

## EMVA 1288 Data Sheet m1237

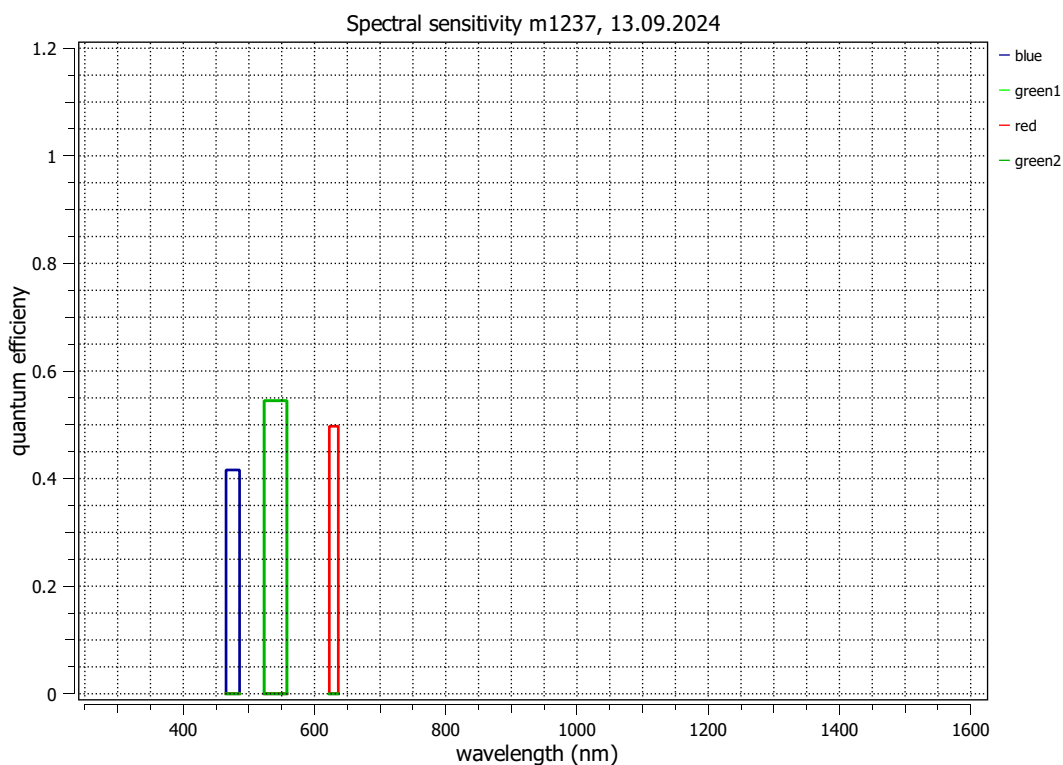
This datasheet describes the specification according to the standard 1288 Release 4.0 Linear issued on 21 June 2021 for "Characterization and Presentation of Specification Data for Image Sensors and Cameras" by the European Machine Vision Association (EMVA), published at <https://www.emva.org/standards-technology/emva-1288/> with proprietary extensions from AEON. The measurements were performed with the AEON ACC2b 14x1 color, Release 9, 13.11.2020, SN 0066(Balluff), software version 2.0.

Measurements performed by Product Development Vision, Balluff GmbH

Type of data presented	Single
Vendor	Balluff GmbH
Model	BVS CA-UB1-0016AC
Serial number	UB100107
Sensor diagonal	6.25 mm
Lens category	C-Mount
Resolution	1448 × 1088, 10 bit
Pixel size (h×v)	3.45 μm × 3.45 μm
Sensor	IMX296
Sensor type	CMOS
Shutter type	Global
Overlap cap.	Overlapping
Max. frame rate	15.0 Hz
Interface type	mvIMPACT acquire

Nr.	Centroid/FWHM	Gain, blacklevel	t <sub>exp</sub> (ms)
1	475.5/20.6 nm	0dB, 1	1.50
2	540.6/34.7 nm	0dB, 1	1.50
3	629.4/13.7 nm	0dB, 1	1.50

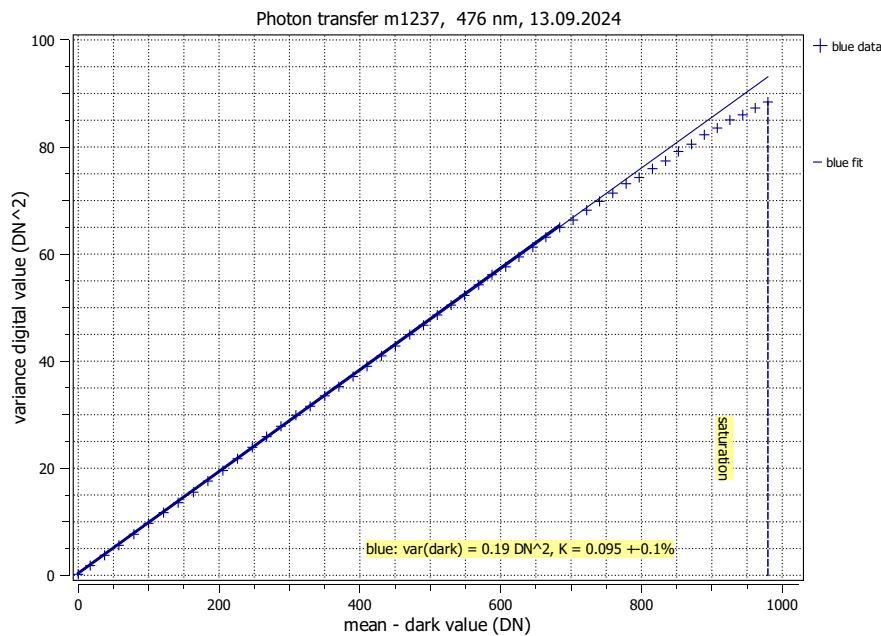
Optional data measured: None



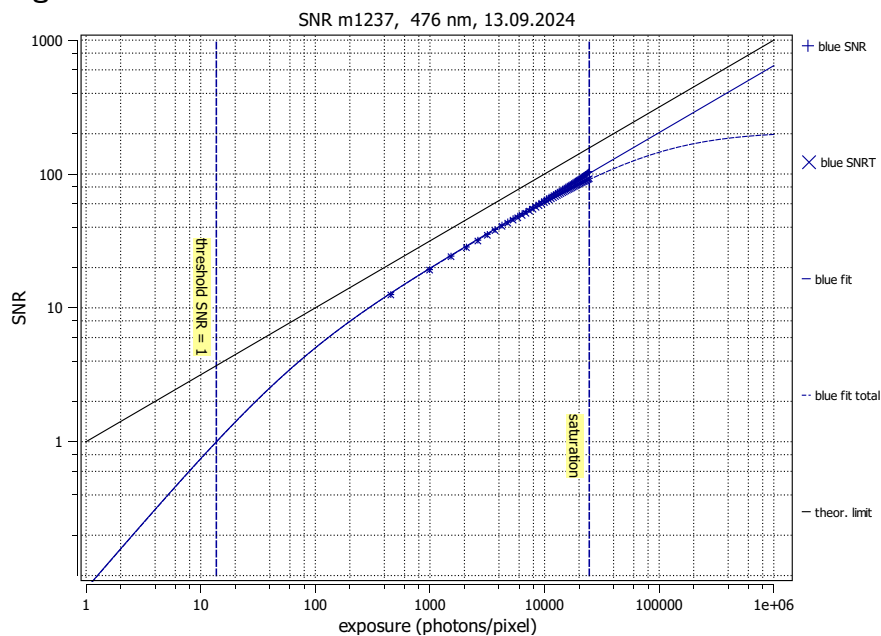
## Summary Sheet for Operation Point 1 at a Wavelength of 476 nm

Type of data	Single	Gain, black-level	0dB, 1
Exposure control	By irradiance	Environmental temperature	20.5°C
Exposure time	1.500 ms	Camera body temperature	23.3°C
Frame rate	15.0 Hz	Internal temperature(s)	—
Data transfer mode	BayerGR10	Wavelength, centr., FWHM	476 nm, 20.6 nm

### Photon Transfer



### Signal-to-Noise Ratio



#### Quantum efficiency

$\eta$  41.6%

#### Overall system gain

$K$  0.094793 DN/e<sup>-</sup>

1/ $K$  10.55 e<sup>-</sup>/DN

#### Temporal dark noise<sup>†</sup>

$\sigma_d$  4.22 e<sup>-</sup>

$\sigma_{y,\text{dark}}$  0.490 DN

#### Signal-to-noise ratio

SNR<sub>max</sub> 101.1

40.1 dB

1/SNR<sub>max</sub> 0.989%

#### Absolute sensitivity threshold<sup>†</sup>

$\mu_{e,\text{min}}$  5.69 e<sup>-</sup>

$\mu_{e,\text{min,area}}$  0.478 e<sup>-</sup>/μm<sup>2</sup>

#### Saturation capacity

$\mu_{e,\text{sat}}$  10215 e<sup>-</sup>

$\mu_{e,\text{sat,area}}$  858 e<sup>-</sup>/μm<sup>2</sup>

#### Dynamic range<sup>†</sup>

DR 1794

65.08 dB

#### Spatial nonuniformities

DSNU<sub>1288</sub> 0.617 e<sup>-</sup>

DSNU<sub>1288.col</sub> 0.081 e<sup>-</sup>

DSNU<sub>1288.row</sub> 0.024 e<sup>-</sup>

DSNU<sub>1288.pix</sub> 0.611 e<sup>-</sup>

PRNU<sub>1288</sub> 0.482 %

PRNU<sub>1288.col</sub> 0.037 %

PRNU<sub>1288.row</sub> 0.036 %

PRNU<sub>1288.pix</sub> 0.479 %

#### Linearity error

LE 0.50%

#### Dark current

$\mu_{c,\text{mean}}$  3.78 e<sup>-</sup>/s

$\mu_{c,\text{var}}$  6.91 e<sup>-</sup>/s

<sup>†</sup> Dominated by quantization

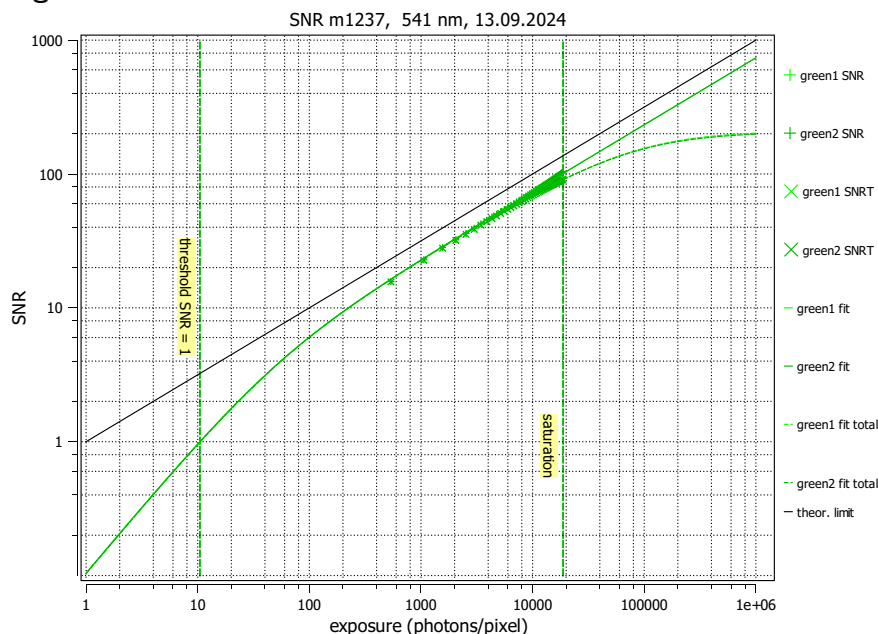
## Summary Sheet for Operation Point 2 at a Wavelength of 541 nm

Type of data	Single	Gain, black-level	0dB, 1
Exposure control	By irradiance	Environmental temperature	20.5°C
Exposure time	1.500 ms	Camera body temperature	23.8°C
Frame rate	15.0 Hz	Internal temperature(s)	—
Data transfer mode	BayerGR10	Wavelength, centr., FWHM	541 nm, 34.7 nm

### Photon Transfer



### Signal-to-Noise Ratio



#### Quantum efficiency

$\eta$  54.5%

#### Overall system gain

$K$  0.094826 DN/e<sup>-</sup>

$1/K$  10.55 e<sup>-</sup>/DN

#### Temporal dark noise<sup>†</sup>

$\sigma_d$  4.22 e<sup>-</sup>

$\sigma_{y,\text{dark}}$  0.490 DN

#### Signal-to-noise ratio

$SNR_{\text{max}}$  101.1

40.1 dB

$1/SNR_{\text{max}}$  0.989%

#### Absolute sensitivity threshold<sup>†</sup>

$\mu_{e,\text{min}}$  5.69 e<sup>-</sup>

$\mu_{e,\text{min,area}}$  0.478 e<sup>-</sup>/μm<sup>2</sup>

#### Saturation capacity

$\mu_{e,\text{sat}}$  10216 e<sup>-</sup>

$\mu_{e,\text{sat,area}}$  858 e<sup>-</sup>/μm<sup>2</sup>

#### Dynamic range<sup>†</sup>

DR 1795

65.08 dB

#### Spatial nonuniformities

DSNU<sub>1288</sub> 0.657 e<sup>-</sup>

DSNU<sub>1288,col</sub> 0.082 e<sup>-</sup>

DSNU<sub>1288,row</sub> 0.022 e<sup>-</sup>

DSNU<sub>1288,pix</sub> 0.651 e<sup>-</sup>

PRNU<sub>1288</sub> 0.476 %

PRNU<sub>1288,col</sub> 0.034 %

PRNU<sub>1288,row</sub> 0.036 %

PRNU<sub>1288,pix</sub> 0.473 %

#### Linearity error

LE 0.54%

#### Dark current

$\mu_{c,\text{mean}}$  3.80 e<sup>-</sup>/s

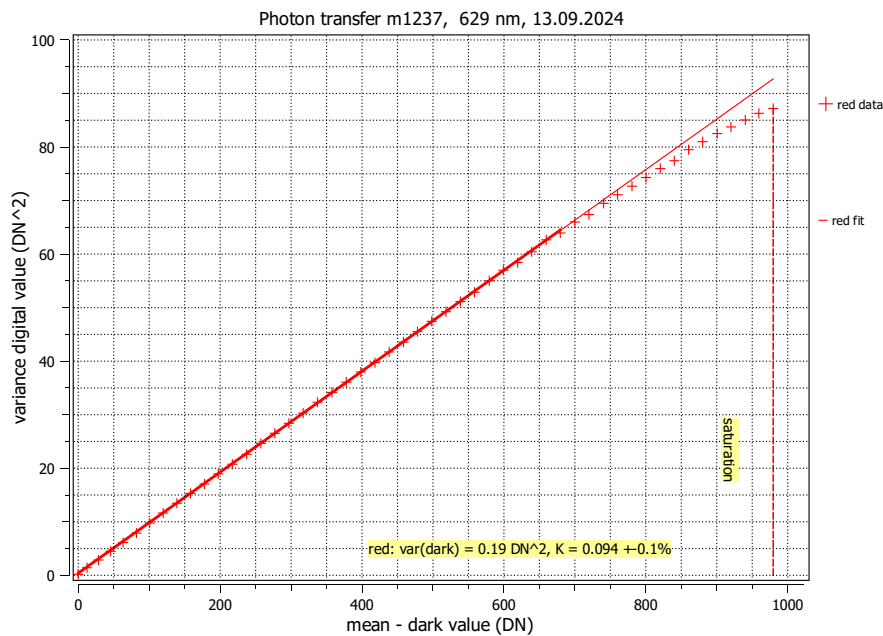
$\mu_{c,\text{var}}$  6.95 e<sup>-</sup>/s

<sup>†</sup> Dominated by quantization

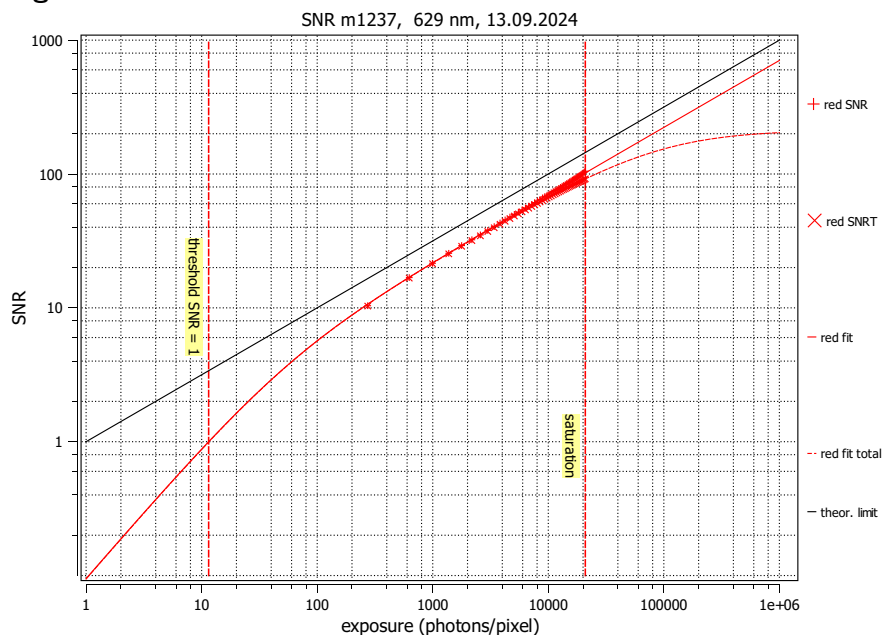
## Summary Sheet for Operation Point 3 at a Wavelength of 629 nm

Type of data	Single	Gain, black-level	0dB, 1
Exposure control	By irradiance	Environmental temperature	20.6°C
Exposure time	1.500 ms	Camera body temperature	24.2°C
Frame rate	15.0 Hz	Internal temperature(s)	—
Data transfer mode	BayerGR10	Wavelength, centr., FWHM	629 nm, 13.7 nm

### Photon Transfer



### Signal-to-Noise Ratio



#### Quantum efficiency

$\eta$  49.7%

#### Overall system gain

$K$  0.094361 DN/e<sup>-</sup>

$1/K$  10.60 e<sup>-</sup>/DN

#### Temporal dark noise<sup>†</sup>

$\sigma_d$  4.24 e<sup>-</sup>

$\sigma_{y,\text{dark}}$  0.490 DN

#### Signal-to-noise ratio

SNR<sub>max</sub> 102.0

40.2 dB

$1/\text{SNR}_{\text{max}}$  0.981%

#### Absolute sensitivity threshold<sup>†</sup>

$\mu_{e,\text{min}}$  5.72 e<sup>-</sup>

$\mu_{e,\text{min},\text{area}}$  0.480 e<sup>-</sup>/μm<sup>2</sup>

#### Saturation capacity

$\mu_{e,\text{sat}}$  10399 e<sup>-</sup>

$\mu_{e,\text{sat},\text{area}}$  874 e<sup>-</sup>/μm<sup>2</sup>

#### Dynamic range<sup>†</sup>

DR 1819

65.20 dB

#### Spatial nonuniformities

DSNU<sub>1288</sub> 0.606 e<sup>-</sup>

DSNU<sub>1288,col</sub> 0.079 e<sup>-</sup>

DSNU<sub>1288,row</sub> 0.023 e<sup>-</sup>

DSNU<sub>1288,pix</sub> 0.600 e<sup>-</sup>

PRNU<sub>1288</sub> 0.470 %

PRNU<sub>1288,col</sub> 0.033 %

PRNU<sub>1288,row</sub> 0.032 %

PRNU<sub>1288,pix</sub> 0.467 %

#### Linearity error

LE 0.13%

#### Dark current

$\mu_{c,\text{mean}}$  3.60 e<sup>-</sup>/s

$\mu_{c,\text{var}}$  6.57 e<sup>-</sup>/s

<sup>†</sup> Dominated by quantization