EMVA 1288 Data Sheet mACC200166

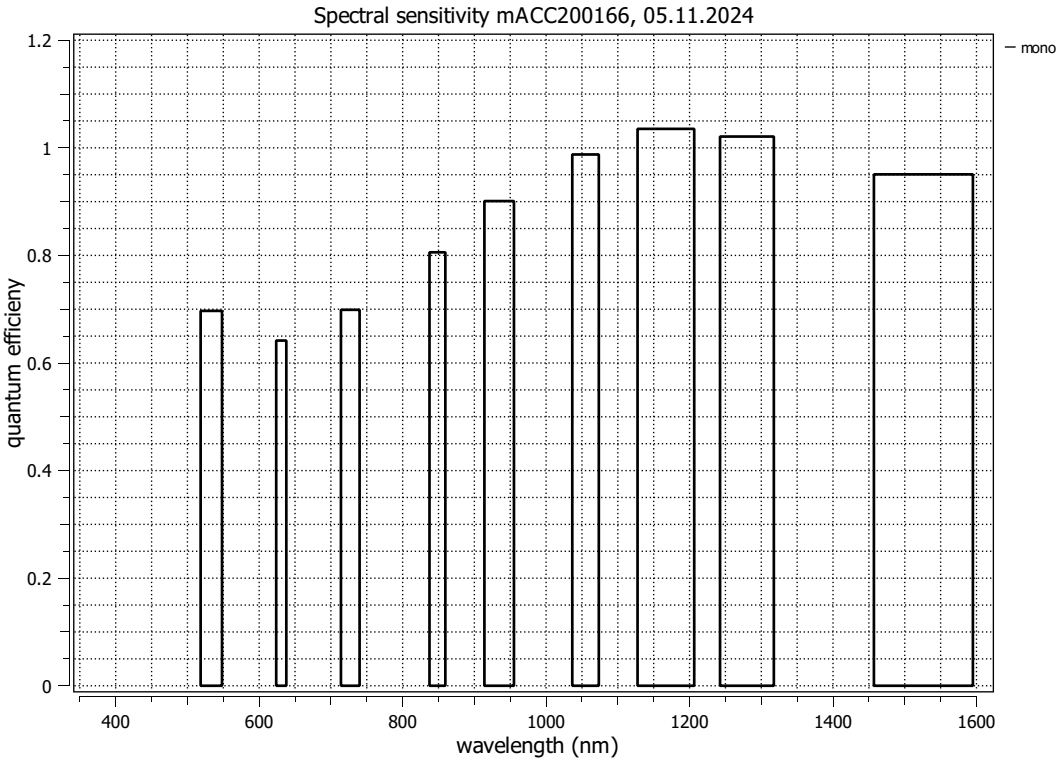
This data sheet describes the specification according to the standard 1288 Release 4.0 Linear issued on 21 June 2021 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" by the European Machine Vision Association (EMVA), published at `https://www.emva.org/standards-technology/emva-1288/` with proprietary extensions from AEON. The measurements were performed with the AEON ACC2b 14x1 color, Release 9, 13.11.2020, SN 0068(Baumer), software version 2.0.

Measurements performed by Baumer Optronic GmbH. The product features and technical data specified do not express or imply any warranty. Technical modifications subject to change.

Type of data presented	Single
Vendor	Baumer
Model	VCXG-03SWIR.XC
Serial number	700011504627
Sensor diagonal	4.19 mm
Lens category	C-Mount
Resolution	656 × 520, 12 bit
Offset/Size used	0 × 0/ 656 × 520
Pixel size (h×v)	5.00 μm × 5.00 μm
Sensor	Sony IMX991
Sensor type	CMOS
Shutter type	Global shutter
Overlap cap.	Overlapped
Max. frame rate	0.0 Hz
Interface type	GEV

Nr.	Centroid/FWHM	Gain, blacklevel	t_{exp} (ms)
1	533.3/29.8 nm	1.0 / 43.0	12.5
2	630.8/14.1 nm	1.0 / 43.0	6.27
3	727.0/26.0 nm	1.0 / 43.0	6.27
4	848.5/22.1 nm	1.0 / 43.0	4.50
5	934.6/41.2 nm	1.0 / 43.0	3.14
6	1055.0/37.0 nm	1.0 / 43.0	6.27
7	1167.0/79.0 nm	1.0 / 43.0	37.5
8	1280.0/75.0 nm	1.0 / 43.0	25.0
9	1526.0/138.0 nm	1.0 / 43.0	27.0

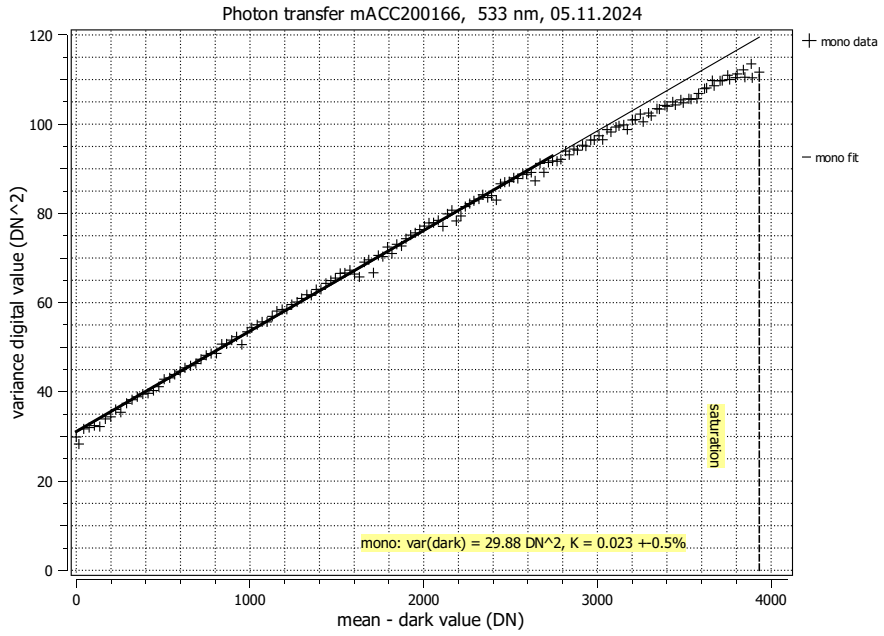
Optional data measured: None



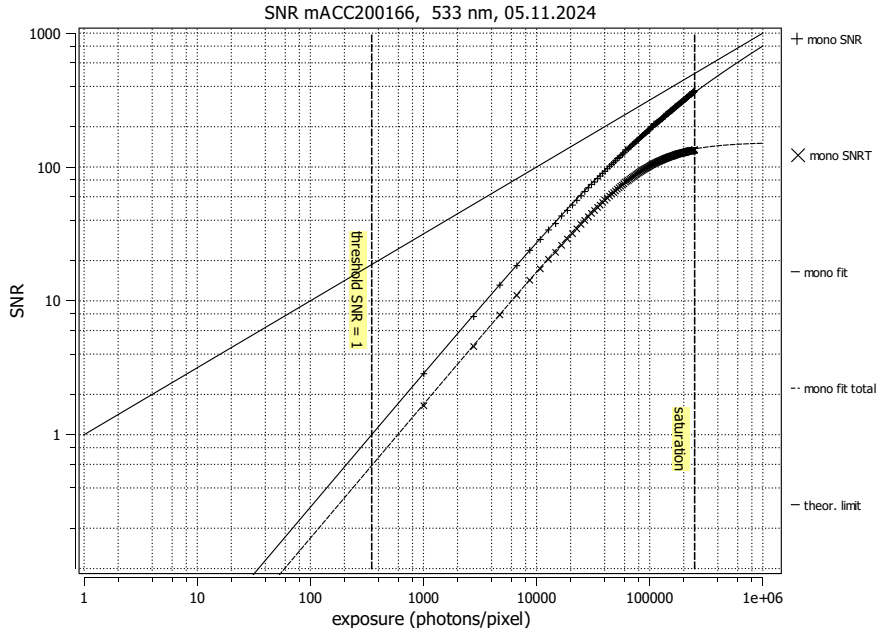
Summary Sheet for Operation Point 1 at a Wavelength of 533 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.5°C
Exposure time	12.515 ms	Camera body temperature	22.6°C
Frame rate	10.0 Hz	Internal temperature(s)	33.3°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	533 nm, 29.8 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	69.7%

Overall system gain

K	0.02254 DN/e$^-$
$1/K$	44.37 e$^-$/DN

Temporal dark noise

σ_d	242 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.47 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	417.1
	52.4 dB
$1/\mathrm{SNR}_{\max}$	0.240 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	243 e$^-$
$\mu_{e.\mathrm{min.area}}$	9.72 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	173968 e$^-$
$\mu_{e.\mathrm{sat.area}}$	6959 e$^-$/μm^2

Dynamic range

DR	716
	57.10 dB

Spatial nonuniformities

DSNU_{1288}	334 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	19 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	333 e$^-$
PRNU_{1288}	0.651 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	-0.003 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.649 %

Linearity error

LE	0.17%

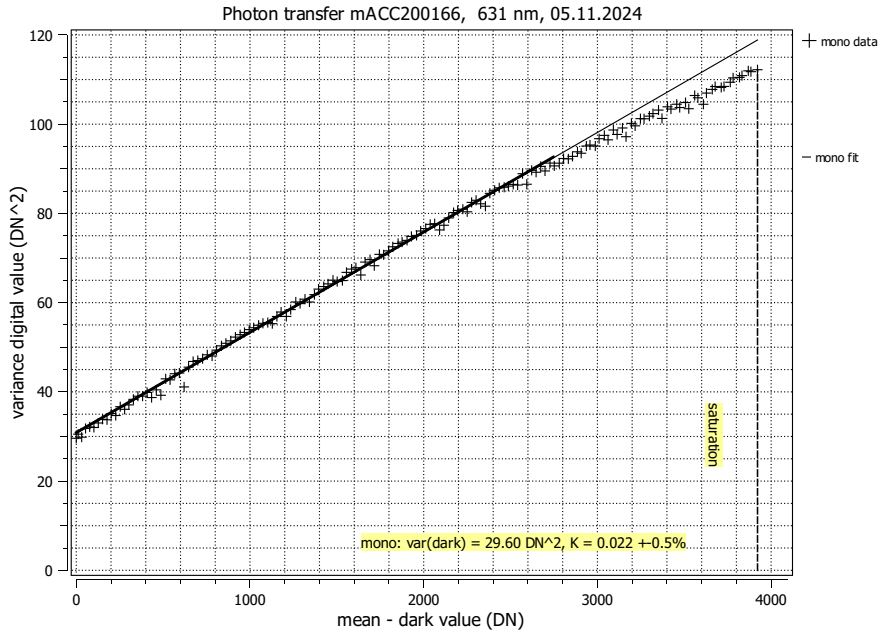
Dark current

$\mu_{c.\mathrm{mean}}$	11.7 e$^-$/s
$\mu_{c.\mathrm{var}}$	-5166 e$^-$/s

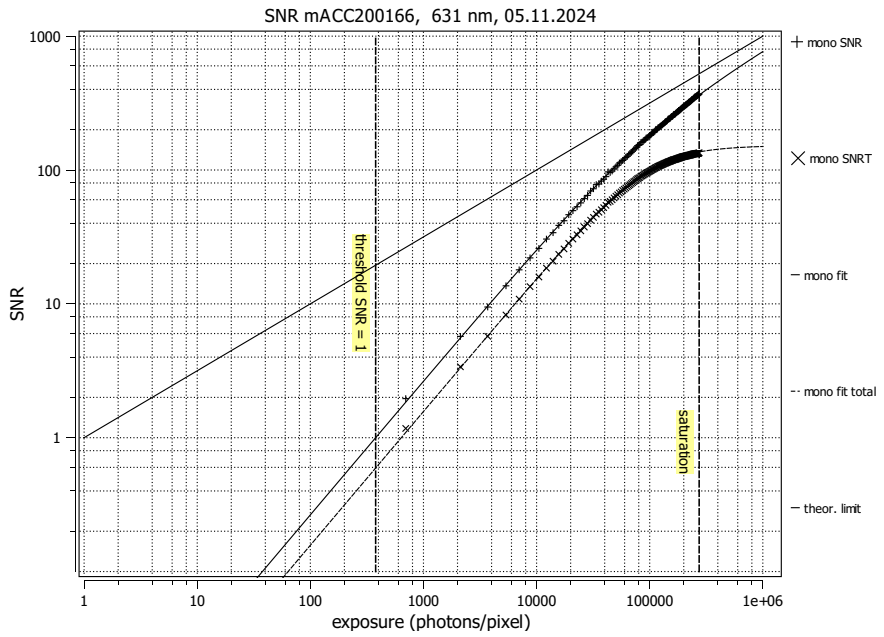
Summary Sheet for Operation Point 2 at a Wavelength of 631 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.5°C
Exposure time	6.268 ms	Camera body temperature	22.6°C
Frame rate	10.0 Hz	Internal temperature(s)	33.3°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	631 nm, 14.1 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	64.2%

Overall system gain

K	0.022488 DN/e$^-$
$1/K$	44.47 e$^-$/DN

Temporal dark noise

σ_d	242 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.44 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\mathrm{max}}$	419.1
	52.4 dB
$1/\mathrm{SNR}_{\mathrm{max}}$	0.239 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	242 e$^-$
$\mu_{e.\mathrm{min.area}}$	9.70 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	175626 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7025 e$^-$/μm^2

Dynamic range

DR	724
	57.20 dB

Spatial nonuniformities

DSNU_{1288}	329 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	19 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	328 e$^-$
PRNU_{1288}	0.652 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	0.001 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.651 %

Linearity error

LE	0.20%

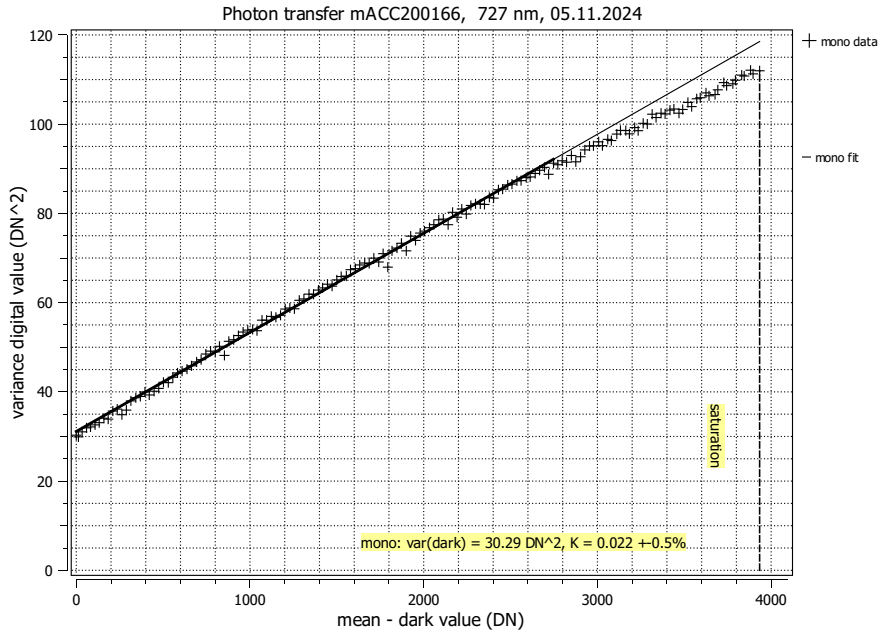
Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

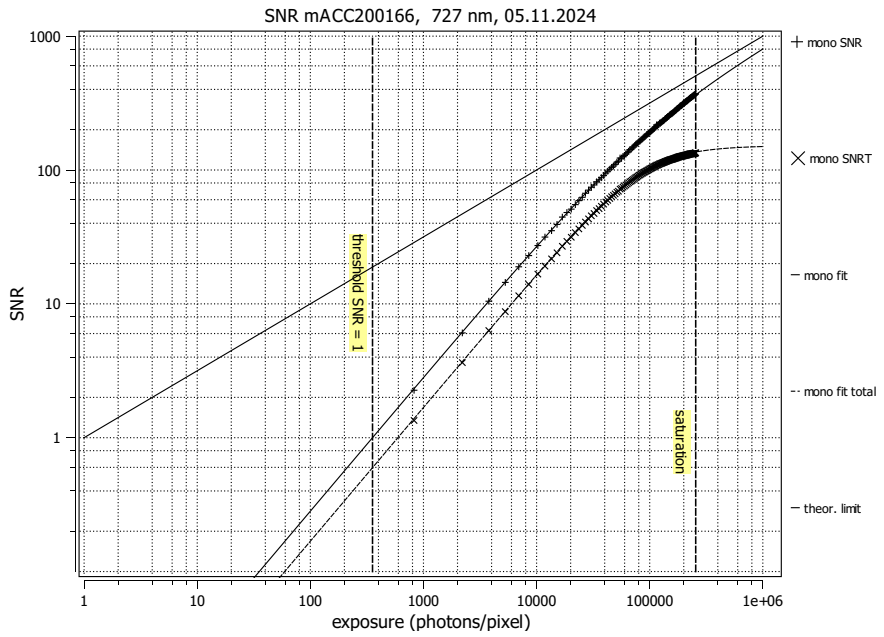
Summary Sheet for Operation Point 3 at a Wavelength of 727 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.5°C
Exposure time	6.268 ms	Camera body temperature	22.7°C
Frame rate	10.0 Hz	Internal temperature(s)	33.4°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	727 nm, 26.0 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	69.9%

Overall system gain

K	0.022259 DN/e$^-$
$1/K$	44.93 e$^-$/DN

Temporal dark noise

σ_d	247 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.50 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	422.2
	52.5 dB
$1/\mathrm{SNR}_{\max}$	0.237 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	248 e$^-$
$\mu_{e.\mathrm{min.area}}$	9.91 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	178285 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7131 e$^-$/μm^2

Dynamic range

DR	720
	57.14 dB

Spatial nonuniformities

DSNU_{1288}	333 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	19 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	332 e$^-$
PRNU_{1288}	0.654 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	0.002 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.653 %

Linearity error

LE	0.28%

Dark current

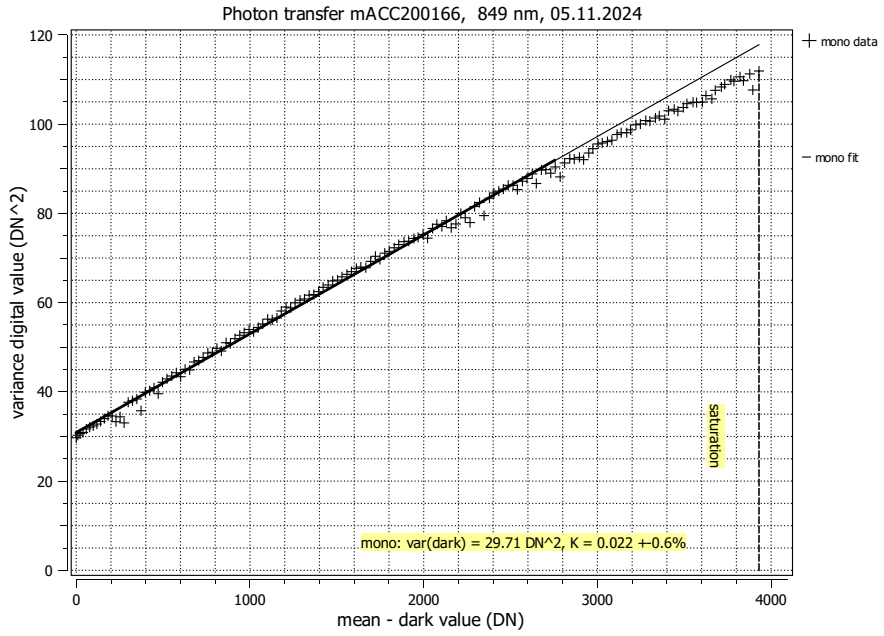
$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

Release 4.0 Linear issued on 21 June 2021

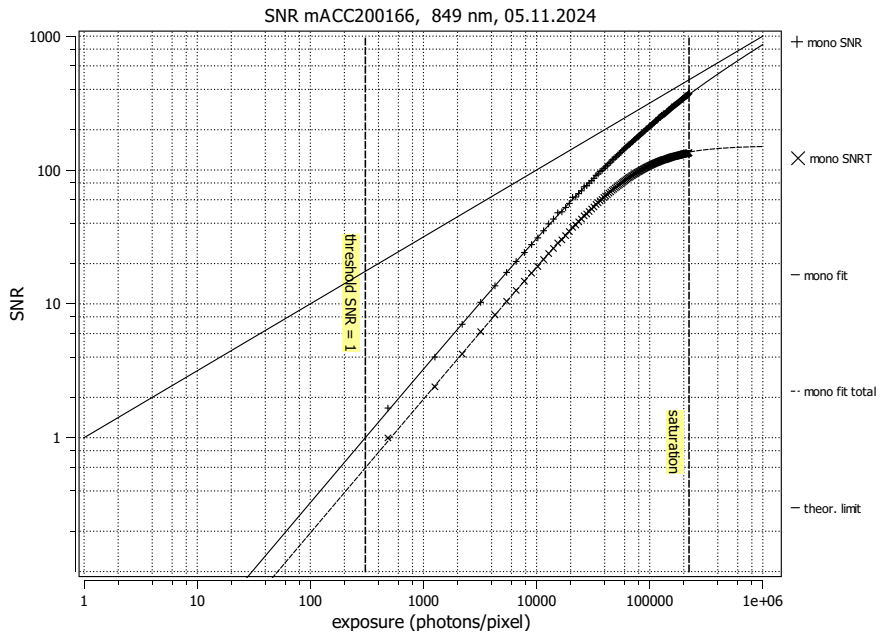
Summary Sheet for Operation Point 4 at a Wavelength of 849 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.5°C
Exposure time	4.500 ms	Camera body temperature	22.7°C
Frame rate	10.0 Hz	Internal temperature(s)	33.4°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	849 nm, 22.1 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	80.6%

Overall system gain

K	0.022126 DN/e$^-$
$1/K$	45.20 e$^-$/DN

Temporal dark noise

σ_d	246 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.45 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	423.6
	52.5 dB
$1/\mathrm{SNR}_{\max}$	0.236 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	247 e$^-$
$\mu_{e.\mathrm{min.area}}$	9.87 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	179441 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7178 e$^-$/μm^2

Dynamic range

DR	727
	57.23 dB

Spatial nonuniformities

DSNU_{1288}	333 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	2 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	19 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	333 e$^-$
PRNU_{1288}	0.656 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	-0.001 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.655 %

Linearity error

LE	0.32%

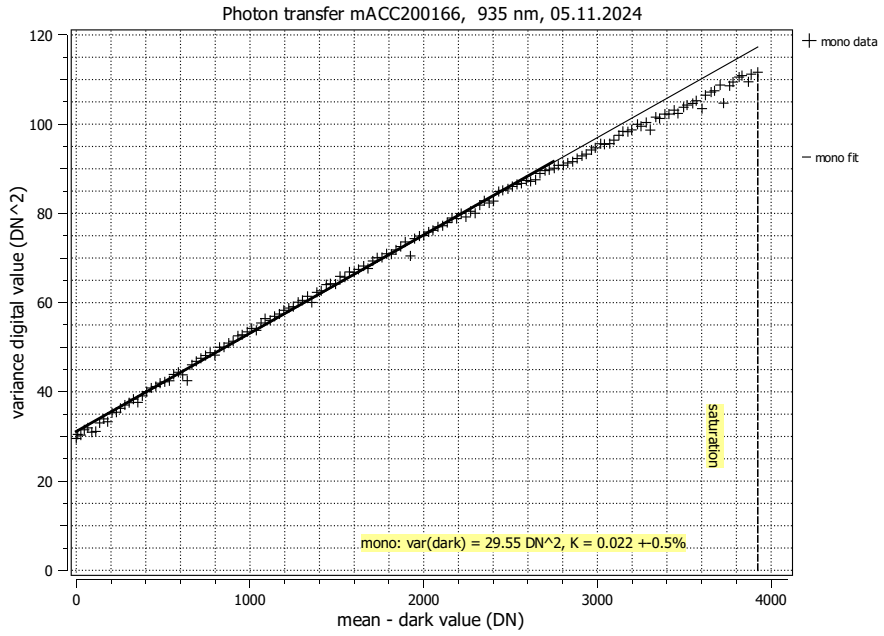
Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

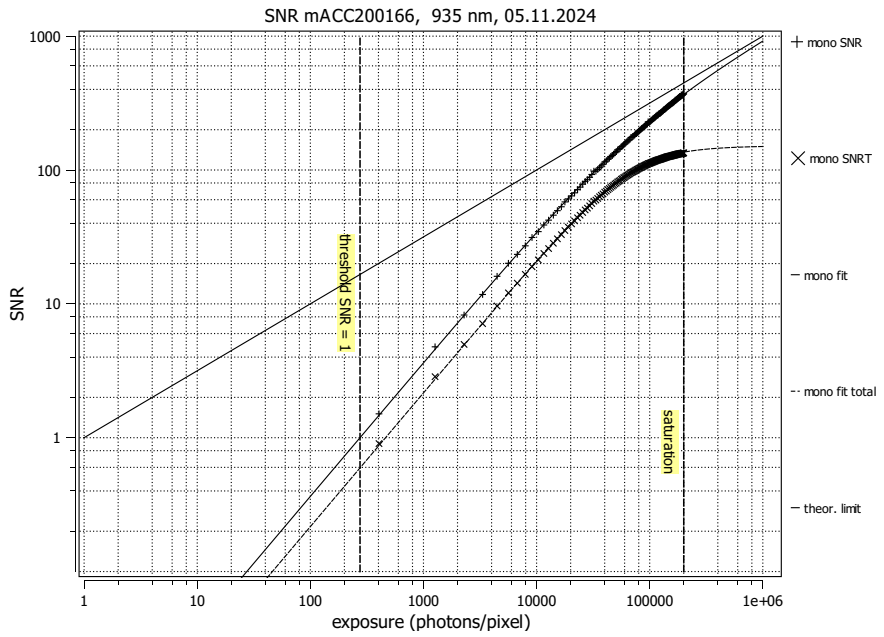
Summary Sheet for Operation Point 5 at a Wavelength of 935 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.7°C
Exposure time	3.144 ms	Camera body temperature	22.8°C
Frame rate	10.0 Hz	Internal temperature(s)	33.5°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	935 nm, 41.2 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	90.1%

Overall system gain

K	0.021992 DN/e$^-$
$1/K$	45.47 e$^-$/DN

Temporal dark noise

σ_d	247 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.44 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	424.5
	52.6 dB
$1/\mathrm{SNR}_{\max}$	0.236 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	248 e$^-$
$\mu_{e.\mathrm{min.area}}$	9.91 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	180232 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7209 e$^-$/μm^2

Dynamic range

DR	728
	57.24 dB

Spatial nonuniformities

DSNU_{1288}	335 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	19 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	334 e$^-$
PRNU_{1288}	0.657 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	-0.004 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.656 %

Linearity error

LE	0.35%

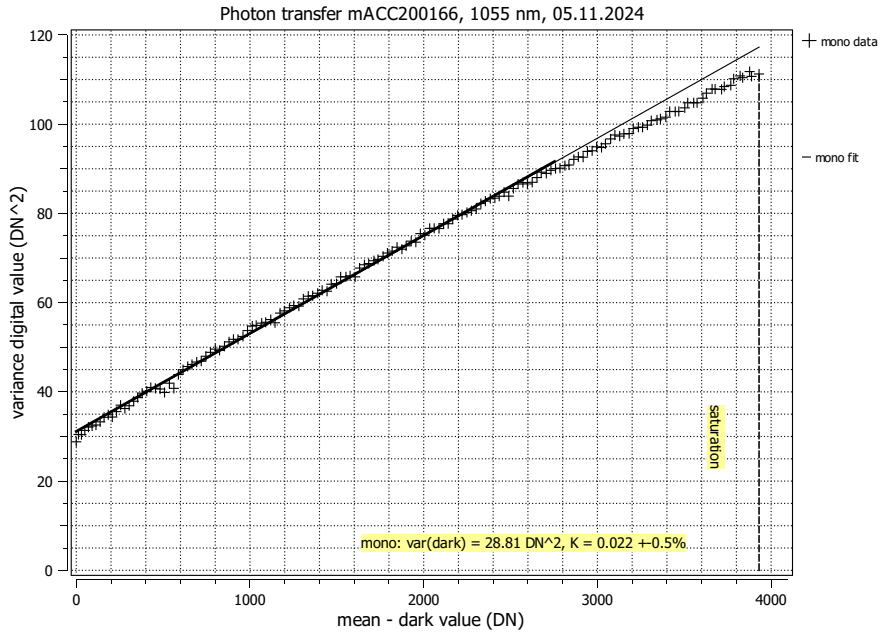
Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

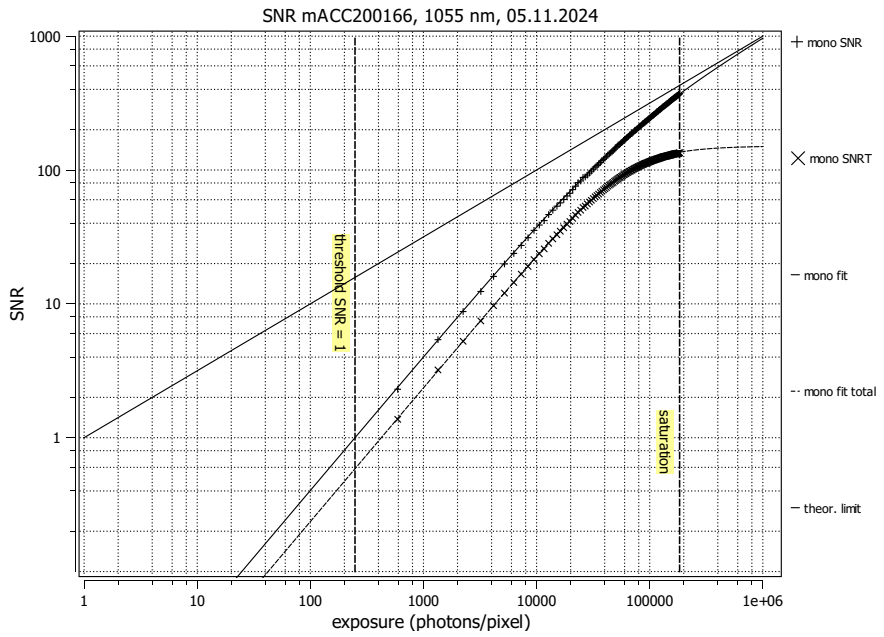
Summary Sheet for Operation Point 6 at a Wavelength of 1055 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.7°C
Exposure time	6.268 ms	Camera body temperature	22.9°C
Frame rate	10.0 Hz	Internal temperature(s)	33.6°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	1055 nm, 37.0 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	98.8%

Overall system gain

K	0.021939 DN/e$^-$
$1/K$	45.58 e$^-$/DN

Temporal dark noise

σ_d	244 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.37 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	426.1
	52.6 dB
$1/\mathrm{SNR}_{\max}$	0.235 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	245 e$^-$
$\mu_{e.\mathrm{min.area}}$	9.81 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	181525 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7261 e$^-$/μm^2

Dynamic range

DR	740
	57.39 dB

Spatial nonuniformities

DSNU_{1288}	339 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	20 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	338 e$^-$
PRNU_{1288}	0.659 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	-0.002 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.658 %

Linearity error

LE	0.44%

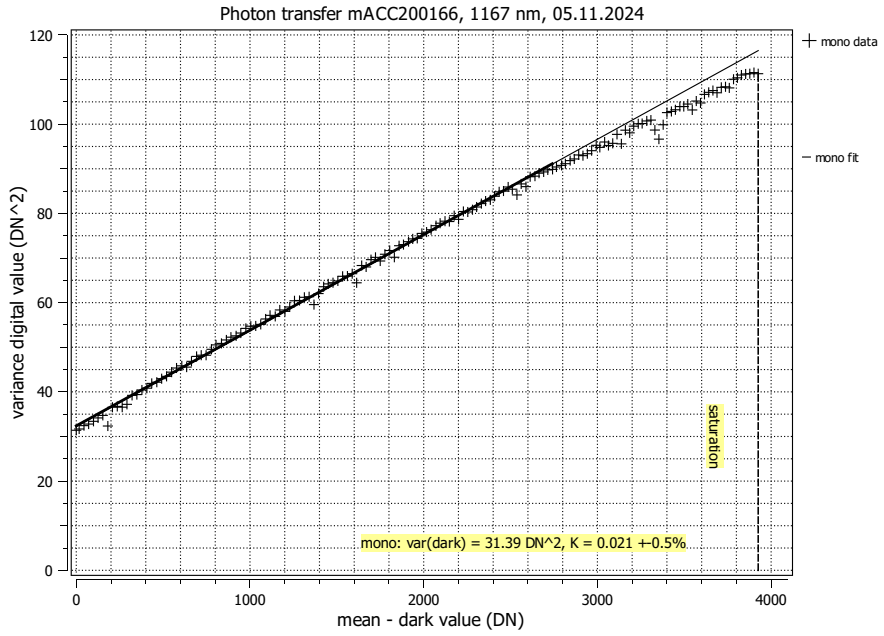
Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

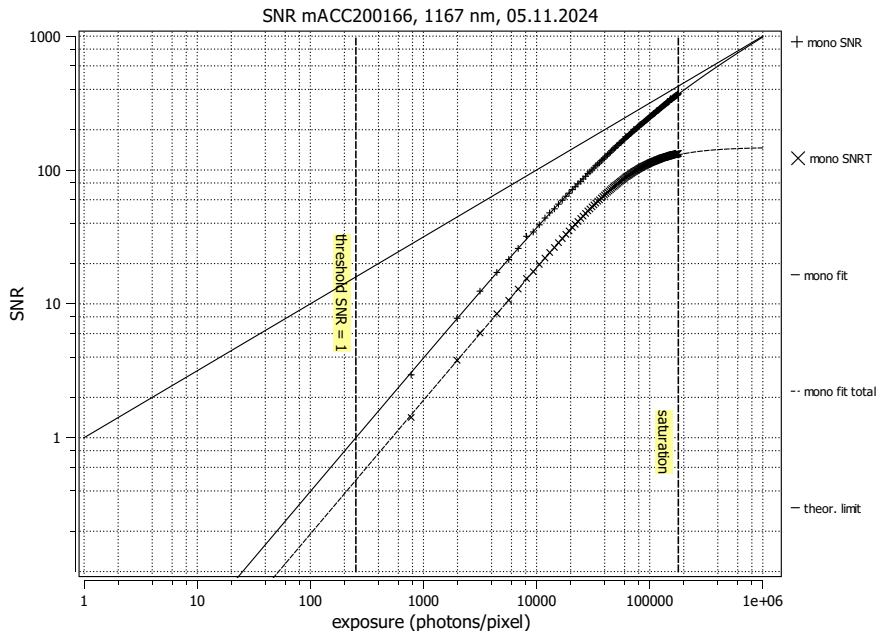
Summary Sheet for Operation Point 7 at a Wavelength of 1167 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	21.8°C
Exposure time	37.505 ms	Camera body temperature	22.9°C
Frame rate	10.0 Hz	Internal temperature(s)	33.7°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	1167 nm, 79.0 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	104%

Overall system gain

K	0.021464 DN/e$^-$
$1/K$	46.59 e$^-$/DN

Temporal dark noise

σ_d	261 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.60 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\mathrm{max}}$	430.6
	52.7 dB
$1/\mathrm{SNR}_{\mathrm{max}}$	0.232 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	262 e$^-$
$\mu_{e.\mathrm{min.area}}$	10.5 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	185390 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7416 e$^-$/μm^2

Dynamic range

DR	709
	57.01 dB

Spatial nonuniformities

DSNU_{1288}	476 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	4 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	20 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	475 e$^-$
PRNU_{1288}	0.674 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	0.003 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.673 %

Linearity error

LE	0.48%

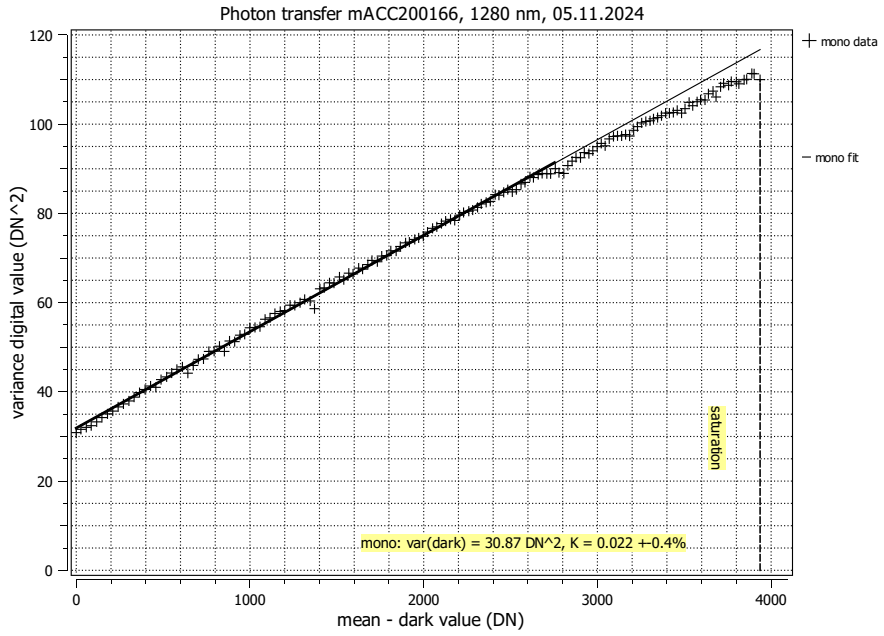
Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

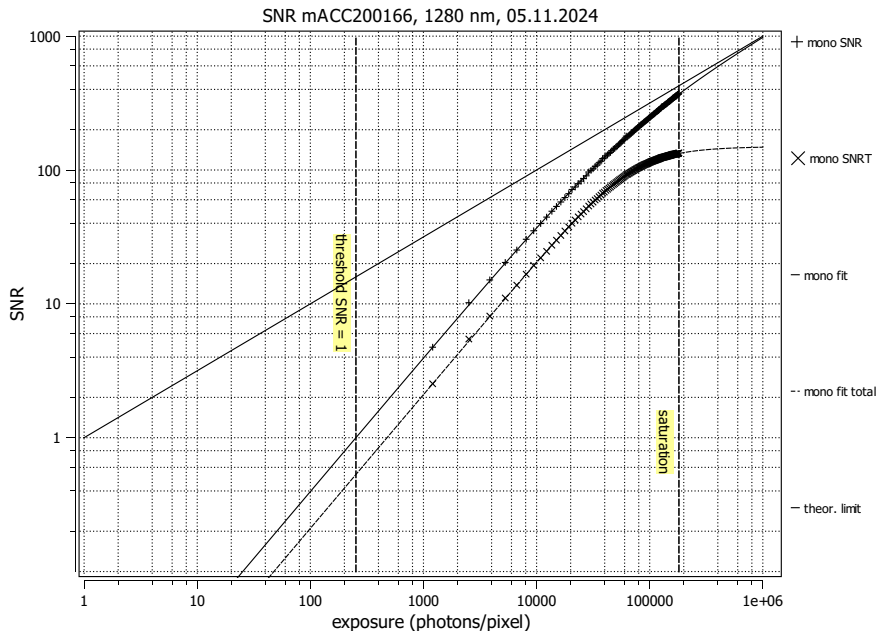
Summary Sheet for Operation Point 8 at a Wavelength of 1280 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	22.0°C
Exposure time	25.010 ms	Camera body temperature	22.9°C
Frame rate	10.0 Hz	Internal temperature(s)	33.8°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	1280 nm, 75.0 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	102%

Overall system gain

K	0.021554 DN/e$^-$
$1/K$	46.40 e$^-$/DN

Temporal dark noise

σ_d	257 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.56 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	430.2
	52.7 dB
$1/\mathrm{SNR}_{\max}$	0.232 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	258 e$^-$
$\mu_{e.\mathrm{min.area}}$	10.3 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	185113 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7405 e$^-$/μm^2

Dynamic range

DR	717
	57.11 dB

Spatial nonuniformities

DSNU_{1288}	412 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	20 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	411 e$^-$
PRNU_{1288}	0.666 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.033 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	0.004 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.665 %

Linearity error

LE	0.50%

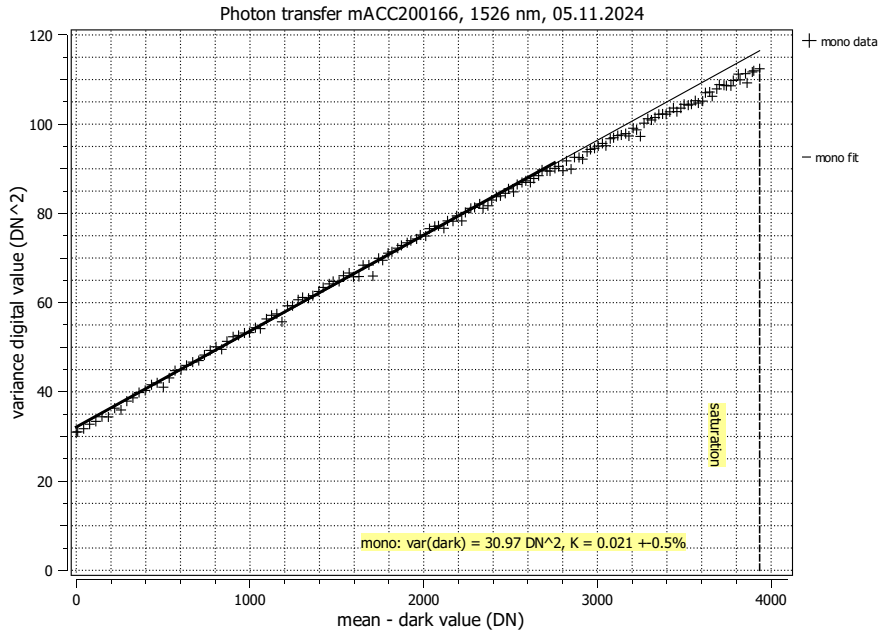
Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s

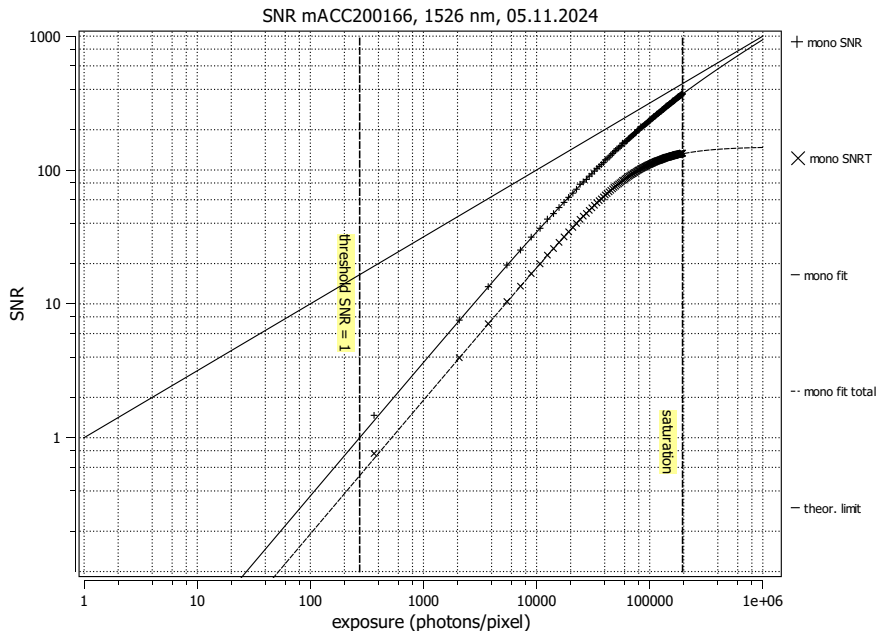
Summary Sheet for Operation Point 9 at a Wavelength of 1526 nm

Type of data	Single	Gain, black-level	1.0 / 43.0
Exposure control	By irradiance	Environmental temperature	22.1°C
Exposure time	27.000 ms	Camera body temperature	23.0°C
Frame rate	10.0 Hz	Internal temperature(s)	33.8°C
Data transfer mode	Mono12	Wavelength, centr., FWHM	1526 nm, 138.0 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	95.1%

Overall system gain

K	0.021491 DN/e$^-$
$1/K$	46.53 e$^-$/DN

Temporal dark noise

σ_d	259 e$^-$
$\sigma_{y.\mathrm{dark}}$	5.57 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	430.8
	52.7 dB
$1/\mathrm{SNR}_{\max}$	0.232 %

Absolute sensitivity threshold

$\mu_{e.\mathrm{min}}$	259 e$^-$
$\mu_{e.\mathrm{min.area}}$	10.4 e$^-$/μm^2

Saturation capacity

$\mu_{e.\mathrm{sat}}$	185569 e$^-$
$\mu_{e.\mathrm{sat.area}}$	7423 e$^-$/μm^2

Dynamic range

DR	715
	57.09 dB

Spatial nonuniformities

DSNU_{1288}	426 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{col}}$	3 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{row}}$	20 e$^-$
$\mathrm{DSNU}_{1288.\mathrm{pix}}$	425 e$^-$
PRNU_{1288}	0.669 %
$\mathrm{PRNU}_{1288.\mathrm{col}}$	0.032 %
$\mathrm{PRNU}_{1288.\mathrm{row}}$	0.002 %
$\mathrm{PRNU}_{1288.\mathrm{pix}}$	0.667 %

Linearity error

LE	0.52%

Dark current

$\mu_{c.\mathrm{mean}}$	— e$^-$/s
$\mu_{c.\mathrm{var}}$	— e$^-$/s