EMVA 1288 Data Sheet m0743

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>mvBlueFOX3-2124rC</td>
</tr>
<tr>
<td>Serial number</td>
<td>FF000018</td>
</tr>
<tr>
<td>Sensor diagonal</td>
<td>9.39 mm</td>
</tr>
<tr>
<td>Lens category</td>
<td>C-Mount</td>
</tr>
<tr>
<td>Resolution</td>
<td>4064 × 3044, 12 bit</td>
</tr>
<tr>
<td>Pixel size (h×v)</td>
<td>1.85 µm × 1.85 µm</td>
</tr>
<tr>
<td>Sensor</td>
<td>IMX226</td>
</tr>
<tr>
<td>Sensor type</td>
<td>CMOS</td>
</tr>
<tr>
<td>Shutter type</td>
<td>Rolling</td>
</tr>
<tr>
<td>Overlap cap.</td>
<td>Overlapping</td>
</tr>
<tr>
<td>Max. frame rate</td>
<td>15.3 Hz</td>
</tr>
<tr>
<td>Interface type</td>
<td>USB3 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 | 0dB, 0.05 |
| Operation point 2 (page 20) | |
| Wavelength centroid | 536.0 nm |
| Wavelength FWHM | 31.0 nm |
| Gain, black-level | 0dB, 0.05 |
| Operation point 3 (page 35) | |
| Wavelength centroid | 630.0 nm |
| Wavelength FWHM | 13.0 nm |
| Gain, black-level | 0dB, 0.05 |

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 | 3.00 ms  
Frame rate | 15.3 Hz  
Data transfer mode | BayerRG12  
Gain, black-level | 0dB, 0.05  
Environmental temperature | 23.3°C  
Camera body temperature | 23.5°C  
Internal temperature(s) | —  
Wavelength, centr., FWHM | 468 nm, 20.0 nm  

Quantum efficiency
\[ \eta = 59.5\% \]

Overall system gain
\[ K = 0.358 \text{DN/e}^{-} \]
\[ 1/K = 2.794 \text{e}^{-/DN} \]

Temporal dark noise
\[ \sigma_d = 3.05 \text{e}^{-} \]
\[ \sigma_y.d\text{ark} = 1.13 \text{DN} \]

Signal-to-noise ratio
\[ \text{SNR}_{\text{max}} = 104 \]
40.3 dB  
6.7 bit  
\[ 1/\text{SNR}_{\text{max}} = 0.96\% \]

Absolute sensitivity threshold
\[ \mu_p.\text{min} = 6.20 \text{p} \]
\[ \mu_p.\text{min.area} = 1.812 \text{p/\mu m}^2 \]
\[ \mu_e.\text{min} = 3.69 \text{e}^{-} \]
\[ \mu_e.\text{min.area} = 1.078 \text{e}^{-/\mu m}^2 \]

Saturation capacity
\[ \mu_p.\text{sat} = 18164 \text{p} \]
\[ \mu_p.\text{sat.area} = 5307 \text{p/\mu m}^2 \]
\[ \mu_e.\text{sat} = 10805 \text{e}^{-} \]
\[ \mu_e.\text{sat.area} = 3157 \text{e}^{-/\mu m}^2 \]

Dynamic range
\[ \text{DR} = 2928 \]
69.3 dB  
11.5 bit  

Spatial nonuniformities
\[ \text{DSNU}_{1288} = 0.26 \text{e}^{-} \]
0.09 DN  
1.53%  
\[ \text{PRNU}_{1288} = 1.53\% \]

Linearity error
\[ \text{LE}_{\text{min}} = -0.25\% \]
\[ \text{LE}_{\text{max}} = 0.58\% \]

Dark current
\[ \mu_c.\text{mean} = 0.3 \pm 0.1 \text{e}^{-/s} \]
0.11 DN/s  
1.2 \pm 0.0 \text{e}^{-/s} \]
\[ T_d = — ^\circ C \]
Summary Sheet for Operation Point 2 at a Wavelength of 536 nm

Type of data | Single
--- | ---
Exposure control | By irradiance
Exposure time | 3.00 ms
Frame rate | 15.3 Hz
Data transfer mode | BayerRG12

Gain, black-level | 0dB, 0.05
Environmental temperature | 23.5°C
Camera body temperature | 23.7°C
Internal temperature(s) | —

Wavelength, centr., FWHM | 536 nm, 31.0 nm

Quantum efficiency
\( \eta \) | 64.1%

Overall system gain
\( K \) | 0.357 DN/e⁻
\( 1/K \) | 2.801 e⁻/DN

Temporal dark noise
\( \sigma_d \) | 3.07 e⁻
\( \sigma_y \) | 1.13 DN

Signal-to-noise ratio
\( SNR_{max} \) | 104
40.3 dB
6.7 bit
\( 1/\text{SNR}_{max} \) | 0.97%

Absolute sensitivity threshold
\( \mu_{p.min} \) | 5.79 p
\( \mu_{p.min}.area \) | 1.691 p/\( \mu \)m²
\( \mu_{e.min} \) | 3.71 e⁻
\( \mu_{e.min}.area \) | 1.084 e⁻/\( \mu \)m²

Saturation capacity
\( \mu_{p.sat} \) | 16748 p
\( \mu_{p.sat}.area \) | 4894 p/\( \mu \)m²
\( \mu_{e.sat} \) | 10735 e⁻
\( \mu_{e.sat}.area \) | 3137 e⁻/\( \mu \)m²

Dynamic range
\( DR \) | 2893
69.2 dB
11.5 bit

Spatial nonuniformities
\( DSNU_{1288} \) | 0.26 e⁻
0.09 DN
\( PRNU_{1288} \) | 1.65%

Linearity error
\( LE_{\text{min}} \) | -0.83%
\( LE_{\text{max}} \) | 1.96%

Dark current
\( \mu_c.\text{mean} \) | 0.2 ± 0.1 e⁻/s
0.08 DN/s
\( \mu_c.\text{var} \) | 1.1 ± 0.0 e⁻/s
\( T_d \) | — °C
Summary Sheet for Operation Point 3 at a Wavelength of 630 nm

<table>
<thead>
<tr>
<th>Type of data</th>
<th>Single</th>
<th>Gain, black-level</th>
<th>0dB, 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure control</td>
<td>By irradiance</td>
<td>Environmental temperature</td>
<td>23.5°C</td>
</tr>
<tr>
<td>Exposure time</td>
<td>3.00 ms</td>
<td>Camera body temperature</td>
<td>23.9°C</td>
</tr>
<tr>
<td>Frame rate</td>
<td>15.3 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>630 nm, 13.0 nm</td>
</tr>
</tbody>
</table>

Quantum efficiency
\[ \eta = 44.7\% \]

Overall system gain
\[ K = 0.358 \text{DN/e} \]
\[ 1/K = 2.792 \text{e}/\text{DN} \]

Temporal dark noise
\[ \sigma_d = 3.08 \text{DN} \]
\[ \sigma_y,\text{dark} = 1.14 \text{DN} \]

Signal-to-noise ratio
\[ \text{SNR}_{\text{max}} = 105 \]
\[ 40.4 \text{dB} \]
\[ 6.7 \text{bit} \]
\[ 1/\text{SNR}_{\text{max}} = 0.95\% \]

Absolute sensitivity threshold
\[ \mu_p,\text{min} = 8.32 \text{p} \]
\[ \mu_p,\text{min.area} = 2.431 \text{p/\mu m}^2 \]
\[ \mu_e,\text{min} = 3.72 \text{e}^{-} \]
\[ \mu_e,\text{min.area} = 1.087 \text{e}^{-}/\text{\mu m}^2 \]

Saturation capacity
\[ \mu_p,\text{sat} = 24767 \text{p} \]
\[ \mu_p,\text{sat.area} = 7237 \text{p/\mu m}^2 \]
\[ \mu_e,\text{sat} = 11077 \text{e}^{-} \]
\[ \mu_e,\text{sat.area} = 3236 \text{e}^{-}/\text{\mu m}^2 \]

Dynamic range
\[ \text{DR} = 2977 \]
\[ 69.5 \text{dB} \]
\[ 11.5 \text{bit} \]

Spatial nonuniformities
\[ \text{DSNU}_{1288} = 0.32 \text{e}^{-} \]
\[ 0.11 \text{DN} \]
\[ \text{PRNU}_{1288} = 0.83\% \]

Linearity error
\[ \text{LE}_{\text{min}} = -0.38\% \]
\[ \text{LE}_{\text{max}} = 0.21\% \]

Dark current
\[ \mu_c,\text{mean} = 0.3 \pm 0.1 \text{e}^{-}/\text{s} \]
\[ 0.11 \text{DN/s} \]
\[ \mu_c,\text{var} = 1.2 \pm 0.0 \text{DN}/\text{s} \]
\[ T_d = — \text{°C} \]