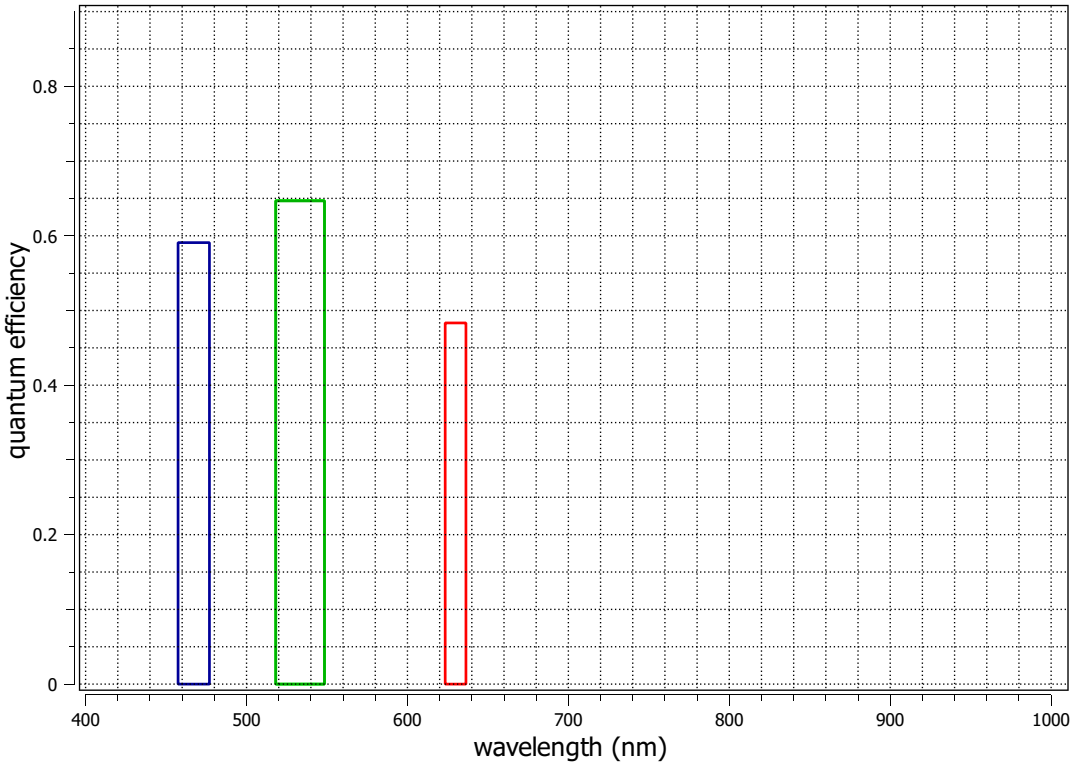
EMVA 1288 Summary Sheet

This datasheet describes the specification according to the standard 1288 release 3.1 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" issued on December 30, 2016 by the European Machine Vision Association (EMVA), published at `www.standard1288.org` and the *zenodo EMVA 1288 community* with proprietary extensions from AEON. The measurements were performed with the AEON ACC3 Release 7, 21.08.2018, SN 0018(AEON).

Measurements performed by Technical and Application Support Center, Baumer Optronic GmbH.

Vendor	Baumer
Model	VCXG.2-65C.R
Serial number	700009821424
Sensor diagonal	8.86 mm
Lens category	C-Mount
Resolution	3072 × 2048, 12 bit
Pixel size (h×v)	2.40 μm × 2.40 μm
Sensor	Sony IMX178
Sensor type	CMOS
Shutter type	Rolling shutter
Overlap cap.	Overlapped
Max. frame rate	0.0 Hz
Interface type	GEV

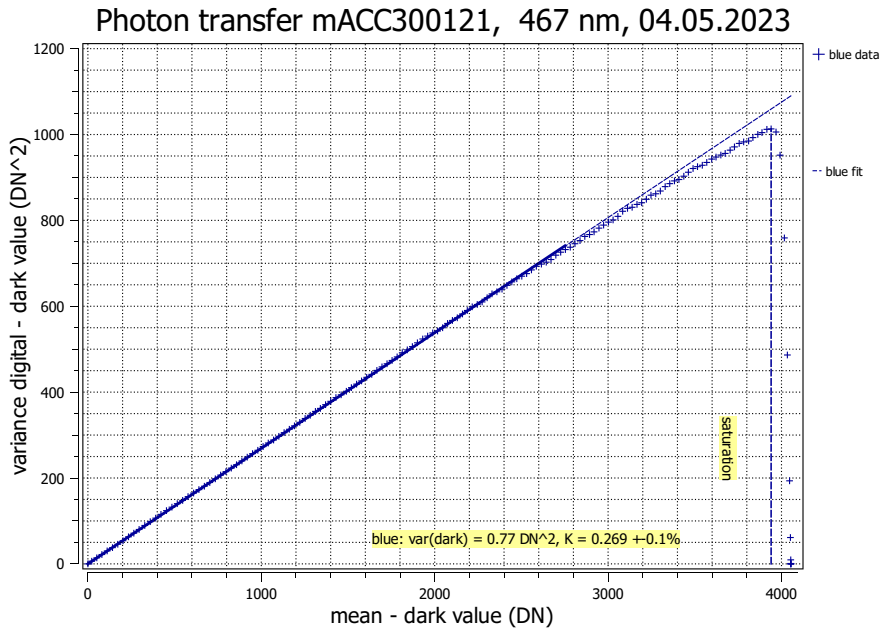
Type of data presented	Single
Operation point 1	
Wavelength centroid	467.2 nm
Wavelength FWHM	19.5 nm
Gain, black-level	1.0 / 40.0
Operation point 2	
Wavelength centroid	533.3 nm
Wavelength FWHM	30.3 nm
Gain, black-level	1.0 / 40.0
Operation point 3	
Wavelength centroid	629.9 nm
Wavelength FWHM	12.9 nm
Gain, black-level	1.0 / 40.0
Optional data measured	
None	



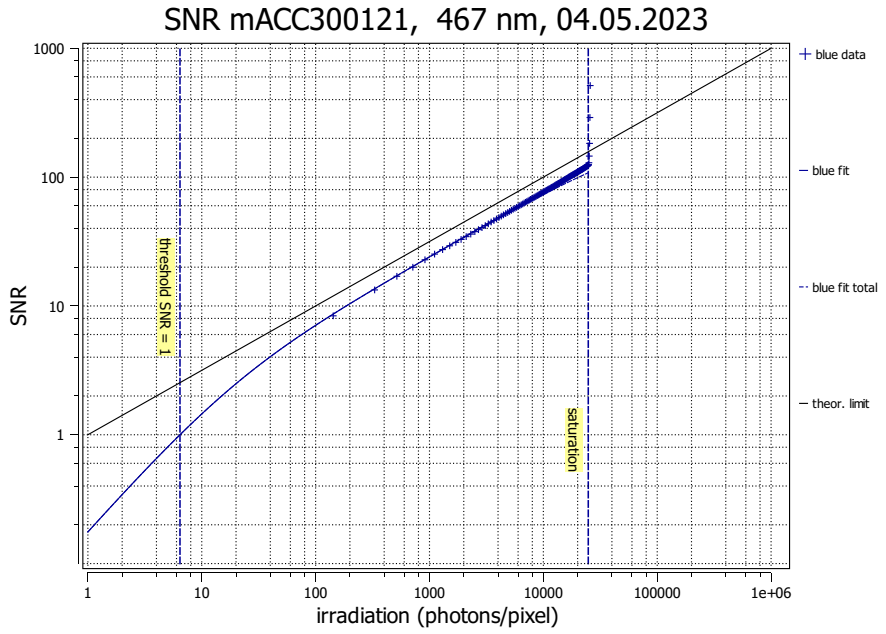
Summary Sheet for Operation Point 1 at a Wavelength of 467 nm

Type of data	Single	Gain, black-level	1.0 / 40.0
Exposure control	By irradiance	Environmental temperature	$25.4°C$
Exposure time	1.60 ms	Camera body temperature	$34.6°C$
Frame rate	9.6 Hz	Internal temperature(s)	—
Data transfer mode	BayerRG12	Wavelength, centr., FWHM	467 nm, 19.5 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	59.1%

Overall system gain

K	$0.269\,\mathrm{DN/e^-}$
$1/K$	$3.719\,\mathrm{e^-/DN}$

Temporal dark noise

σ_d	$3.08\,\mathrm{e^-}$
$\sigma_{y.\mathrm{dark}}$	0.88 DN

Signal-to-noise ratio

$\mathrm{SNR_{max}}$	121
	41.7 dB
	6.9 bit
$1/\mathrm{SNR_{max}}$	0.83 %

Absolute sensitivity threshold

$\mu_{p.\mathrm{min}}$	6.44 p
$\mu_{p.\mathrm{min.area}}$	$1.118\,\mathrm{p}/\mu\mathrm{m}^2$
$\mu_{e.\mathrm{min}}$	$3.80\,\mathrm{e^-}$
$\mu_{e.\mathrm{min.area}}$	$0.660\,\mathrm{e^-}/\mu\mathrm{m}^2$

Saturation capacity

$\mu_{p.\mathrm{sat}}$	24802 p
$\mu_{p.\mathrm{sat.area}}$	$4306\,\mathrm{p}/\mu\mathrm{m}^2$
$\mu_{e.\mathrm{sat}}$	$14654\,\mathrm{e^-}$
$\mu_{e.\mathrm{sat.area}}$	$2544\,\mathrm{e^-}/\mu\mathrm{m}^2$

Dynamic range

DR	3853
	71.7 dB
	11.9 bit

Spatial nonuniformities

$\mathrm{DSNU_{1288}}$	$0.18\,\mathrm{e^-}$
	0.05 DN
$\mathrm{PRNU_{1288}}$	0.41 %

Linearity error

$\mathrm{LE_{min}}$	-0.28%
$\mathrm{LE_{max}}$	0.87%

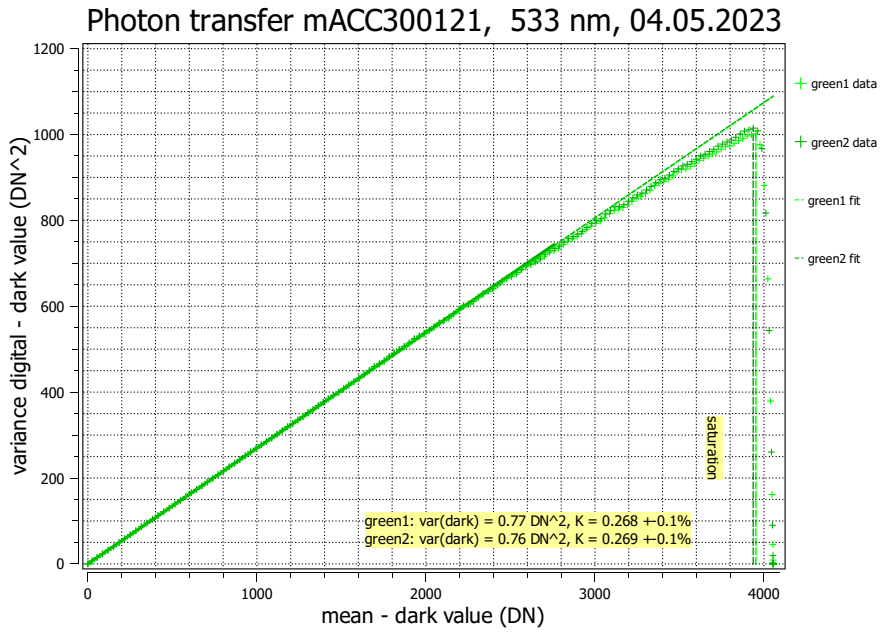
Dark current

$\mu_{c.\mathrm{mean}}$	$0.20 \pm 0.01\,\mathrm{e^-/s}$
	$0.05\,\mathrm{DN/s}$
$\mu_{c.\mathrm{var}}$	$0.85 \pm 0.03\,\mathrm{e^-/s}$
T_d	— °C

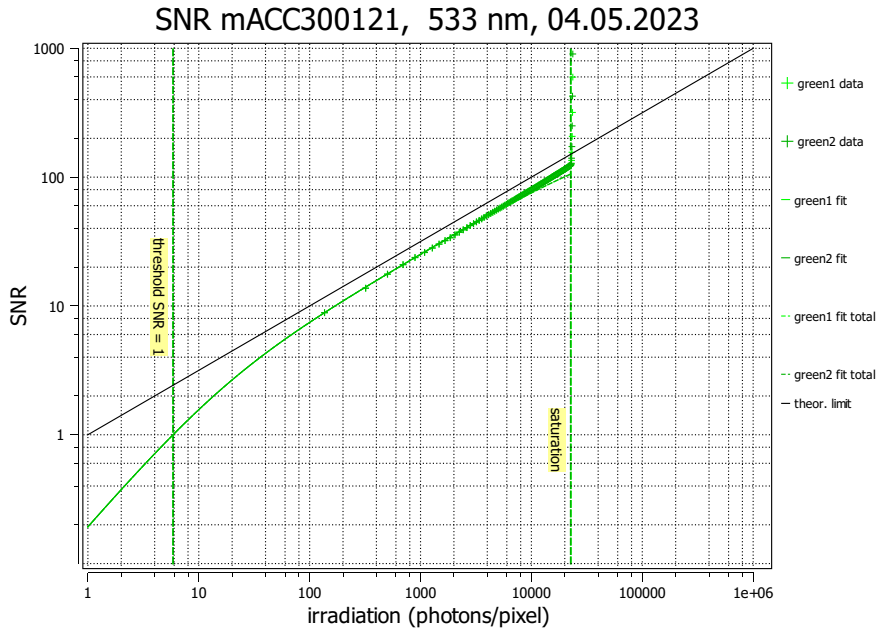
Summary Sheet for Operation Point 2 at a Wavelength of 533 nm

Type of data	Single	Gain, black-level	1.0 / 40.0
Exposure control	By irradiance	Environmental temperature	25.5 °C
Exposure time	3.16 ms	Camera body temperature	35.8 °C
Frame rate	9.6 Hz	Internal temperature(s)	—
Data transfer mode	BayerRG12	Wavelength, centr., FWHM	533 nm, 30.3 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	64.7%

Overall system gain

K	0.268 DN/e$^-$
$1/K$	3.727 e$^-$/DN

Temporal dark noise

σ_d	3.08 e$^-$
$\sigma_{y.\mathrm{dark}}$	0.87 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	121
	41.7 dB
	6.9 bit
$1/\mathrm{SNR}_{\max}$	0.82 %

Absolute sensitivity threshold

$\mu_{p.\mathrm{min}}$	5.87 p
$\mu_{p.\mathrm{min.area}}$	1.019 p/μm^2
$\mu_{e.\mathrm{min}}$	3.80 e$^-$
$\mu_{e.\mathrm{min.area}}$	0.660 e$^-$/μm^2

Saturation capacity

$\mu_{p.\mathrm{sat}}$	22739 p
$\mu_{p.\mathrm{sat.area}}$	3948 p/μm^2
$\mu_{e.\mathrm{sat}}$	14716 e$^-$
$\mu_{e.\mathrm{sat.area}}$	2555 e$^-$/μm^2

Dynamic range

DR	3874
	71.8 dB
	11.9 bit

Spatial nonuniformities

DSNU_{1288}	0.18 e$^-$
	0.05 DN
PRNU_{1288}	0.47 %

Linearity error

$\mathrm{LE}_{\min}$	-0.46%
$\mathrm{LE}_{\max}$	0.83%

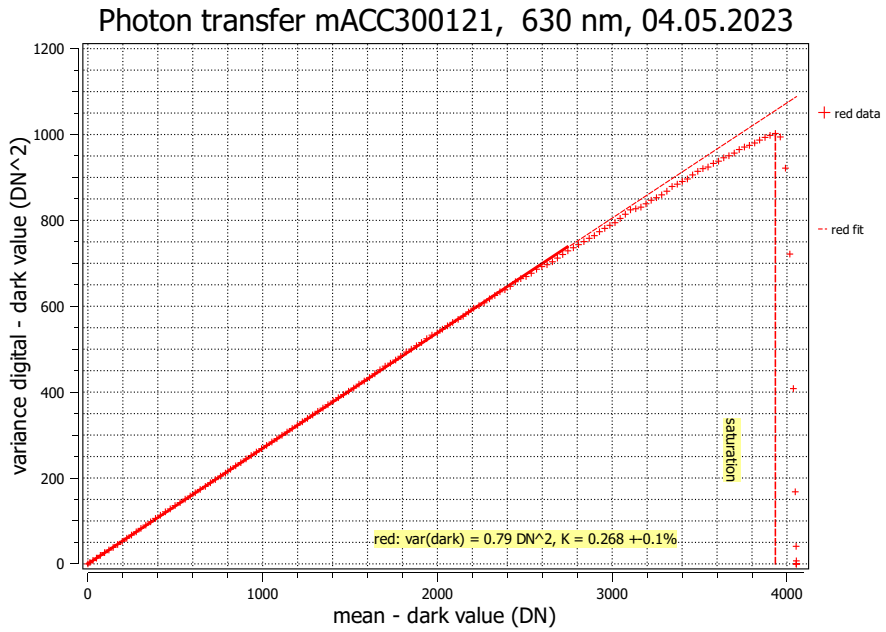
Dark current

$\mu_{c.\mathrm{mean}}$	0.4 ± 0.0 e$^-$/s
	0.10 DN/s
$\mu_{c.\mathrm{var}}$	1.0 ± 0.1 e$^-$/s
T_d	— °C

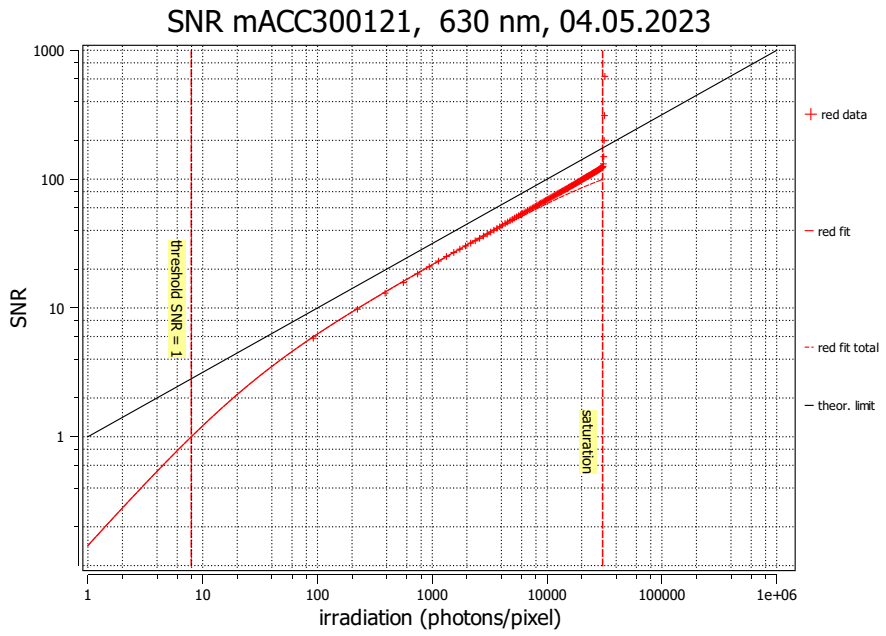
Summary Sheet for Operation Point 3 at a Wavelength of 630 nm

Type of data	Single	Gain, black-level	1.0 / 40.0
Exposure control	By irradiance	Environmental temperature	25.7 °C
Exposure time	3.16 ms	Camera body temperature	36.8 °C
Frame rate	9.6 Hz	Internal temperature(s)	—
Data transfer mode	BayerRG12	Wavelength, centr., FWHM	630 nm, 12.9 nm

Photon Transfer



Signal-to-Noise Ratio



Quantum efficiency

η	48.3%

Overall system gain

K	0.268 DN/e$^-$
$1/K$	3.725 e$^-$/DN

Temporal dark noise

σ_d	3.13 e$^-$
$\sigma_{y.\mathrm{dark}}$	0.89 DN

Signal-to-noise ratio

$\mathrm{SNR}_{\max}$	121
	41.7 dB
	6.9 bit
$1/\mathrm{SNR}_{\max}$	0.82 %

Absolute sensitivity threshold

$\mu_{p.\mathrm{min}}$	7.95 p
$\mu_{p.\mathrm{min.area}}$	1.381 p/μm^2
$\mu_{e.\mathrm{min}}$	3.84 e$^-$
$\mu_{e.\mathrm{min.area}}$	0.667 e$^-$/μm^2

Saturation capacity

$\mu_{p.\mathrm{sat}}$	30462 p
$\mu_{p.\mathrm{sat.area}}$	5288 p/μm^2
$\mu_{e.\mathrm{sat}}$	14723 e$^-$
$\mu_{e.\mathrm{sat.area}}$	2556 e$^-$/μm^2

Dynamic range

DR	3831
	71.7 dB
	11.9 bit

Spatial nonuniformities

DSNU_{1288}	0.21 e$^-$
	0.06 DN
PRNU_{1288}	0.57 %

Linearity error

$\mathrm{LE}_{\min}$	-0.37%
$\mathrm{LE}_{\max}$	0.15%

Dark current

$\mu_{c.\mathrm{mean}}$	0.24 ± 0.01 e$^-$/s
	0.06 DN/s
$\mu_{c.\mathrm{var}}$	0.88 ± 0.03 e$^-$/s
T_d	— °C