EMVA 1288 Data Sheet m0722

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 6, 26.11.2016, SN 0005(MatrixVision).

Measurements performed by T.Renner, Matrix Vision GmbH

Vendor MATRIX VISION
Model mvBlueCOUGAR-X102kC
Serial number GX024083
Sensor diagonal 17.55 mm
Lens category C-Mount
Resolution 1608 × 1104, 12 bit
Pixel size (h × v) 9.00 µm × 9.00 µm
Sensor IMX432
Sensor type CMOS
Shutter type Global
Overlap cap. Overlapping
Max. frame rate 33.6 Hz
Interface type GigE Vision

Type of data presented Single

Operation point 1 (page 5)
Wavelength centroid 468.0 nm
Wavelength FWHM 20.0 nm
Gain, black-level 0 dB, 0.1

Operation point 2 (page 20)
Wavelength centroid 536.0 nm
Wavelength FWHM 31.0 nm
Gain, black-level 0 dB, 0.1

Operation point 3 (page 35)
Wavelength centroid 630.0 nm
Wavelength FWHM 13.0 nm
Gain, black-level 0 dB, 0.1

Optional data measured None

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Summary Sheet for Operation Point 1 at a Wavelength of 468 nm

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Single</th>
<th>Gain, black-level</th>
<th>0dB, 0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure control</td>
<td>By irradiance</td>
<td>Environmental temperature</td>
<td>24.7°C</td>
</tr>
<tr>
<td>Exposure time</td>
<td>18.00 ms</td>
<td>Camera body temperature</td>
<td>46.9°C</td>
</tr>
<tr>
<td>Frame rate</td>
<td>30.0 Hz</td>
<td>Internal temperature(s)</td>
<td>—</td>
</tr>
<tr>
<td>Data transfer mode</td>
<td>BayerRG12</td>
<td>Wavelength, centr., FWHM</td>
<td>468 nm, 20.0 nm</td>
</tr>
</tbody>
</table>

**Photon Transfer**

Photon transfer m0722, 468 nm, 10.08.2018

**Signal-to-Noise Ratio**

SNR m0722, 468 nm, 10.08.2018

**Quantum efficiency**

$\eta = 53.6\%$

**Overall system gain**

$K = 0.043 \text{ DN/e}^-$

$1/K = 23.451 \text{ e^-/DN}$

**Temporal dark noise**

$\sigma_d = 21.75 \text{ e^-}$

$\sigma_y.d = 0.97 \text{ DN}$

**Signal-to-noise ratio**

$\text{SNR}_{\text{max}} = 307$

$49.7 \text{ dB}$

$8.3 \text{ bit}$

$1/\text{SNR}_{\text{max}} = 0.33\%$

**Absolute sensitivity threshold**

$\mu_{p.\text{min}} = 43.4 \text{ p}$

$\mu_{p.\text{min}.\text{area}} = 0.54 \text{ p/\mu m}^2$

$\mu_{e.\text{min}} = 23.3 \text{ e^-}$

$\mu_{e.\text{min}.\text{area}} = 0.29 \text{ e^-/\mu m}^2$

**Saturation capacity**

$\mu_{p.\text{sat}} = 175344 \text{ p}$

$\mu_{p.\text{sat}.\text{area}} = 2165 \text{ p/\mu m}^2$

$\mu_{e.\text{sat}} = 93993 \text{ e^-}$

$\mu_{e.\text{sat}.\text{area}} = 1160 \text{ e^-/\mu m}^2$

**Dynamic range**

$\text{DR} = 4037$

$72.1 \text{ dB}$

$12.0 \text{ bit}$

**Spatial nonuniformities**

$\text{DSNU}_{1288} = 2.89 \text{ e^-}$

$0.12 \text{ DN}$

$\text{PRNU}_{1288} = 0.79\%$

**Linearity error**

$\text{LE}_{\text{min}} = -0.27\%$

$\text{LE}_{\text{max}} = 0.58\%$

**Dark current**

$\mu_{c.\text{mean}} = -64 \pm 23 \text{ e^-/s}$

$-2.7 \text{ DN/s}$

$\mu_{c.\text{var}} = 89 \pm 36 \text{ e^-/s}$

$T_d = -\text{ °C}$
Summary Sheet for Operation Point 2 at a Wavelength of 536 nm

Type of data: Single
Exposure control: By irradiance
Exposure time: 18.00 ms
Frame rate: 30.0 Hz
Data transfer mode: BayerRG12

Gain, black-level: 0dB, 0.1
Environmental temperature: 24.8°C
Camera body temperature: 46.8°C
Internal temperature(s): —
Wavelength, centr., FWHM: 536 nm, 31.0 nm

Photon Transfer

SNR m0722, 536 nm, 10.08.2018

Signal-to-Noise Ratio

DSNU1288 2.70 e^- 0.12 DN
PRNU1288 0.82 %

Quantum efficiency
η 63.4%

Overall system gain
K 0.043 DN/e^-
1/K 23.421 e^-/DN

Temporal dark noise
σ_d 21.72 e^-
σ_y,dark 0.97 DN

Signal-to-noise ratio
SNR_max 306
49.7 dB
8.3 bit
1/SNR_max 0.33 %

Absolute sensitivity threshold
μ_p, min 36.7 p
μ_p, min.area 0.45 p/μm^2
μ_e, min 23.3 e^-μm^2
μ_e, min.area 0.29 e^-/μm^2

Saturation capacity
μ_p, sat 147968 p
μ_p, sat.area 1827 p/μm^2
μ_e, sat 93796 e^-μm^2
μ_e, sat.area 1158 e^-/μm^2

Dynamic range
DR 4034
72.1 dB
12.0 bit

Spatial nonuniformities
DSNU 2.70 e^- 0.12 DN
PRNU 0.82 %

Linearity error
LE_min -0.52%
LE_max 0.63%

Dark current
μ_c, mean -64 ± 23 e^-/s
-2.8 DN/s
μ_c, var 60 ± 14 e^-/s
T_d — °C
Summary Sheet for Operation Point 3 at a Wavelength of 630 nm

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of data</td>
<td>Single</td>
</tr>
<tr>
<td>Exposure control</td>
<td>By irradiance</td>
</tr>
<tr>
<td>Exposure time</td>
<td>18.00 ms</td>
</tr>
<tr>
<td>Frame rate</td>
<td>30.0 Hz</td>
</tr>
<tr>
<td>Data transfer mode</td>
<td>BayerRG12</td>
</tr>
<tr>
<td>Gain, black-level</td>
<td>0dB, 0.1</td>
</tr>
<tr>
<td>Environmental temperature</td>
<td>24.8°C</td>
</tr>
<tr>
<td>Camera body temperature</td>
<td>46.7°C</td>
</tr>
<tr>
<td>Internal temperature(s)</td>
<td>—</td>
</tr>
<tr>
<td>Wavelength, centr., FWHM</td>
<td>630 nm, 13.0 nm</td>
</tr>
</tbody>
</table>

### Photon Transfer

- **Photon transfer m0722, 630 nm, 10.08.2018**

### Signal-to-Noise Ratio

- **SNR m0722, 630 nm, 10.08.2018**

### Quantum efficiency

- $\eta = 59.3\%$

### Overall system gain

- $K = 0.043$ DN/e$^-$
- $1/K = 23.471$ e$^-$/DN

### Temporal dark noise

- $\sigma_d = 21.73$ e$^-$
- $\sigma_y\text{.dark} = 0.97$ DN

### Signal-to-noise ratio

- $\text{SNR}_{\text{max}} = 307$
- $\text{SNR}_{\text{max}}$ = 49.7 dB
- $1/\text{SNR}_{\text{max}} = 0.33\%$

### Absolute sensitivity threshold

- $\mu_{\text{p.min}} = 39.2$ p
- $\mu_{\text{p.min}.\text{area}} = 0.48$ p/µm$^2$
- $\mu_{\text{e.min}} = 23.3$ e$^-$
- $\mu_{\text{e.min}.\text{area}} = 0.29$ e$^-$/µm$^2$

### Saturation capacity

- $\mu_{\text{p.sat}} = 158468$ p
- $\mu_{\text{p.sat}.\text{area}} = 1956$ p/µm$^2$
- $\mu_{\text{e.sat}} = 93988$ e$^-$
- $\mu_{\text{e.sat}.\text{area}} = 1160$ e$^-$/µm$^2$

### Dynamic range

- $\text{DR} = 4040$
- $\text{DR} = 72.1$ dB
- $\text{DR} = 12.0$ bit

### Spatial nonuniformities

- $\text{DSNU}_{1288} = 4.19$ e$^-$
- $\text{PRNU}_{1288} = 0.18$ DN
- $\text{PRNU}_{1288} = 1.10\%$

### Linearity error

- $\text{LE}_{\text{min}} = -1.07\%$
- $\text{LE}_{\text{max}} = 0.32\%$

### Dark current

- $\mu_{\text{c.mean}} = -64 \pm 23$ e$^-$/s
- $\mu_{\text{c.var}} = 92 \pm 14$ e$^-$/s
- $T_{\text{d}} = -^\circ$C