

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 diagonal | 11.8mm |
| Model | Iron2509HS-C | Sensor | GMAX2509 |
| Camera type | Color | Sensor type | CMOS |
| Date | 28-Feb-2023 11:11:00 | Shutter type | Global |
| Data type | Single | Overlap capabilities | Overlapping |
| Sensor type | CMOS | Frame rate | 100 Hz |
| Lens category | C-Mount | Exposure control | by irradiance |
| Resolution | 4200 x 2160 ,10 bits | Exposure time | 3000.239 μ s |
| Pixel size | 2.5 μ m x 2.5 μ m | Illumination | Variable with constant exposure time |
| Maximum readout rate | 286 fps | Irradiation Steps | 50 |
| Dark current compensation | No | Irradiation calibration accuracy | - |
| Interface type | CXP-12 | Irradiation measurement error | - |
| Serial number | 2305068 | Standart version | 4.0 Linear |
| Firmware version | 2.2.2-2023.2.27 | Light source | Integrating Sphere |

International Distributor

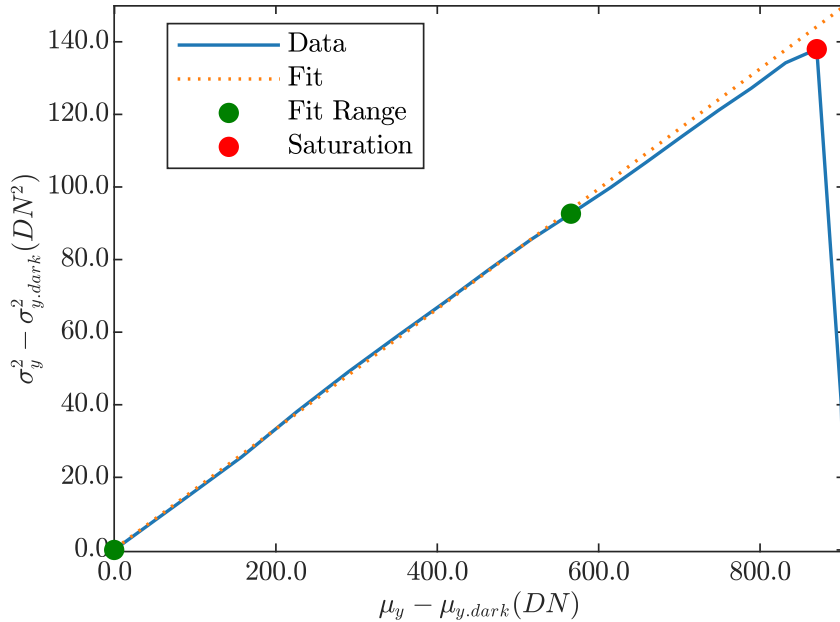


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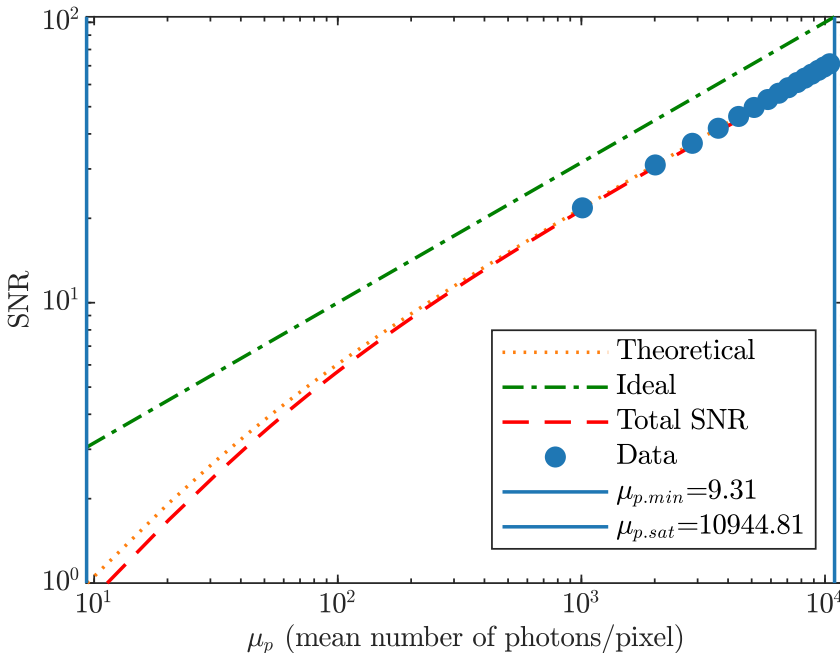
Summary Sheet for Operation Point 1 at a Wavelength of 520 nm

| Camera setting | | Operation point parameters | |
|----------------|------|----------------------------|-------|
| Gain | 2 | Environmental temperature | 22.5 |
| Black level | -500 | Camera body temperature | 42.31 |
| | | Sensor temperature | 48 |
| | | Processor temperature | 48 |

Photon Transfer



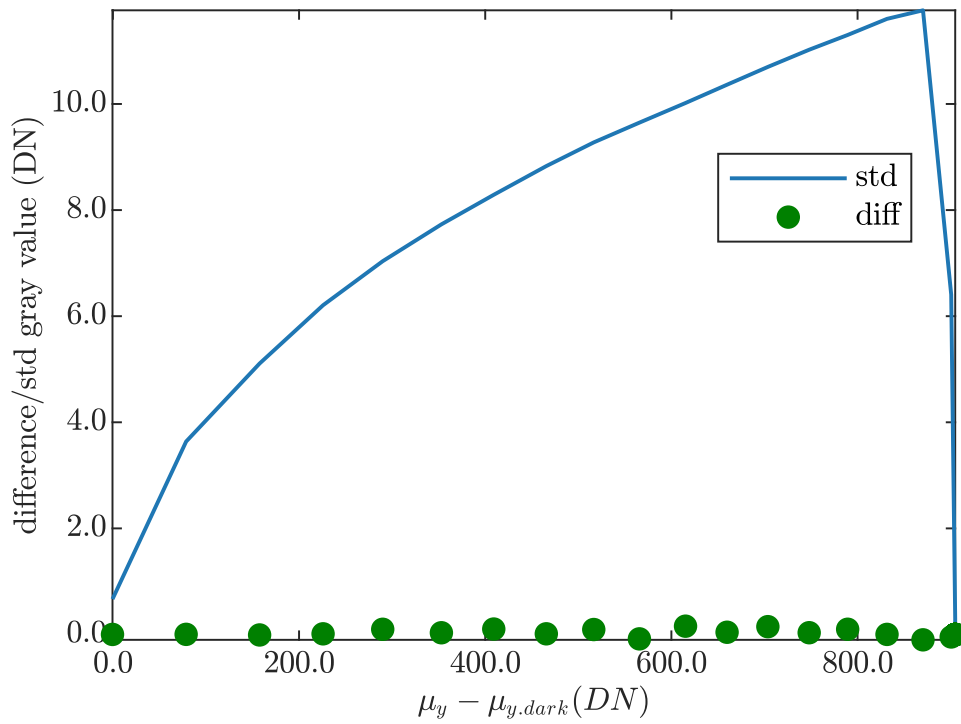
Signal-to-Noise Ratio



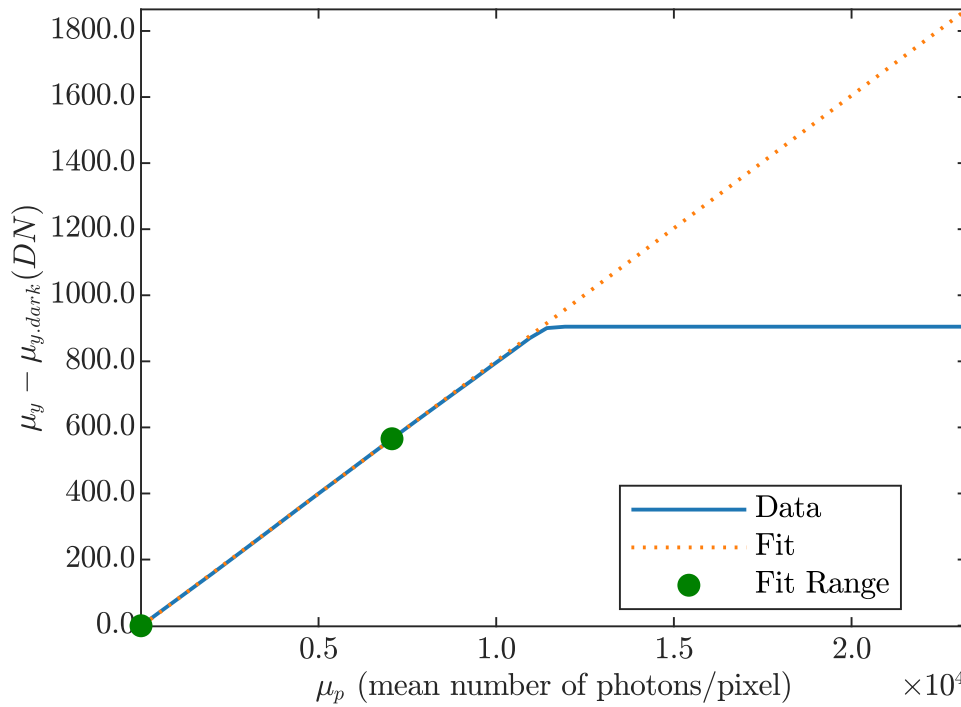
Performance

| Quantum efficiency | | |
|--------------------------------|-----------|---------------------------------|
| η | 48.5834 | % |
| System gain | | |
| K | 0.16538 | DN/e ⁻ |
| 1/K | 6.0466 | e ⁻ /DN |
| Temporal dark noise | | |
| σ_d | 3.6249 | e ⁻ |
| $\sigma_{y,dark}$ | 0.66538 | DN |
| Signal-to-noise ratio | | |
| SNR _{max} | 72.9202 | |
| | 37.257 | dB |
| | 6.1882 | bit |
| 1/SNR _{max} | 1.3714 | % |
| Absolute sensitivity threshold | | |
| $\mu_{e,min}$ | 4.5233 | e ⁻ |
| $\mu_{e,min,area}$ | 0.72372 | e ⁻ /μm ² |
| Saturation capacity | | |
| $\mu_{e,sat}$ | 5317.3587 | e ⁻ |
| $\mu_{e,sat,area}$ | 850.7774 | e ⁻ /μm ² |
| Dynamic range | | |
| DR | 1175.5541 | |
| | 61.4049 | dB |
| | 10.1991 | bit |
| Spatial nonuniformities | | |
| DSNU ₁₂₈₈ | 2.8749 | e ⁻ |
| DSNU _{1288,col} | 2.1838 | e ⁻ |
| DSNU _{1288,row} | 1.8034 | e ⁻ |
| DSNU _{1288,pix} | 0.49367 | e ⁻ |
| PRNU ₁₂₈₈ | 0.51453 | % |
| PRNU _{1288,col} | 0.23349 | % |
| PRNU _{1288,row} | 0.040043 | % |
| PRNU _{1288,pix} | 0.45675 | % |
| Linearity error | | |
| LE | 0.0017908 | % |
| Dark current | | |
| $\mu_{l,mean}$ | 45.9612 | e ⁻ /s |
| $\mu_{l,var}$ | 58.5954 | e ⁻ /s |

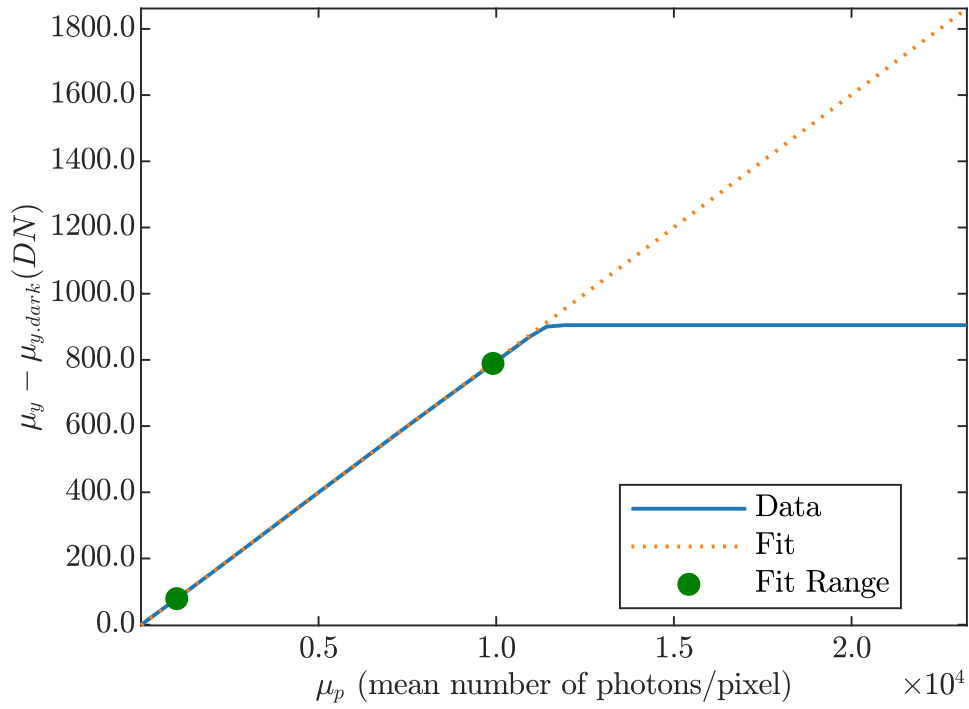
Stability check



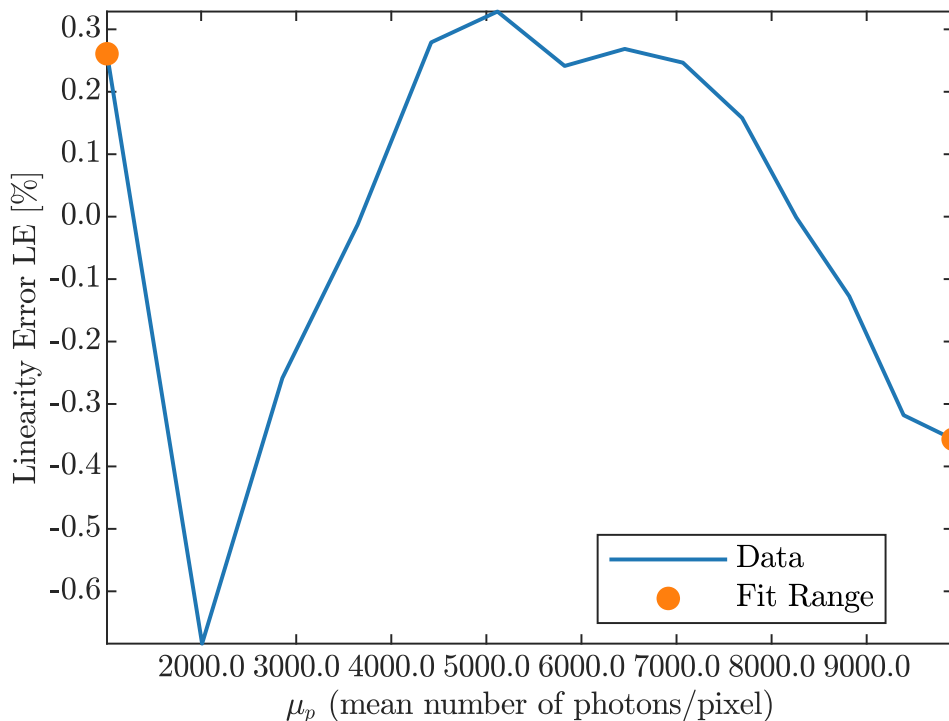
Sensitivity



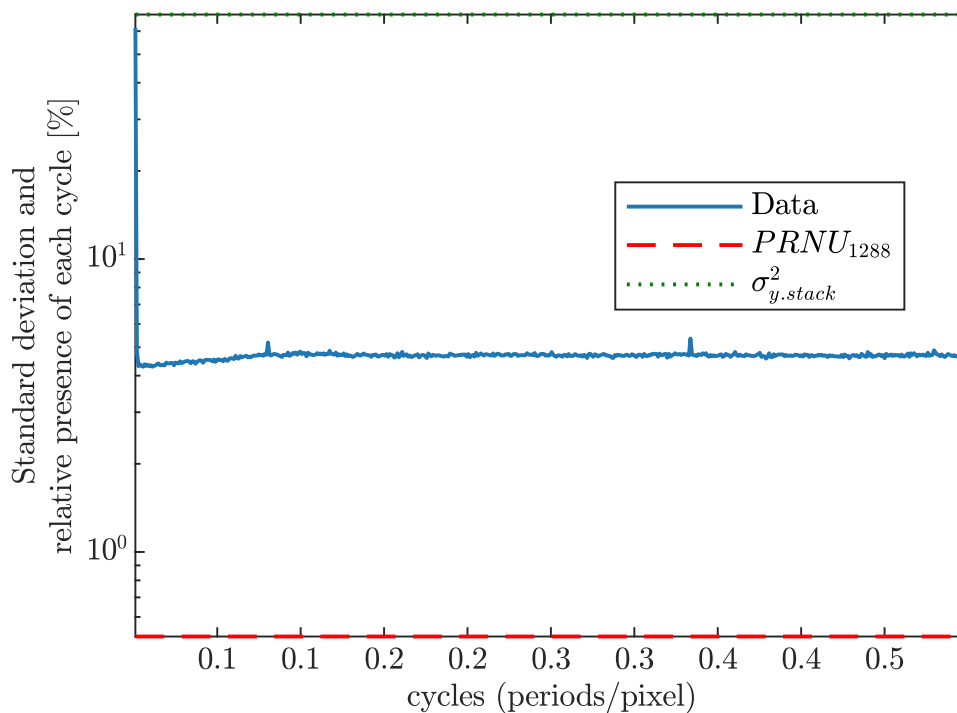
Linearity



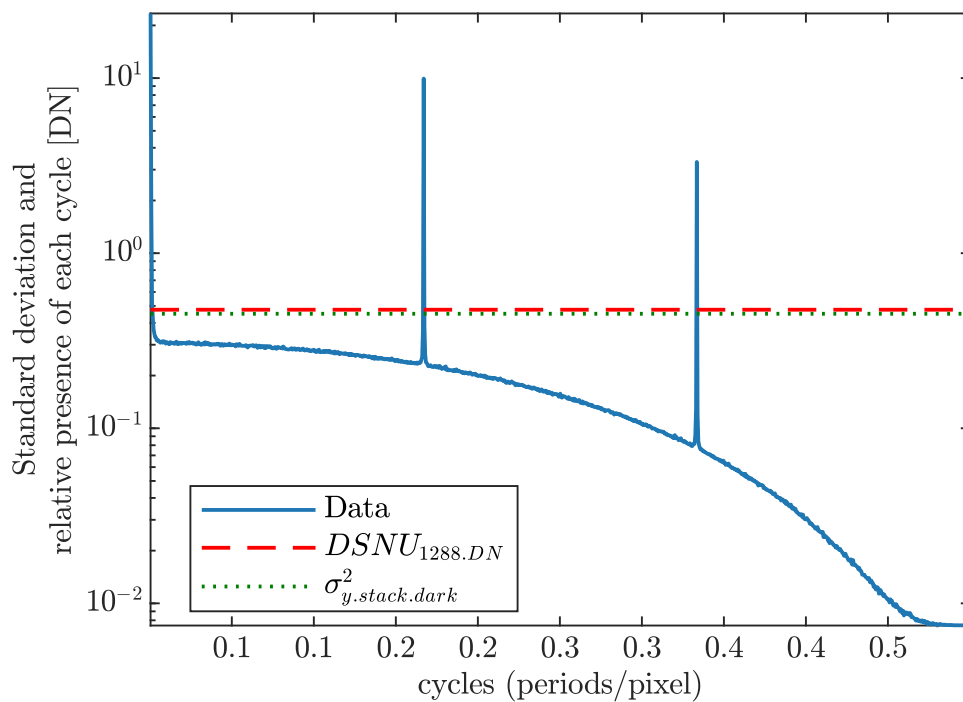
Deviation Linearity



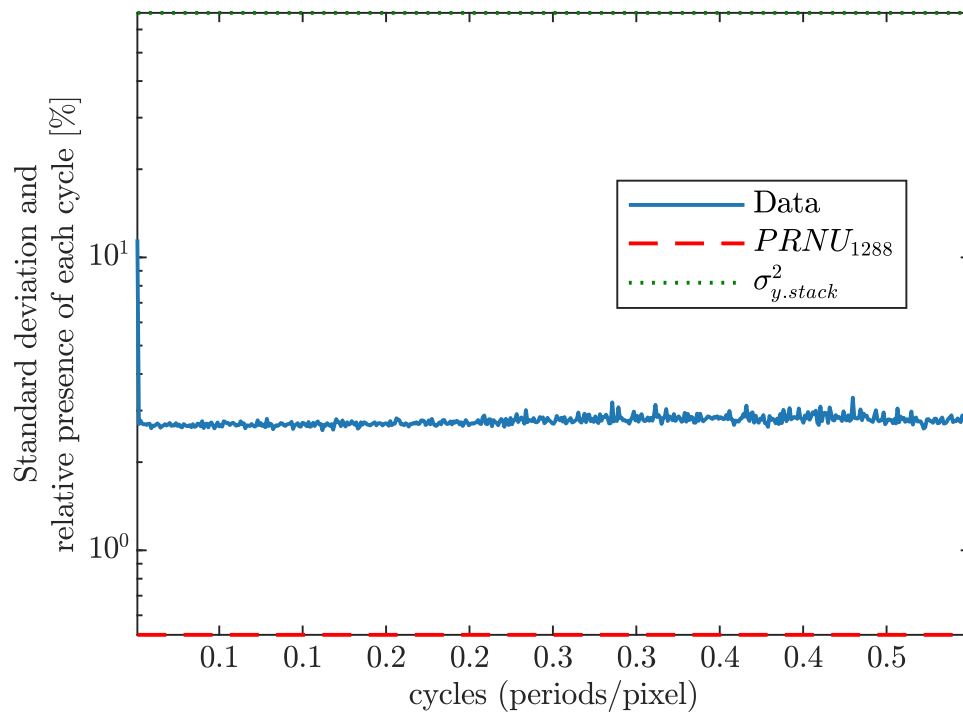
Horizontal Spectrogram PRNU



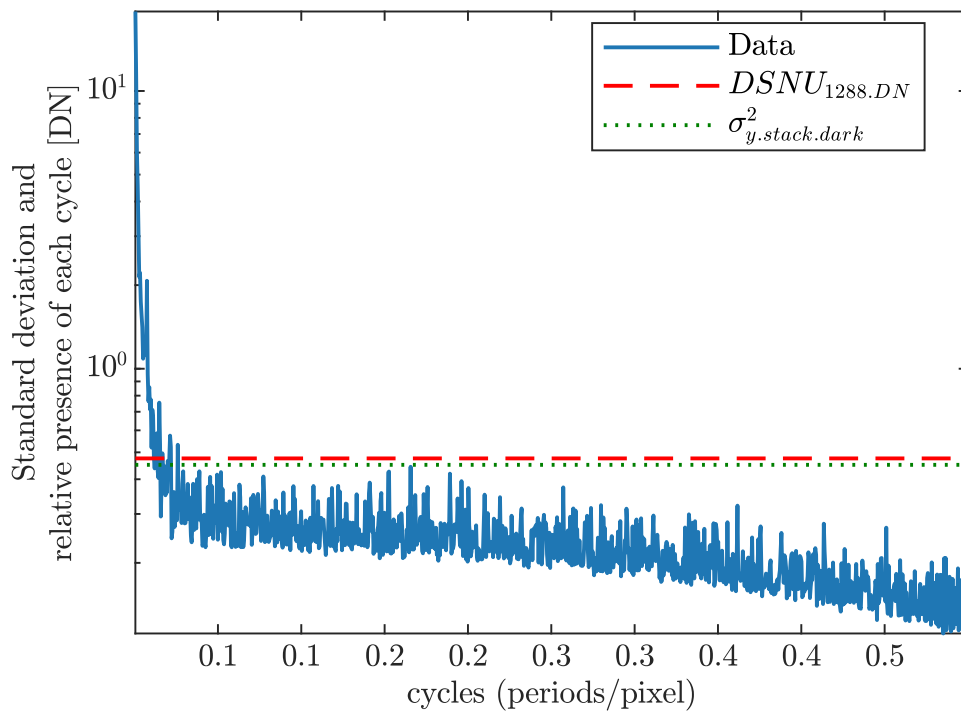
Horizontal Spectrogram DSNU



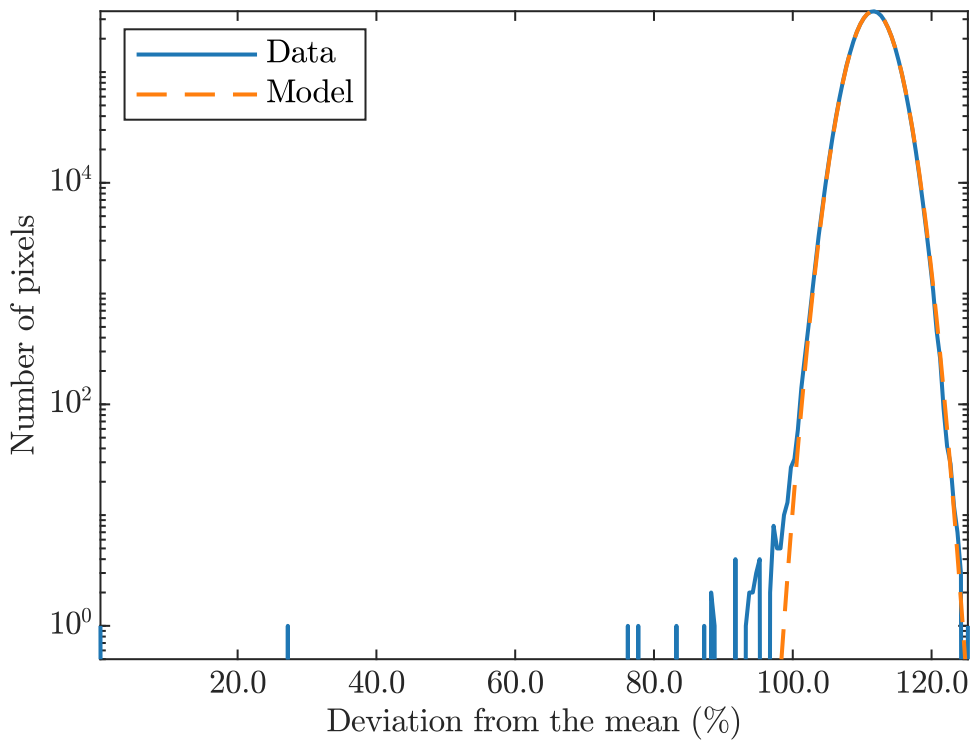
Vertical Spectrogram PRNU



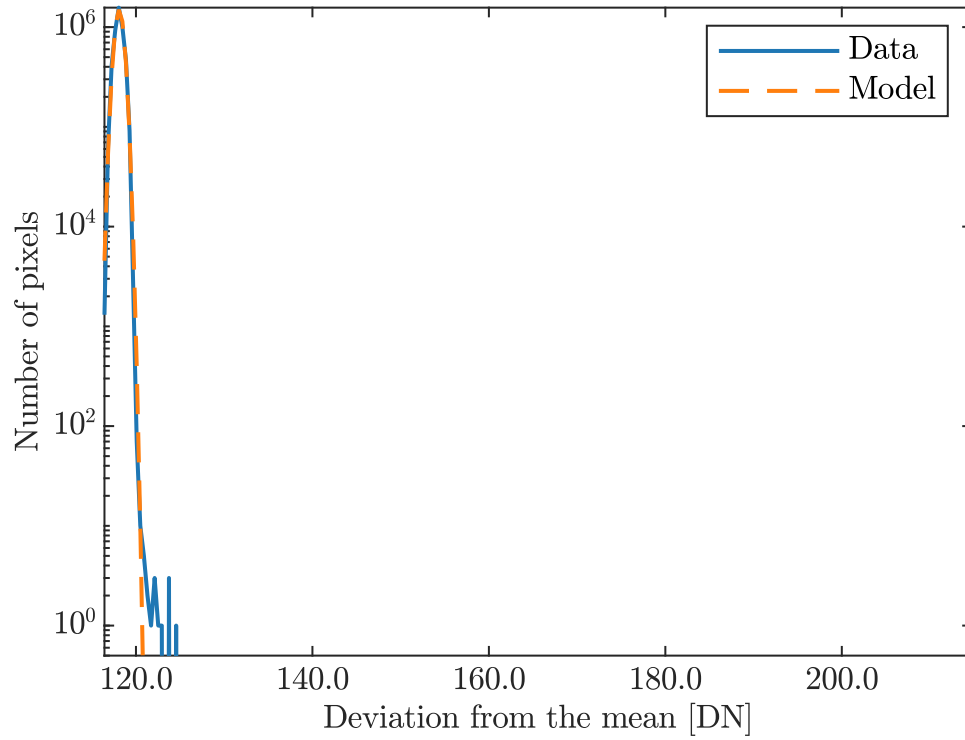
Vertical Spectrogram DSNU



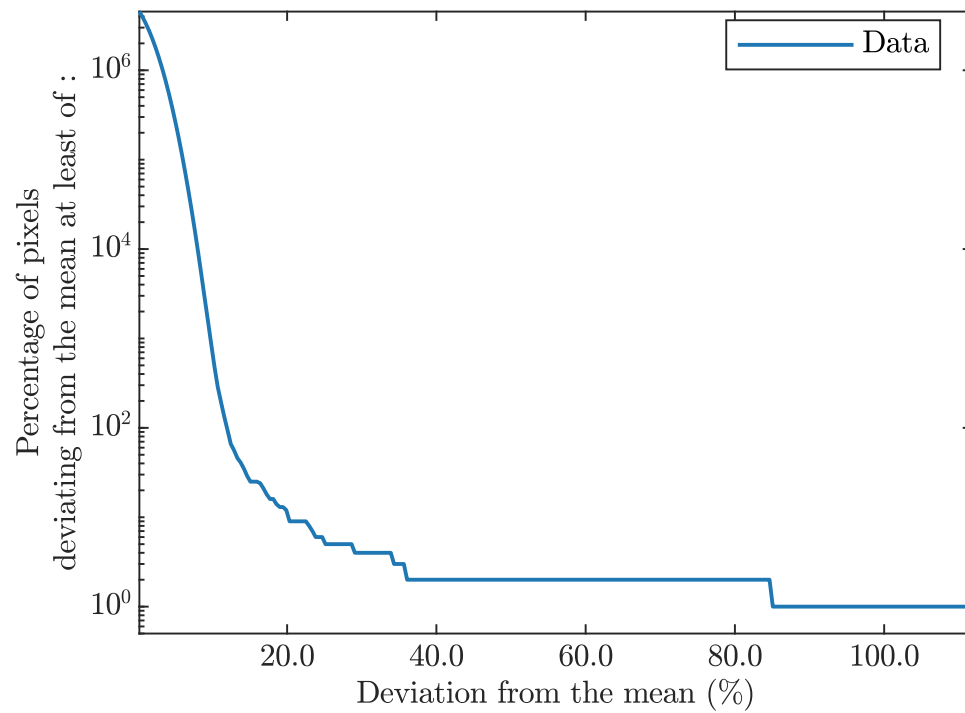
Logarithmic Histogram PRNU



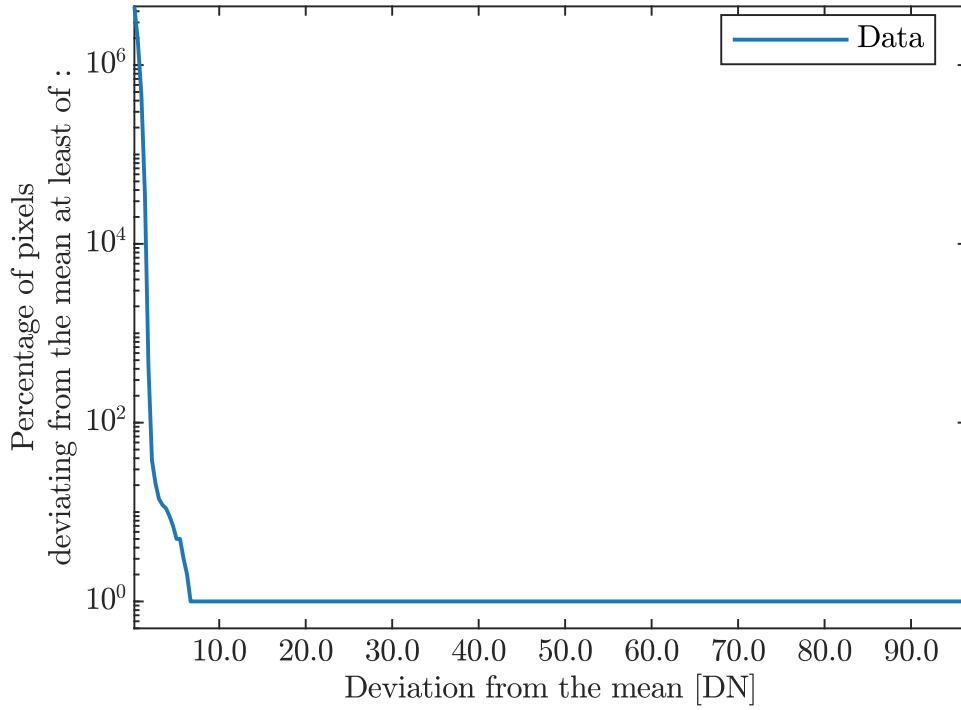
Logarithmic Histogram DSNU



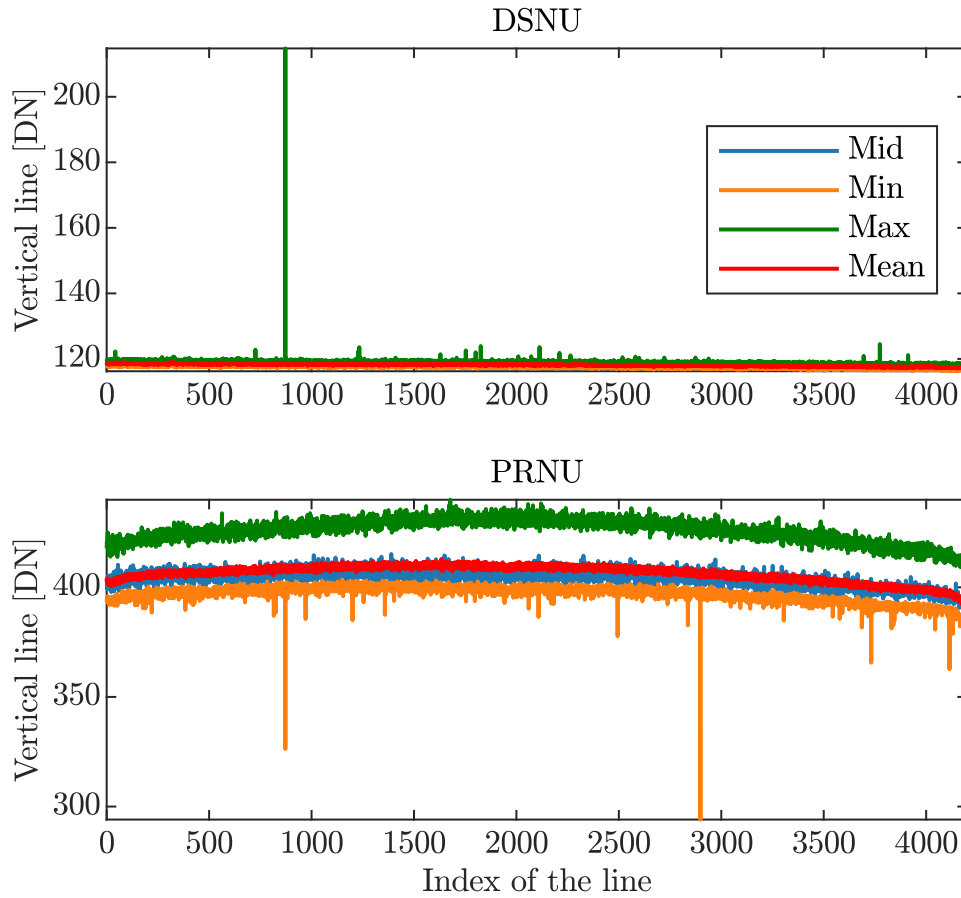
Accumulated Log Histogram PRNU



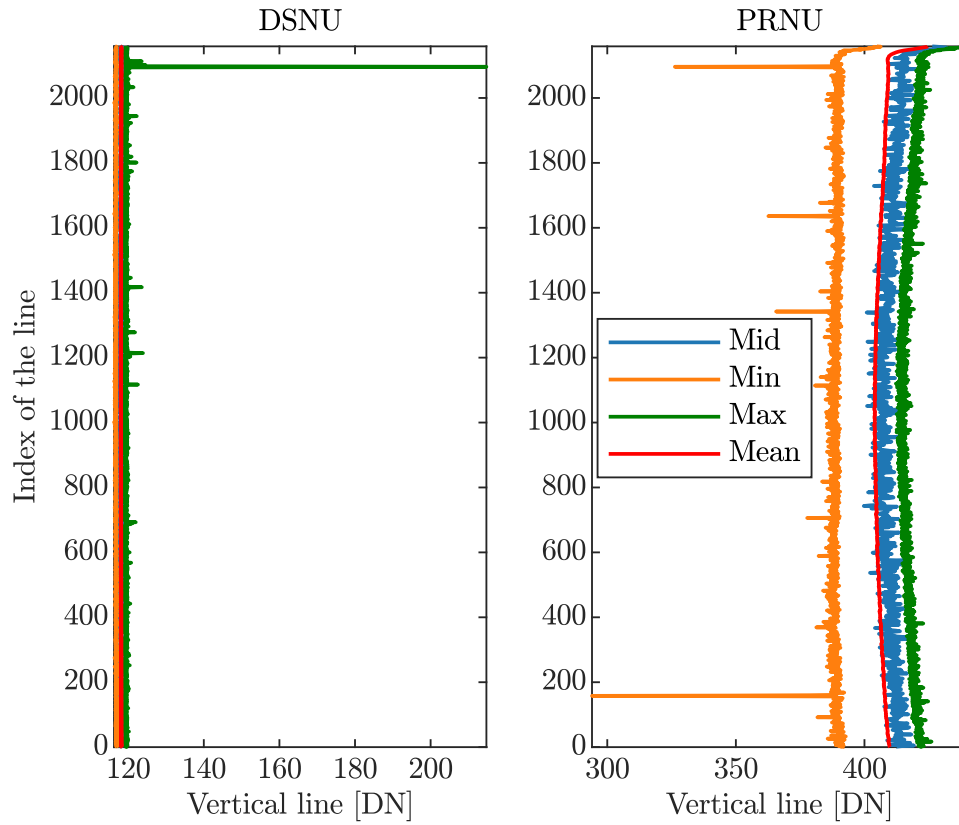
Accumulated Log Histogram DSNU



Horizontal Profile



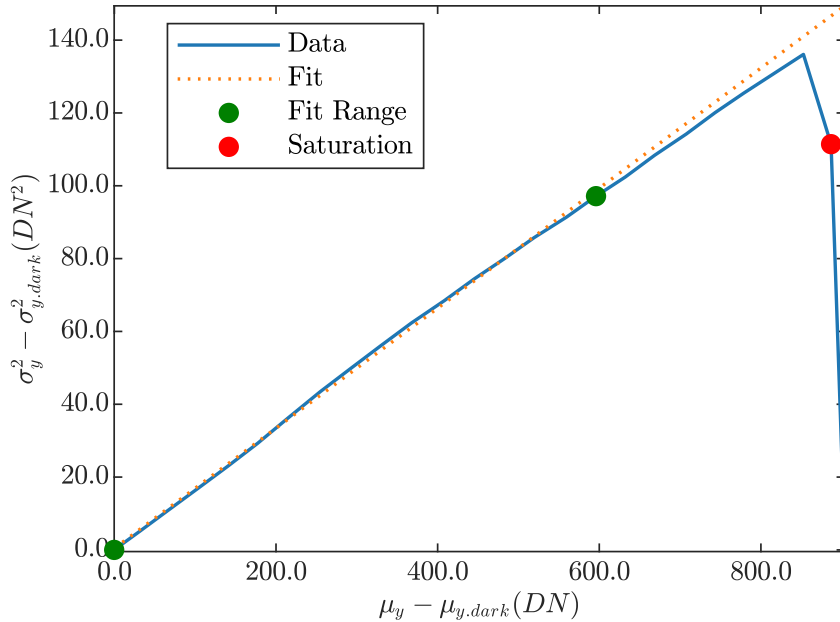
Vertical Profile



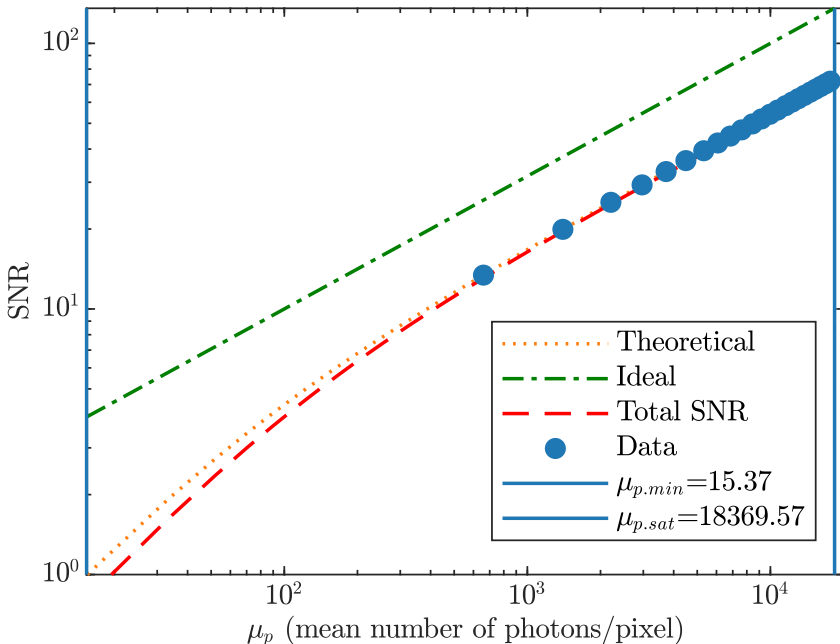
Summary Sheet for Operation Point 2 at a Wavelength of 632 nm

| Camera setting | | Operation point parameters | |
|----------------|------|----------------------------|-------|
| Gain | 2 | Environmental temperature | 22.68 |
| Black level | -500 | Camera body temperature | 42.43 |
| | | Sensor temperature | 50 |
| | | Processor temperature | 50 |

Photon Transfer

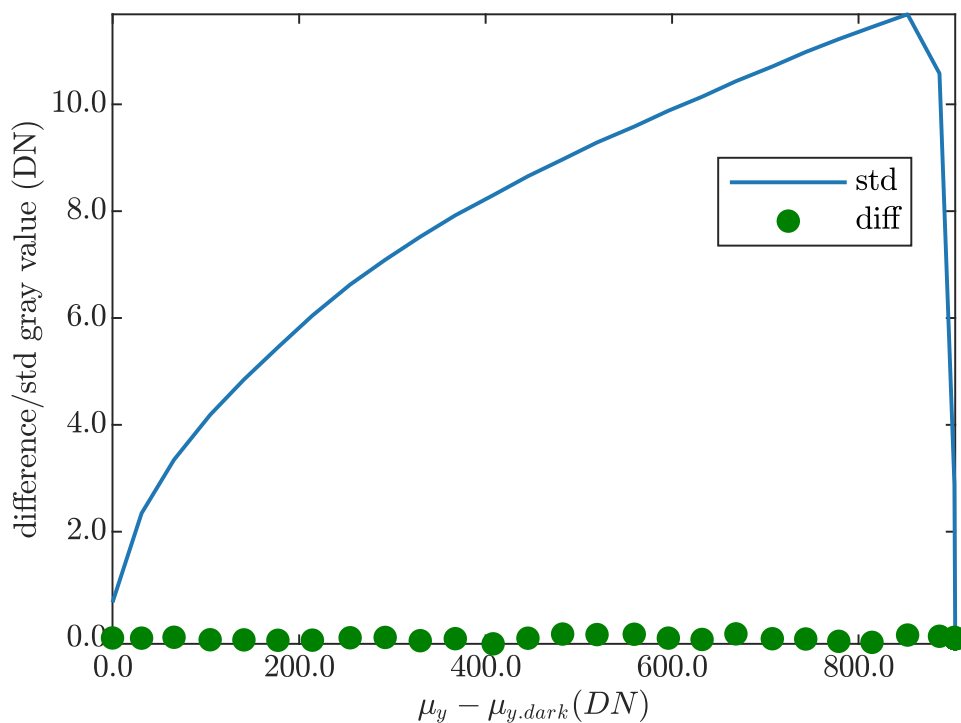


Signal-to-Noise Ratio

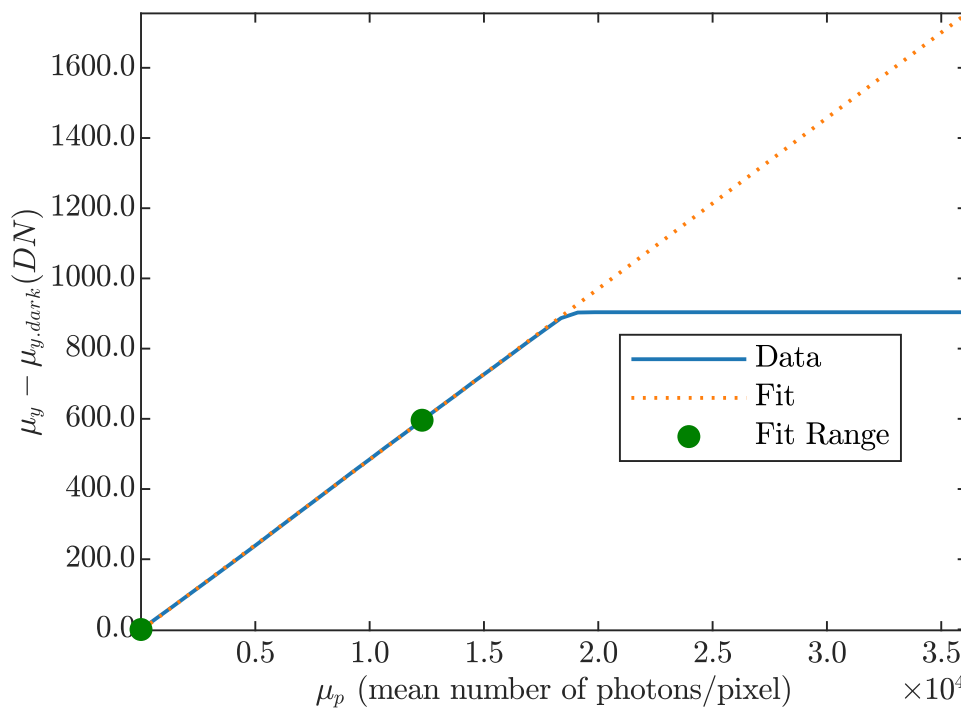


| Performance | | |
|---------------------------------------|-----------|---------------------------------|
| Quantum efficiency | | |
| η | 29.5219 | % |
| System gain | | |
| K | 0.16483 | DN/e ⁻ |
| 1/K | 6.067 | e ⁻ /DN |
| Temporal dark noise | | |
| σ_d | 3.6372 | e ⁻ |
| $\sigma_{y,dark}$ | 0.66538 | DN |
| Signal-to-noise ratio | | |
| SNR _{max} | 73.6413 | |
| | 37.3424 | dB |
| | 6.2024 | bit |
| 1/SNR _{max} | 1.3579 | % |
| Absolute sensitivity threshold | | |
| $\mu_{e,min}$ | 4.5369 | e ⁻ |
| $\mu_{e,min,area}$ | 0.7259 | e ⁻ /μm ² |
| Saturation capacity | | |
| $\mu_{e,sat}$ | 5423.0395 | e ⁻ |
| $\mu_{e,sat,area}$ | 867.6863 | e ⁻ /μm ² |
| Dynamic range | | |
| DR | 1195.3299 | |
| | 61.5498 | dB |
| | 10.2232 | bit |
| Spatial nonuniformities | | |
| DSNU ₁₂₈₈ | 3.2578 | e ⁻ |
| DSNU _{1288,col} | 1.1894 | e ⁻ |
| DSNU _{1288,row} | 2.8816 | e ⁻ |
| DSNU _{1288,pix} | 0.94576 | e ⁻ |
| PRNU ₁₂₈₈ | 0.48781 | % |
| PRNU _{1288,col} | 0.12718 | % |
| PRNU _{1288,row} | 0.078221 | % |
| PRNU _{1288,pix} | 0.4644 | % |
| Linearity error | | |
| LE | 0.002009 | % |
| Dark current | | |
| $\mu_{l,mean}$ | 45.9612 | e ⁻ /s |
| $\mu_{l,var}$ | 58.5954 | e ⁻ /s |

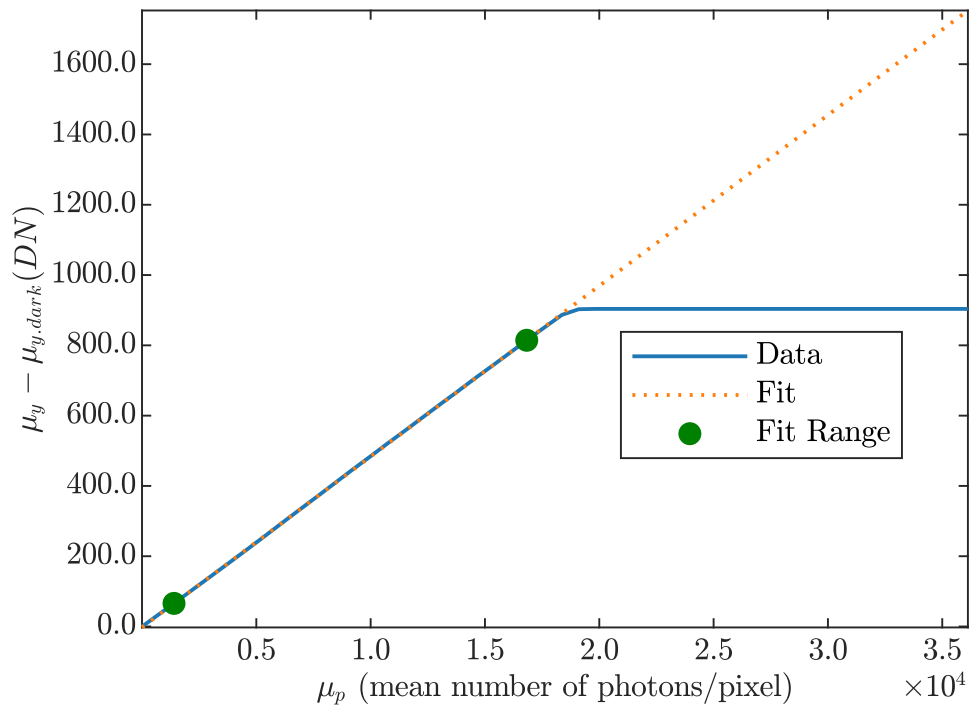
Stability check



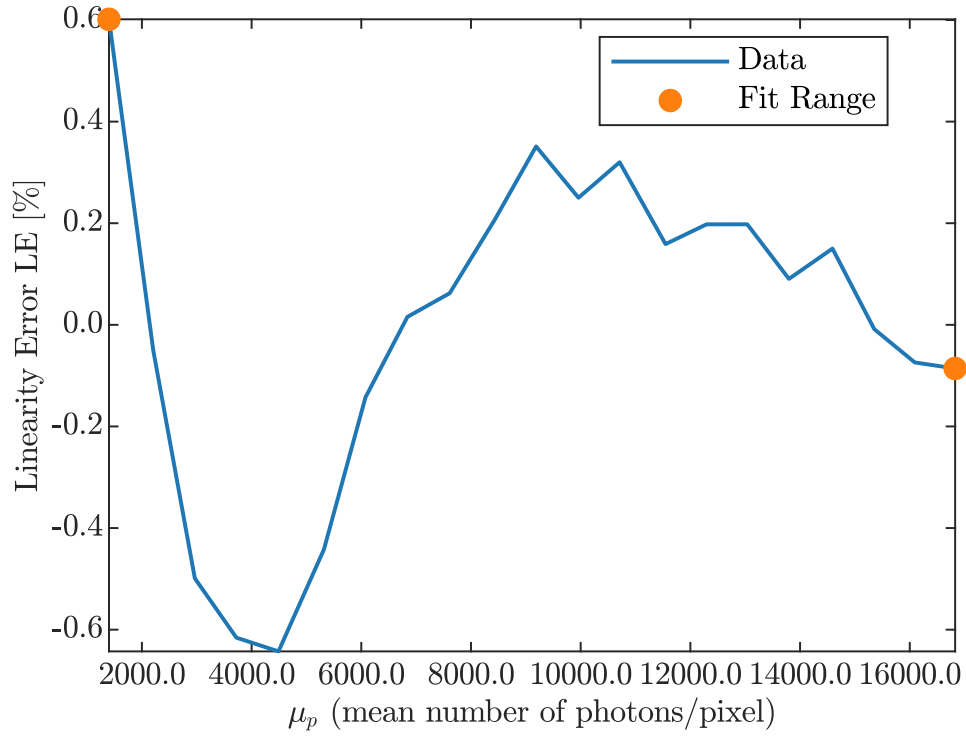
Sensitivity



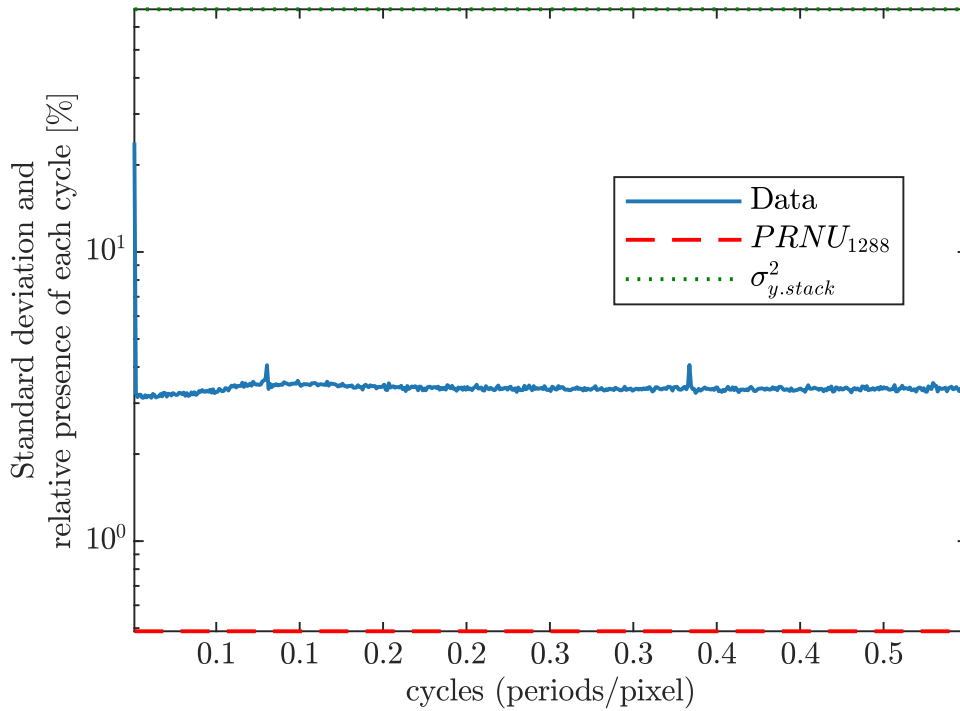
Linearity



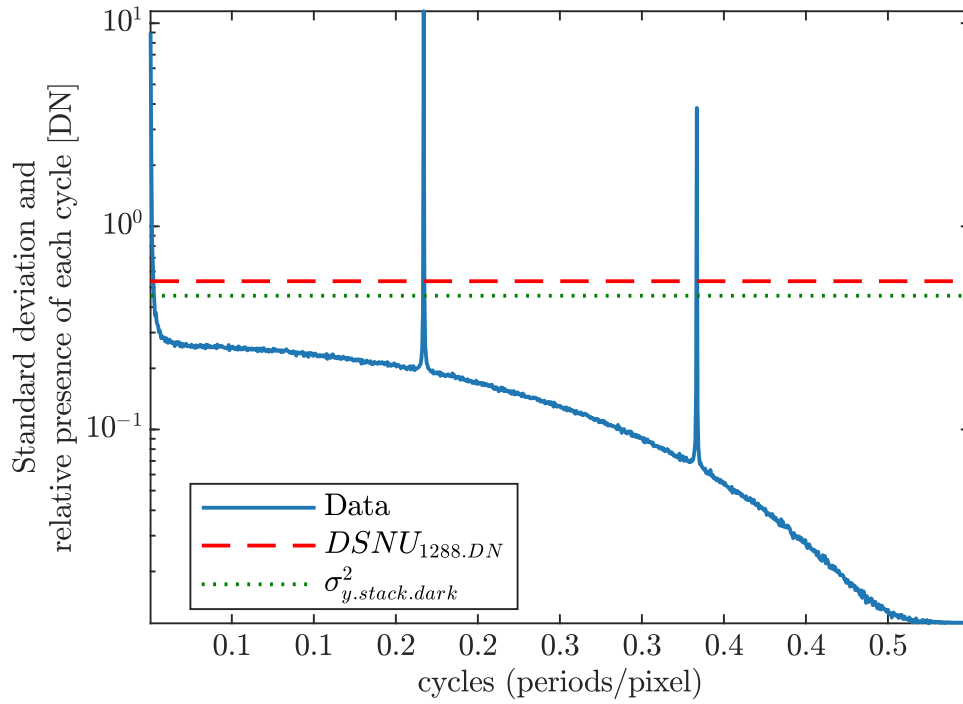
Deviation Linearity



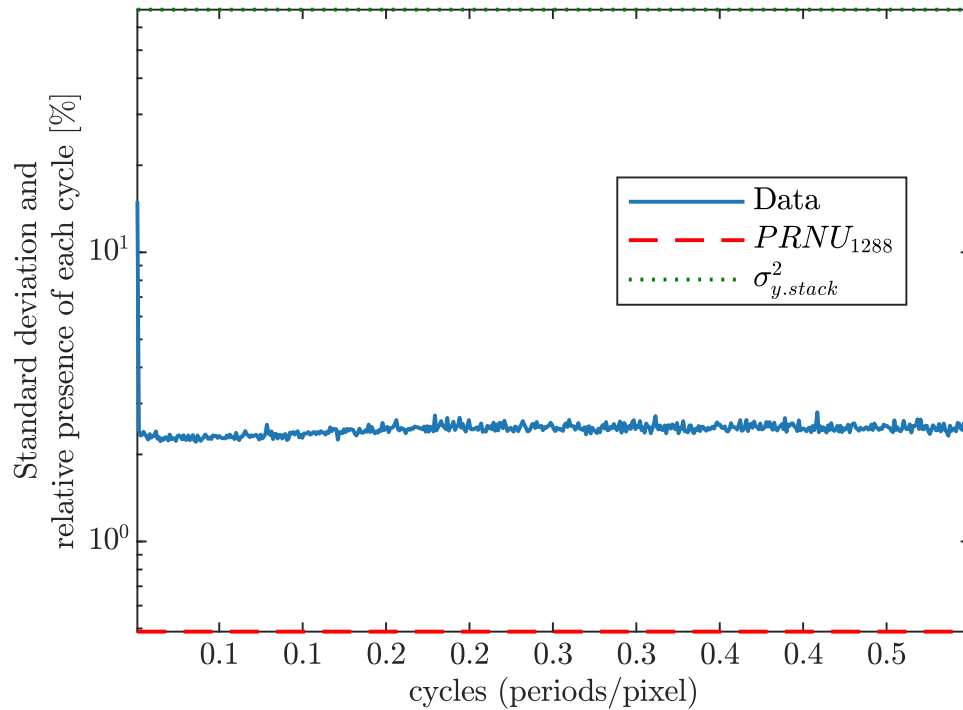
Horizontal Spectrogram PRNU



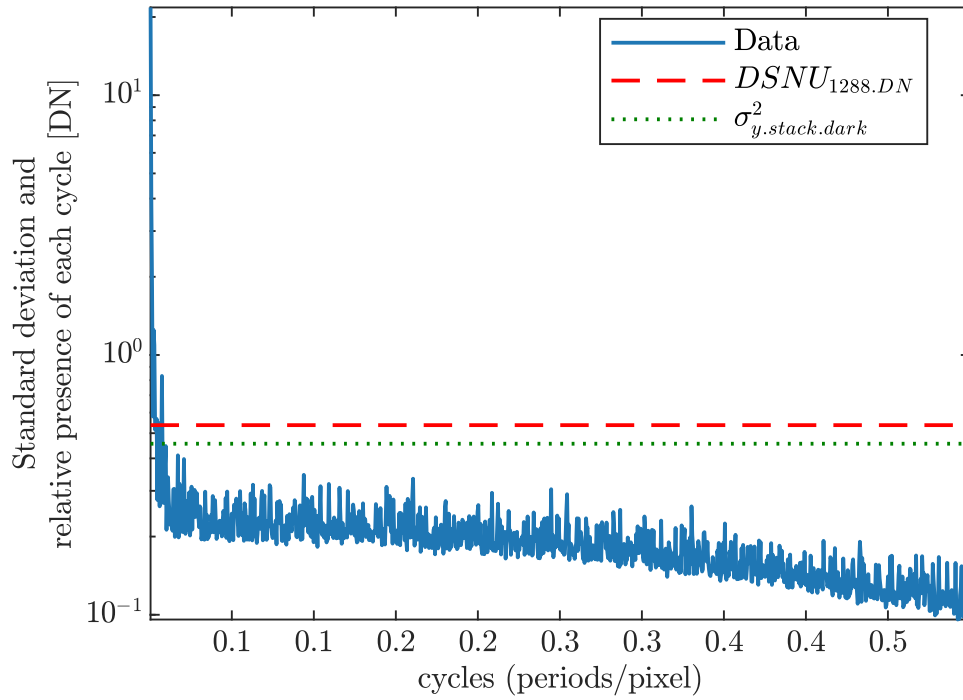
Horizontal Spectrogram DSNU



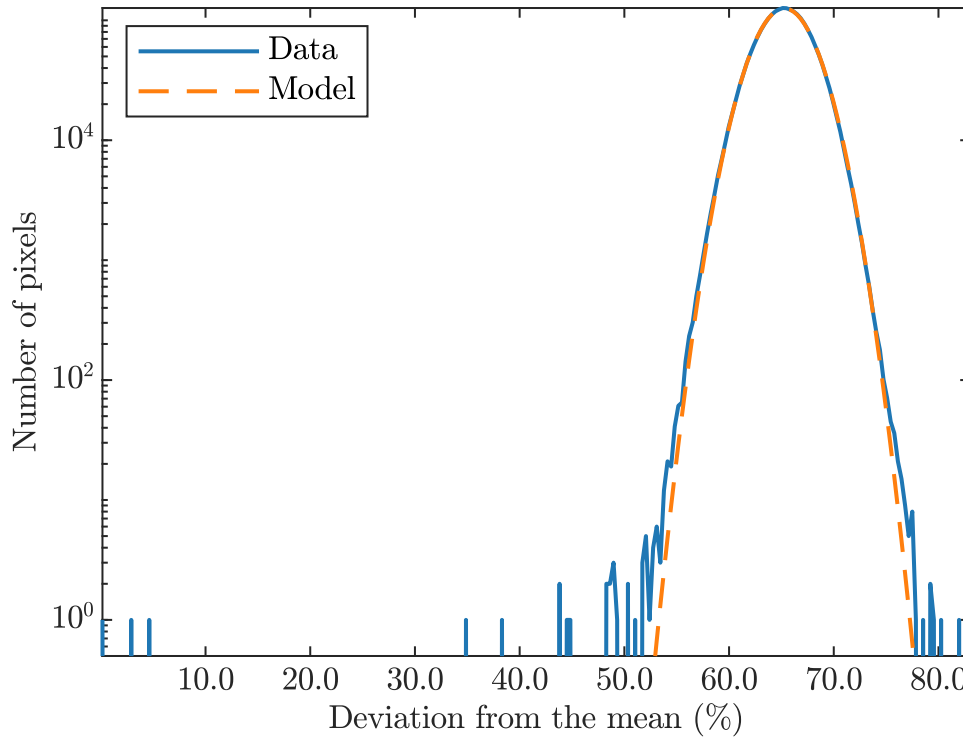
Vertical Spectrogram PRNU



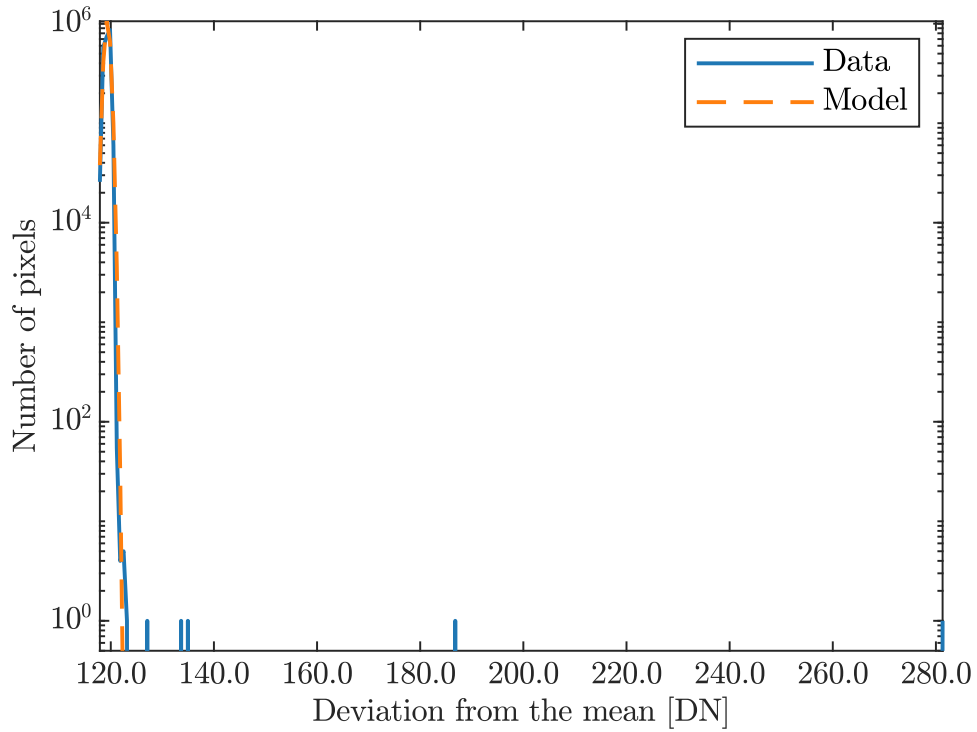
Vertical Spectrogram DSNU



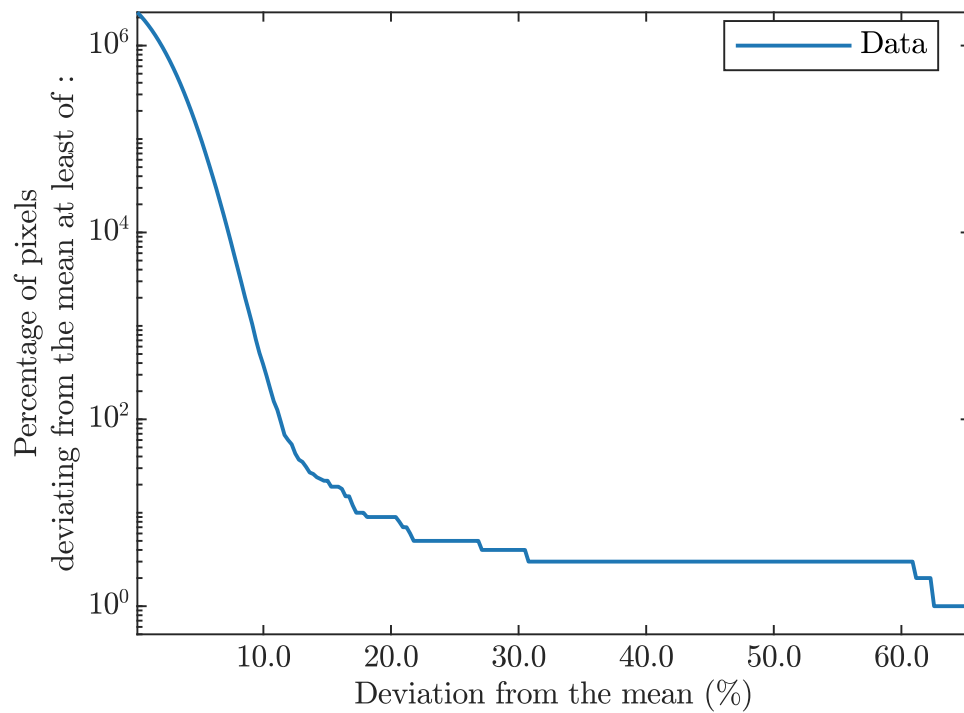
Logarithmic Histogram PRNU



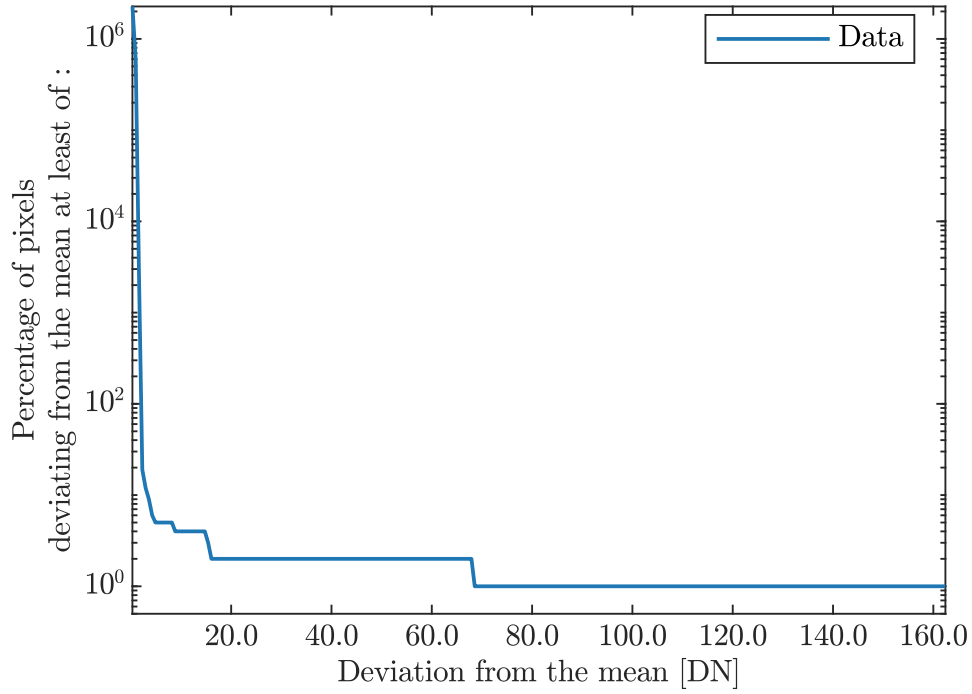
Logarithmic Histogram DSNU



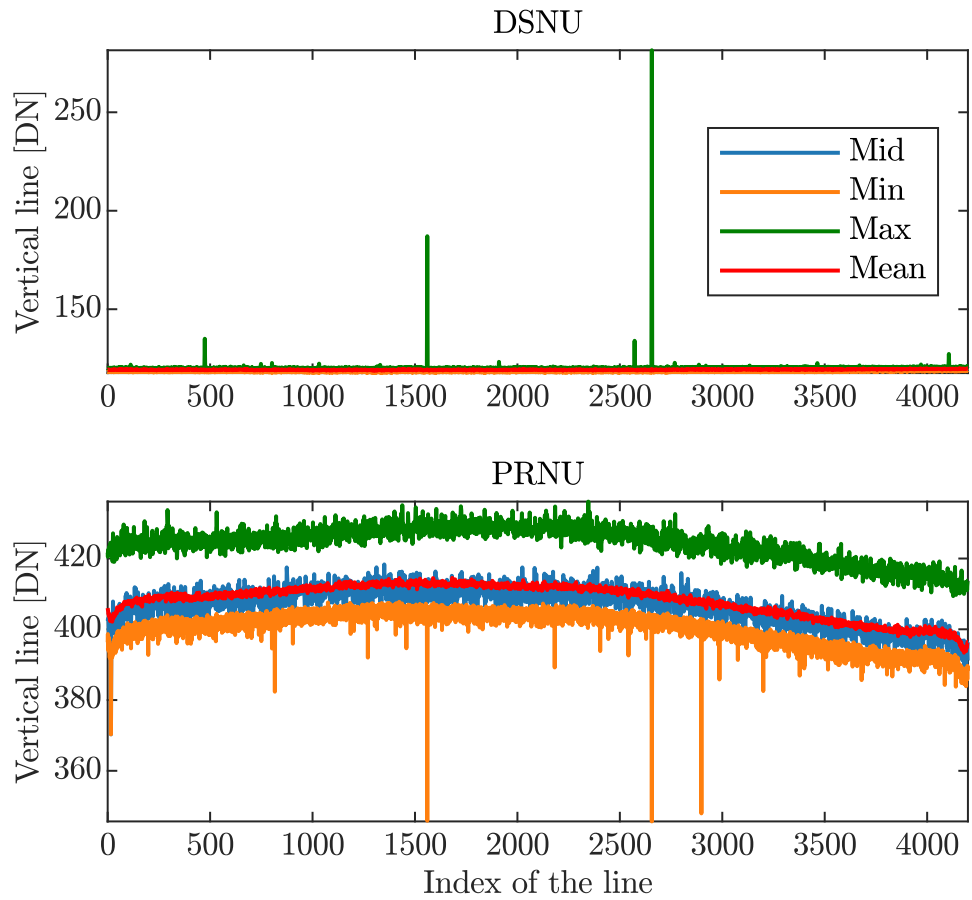
Accumulated Log Histogram PRNU



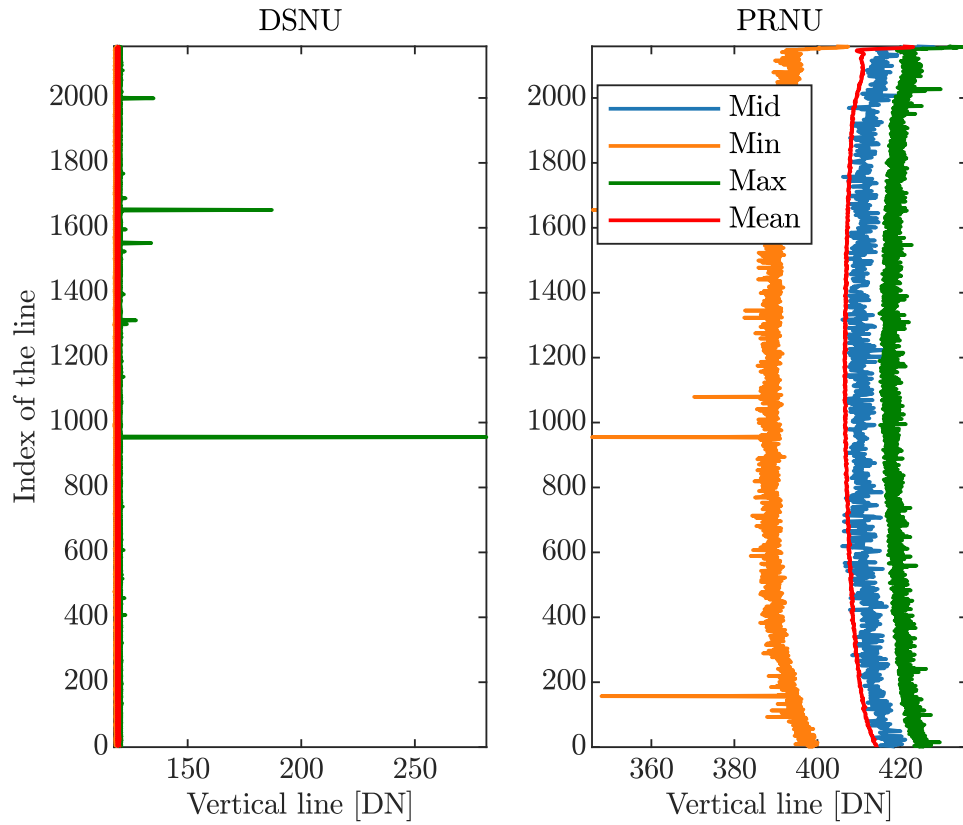
Accumulated Log Histogram DSNU



Horizontal Profile



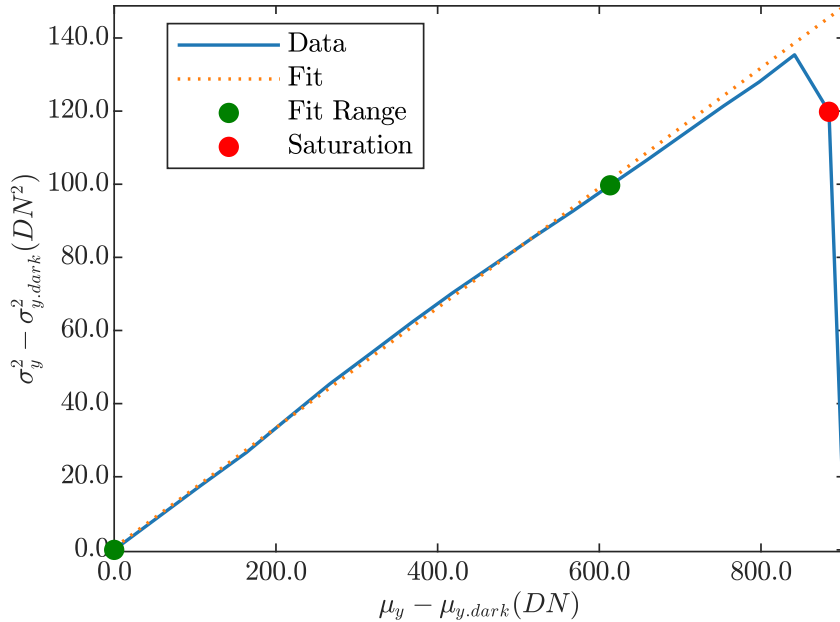
Vertical Profile



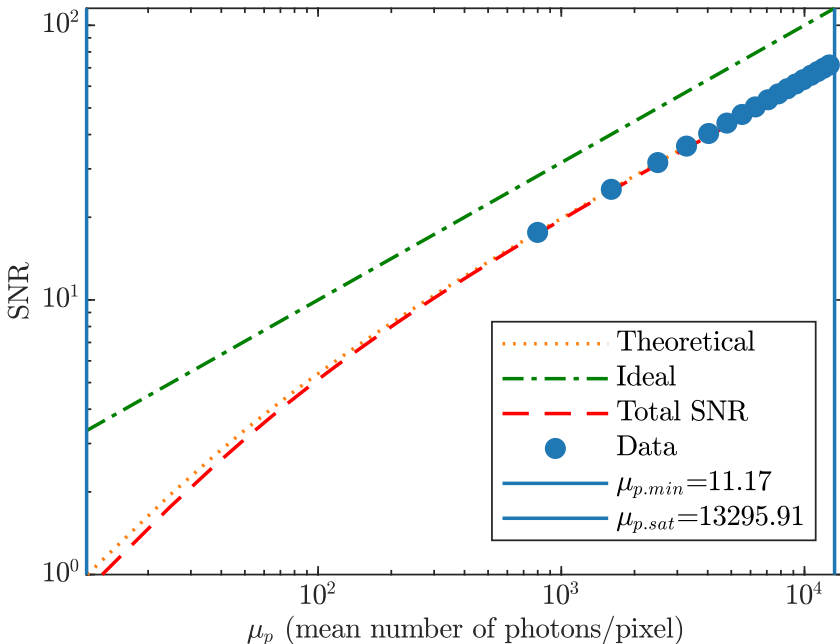
Summary Sheet for Operation Point 3 at a Wavelength of 448 nm

| Camera setting | | Operation point parameters | |
|----------------|------|----------------------------|-------|
| Gain | 2 | Environmental temperature | 22.75 |
| Black level | -500 | Camera body temperature | 42.5 |
| | | Sensor temperature | 51 |
| | | Processor temperature | 53 |

Photon Transfer



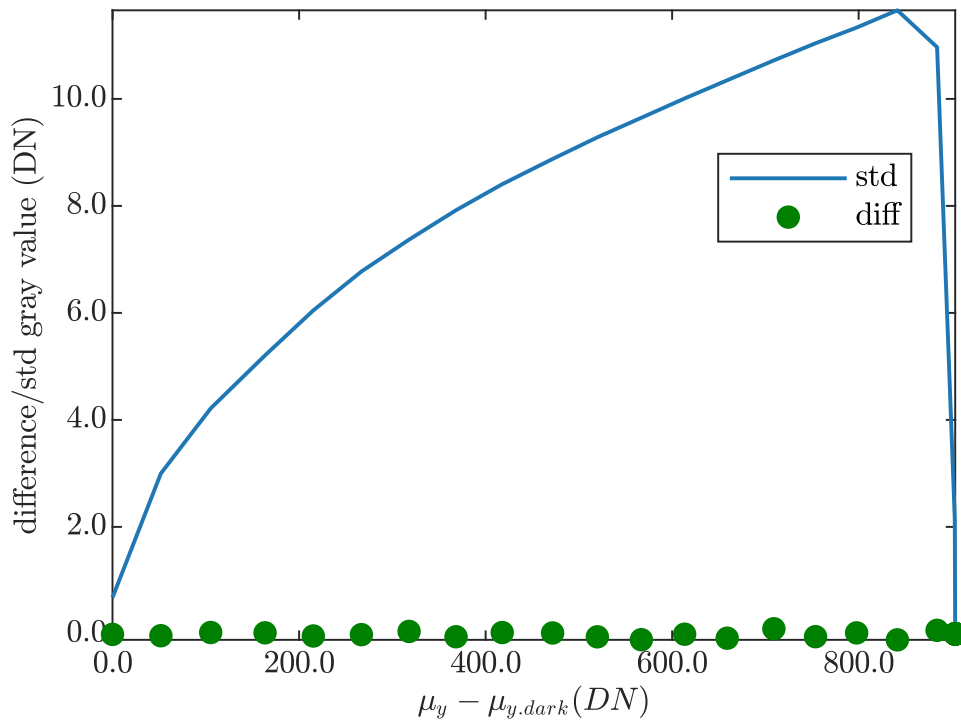
Signal-to-Noise Ratio



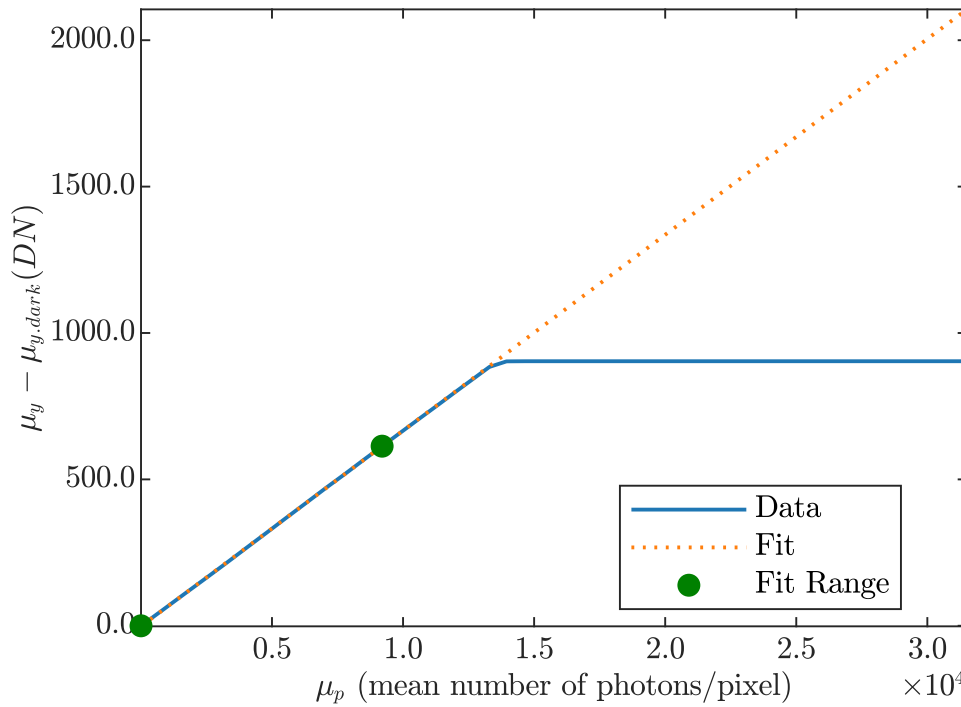
Performance

| Quantum efficiency | | |
|--------------------------------|-----------|---------------------------------|
| η | 40.7827 | % |
| System gain | | |
| K | 0.16401 | DN/e ⁻ |
| 1/K | 6.0973 | e ⁻ /DN |
| Temporal dark noise | | |
| σ_d | 3.6554 | e ⁻ |
| $\sigma_{y,dark}$ | 0.66538 | DN |
| Signal-to-noise ratio | | |
| SNR _{max} | 73.6372 | |
| | 37.3419 | dB |
| | 6.2024 | bit |
| 1/SNR _{max} | 1.358 | % |
| Absolute sensitivity threshold | | |
| $\mu_{e,min}$ | 4.5571 | e ⁻ |
| $\mu_{e,min,area}$ | 0.72913 | e ⁻ /μm ² |
| Saturation capacity | | |
| $\mu_{e,sat}$ | 5422.4349 | e ⁻ |
| $\mu_{e,sat,area}$ | 867.5896 | e ⁻ /μm ² |
| Dynamic range | | |
| DR | 1189.8963 | |
| | 61.5102 | dB |
| | 10.2166 | bit |
| Spatial nonuniformities | | |
| DSNU ₁₂₈₈ | 2.4387 | e ⁻ |
| DSNU _{1288,col} | 1.1814 | e ⁻ |
| DSNU _{1288,row} | 1.9958 | e ⁻ |
| DSNU _{1288,pix} | 0.75376 | e ⁻ |
| PRNU ₁₂₈₈ | 0.49786 | % |
| PRNU _{1288,col} | 0.1322 | % |
| PRNU _{1288,row} | 0.091236 | % |
| PRNU _{1288,pix} | 0.47124 | % |
| Linearity error | | |
| LE | 0.0018386 | % |
| Dark current | | |
| $\mu_{l,mean}$ | 45.9612 | e ⁻ /s |
| $\mu_{l,var}$ | 58.5954 | e ⁻ /s |

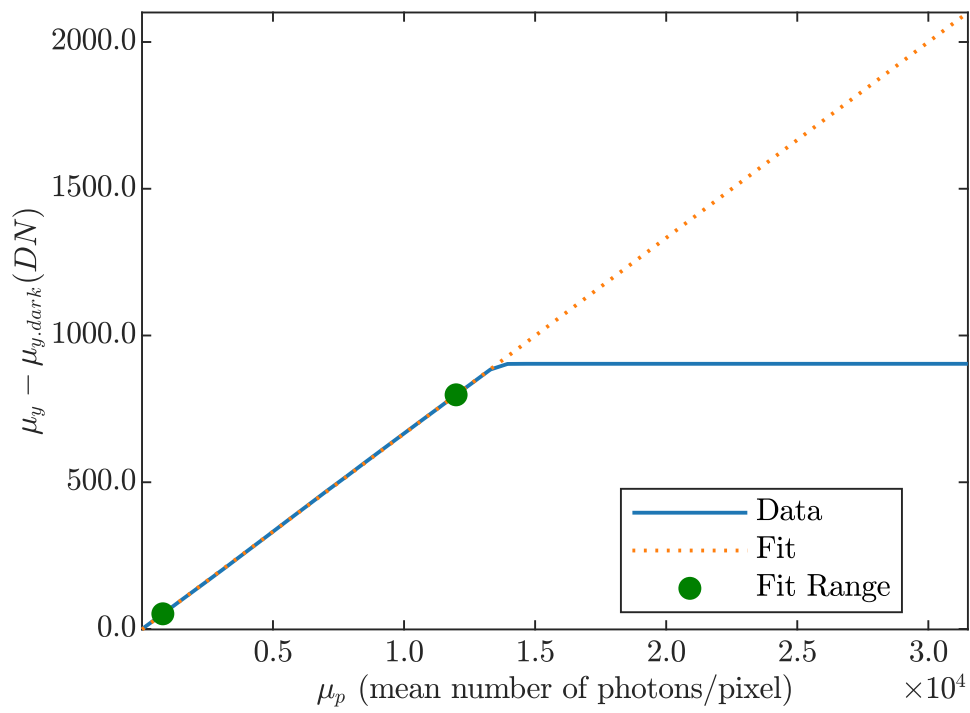
Stability check



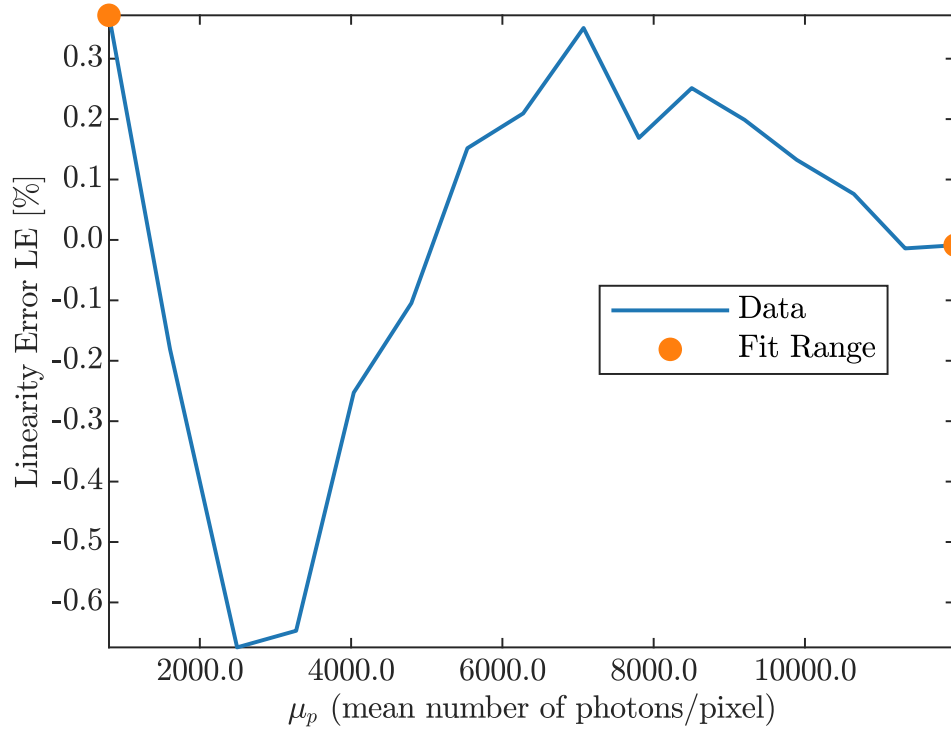
Sensitivity



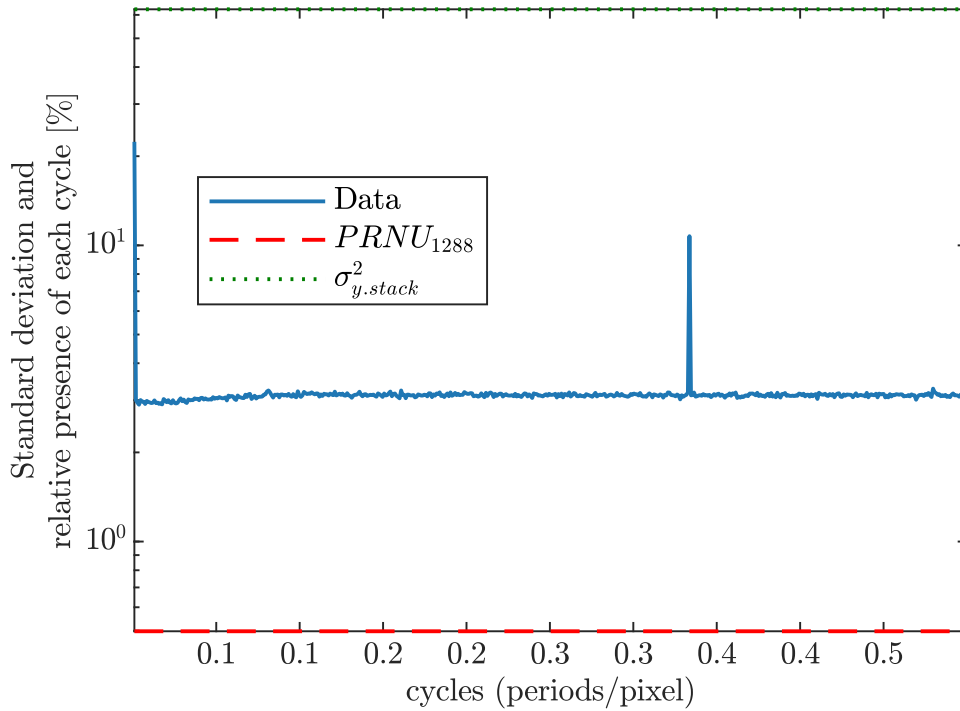
Linearity



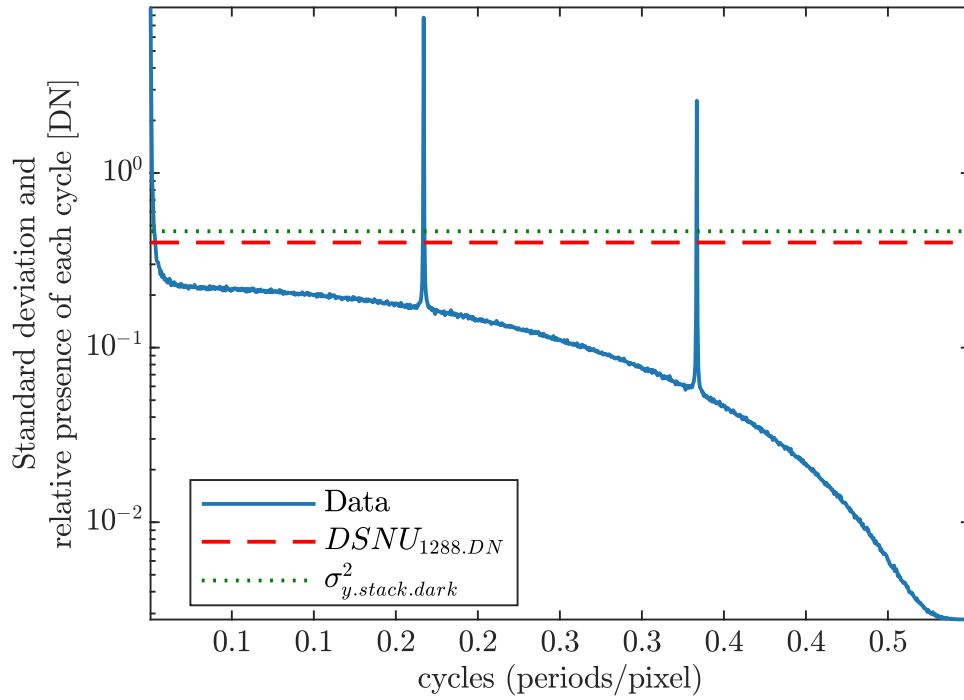
Deviation Linearity



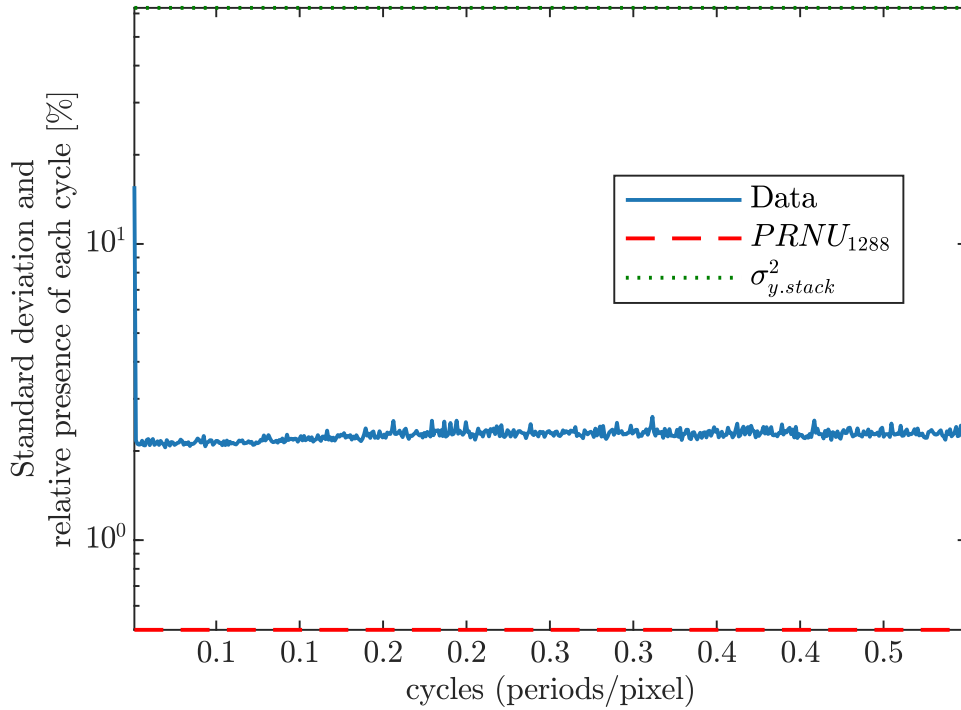
Horizontal Spectrogram PRNU



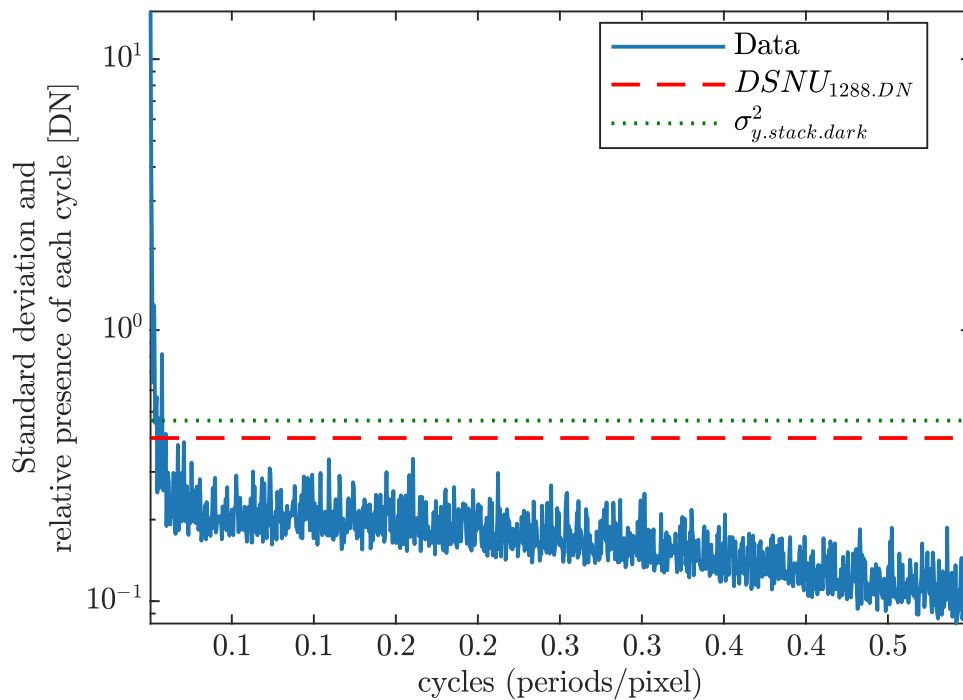
Horizontal Spectrogram DSNU



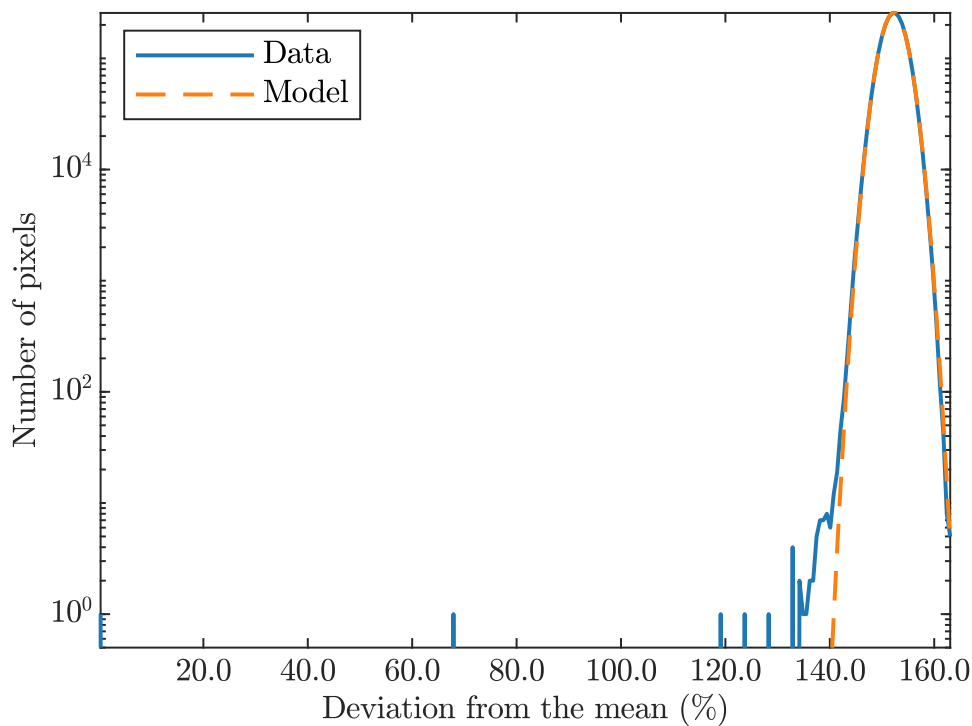
Vertical Spectrogram PRNU



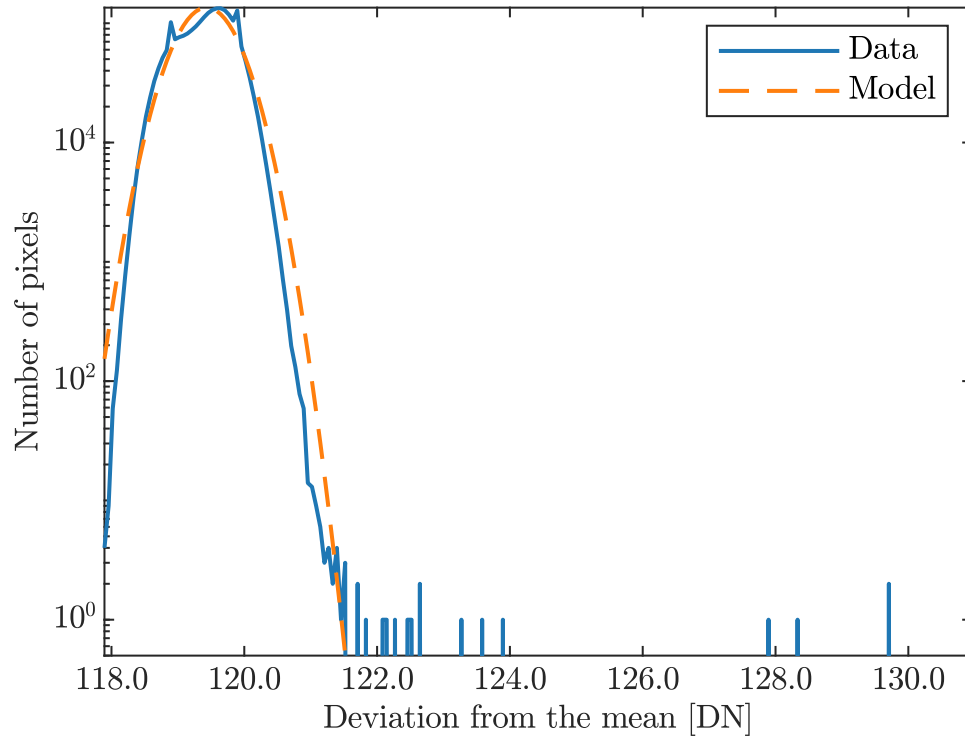
Vertical Spectrogram DSNU



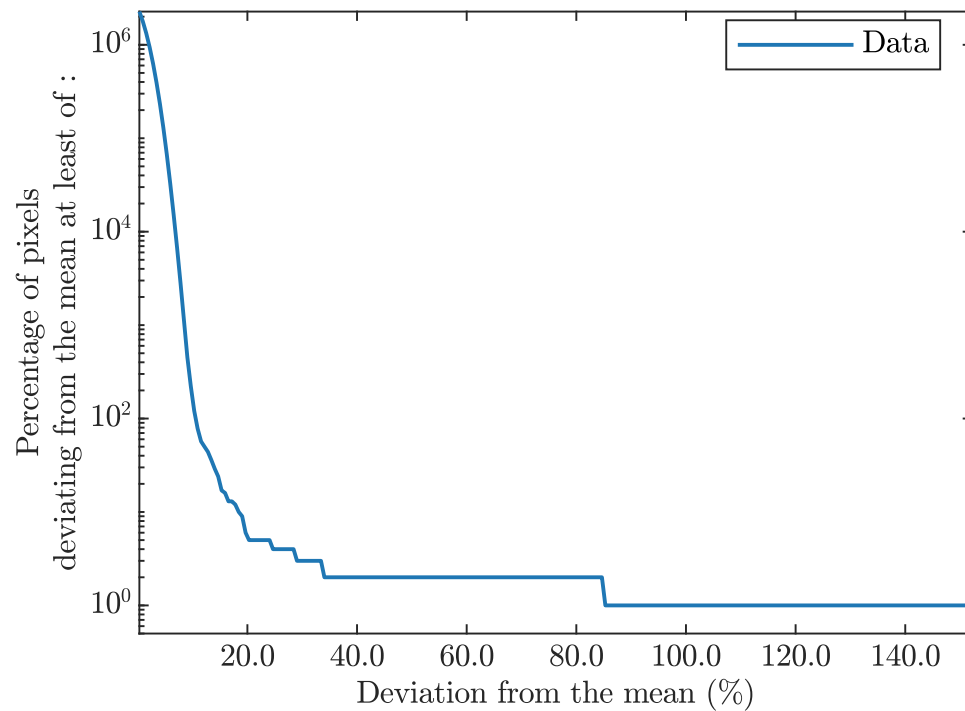
Logarithmic Histogram PRNU



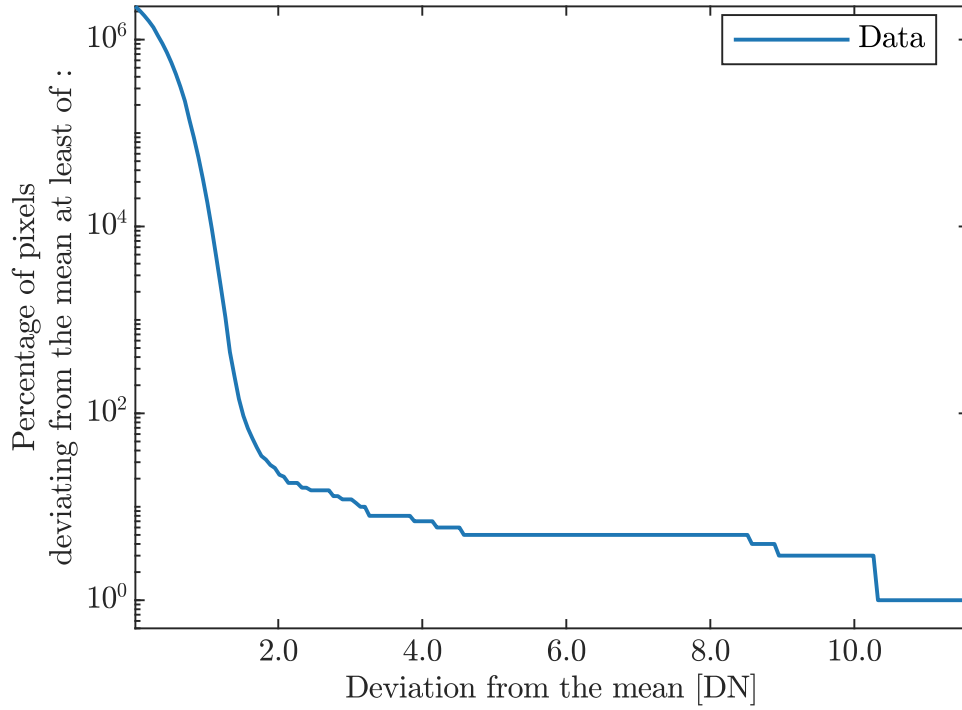
Logarithmic Histogram DSNU



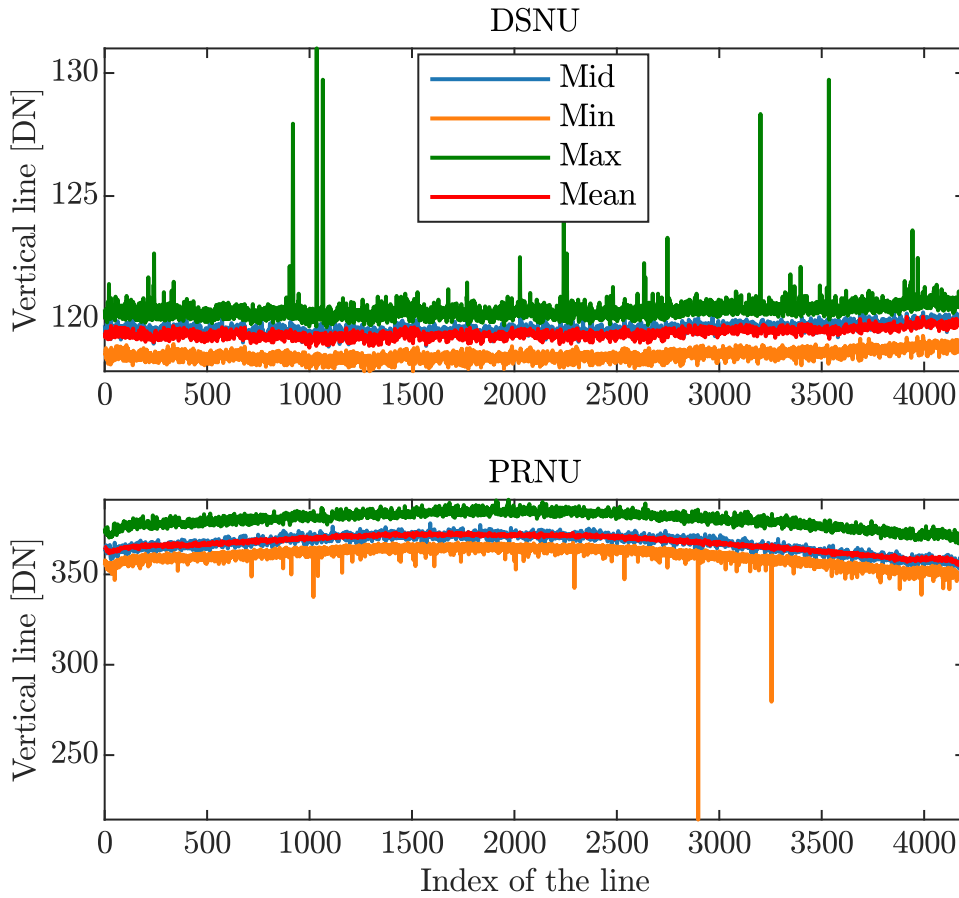
Accumulated Log Histogram PRNU



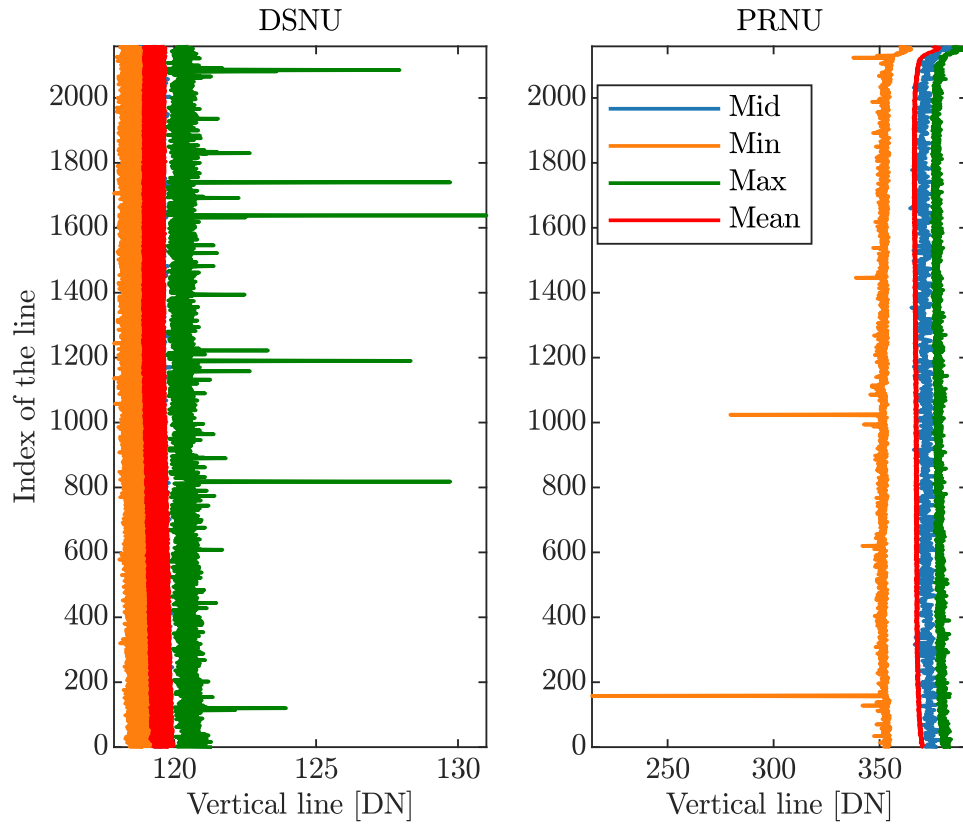
Accumulated Log Histogram DSNU



Horizontal Profile

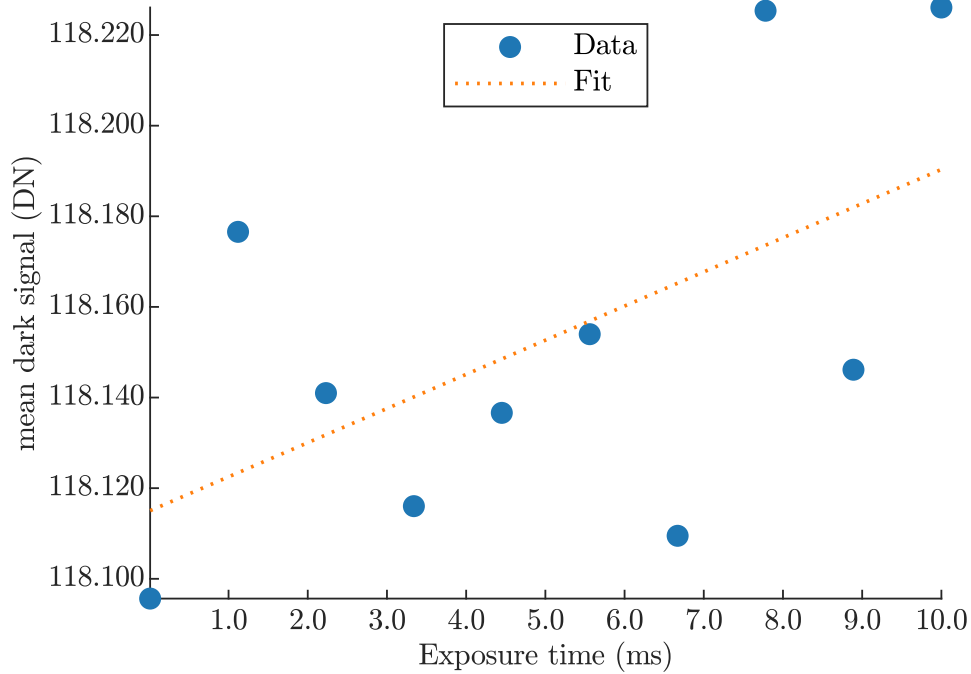


Vertical Profile

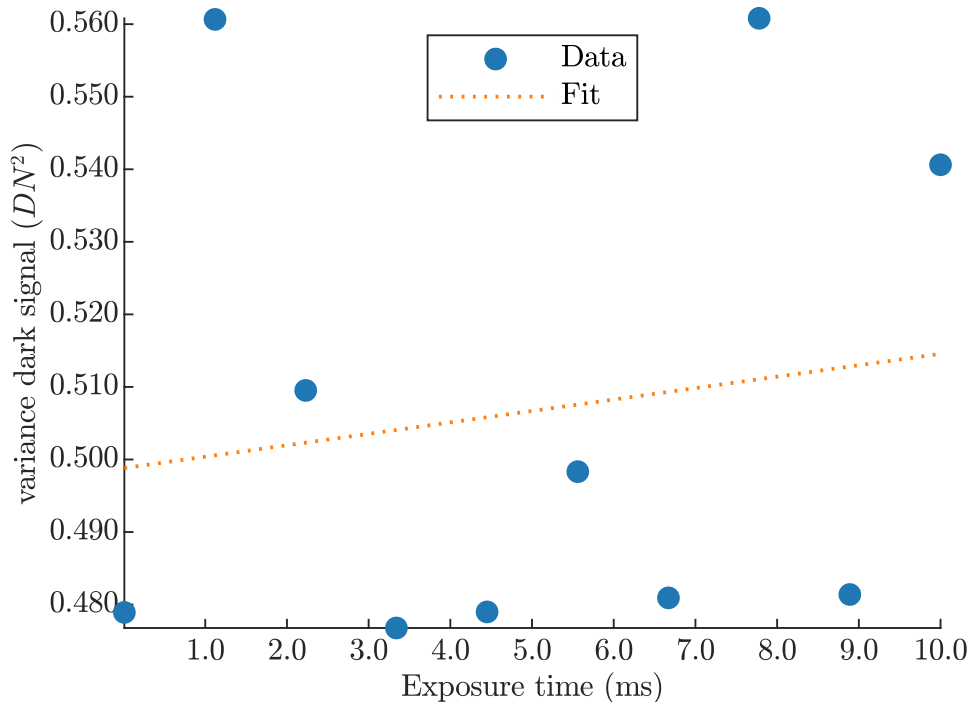


Dark Current

Dark Current from Mean



Dark Current from Variance



International Distributor



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