

EMVA 1288 Report Summary Cover Page

Package includes all associated EMVA Report Summaries valid for the following Phantom camera models

TMX 7510, TMX 6410, TMX 5010

Updated for cameras w/ minimum firmware phfw 203

Refer to the report corresponding with your camera configuration:

- Monochrome models, Standard mode: PDF pages 2-3
- Monochrome models, Binned mode: PDF pages 4-5
- Color models, Standard mode: PDF pages 6-9

These monochrome reports also apply to TMX-UV camera models.

Each report summary was generated by Vision Research in accordance with the EMVA 1288 4.0 standard.

For more information on EMVA 1288 image measurements visit:
www.phantomhighspeed.com/emva

EMVA 1288 Data Sheet m0440

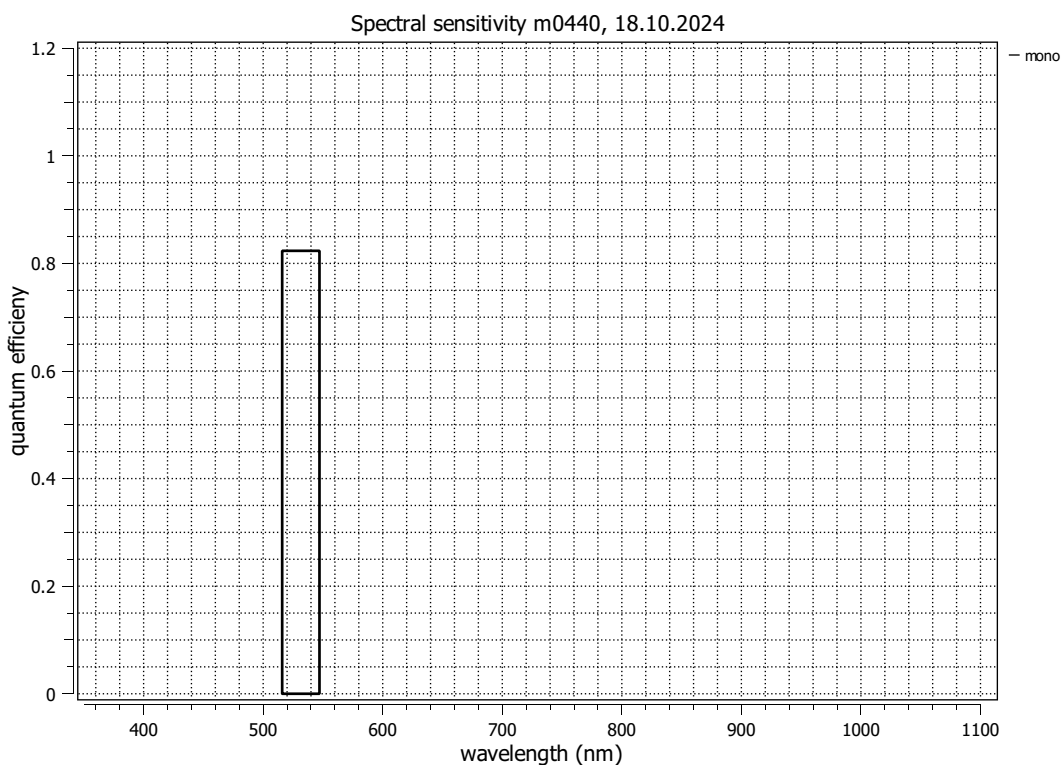
This data sheet describes the specification according to the standard 1288 Release 4.0 Linear issued on 21 June 2021 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" by the European Machine Vision Association (EMVA), published at <https://www.emva.org/standards-technology/emva-1288/> with proprietary extensions from AEON. The measurements were performed with the AEON ACC2b RGB-IR, Release 9, 31.10.2023, SN 0032(AMETEK), software version 2.0.

Measurements performed by Vision Research.

Type of data presented	Single
Vendor	Vision Research
Model	Phantom TMX 7510
Serial number	441
Sensor diagonal	27.92 mm
Lens category	F-Mount
Resolution	1280 × 800, 12 bit
Offset/Size used	0 × 0/ 1280 × 800
Pixel size (h×v)	18.50 μm × 18.50 μm
Sensor	Vision Research Proprietary
Sensor type	CMOS
Shutter type	Global
Overlap cap.	Overlapping
Max. frame rate	76086.0 Hz
Interface type	Ethernet

Nr.	Centroid/FWHM	Gain, blacklevel	t_{exp} (ms)
1	531.5/31.2 nm	1 / 0.4%	0.0100

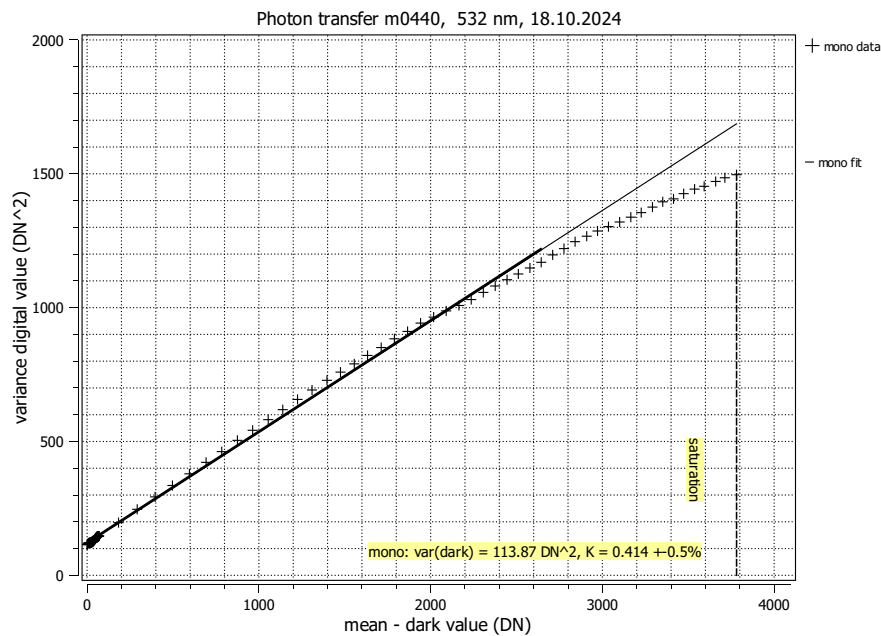
Optional data measured: None



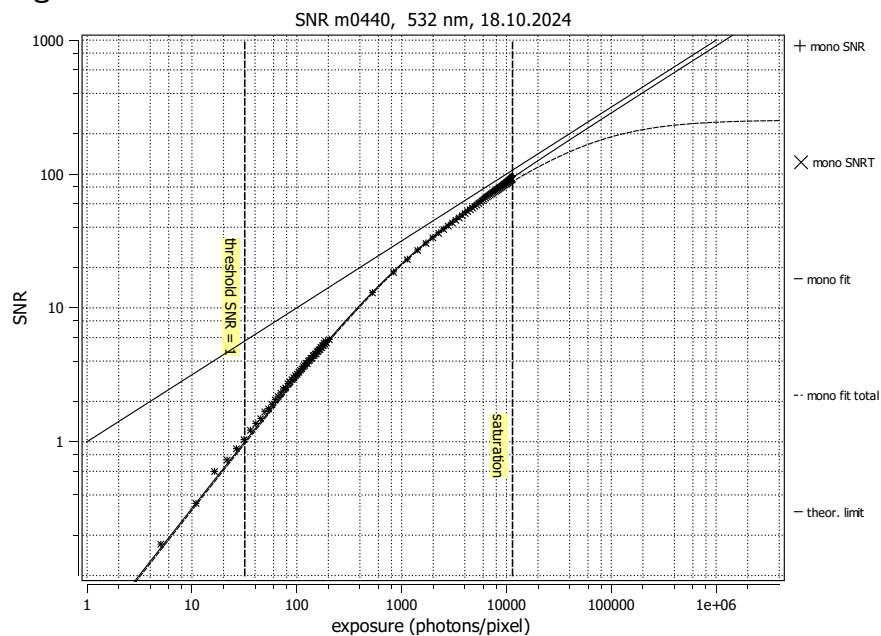
Summary Sheet for Operation Point 1 at a Wavelength of 532 nm

Type of data	Single	Gain, black-level	1 / 0.4%
Exposure control	By irradiance	Environmental temperature	25.7°C
Exposure time	10.000 μ s	Camera body temperature	31.1°C
Frame rate	1000.0 Hz	Internal temperature(s)	—
Data transfer mode	Mono 12 (R3C)	Wavelength, centr., FWHM	532 nm, 31.2 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η 82.3%

Overall system gain

K 0.4143 DN/e⁻

$1/K$ 2.414 e⁻/DN

Temporal dark noise

σ_d 25.7 e⁻

$\sigma_{y,\text{dark}}$ 10.7 DN

Signal-to-noise ratio

SNR_{max} 97.0

39.7 dB

$1/\text{SNR}_{\text{max}}$ 1.031 %

Absolute sensitivity threshold

$\mu_{e,\text{min}}$ 26.3 e⁻

$\mu_{e,\text{min},\text{area}}$ 0.0767 e⁻/μm²

Saturation capacity

$\mu_{e,\text{sat}}$ 9406 e⁻

$\mu_{e,\text{sat},\text{area}}$ 27 e⁻/μm²

Dynamic range

DR 358

51.08 dB

Spatial nonuniformities

DSNU₁₂₈₈ 6.89 e⁻

DSNU_{1288.col} 0.11 e⁻

DSNU_{1288.row} 0.06 e⁻

DSNU_{1288.pix} 6.88 e⁻

PRNU₁₂₈₈ 0.395 %

PRNU_{1288.col} 0.102 %

PRNU_{1288.row} 0.025 %

PRNU_{1288.pix} 0.381 %

Linearity error

LE 1.15%

Dark current

$\mu_{c,\text{mean}}$ 44571 e⁻/s

$\mu_{c,\text{var}}$ 43745 e⁻/s

EMVA 1288 Data Sheet m0443

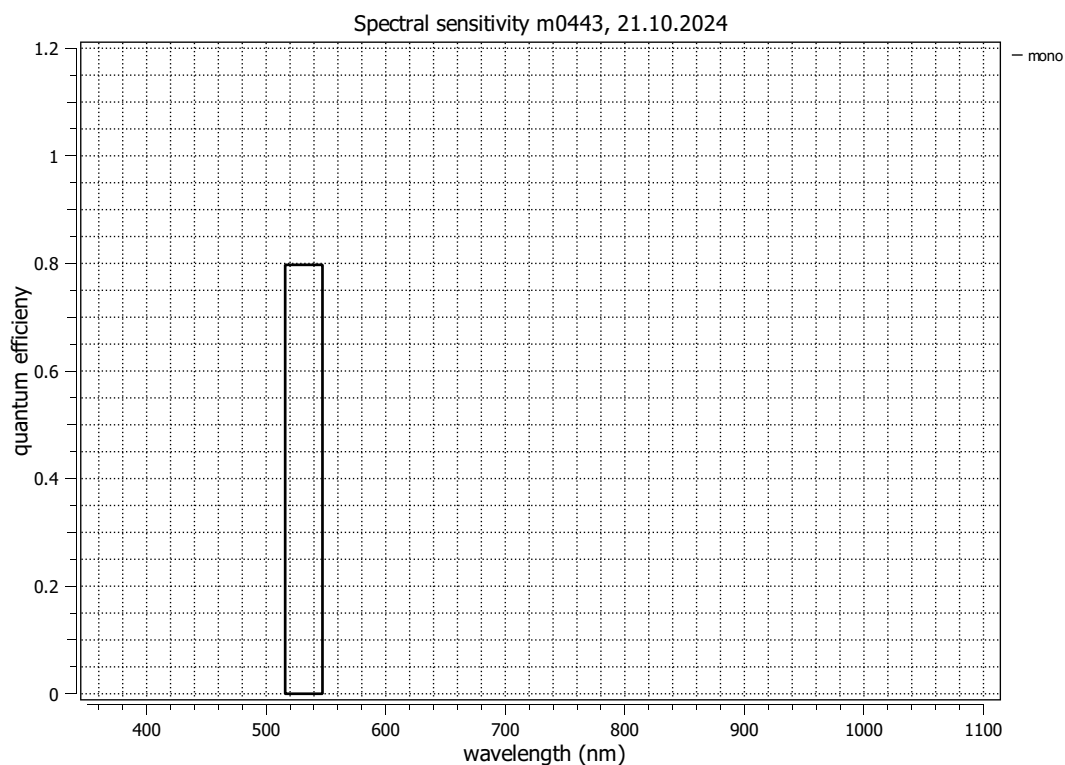
This data sheet describes the specification according to the standard 1288 Release 4.0 Linear issued on 21 June 2021 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" by the European Machine Vision Association (EMVA), published at <https://www.emva.org/standards-technology/emva-1288/> with proprietary extensions from AEON. The measurements were performed with the AEON ACC2b RGB-IR, Release 9, 31.10.2023, SN 0032(AMETEK), software version 2.0.

Measurements performed by Vision Research.

Type of data presented	Single
Vendor	Vision Research
Model	Phantom TMX 7510
Serial number	441
Sensor diagonal	27.62 mm
Lens category	F-Mount
Resolution	640 × 384, 12 bit
Offset/Size used	0 × 0/ 640 × 384
Pixel size (h×v)	37.00 μm × 37.00 μm
Sensor	Vision Research Proprietary
Sensor type	CMOS
Shutter type	Global
Overlap cap.	Overlapping
Max. frame rate	308823.0 Hz
Interface type	Ethernet

Nr.	Centroid/FWHM	Gain, blacklevel	t_{exp} (ms)
1	531.5/31.2 nm	1 / 0.4%	0.0100

Optional data measured: None

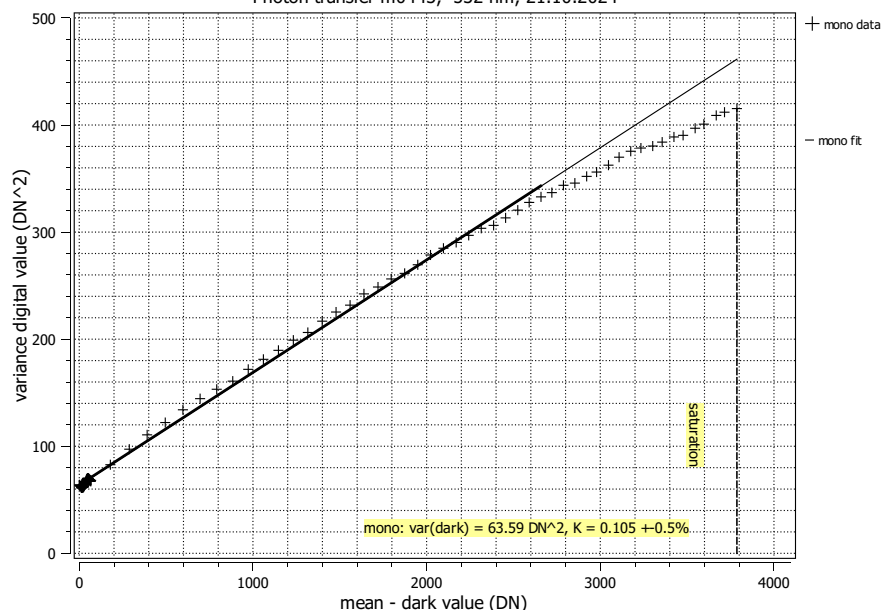


Summary Sheet for Operation Point 1 at a Wavelength of 532 nm

Type of data	Single	Gain, black-level	1 / 0.4%
Exposure control	By irradiance	Environmental temperature	25.8°C
Exposure time	10.000 us	Camera body temperature	32.1°C
Frame rate	1000.0 Hz	Internal temperature(s)	—
Data transfer mode	Mono 12 (Binning R3C)	Wavelength, centr., FWHM	532 nm, 31.2 nm

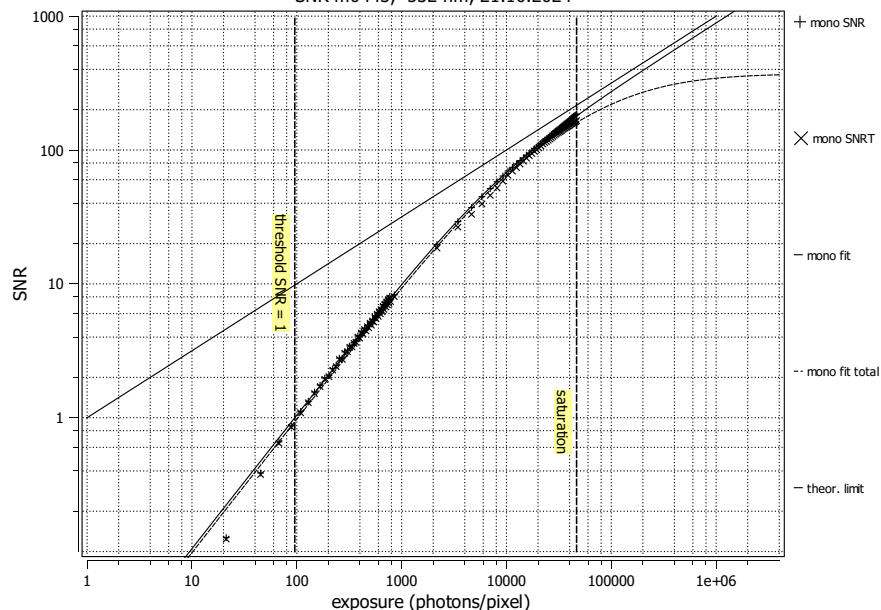
Photon Transfer

Photon transfer m0443, 532 nm, 21.10.2024



Signal-to-Noise Ratio

SNR m0443, 532 nm, 21.10.2024



Quantum efficiency

η 79.7%

Overall system gain

K 0.1051 DN/e⁻

$1/K$ 9.510 e⁻/DN

Temporal dark noise

σ_d 75.8 e⁻

$\sigma_{y,\text{dark}}$ 7.97 DN

Signal-to-noise ratio

SNR_{max} 192.9

45.7 dB

$1/\text{SNR}_{\text{max}}$ 0.518 %

Absolute sensitivity threshold

$\mu_{e,\text{min}}$ 76.3 e⁻

$\mu_{e,\text{min},\text{area}}$ 0.0558 e⁻/μm²

Saturation capacity

$\mu_{e,\text{sat}}$ 37199 e⁻

$\mu_{e,\text{sat},\text{area}}$ 27 e⁻/μm²

Dynamic range

DR 487

53.76 dB

Spatial nonuniformities

DSNU₁₂₈₈ 29.3 e⁻

DSNU_{1288.col} 0.6 e⁻

DSNU_{1288.row} 1.8 e⁻

DSNU_{1288.pix} 29.2 e⁻

PRNU₁₂₈₈ 0.268 %

PRNU_{1288.col} 0.086 %

PRNU_{1288.row} 0.062 %

PRNU_{1288.pix} 0.246 %

Linearity error

LE 1.29%

Dark current

$\mu_{c,\text{mean}}$ 195787 e⁻/s

$\mu_{c,\text{var}}$ 287453 e⁻/s

EMVA 1288 Data Sheet m0444

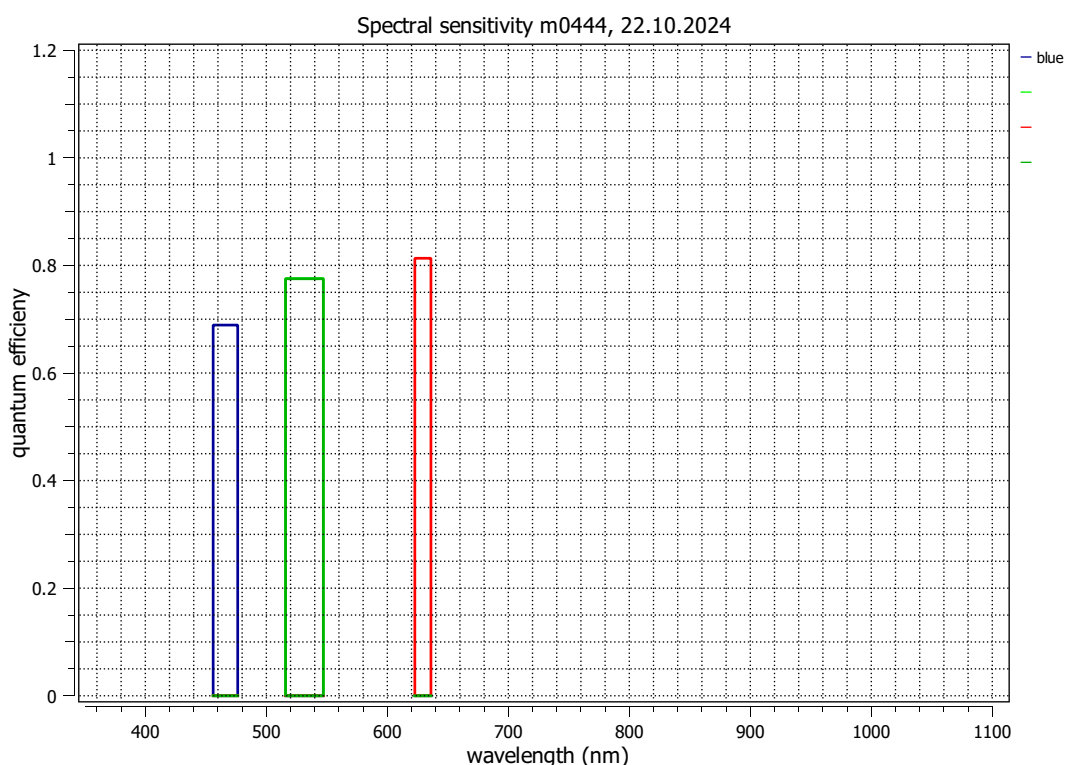
This data sheet describes the specification according to the standard 1288 Release 4.0 Linear issued on 21 June 2021 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" by the European Machine Vision Association (EMVA), published at <https://www.emva.org/standards-technology/emva-1288/> with proprietary extensions from AEON. The measurements were performed with the AEON ACC2b RGB-IR, Release 9, 31.10.2023, SN 0032(AMETEK), software version 2.0.

Measurements performed by Vision Research.

Type of data presented	Single
Vendor	Vision Research
Model	Phantom TMX 7510
Serial number	433
Sensor diagonal	27.92 mm
Lens category	F-Mount
Resolution	1280 × 800, 12 bit
Offset/Size used	0 × 0/ 1280 × 800
Pixel size (h×v)	18.50 μm × 18.50 μm
Sensor	Vision Research Proprietary
Sensor type	CMOS
Shutter type	Global
Overlap cap.	Overlapping
Max. frame rate	76086.0 Hz
Interface type	Ethernet

Nr.	Centroid/FWHM	Gain, blacklevel	t_{exp} (ms)
1	466.2/20.3 nm	1 / 0.4%	0.0200
2	531.5/31.2 nm	1 / 0.4%	0.0200
3	629.4/13.3 nm	1 / 0.4%	0.0200

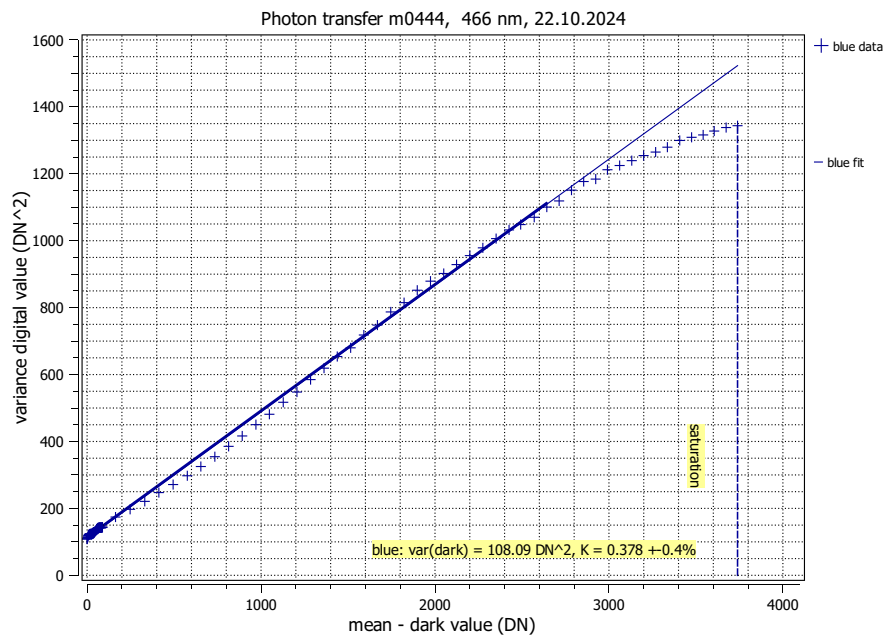
Optional data measured: None



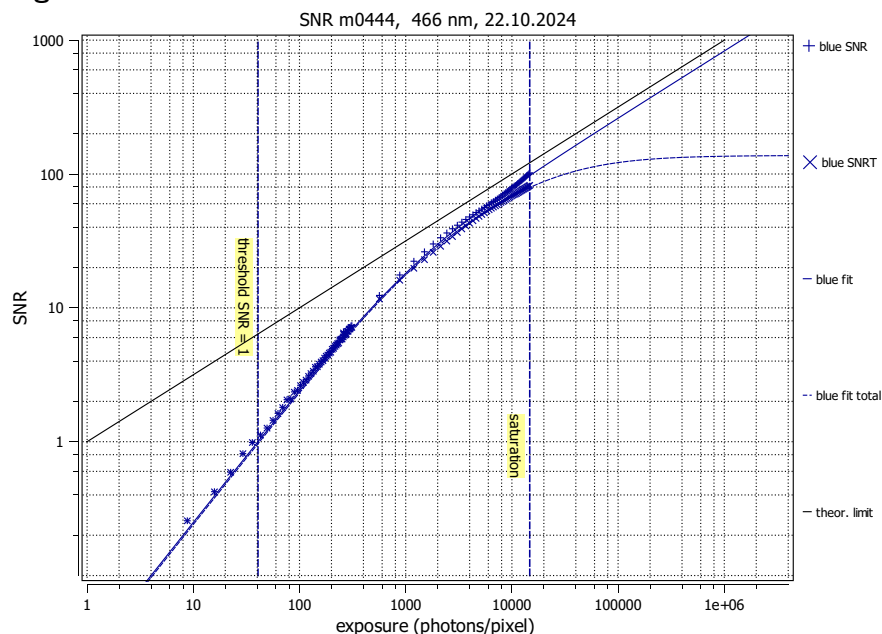
Summary Sheet for Operation Point 1 at a Wavelength of 466 nm

Type of data	Single	Gain, black-level	1 / 0.4%
Exposure control	By irradiance	Environmental temperature	26.0°C
Exposure time	20.000 us	Camera body temperature	29.2°C
Frame rate	1000.0 Hz	Internal temperature(s)	—
Data transfer mode	Color 12 (R3C)	Wavelength, centr., FWHM	466 nm, 20.3 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η 68.9%

Overall system gain

K 0.3778 DN/e⁻

$1/K$ 2.647 e⁻/DN

Temporal dark noise

σ_d 27.5 e⁻

$\sigma_{y,\text{dark}}$ 10.4 DN

Signal-to-noise ratio

SNR_{max} 100.7

40.1 dB

$1/\text{SNR}_{\text{max}}$ 0.993 %

Absolute sensitivity threshold

$\mu_{e,\text{min}}$ 28.0 e⁻

$\mu_{e,\text{min},\text{area}}$ 0.0819 e⁻/μm²

Saturation capacity

$\mu_{e,\text{sat}}$ 10145 e⁻

$\mu_{e,\text{sat},\text{area}}$ 30 e⁻/μm²

Dynamic range

DR 362

51.17 dB

Spatial nonuniformities

DSNU₁₂₈₈ 7.44 e⁻

DSNU_{1288.col} 0.10 e⁻

DSNU_{1288.row} 0.23 e⁻

DSNU_{1288.pix} 7.43 e⁻

PRNU₁₂₈₈ 0.727 %

PRNU_{1288.col} 0.077 %

PRNU_{1288.row} 0.133 %

PRNU_{1288.pix} 0.710 %

Linearity error

LE 0.50%

Dark current

$\mu_{c,\text{mean}}$ 43497 e⁻/s

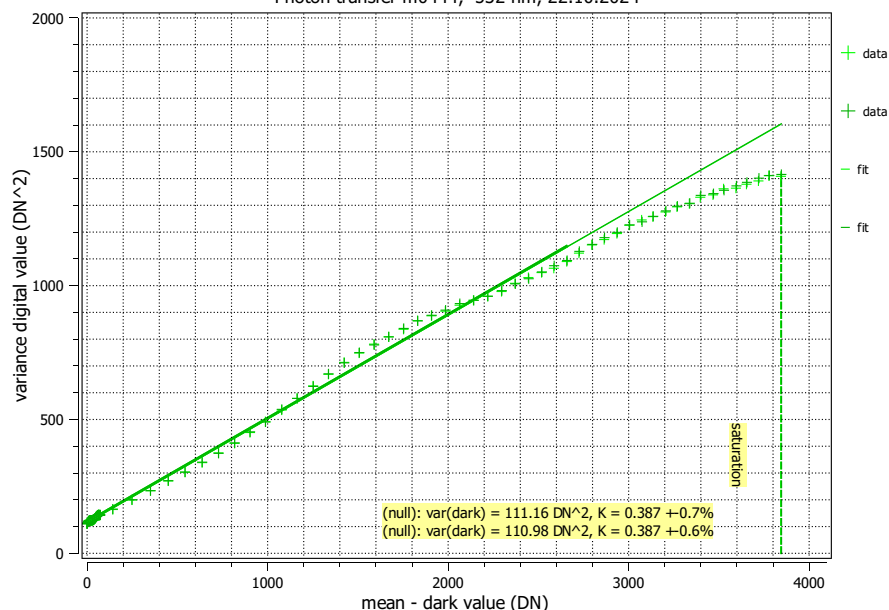
$\mu_{c,\text{var}}$ 50073 e⁻/s

Summary Sheet for Operation Point 2 at a Wavelength of 532 nm

Type of data	Single	Gain, black-level	1 / 0.4%
Exposure control	By irradiance	Environmental temperature	26.0°C
Exposure time	20.000 us	Camera body temperature	29.2°C
Frame rate	1000.0 Hz	Internal temperature(s)	—
Data transfer mode	Color 12 (R3C)	Wavelength, centr., FWHM	532 nm, 31.2 nm

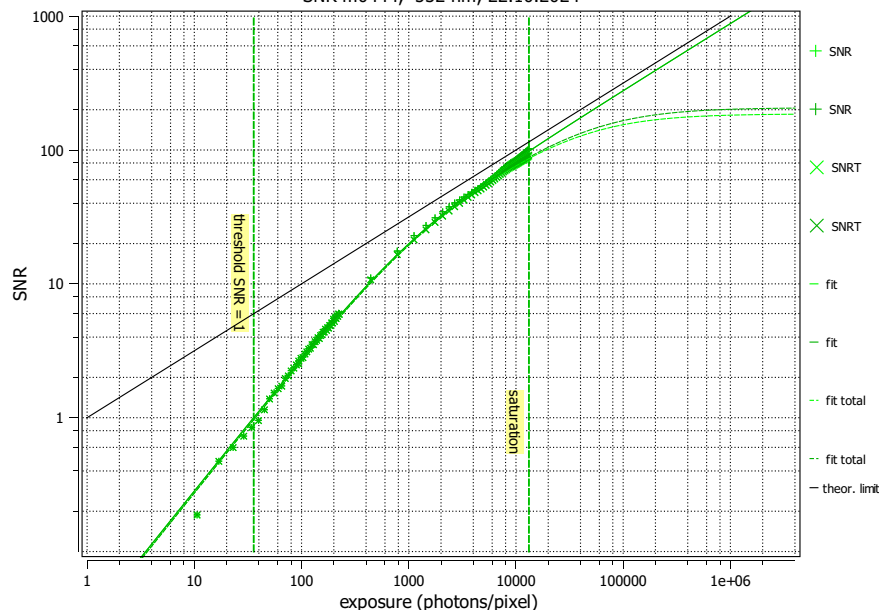
Photon Transfer

Photon transfer m0444, 532 nm, 22.10.2024



Signal-to-Noise Ratio

SNR m0444, 532 nm, 22.10.2024



Quantum efficiency

η 77.6%

Overall system gain

K 0.3867 DN/e⁻

$1/K$ 2.586 e⁻/DN

Temporal dark noise

σ_d 27.3 e⁻

$\sigma_{y,\text{dark}}$ 10.5 DN

Signal-to-noise ratio

SNR_{max} 101.2

40.1 dB

$1/\text{SNR}_{\text{max}}$ 0.988 %

Absolute sensitivity threshold

$\mu_{e,\text{min}}$ 27.8 e⁻

$\mu_{e,\text{min},\text{area}}$ 0.0811 e⁻/μm²

Saturation capacity

$\mu_{e,\text{sat}}$ 10241 e⁻

$\mu_{e,\text{sat},\text{area}}$ 30 e⁻/μm²

Dynamic range

DR 369

51.34 dB

Spatial nonuniformities

DSNU_{1288} 7.36 e⁻

$\text{DSNU}_{1288,\text{col}}$ 0.11 e⁻

$\text{DSNU}_{1288,\text{row}}$ 0.24 e⁻

$\text{DSNU}_{1288,\text{pix}}$ 7.35 e⁻

PRNU_{1288} 0.537 %

$\text{PRNU}_{1288,\text{col}}$ 0.041 %

$\text{PRNU}_{1288,\text{row}}$ 0.108 %

$\text{PRNU}_{1288,\text{pix}}$ 0.524 %

Linearity error

LE 0.76%

Dark current

$\mu_{c,\text{mean}}$ 42442 e⁻/s

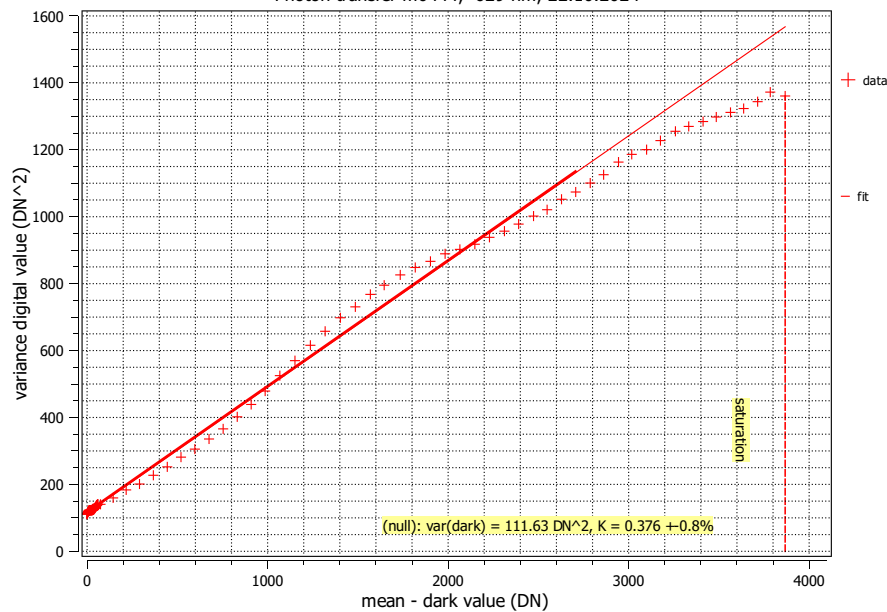
$\mu_{c,\text{var}}$ 47704 e⁻/s

Summary Sheet for Operation Point 3 at a Wavelength of 629 nm

Type of data	Single	Gain, black-level	1 / 0.4%
Exposure control	By irradiance	Environmental temperature	25.9°C
Exposure time	20.000 us	Camera body temperature	29.2°C
Frame rate	1000.0 Hz	Internal temperature(s)	—
Data transfer mode	Color 12 (R3C)	Wavelength, centr., FWHM	629 nm, 13.3 nm

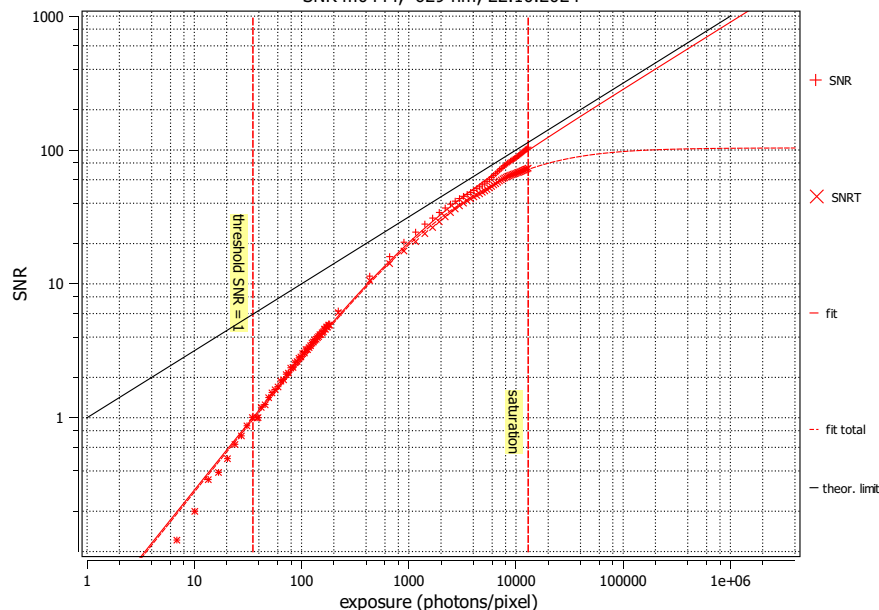
Photon Transfer

Photon transfer m0444, 629 nm, 22.10.2024



Signal-to-Noise Ratio

SNR m0444, 629 nm, 22.10.2024



Quantum efficiency

η 81.3%

Overall system gain

K 0.3757 DN/e⁻

$1/K$ 2.662 e⁻/DN

Temporal dark noise

σ_d 28.1 e⁻

$\sigma_{y,\text{dark}}$ 10.6 DN

Signal-to-noise ratio

SNR_{max} 102.8

40.2 dB

$1/\text{SNR}_{\text{max}}$ 0.972 %

Absolute sensitivity threshold

$\mu_{e,\text{min}}$ 28.6 e⁻

$\mu_{e,\text{min},\text{area}}$ 0.0836 e⁻/μm²

Saturation capacity

$\mu_{e,\text{sat}}$ 10575 e⁻

$\mu_{e,\text{sat},\text{area}}$ 31 e⁻/μm²

Dynamic range

DR 369

51.35 dB

Spatial nonuniformities

DSNU₁₂₈₈ 7.56 e⁻

DSNU_{1288.col} 0.12 e⁻

DSNU_{1288.row} 0.21 e⁻

DSNU_{1288.pix} 7.55 e⁻

PRNU₁₂₈₈ 0.965 %

PRNU_{1288.col} 0.032 %

PRNU_{1288.row} 0.047 %

PRNU_{1288.pix} 0.962 %

Linearity error

LE 0.53%

Dark current

$\mu_{c,\text{mean}}$ 42233 e⁻/s

$\mu_{c,\text{var}}$ 47859 e⁻/s