.61 e⁻
0.2279 DN
PRNU₁₂₈₈ 0.62985 %

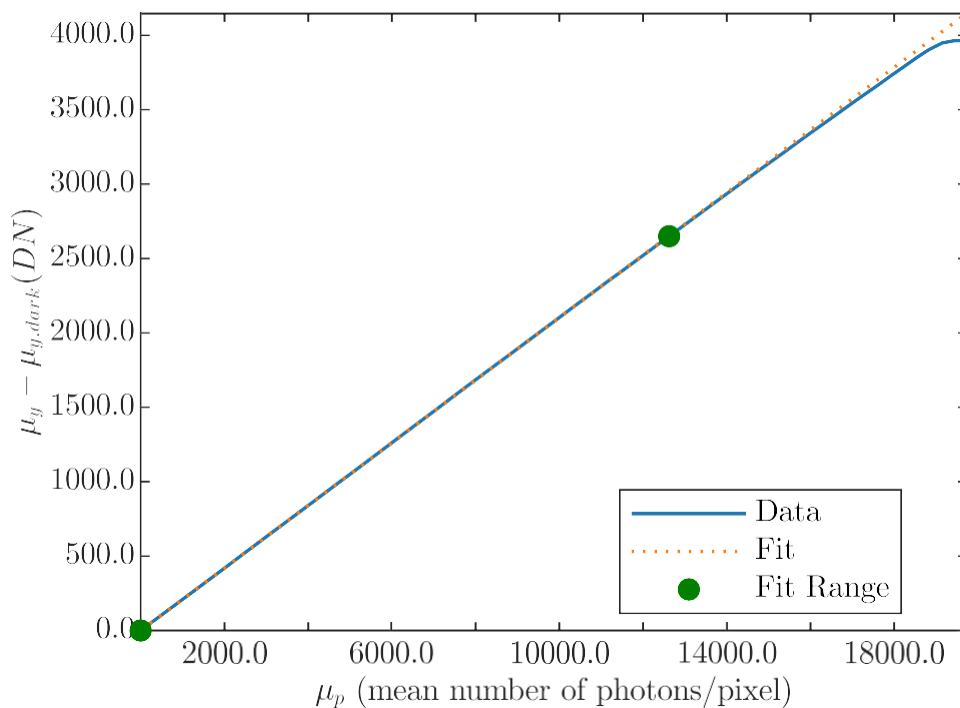
Linearity error

LE_{min} -0.63997 %
LE_{max} 0.36945 %

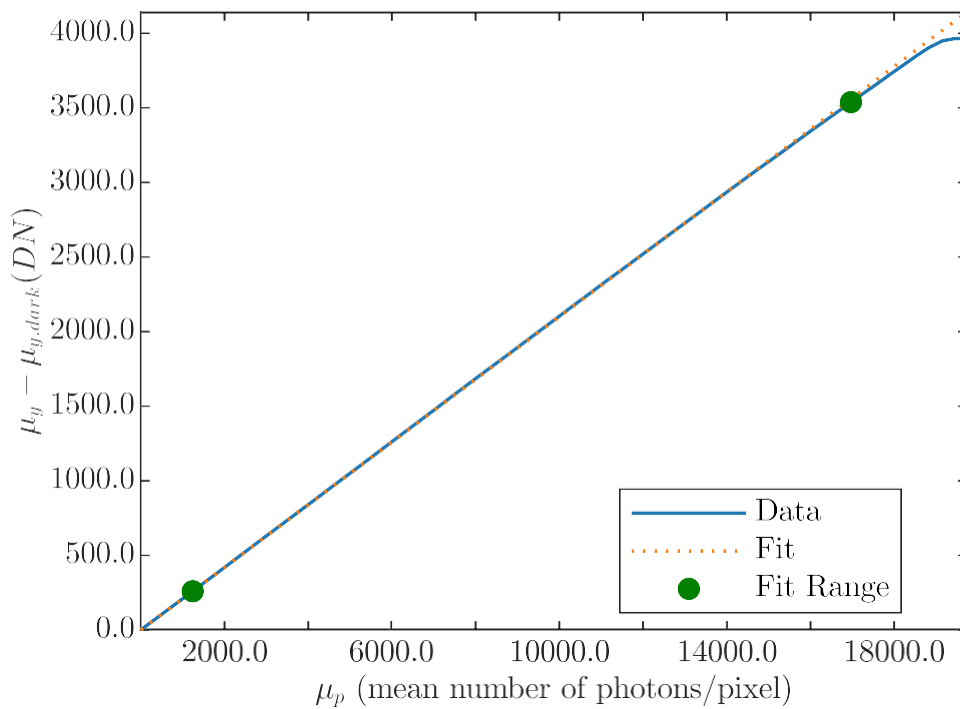
Dark current

$\mu_{l,mean}$ 11.6326 e⁻/s
4.3847 DN/s
 $\mu_{l,var}$ 0.91034 e⁻/s
0.12934 DN/s

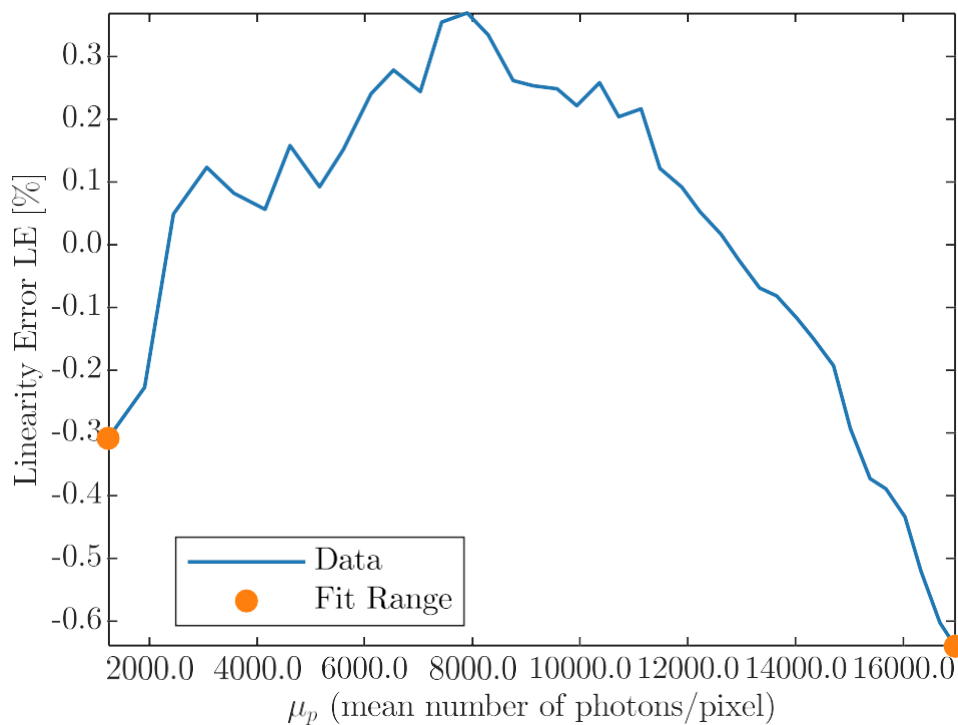
Sensitivity



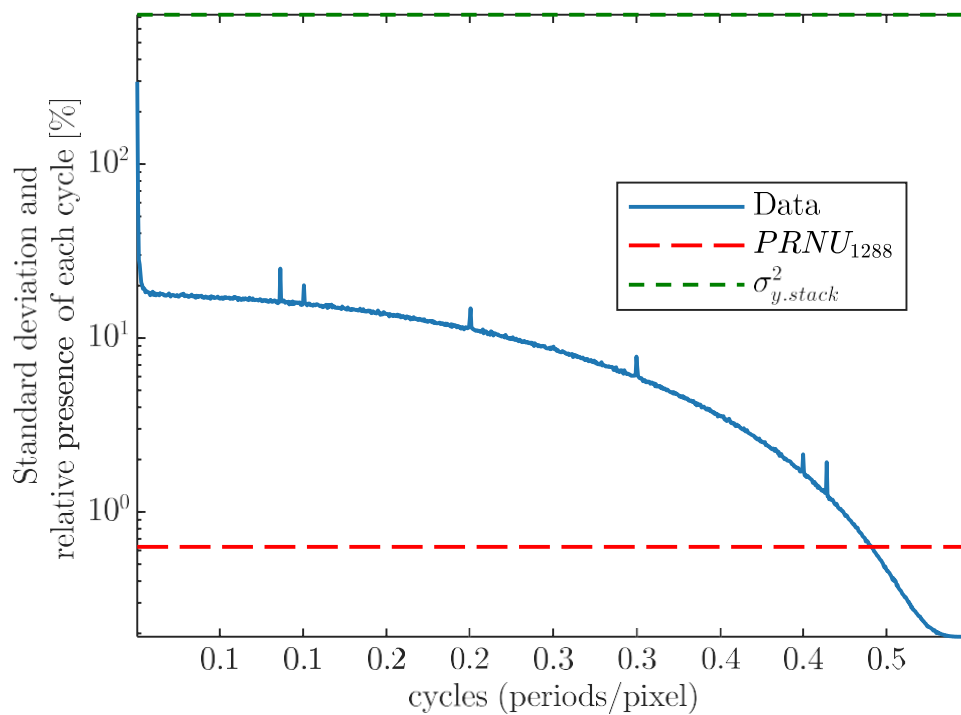
Linearity



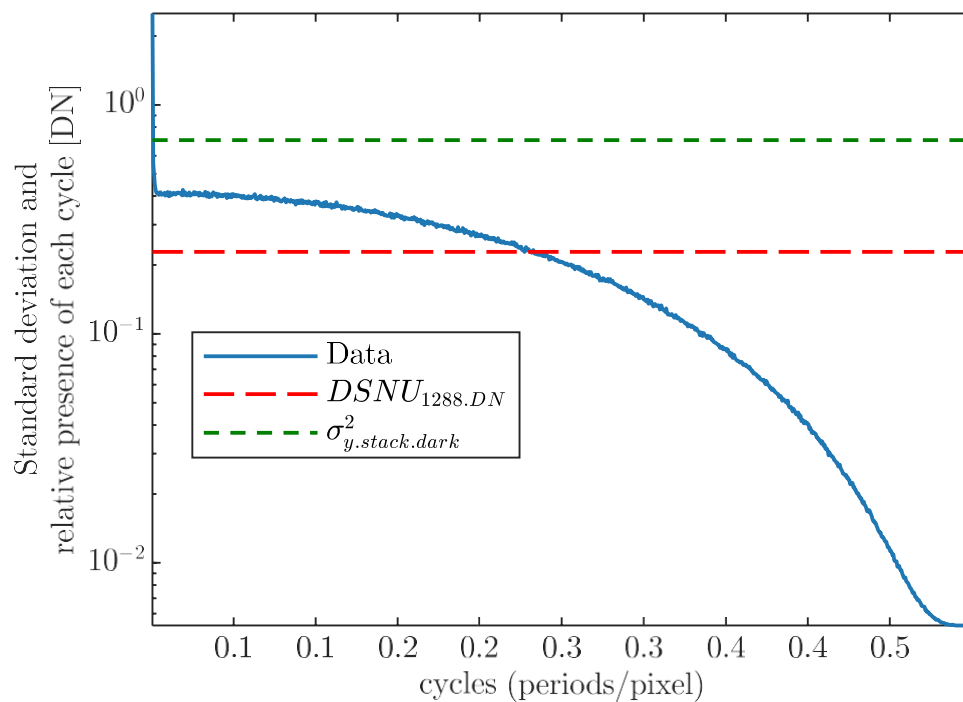
Deviation Linearity



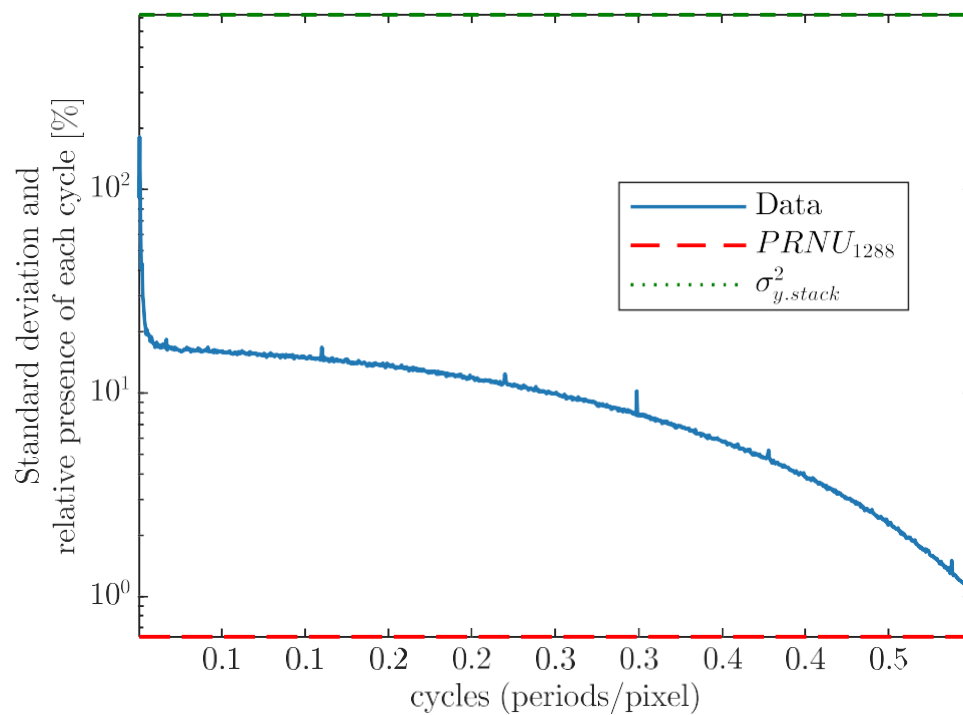
Horizontal Spectrogram PRNU



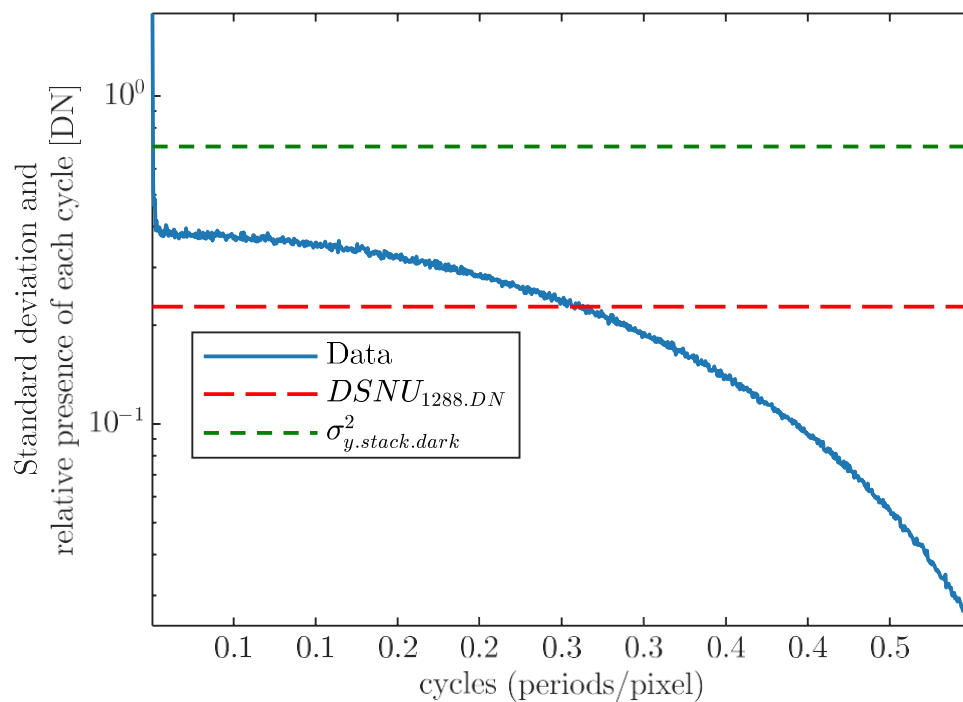
Horizontal Spectrogram DSNU



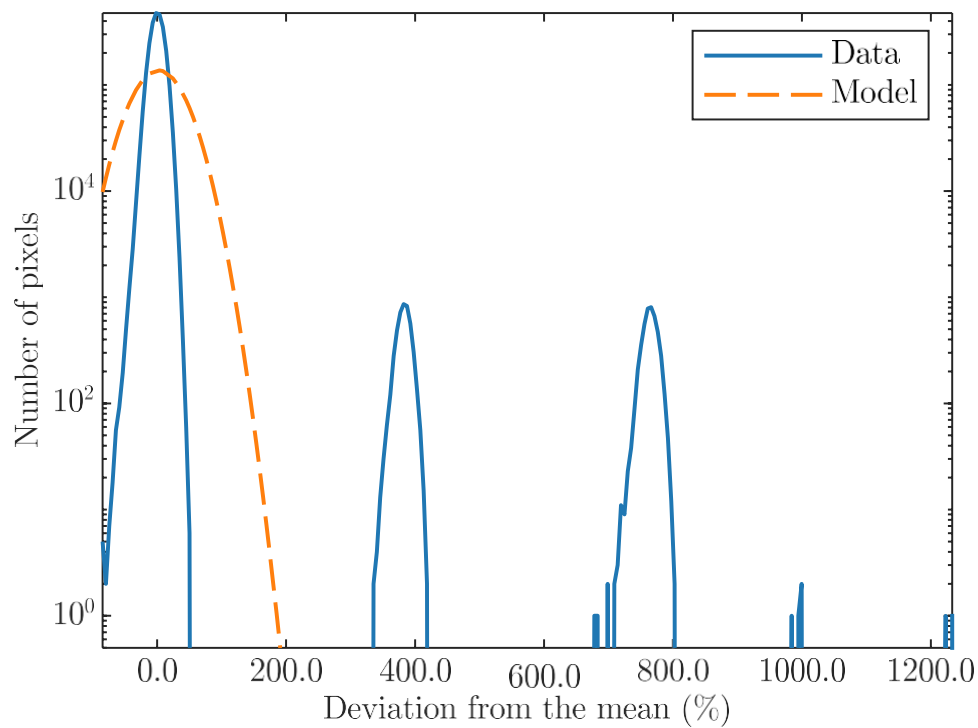
Vertical Spectrogram PRNU



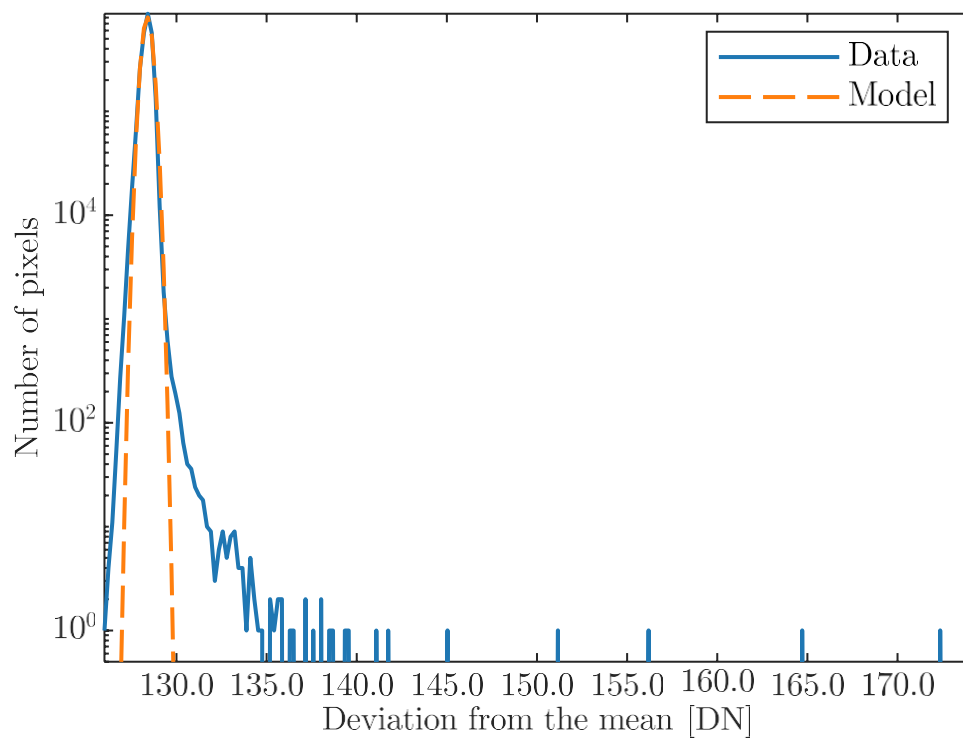
Vertical Spectrogram DSNU



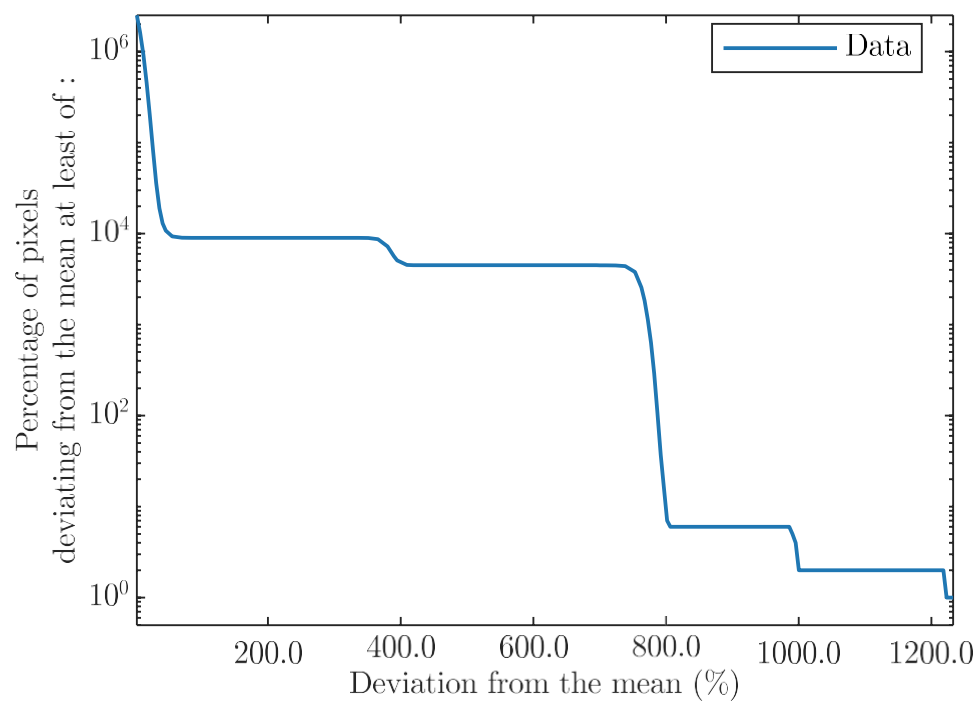
Logarithmic Histogram PRNU



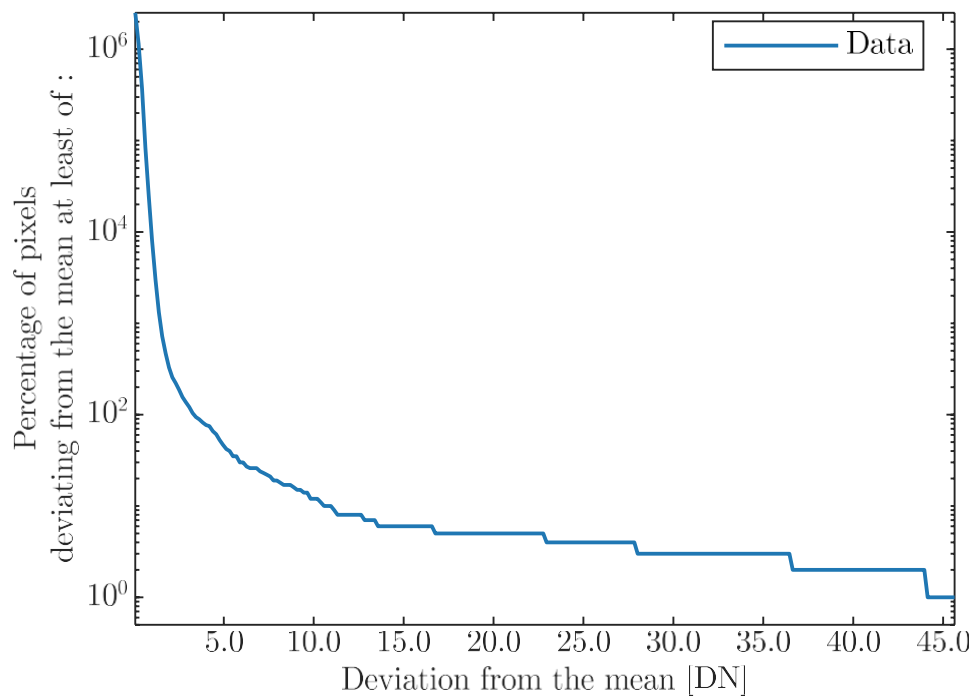
Logarithmic Histogram DSNU



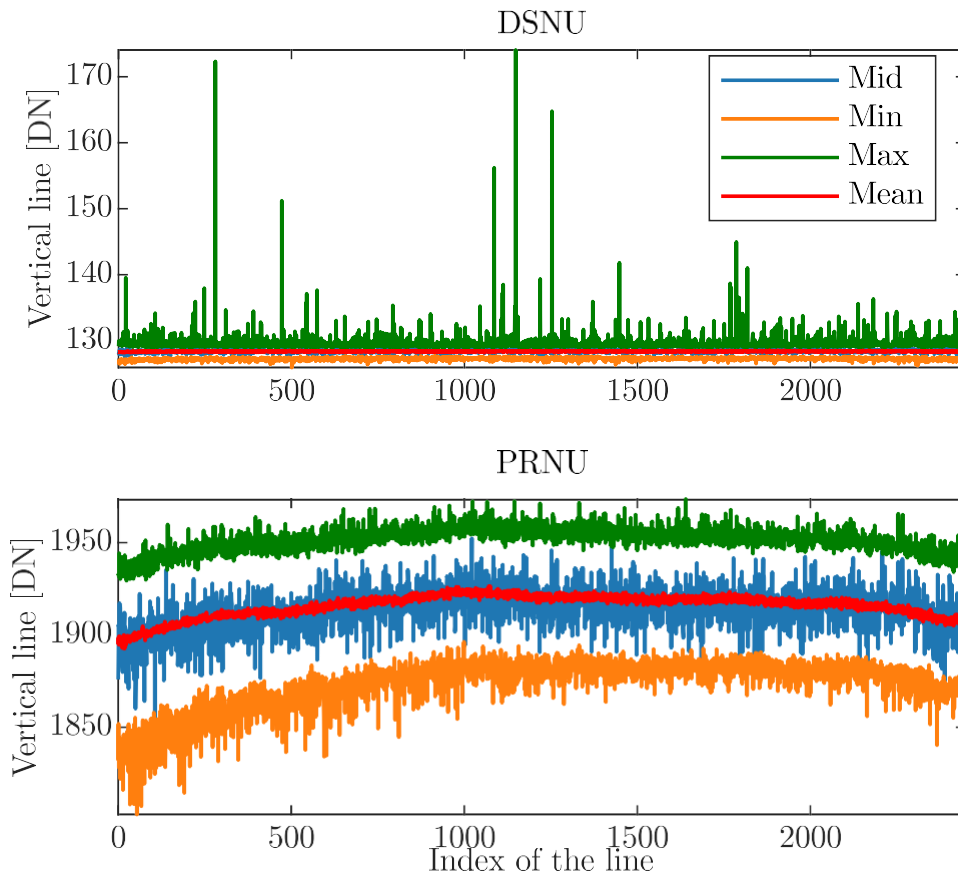
Accumulated Log Histogram PRNU



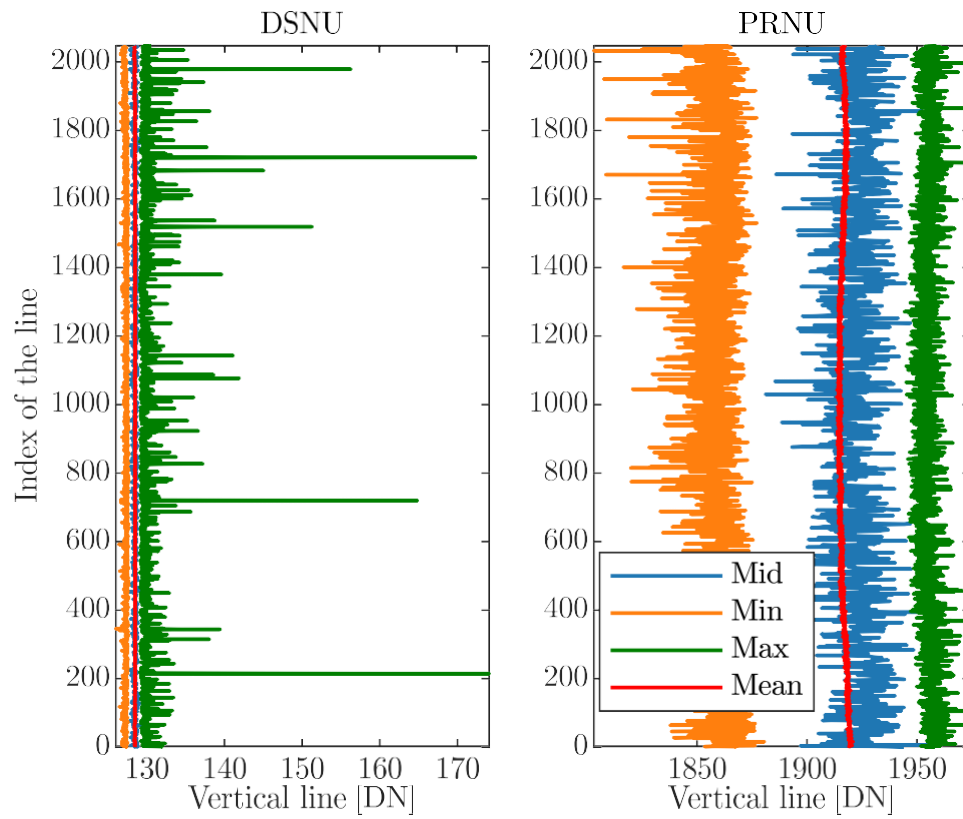
Accumulated Log Histogram DSNU



Horizontal Profile



Vertical Profile



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

Camera setting

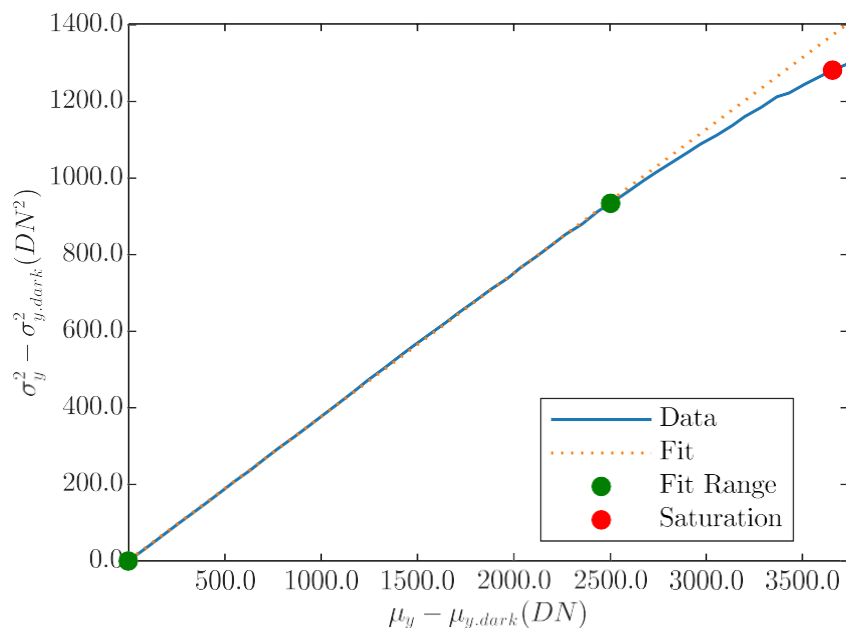
Gain
Black level

GainLevelx1
128

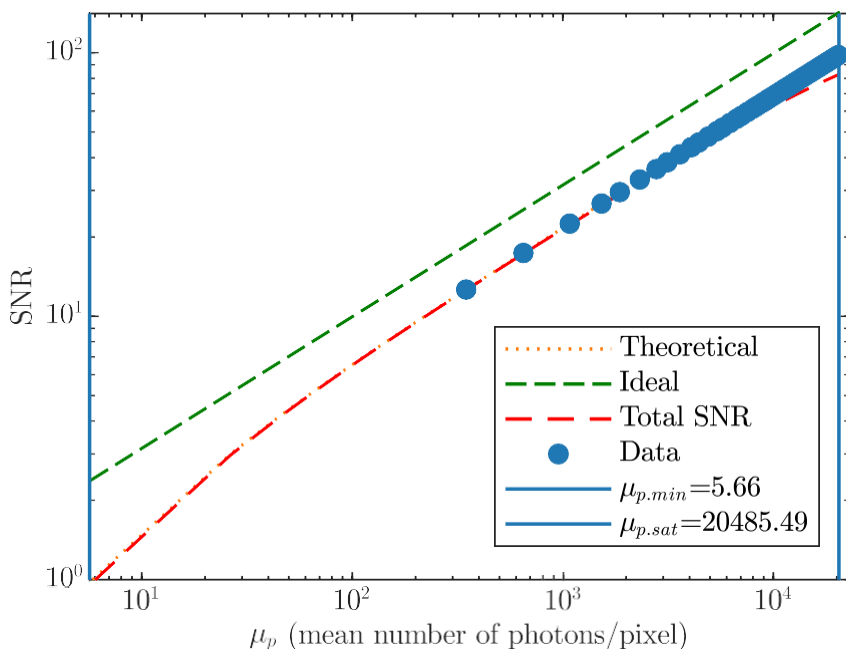
Operation point parameters

Environmental temperature 2.81
Camera body temperature 31
Sensor temperature 36.856
Processor temperature 36

Photon Transfer



Signal-to-Noise Ratio



Performance

Quantum efficiency

η 47.6938 %

System gain

K 0.3757 DN/e⁻
1/K 2.6617 e⁻/DN

Temporal dark noise

σ_d 2.0605 e⁻
 $\sigma_{y,dark}$ 0.82619 DN

Signal-to-noise ratio

SNR_{max} 98.8449
39.8991 dB
6.6271 bit
1/SNR_{max} 1.0117 %

Absolute sensitivity threshold

$\mu_{p,min}$ 5.6591 p
 $\mu_{p,min,area}$ 0.47546 p/ μm^2
 $\mu_{e,min}$ 2.6991 e⁻
 $\mu_{e,min,area}$ 0.22676 e⁻/ μm^2

Saturation capacity

$\mu_{p,sat}$ 20485.4941 p
 $\mu_{p,sat,area}$ 1721.1085 p/ μm^2
 $\mu_{e,sat}$ 9770.3056 e⁻
 $\mu_{e,sat,area}$ 820.8616 e⁻/ μm^2

Dynamic range

DR 3619.893
71.1739 dB
11.8217 bit

Spatial nonuniformities

DSNU₁₂₈₈ 0.5913 e⁻
0.22215 DN
PRNU₁₂₈₈ 0.65174 %

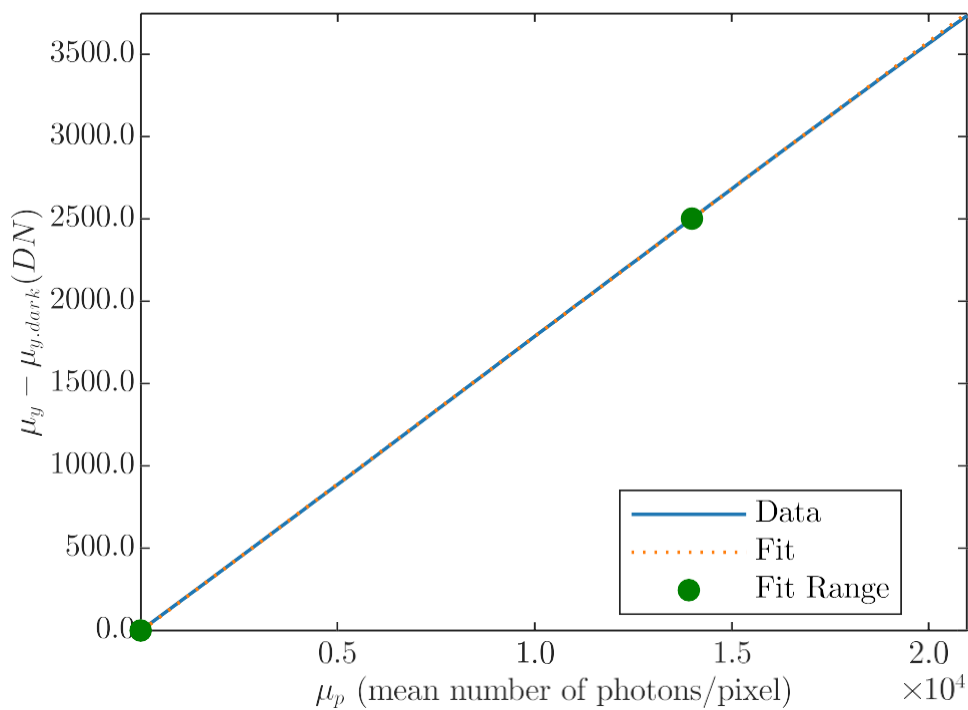
Linearity error

LE_{min} -0.37885 %
LE_{max} 0.64748 %

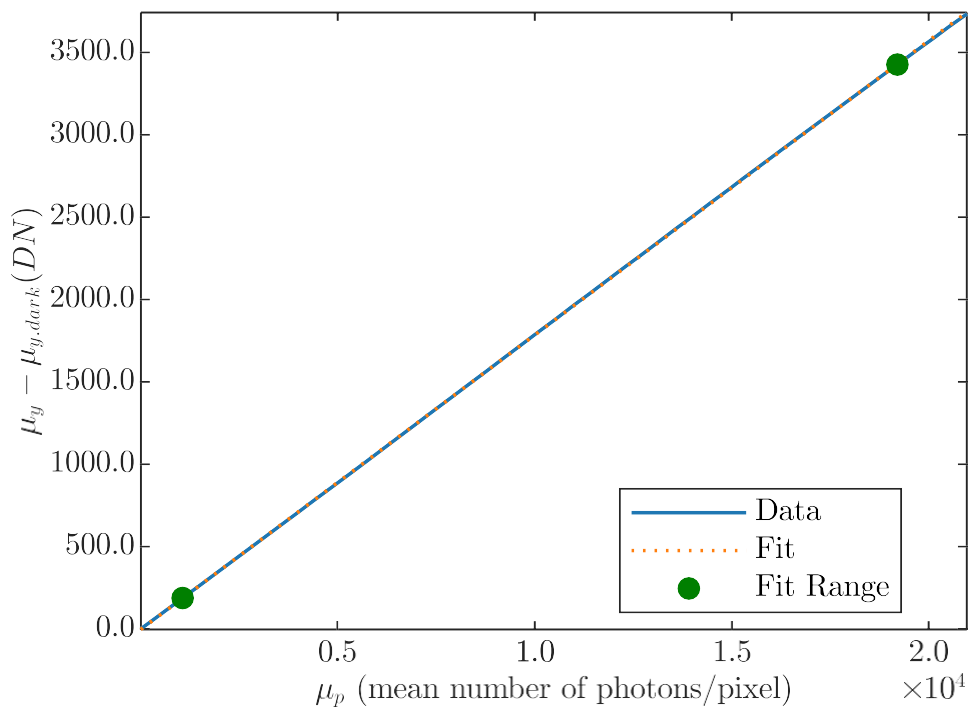
Dark current

$\mu_{l,mean}$ 11.6326 e⁻/s
4.3847 DN/s
 $\mu_{l,var}$ 0.91034 e⁻/s
0.12934 DN/s

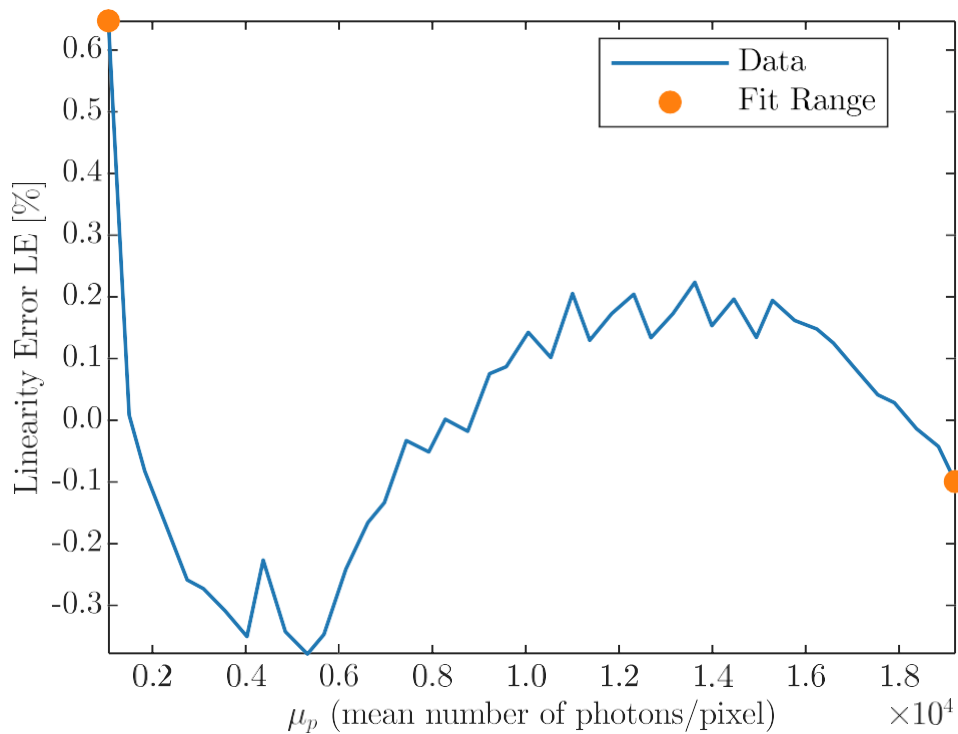
Sensitivity



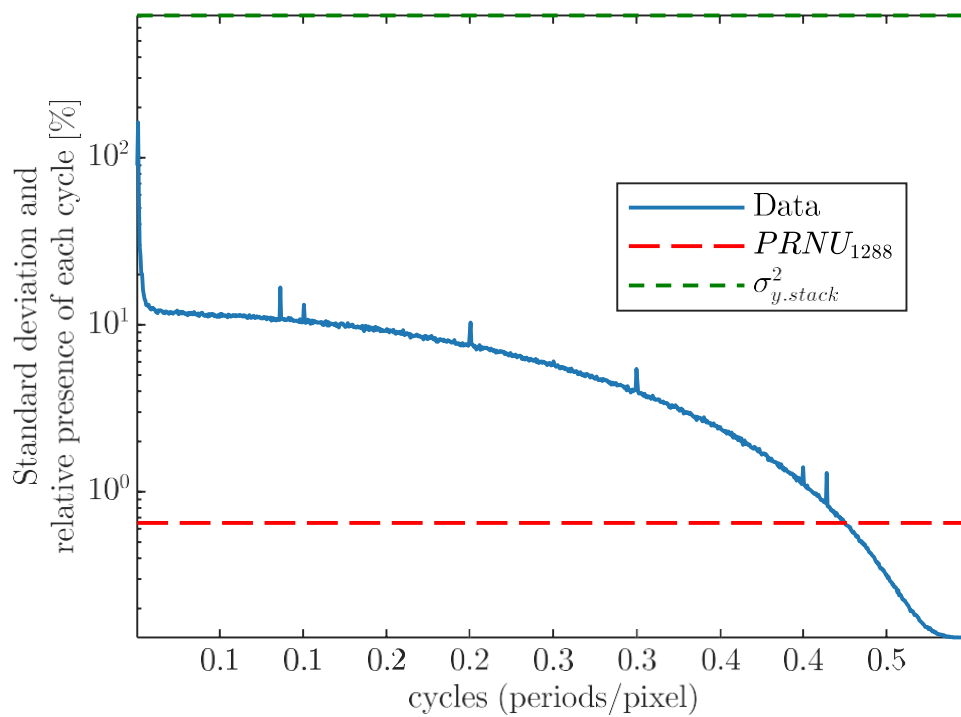
Linearity



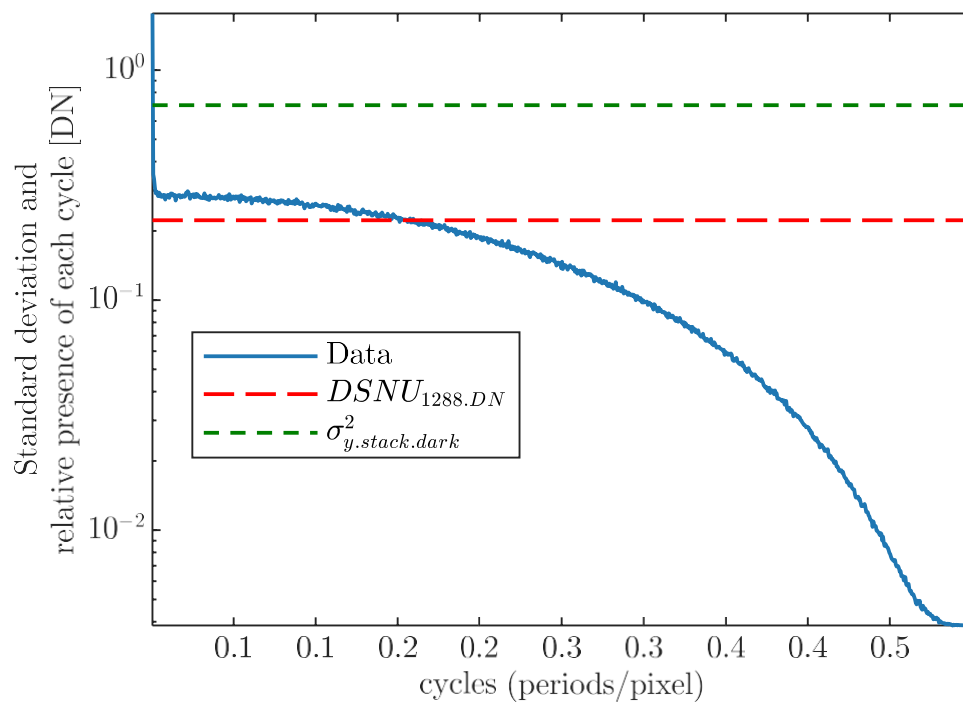
Deviation Linearity



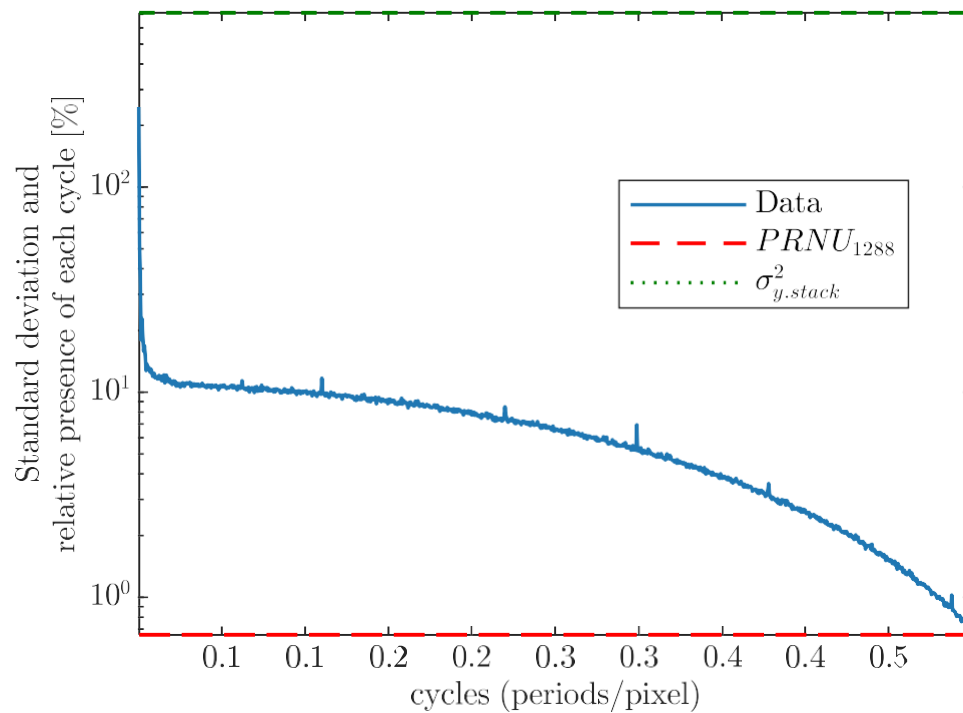
Horizontal Spectrogram PRNU



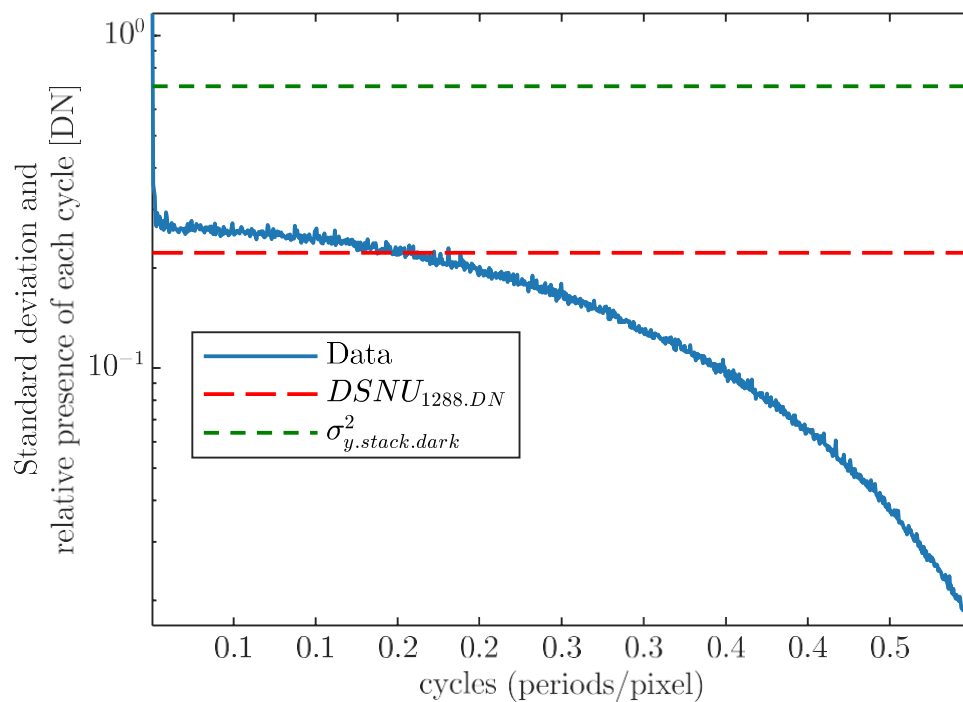
Horizontal Spectrogram DSNU



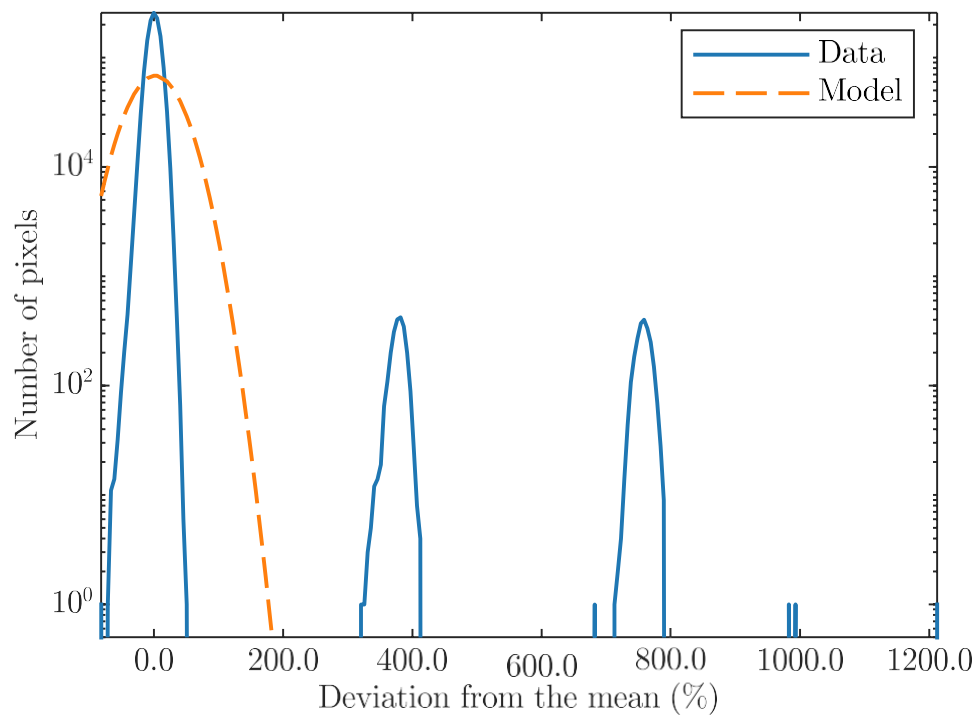
Vertical Spectrogram PRNU



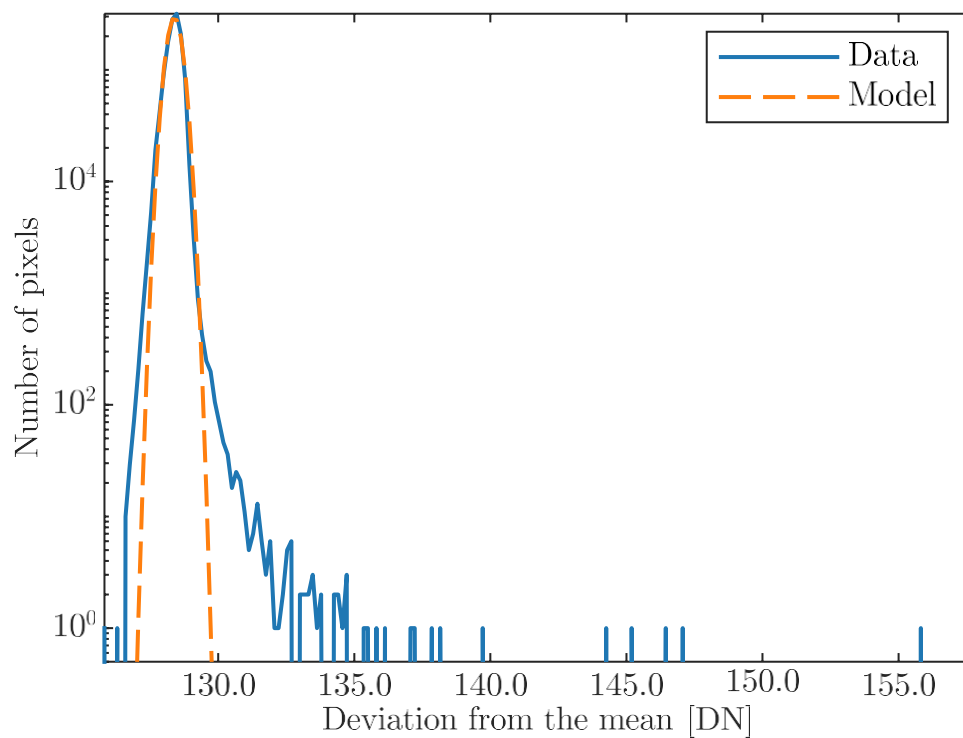
Vertical Spectrogram DSNU



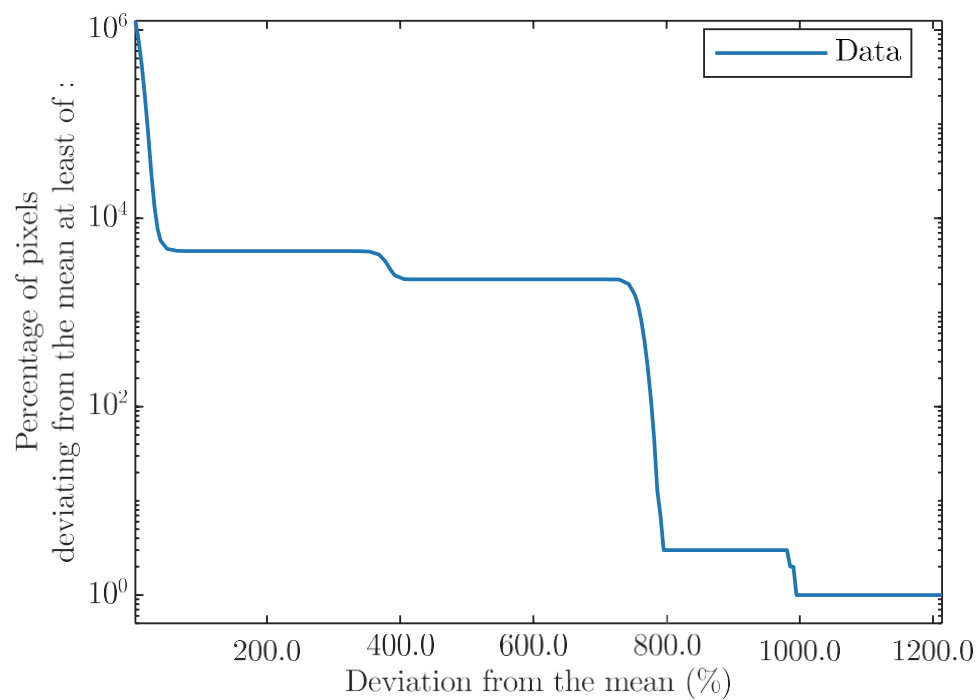
Logarithmic Histogram PRNU



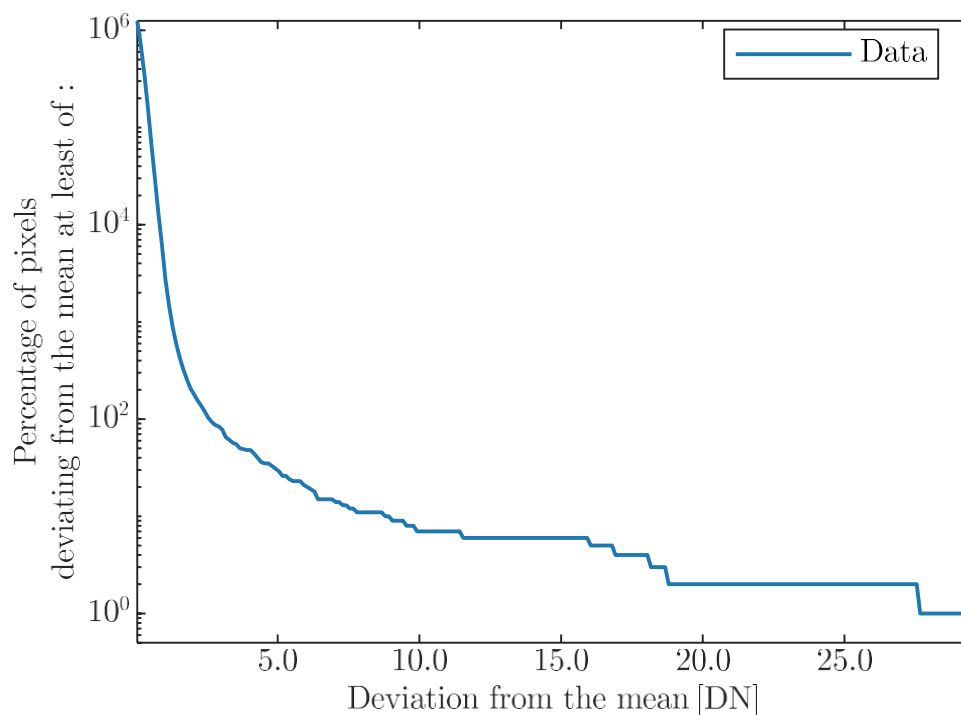
Logarithmic Histogram DSNU



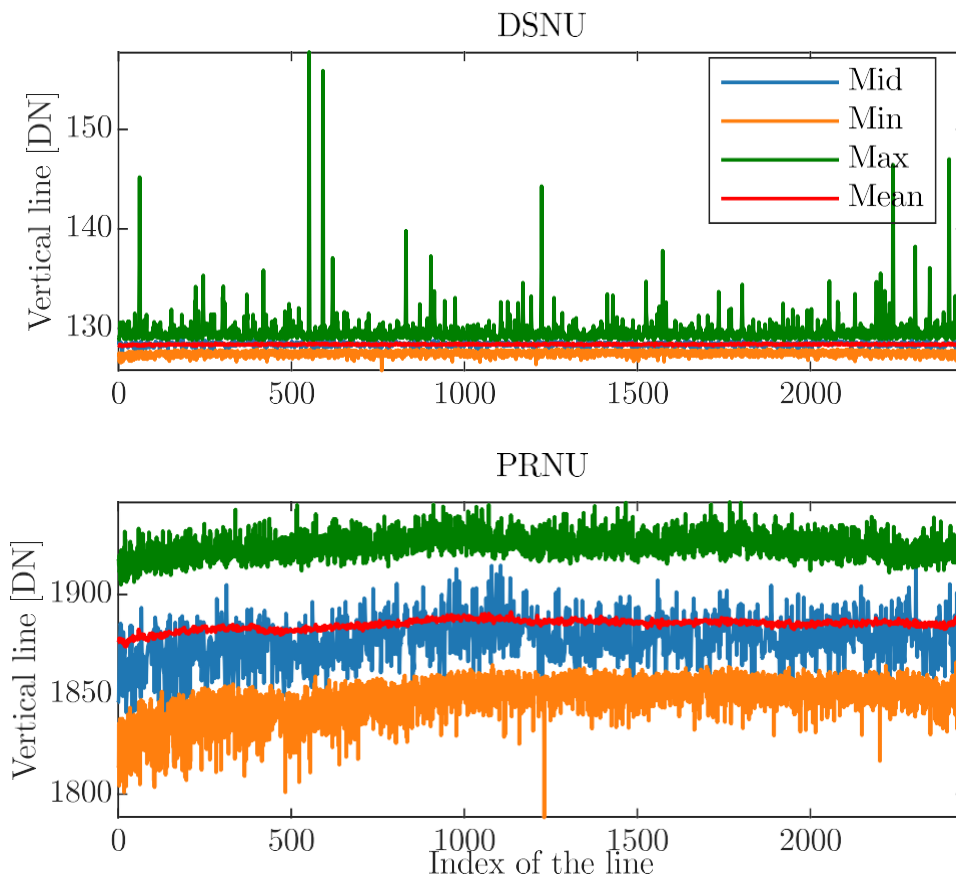
Accumulated Log Histogram PRNU



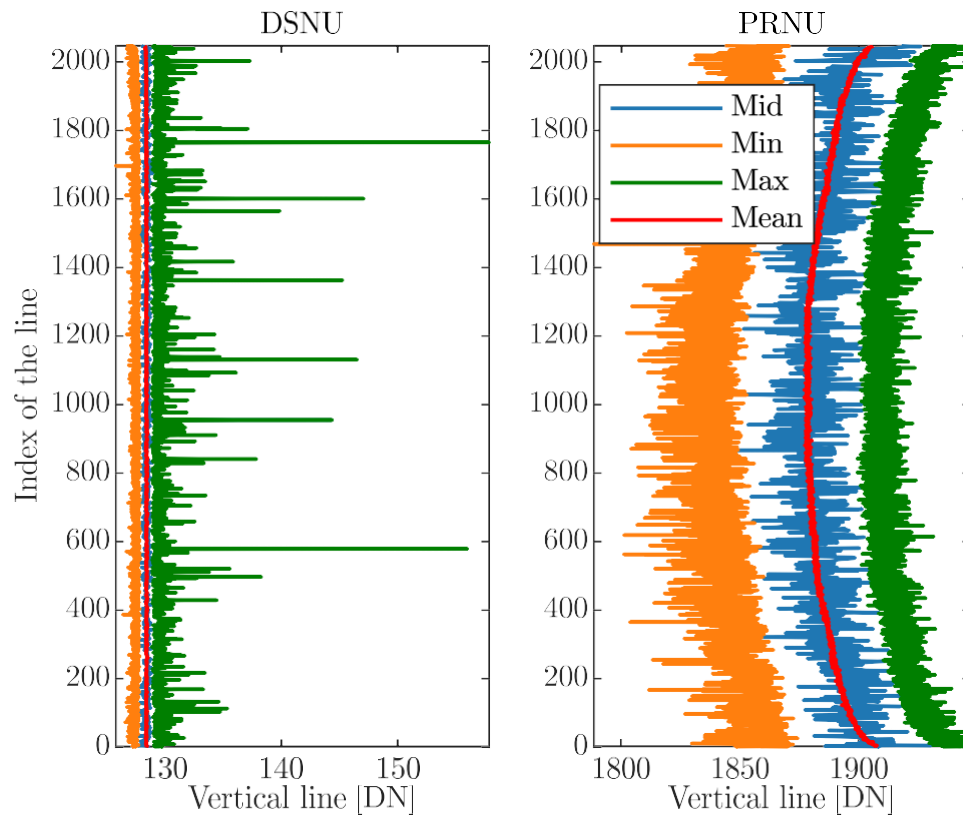
Accumulated Log Histogram DSNU



Horizontal Profile



Vertical Profile



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

Camera setting

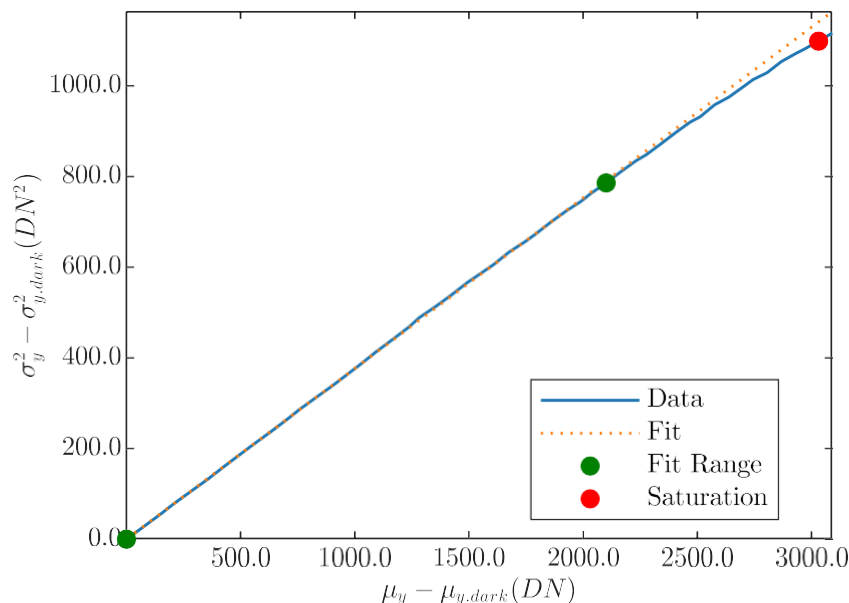
Gain
Black level

GainLevelx1
128

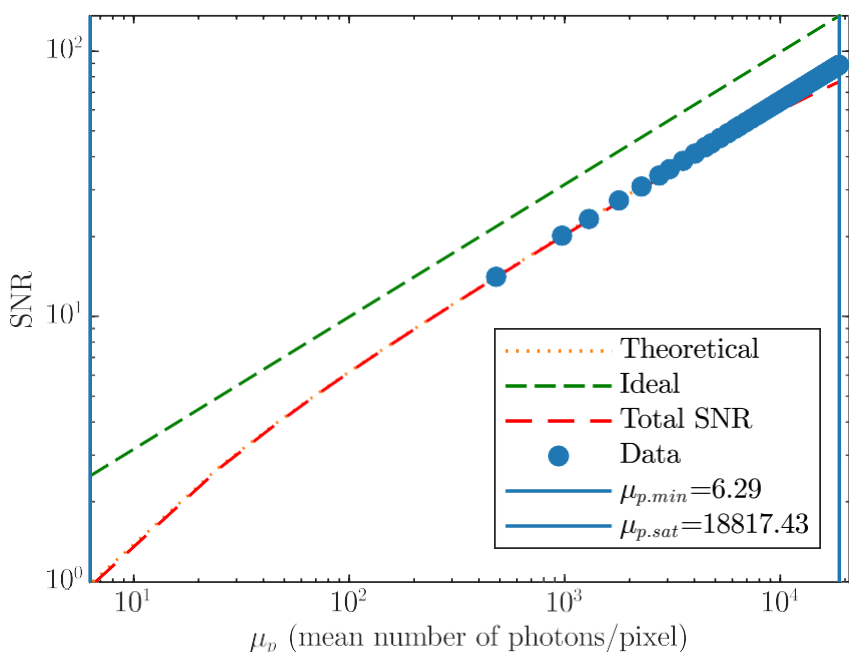
Operation point parameters

Environmental temperature 2.81
Camera body temperature 31
Sensor temperature 37.464
Processor temperature 36

Photon Transfer



Signal-to-Noise Ratio



Performance

Quantum efficiency

η 42.8008 %

System gain

K 0.37694 DN/e⁻
1/K 2.653 e⁻/DN

Temporal dark noise

σ_d 2.0537 e⁻
 $\sigma_{y,dark}$ 0.82619 DN

Signal-to-noise ratio

SNR_{max} 89.7441
39.0601 dB
6.4877 bit
1/SNR_{max} 1.1143 %

Absolute sensitivity threshold

$\mu_{p,min}$ 6.2893 p
 $\mu_{p,min,area}$ 0.5284 p/ μm^2
 $\mu_{e,min}$ 2.6919 e⁻
 $\mu_{e,min,area}$ 0.22616 e⁻/ μm^2

Saturation capacity

$\mu_{p,sat}$ 18817.4301 p
 $\mu_{p,sat,area}$ 1580.9645 p/ μm^2
 $\mu_{e,sat}$ 8054.0108 e⁻
 $\mu_{e,sat,area}$ 676.6655 e⁻/ μm^2

Dynamic range

DR 2991.9878
69.5192 dB
11.5469 bit

Spatial nonuniformities

DSNU₁₂₈₈ 0.61502 e⁻
0.23182 DN
PRNU₁₂₈₈ 0.65976 %

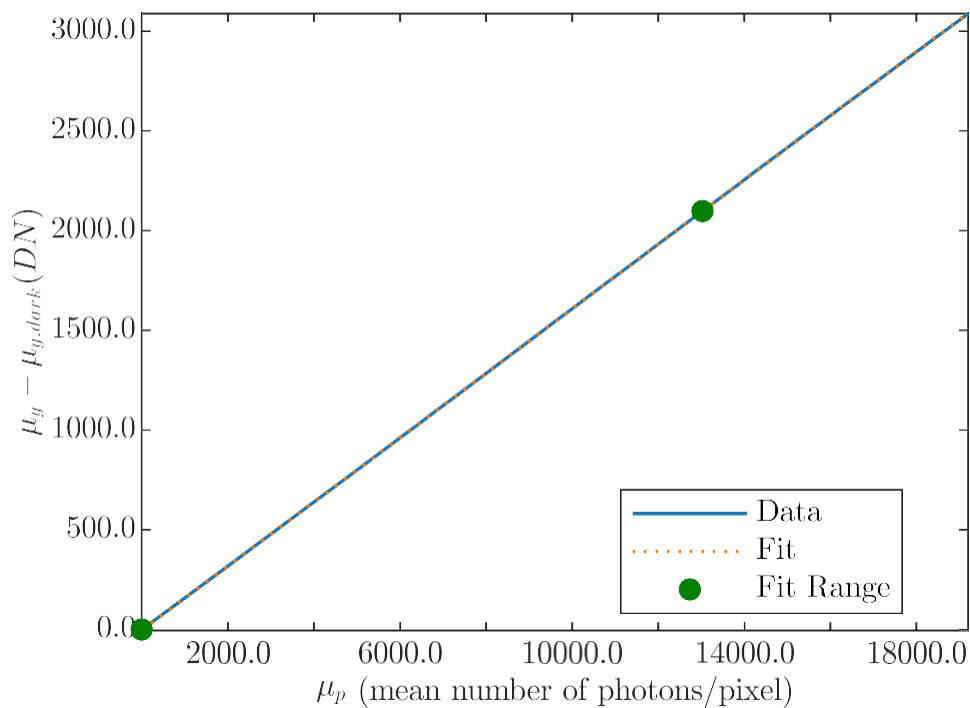
Linearity error

LE_{min} -0.32906 %
LE_{max} 0.42111 %

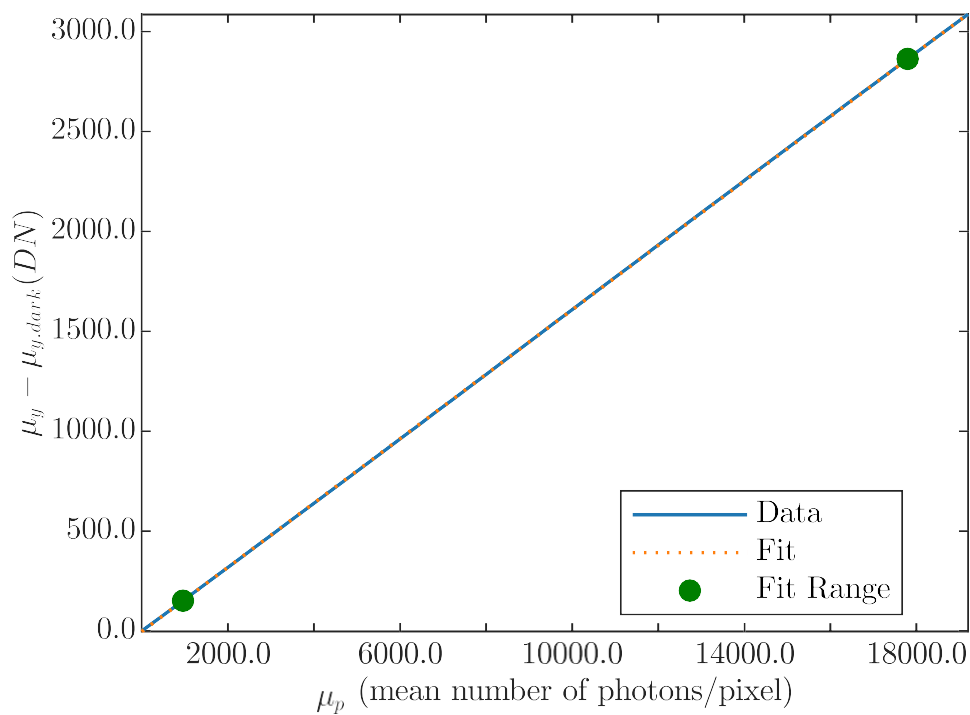
Dark current

$\mu_{l,mean}$ 11.6326 e⁻/s
4.3847 DN/s
 $\mu_{l,var}$ 0.91034 e⁻/s
0.12934 DN/s

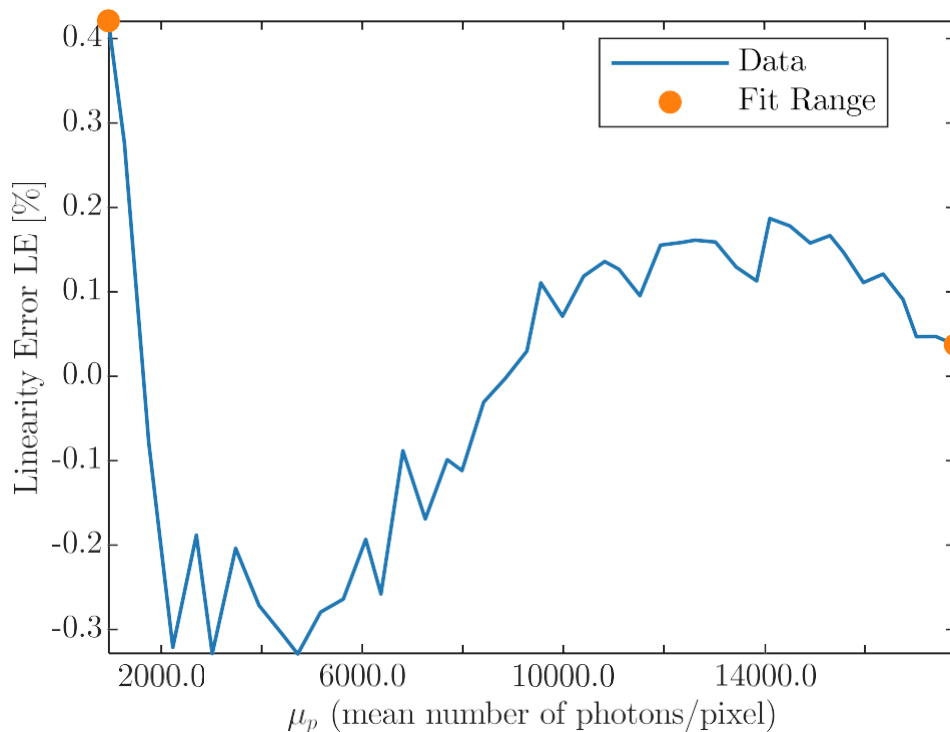
Sensitivity



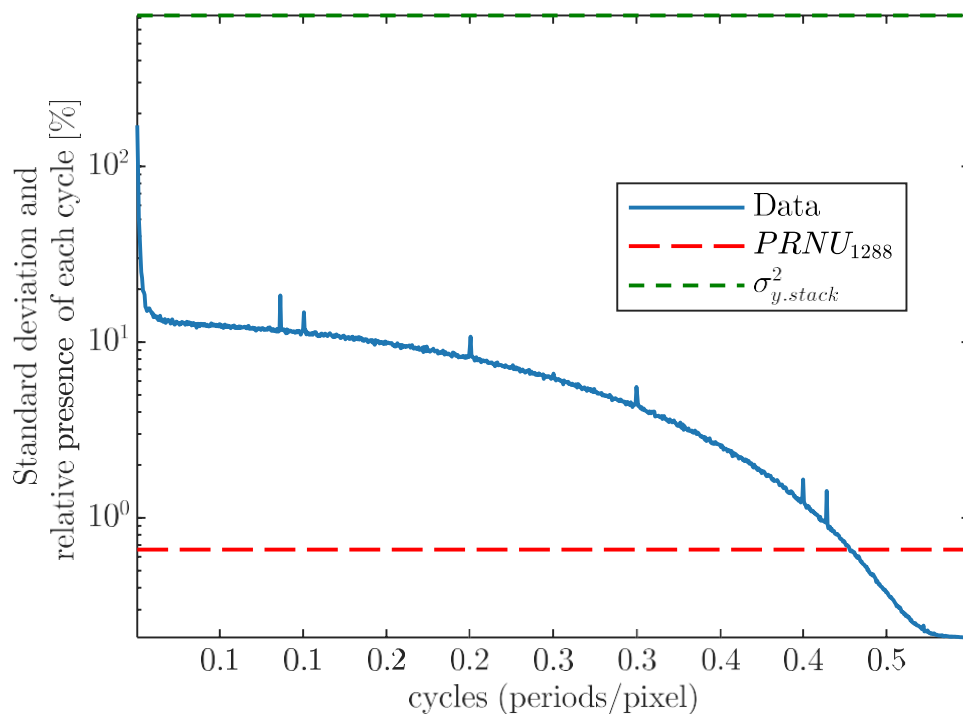
Linearity



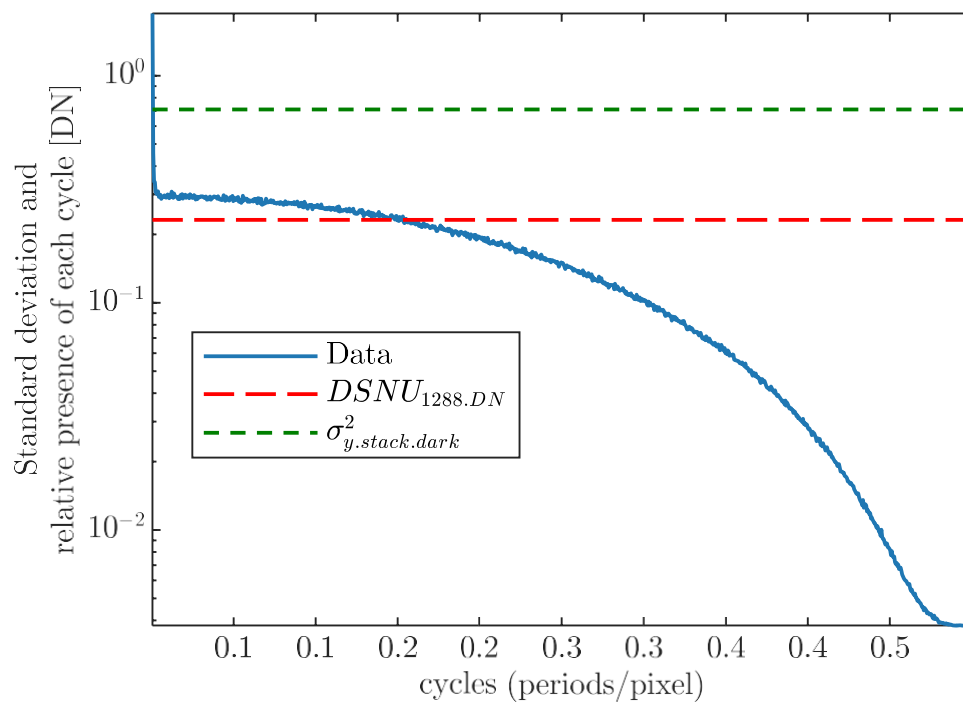
Deviation Linearity



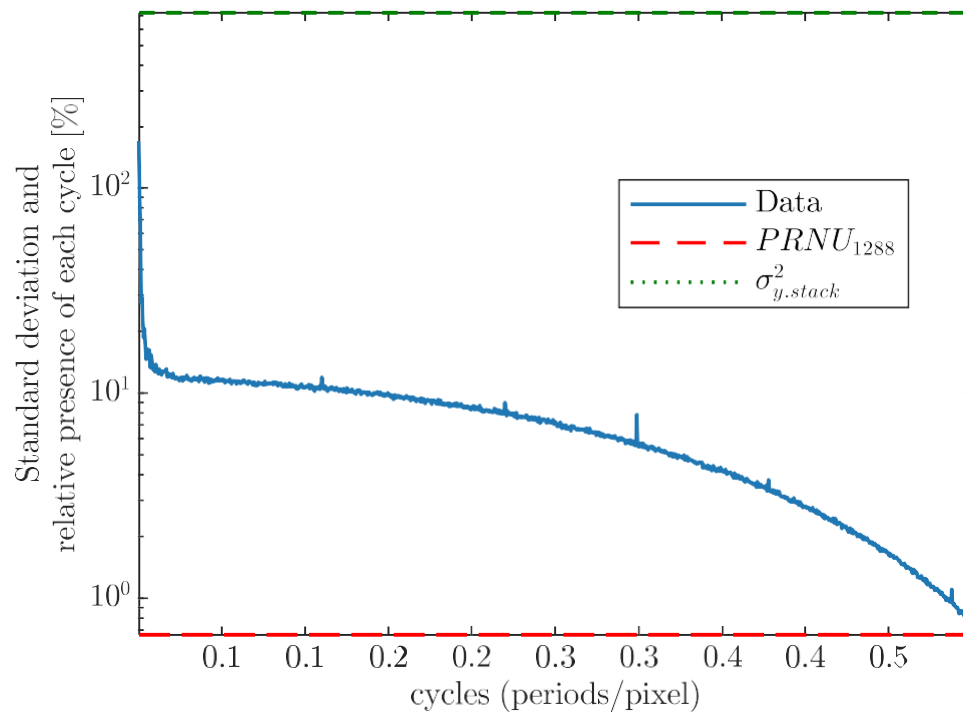
Horizontal Spectrogram PRNU



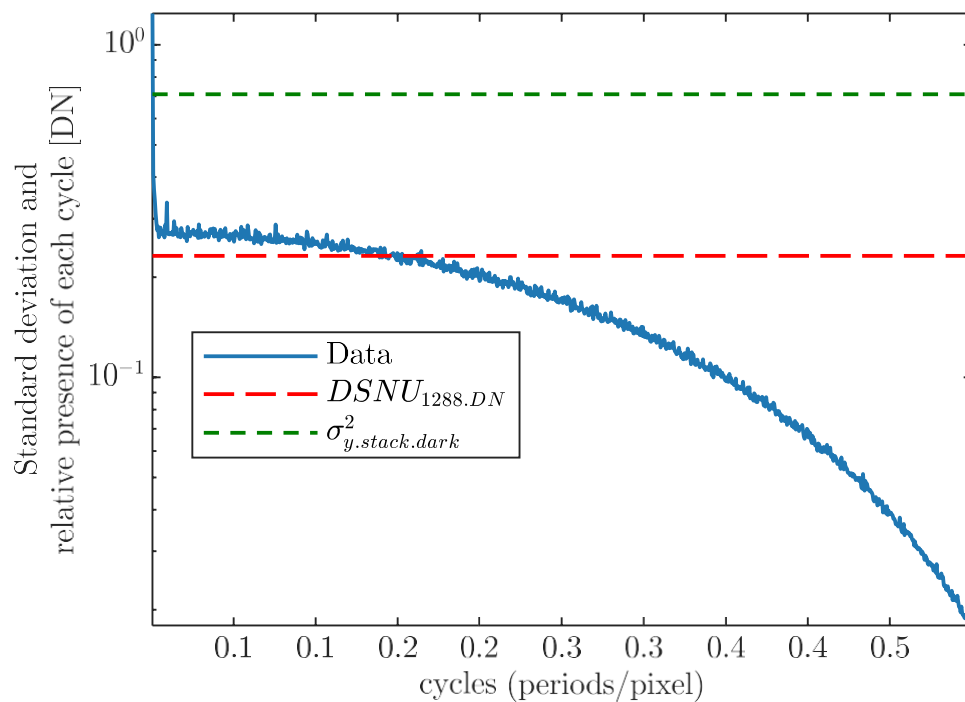
Horizontal Spectrogram DSNU



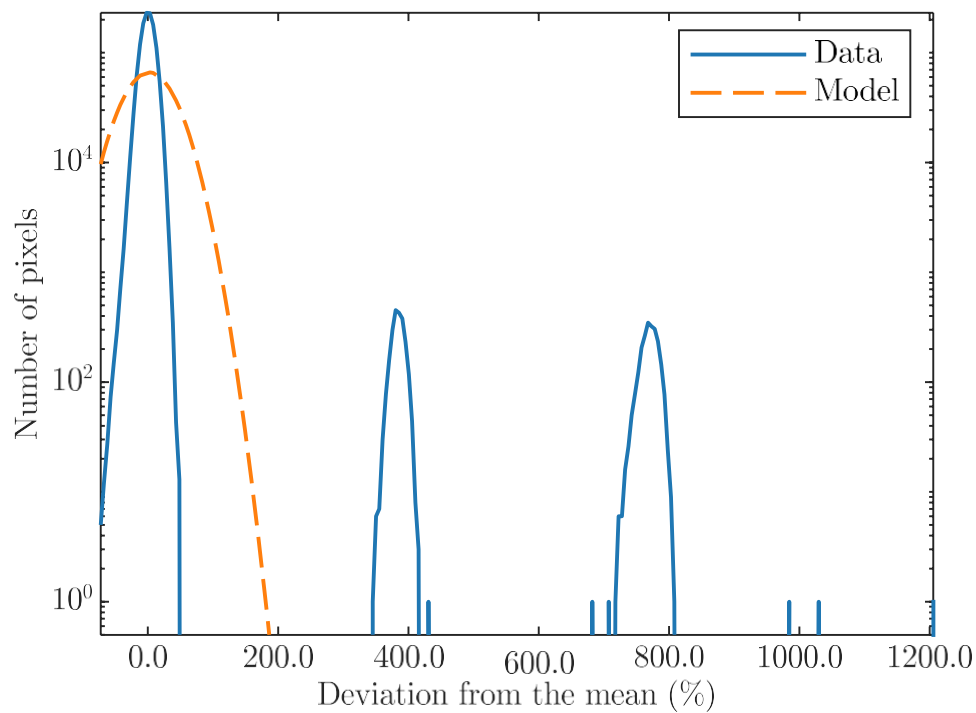
Vertical Spectrogram PRNU



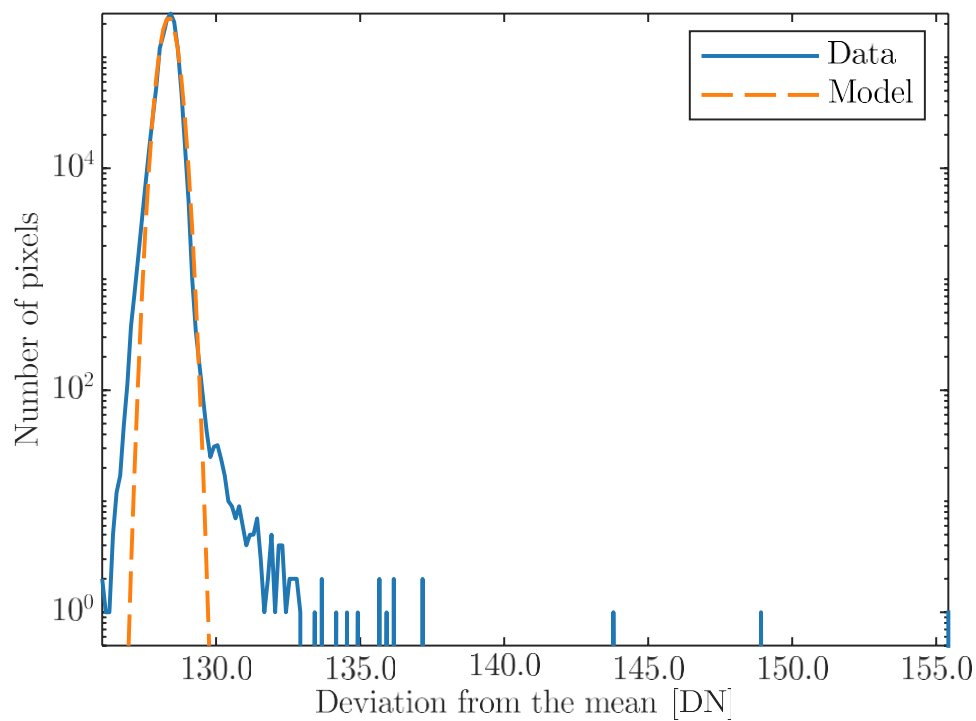
Vertical Spectrogram DSNU



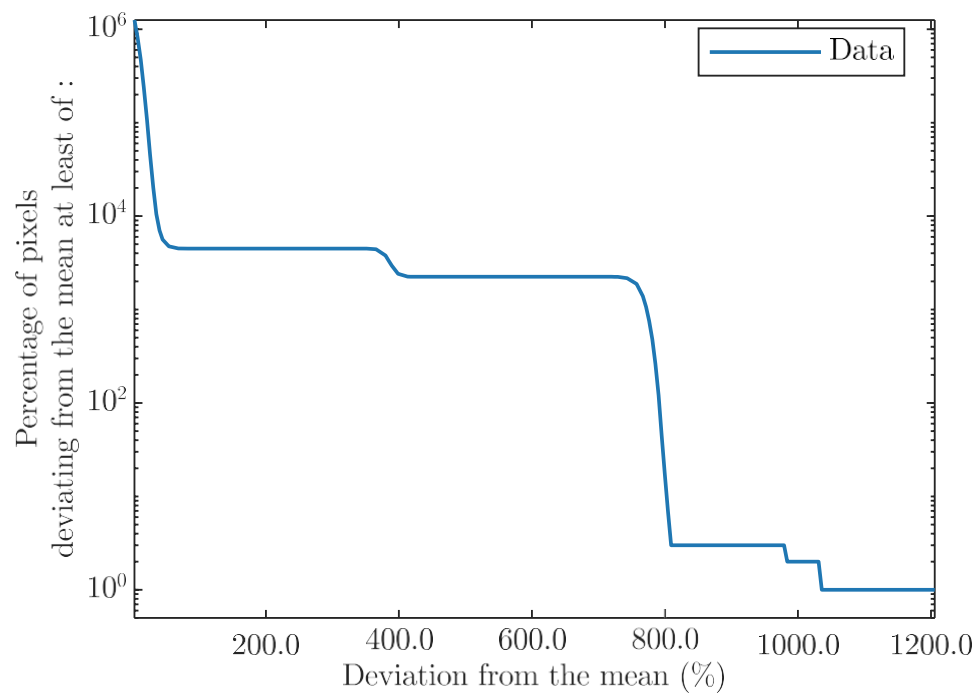
Logarithmic Histogram PRNU



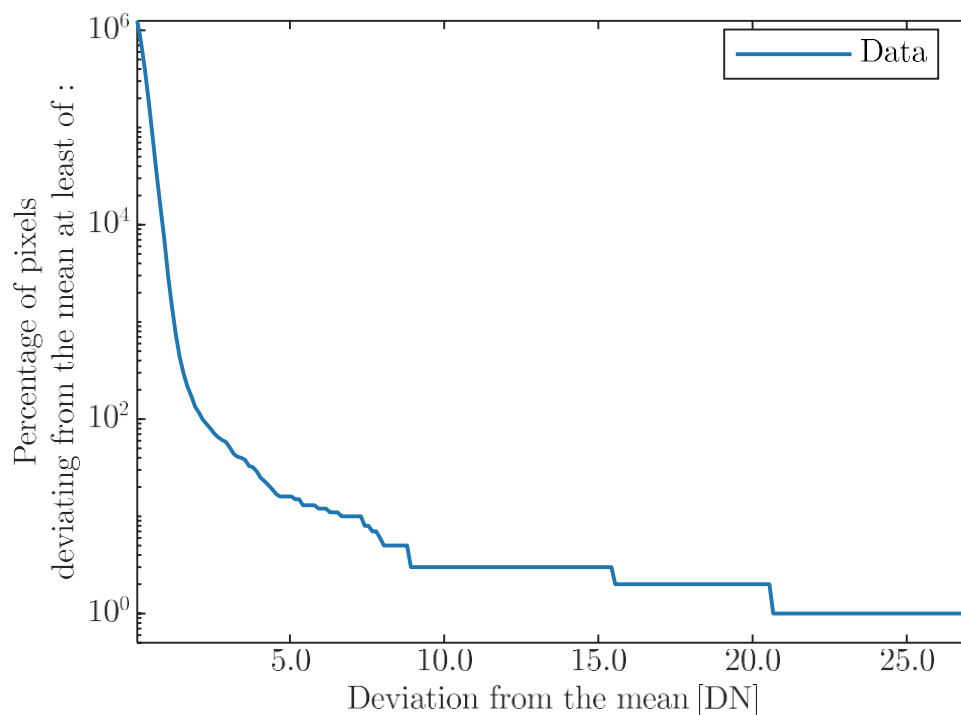
Logarithmic Histogram DSNU



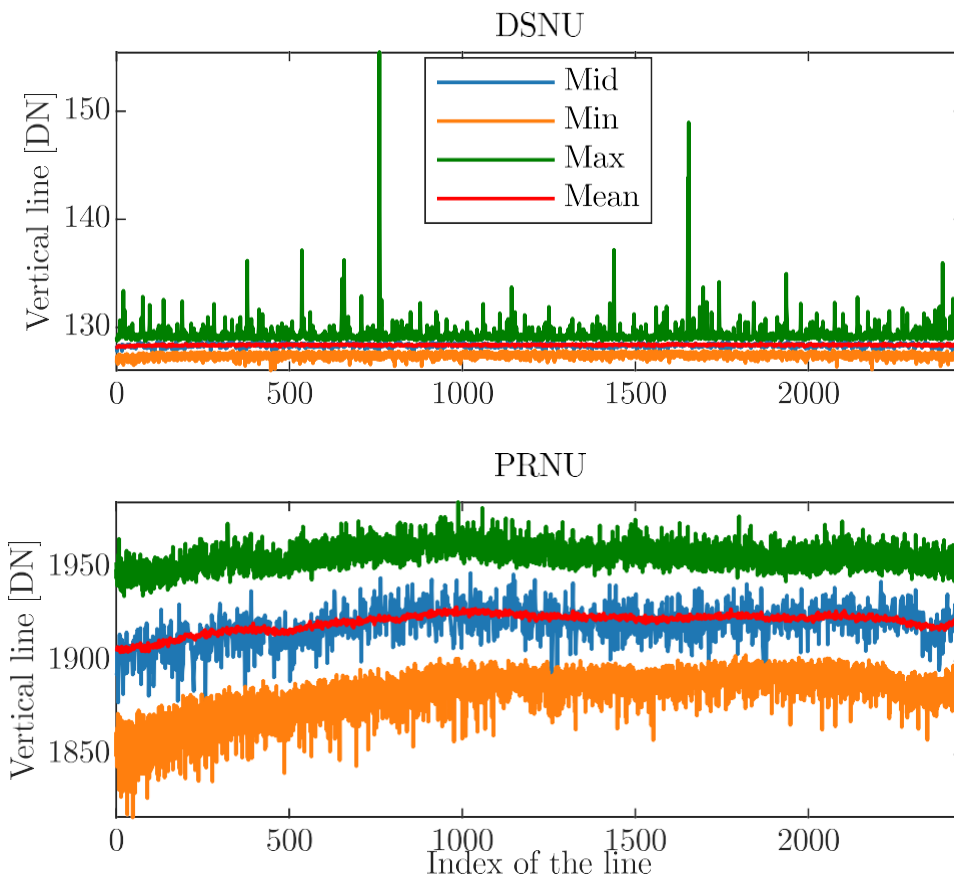
Accumulated Log Histogram PRNU



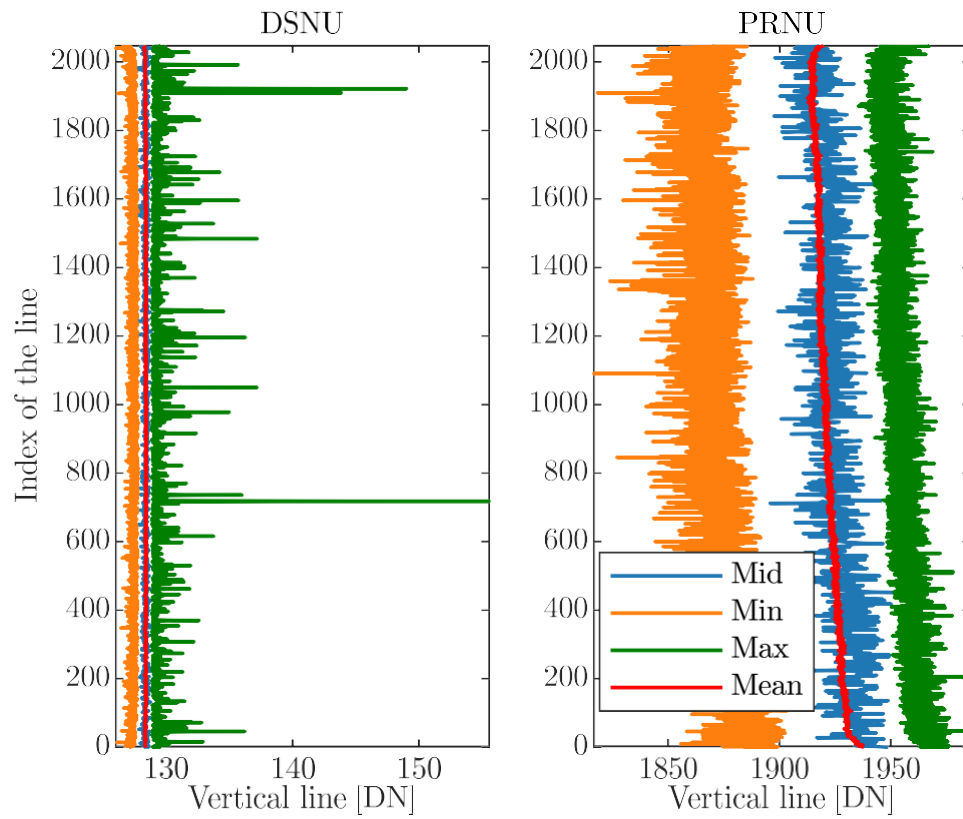
Accumulated Log Histogram DSNU



Horizontal Profile

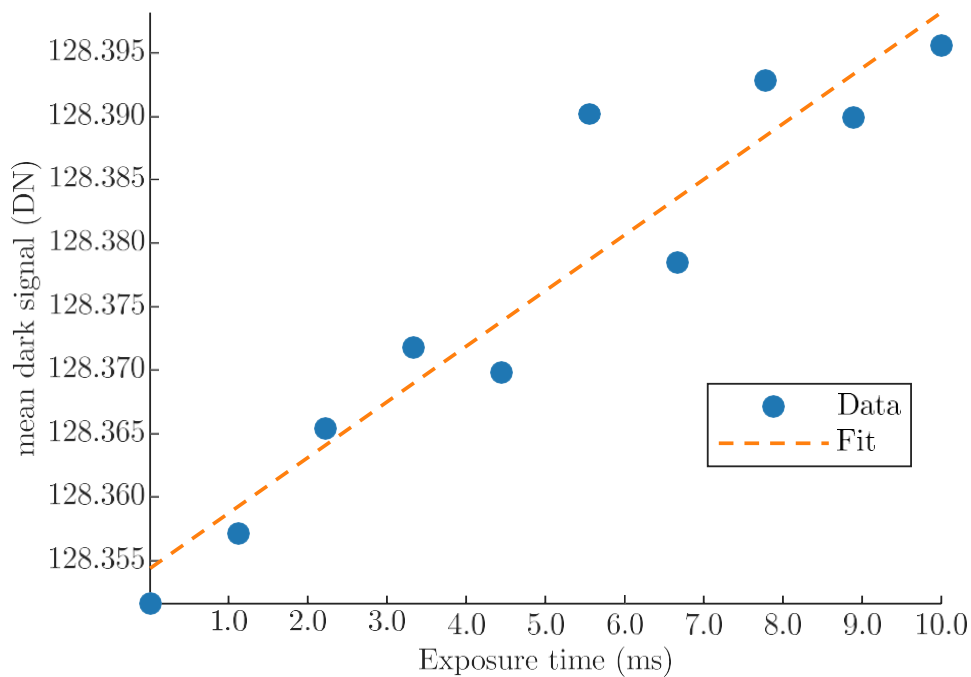


Vertical Profile

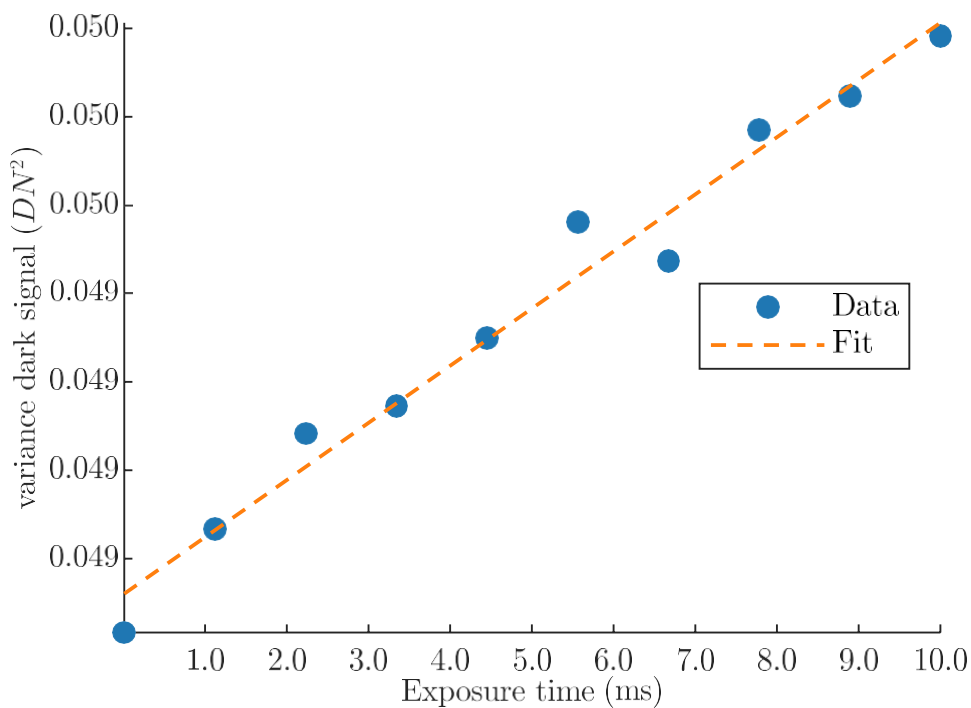


Dark Current

Dark Current from Mean



Dark Current from Variance



Acceptance Test Result (Not part of EMVA1288 standard)

Test Date

17-Nov-2020 11:01:13

Tester Name

Tester

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	0	≤ 10	
2	Dead Clusters	Pass	0	≤ 1	
3	QE	Pass	56.3 47.7 42.8	$\geq 50 \geq 47 \geq 42$	
4	SNR	Pass	40.1 39.9 39.1	≥ 38	
5	DR	Pass	71.6 71.2 69.5	≥ 67	
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 [%]
-	-	-	-	-

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

Camera setting

Gain	GainLevelx1
Black level	128
Frame rate	50 Hz
Exposure time	6000.7266 μ s

Operation point parameters

Environmental temperature	2.75
Camera body temperature	2.75
Sensor temperature	35.032

Spectrum of Calibration light source

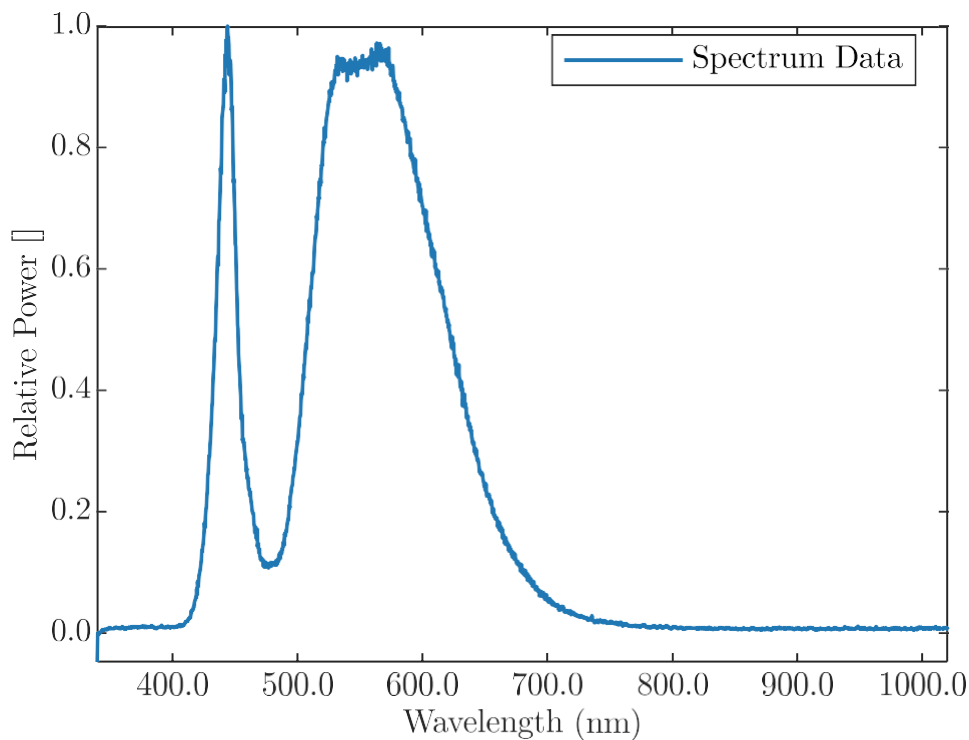


Table 3: Calibrated features summary

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	1.4142
Green	1
Blue	1.581

Dead Pixels

Table 5: Dead pixels summary

Number	Column	Row	Deviation from mean DSNU [DN]	Deviation from mean PRNU [%]
-	-	-	-	-

International Distributor



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