EMVA 1288 Data Sheet m0748

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

<table>
<thead>
<tr>
<th>Vendor</th>
<th>MATRIX VISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>mvBlueCOUGAR-X102nC</td>
</tr>
<tr>
<td>Serial number</td>
<td>GX025786</td>
</tr>
<tr>
<td>Sensor diagonal</td>
<td>9.25 mm</td>
</tr>
<tr>
<td>Lens category</td>
<td>C-Mount</td>
</tr>
<tr>
<td>Resolution</td>
<td>1632 × 1248, 12 bit</td>
</tr>
<tr>
<td>Pixel size (h×v)</td>
<td>4.50 µm × 4.50 µm</td>
</tr>
<tr>
<td>Sensor</td>
<td>IMX430</td>
</tr>
<tr>
<td>Sensor type</td>
<td>CMOS</td>
</tr>
<tr>
<td>Shutter type</td>
<td>Global</td>
</tr>
<tr>
<td>Overlap cap.</td>
<td>Overlapping</td>
</tr>
<tr>
<td>Max. frame rate</td>
<td>29.3 Hz</td>
</tr>
<tr>
<td>Interface type</td>
<td>GigE Vision</td>
</tr>
</tbody>
</table>

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

Type of data | Single  
--- | ---  
Exposure control | By irradiance  
Exposure time | 18.00 ms  
Frame rate | 28.0 Hz  
Data transfer mode | BayerRG12  
Gain, black-level | 0dB, 0.1  
Environmental temperature | 25.6°C  
Camera body temperature | 47.1°C  
Internal temperature(s) | —  
Wavelength, centr., FWHM | 468 nm, 20.0 nm

Photon Transfer

Signal-to-Noise Ratio

Quantum efficiency
\[ \eta = 49.6\% \]

Overall system gain
\[ K = 0.159 \text{DN/e}^- \]
\[ 1/K = 6.282 \text{e}^-/\text{DN} \]

Temporal dark noise
\[ \sigma_d = 5.70 \text{e}^- \]
\[ \sigma_y, \text{dark} = 0.95 \text{DN} \]

Signal-to-noise ratio
\[ \text{SNR}_{\text{max}} = 158 \]
\[ 44.0 \text{dB} \]
\[ 7.3 \text{bit} \]
\[ 1/\text{SNR}_{\text{max}} = 0.63\% \]

Absolute sensitivity threshold
\[ \mu_{\text{p.min}} = 13.10 \text{p} \]
\[ \mu_{\text{p.min.area}} = 0.647 \text{p}/\mu\text{m}^2 \]
\[ \mu_{\text{e.min}} = 6.50 \text{e}^- \]
\[ \mu_{\text{e.min.area}} = 0.321 \text{e}^-/\mu\text{m}^2 \]

Saturation capacity
\[ \mu_{\text{p.sat}} = 50430 \text{p} \]
\[ \mu_{\text{p.sat.area}} = 2490 \text{p}/\mu\text{m}^2 \]
\[ \mu_{\text{sat}} = 25016 \text{e}^- \]
\[ \mu_{\text{e.sat.area}} = 1235 \text{e}^-/\mu\text{m}^2 \]

Dynamic range
\[ \text{DR} = 3850 \]
\[ 71.7 \text{dB} \]
\[ 11.9 \text{bit} \]

Spatial nonuniformities
\[ \text{DSNU}_{1288} = 1.73 \text{e}^- \]
\[ 0.28 \text{DN} \]
\[ \text{PRNU}_{1288} = 0.48\% \]

Linearity error
\[ \text{LE}_{\text{min}} = -0.27\% \]
\[ \text{LE}_{\text{max}} = 0.49\% \]

Dark current
\[ \mu_{\text{c.mean}} = -27.6 \pm 5.9 \text{e}^-/\text{s} \]
\[ -4.40 \text{DN/s} \]
\[ \mu_{\text{c.var}} = 4.1 \pm 5.7 \text{e}^-/\text{s} \]
\[ T_d = -^\circ\text{C} \]
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 | 28.0 Hz
Data transfer mode | BayerRG12

Gain, black-level: 0dB, 0.1

Environmental temperature: 25.6°C
Camera body temperature: 47.6°C
Internal temperature(s): —
Wavelength, centr., FWHM: 536 nm, 31.0 nm

Photon Transfer

- Photon transfer m0748, 536 nm, 07.12.2018
- Green1 data
- Green2 data
- Green1 fit
- Green2 fit
- Variance digital - dark value (DN²)
- Mean - dark value (DN)
- Green1: var(dark) = 0.91 DN², K = 0.159 ± 0.0%
- Green2: var(dark) = 0.91 DN², K = 0.159 ± 0.0%

Signal-to-Noise Ratio

- SNR m0748, 536 nm, 07.12.2018
- Green1 data
- Green2 data
- Green1 fit total
- Green2 fit total
- Theor. limit
- Mean - dark value (DN)
- Irradiation (photons/pixel)
- Saturation threshold SNR = 1
- Dynamic range
- DSNU: 1288
- PRNU: 0.58%
- Linearity error
- LE min: -0.31%
- LE max: 0.76%
- Dark current
- μc.mean: −27.8 ± 5.8 e−/s
- μc.var: 3.3 ± 5.7 e−/s
- Td: 0°C

Quantum efficiency
η: 61.8%

Overall system gain
K: 0.159 DN/e−
1/K: 6.276 e−/DN

Temporal dark noise
σ_d: 5.70 e−
σ_y.dark: 0.95 DN

Signal-to-noise ratio
SNR max: 158
44.0 dB
7.3 bit
1/SNR max: 0.63%

Absolute sensitivity threshold
μ_p.min: 10.51 p
μ_p.min.area: 0.519 p/µm²
μ_e.min: 6.50 e−
μ_e.min.area: 0.321 e−/µm²

Saturation capacity
μ_p.sat: 40544 p
μ_p.sat.area: 2002 p/µm²
μ_e.sat: 25071 e−
μ_e.sat.area: 1238 e−/µm²

Dynamic range
DR: 3859
71.7 dB
11.9 bit

Spatial nonuniformities
DSNU: 1.27 e−
PRNU: 0.20 DN

Linearity error
LE min: -0.31%
LE max: 0.76%

Dark current
μc.mean: −27.8 ± 5.8 e−/s
μc.var: 3.3 ± 5.7 e−/s
Td: 0°C
Summary Sheet for Operation Point 3 at a Wavelength of 630 nm

Type of data: Single
Exposure control: By irradiance
Exposure time: 18.00 ms
Frame rate: 28.0 Hz
Data transfer mode: BayerRG12

Gain, black-level: 0dB, 0.1

Environmental temperature: 25.6°C
Camera body temperature: 47.8°C
Internal temperature(s): —

Wavelength, centr., FWHM: 630 nm, 13.0 nm

Quantum efficiency: η = 55.7%
Overall system gain: K = 0.159 DN/e⁻, 1/K = 6.289 e⁻/DN

Temporal dark noise:
σ_d = 5.71 e⁻
σ_y.dark = 0.95 DN

Signal-to-noise ratio:
SNR_max = 159
44.0 dB
7.3 bit
1/SNR_max = 0.63 %

Absolute sensitivity threshold:
μ_p.min = 11.69 p
μ_p.min.area = 0.577 p/μm²
μ_e.min = 6.51 e⁻
μ_e.min.area = 0.322 e⁻/μm²

Saturation capacity:
μ_p.sat = 45430 p
μ_p.sat.area = 2243 p/μm²
μ_e.sat = 25315 e⁻
μ_e.sat.area = 1250 e⁻/μm²

Dynamic range:
DR = 3887
71.8 dB
11.9 bit

Spatial nonuniformities:
DSNU = 2.30 e⁻
PRNU = 0.44 %

Linearity error:
LE_min = -0.49%
LE_max = 0.33%

Dark current:
μ_c.mean = -27.8 ± 5.8 e⁻/s
-4.44 DN/s
μ_c.var = 1.8 ± 5.9 e⁻/s
T_d = — °C