# FL 9BW


FL 9BW is a cooled CMOS camera designed for long exposure imaging. It not only incorporates high sensitivity and low noise advantages from latest sensor technologies, but also leverages Tucsen's many years experiences on cooling chamber design and advanced image processing. FL 9BW is able to capture clean and even images for up to 60 minutes exposure time.

| Key Features | Benefits |
|---|---|
| Scientific Grade CMOS | 92 % peak QE, 0.9 e- readout noise and no glow. |
| < 0.0005 e-/p/s Dark Current | Equivalent to the cooled CCD for long exposure imaging. |
| 16000 : 1 Dynamic Range | More than 4 times that of the CCD, greatly expanding the signal detection range. |
| Pixel Correction Technology | High background quality ensures more accurate quantitative analysis.[1] |
| Flexible Binning Mode | Improving the sensitivity and dynamic range capability. |
| High Reliability Cooling Chamber | Cooled to -25 °C @ 22 °C, no condensation or other problems. |
| Compact Design | Conducive to instrument system integration. |

## Typical Applications

- Chemiluminescence
- Bioluminescence
- dPCR
- Fluorescence imaging

## Noted Examples

[1] The FL 9BW has excellent background uniformity, as it has basically eliminated the bad factors such as amplifier grow and bad pixels.

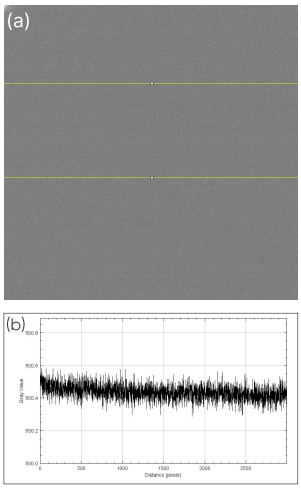
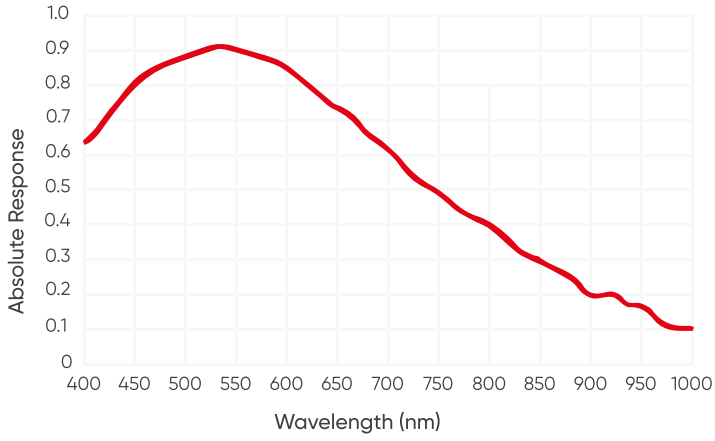
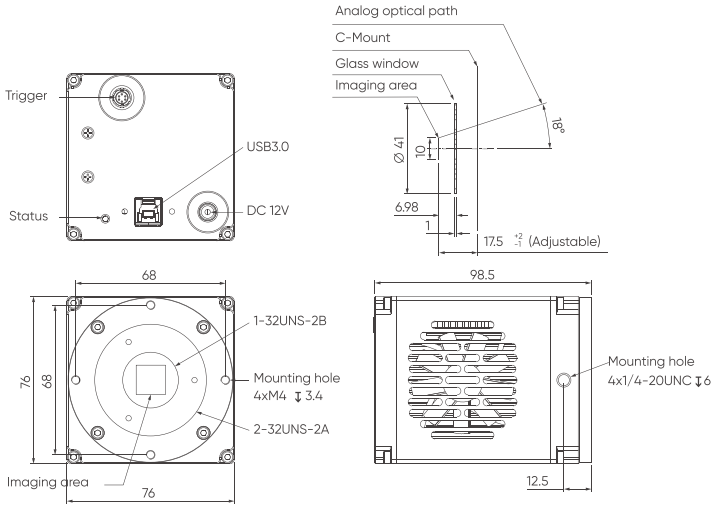



Figure (a) is the background image taken by FL 9BW with 600s exposure. Figure (b) is the grayscale intensity curve corresponding to the yellow region, showing excellent background uniformity.

## Quantum Efficiency




## Dimensions (Unit: mm)



# Specifications

Long Exposure Cooled CMOS Camera

www.tucsen.com

| | | | | |
|---|---|---|---|---|
| Model | FL 9BW | | | |
| Sensor Type | BSI CMOS | | | |
| Sensor Model | SONY IMX533CLK-D | | | |
| Color / Mono | Mono | | | |
| Array Diagonal | 15.96 mm (1") | | | |
| Effective Area | 11.28 mm × 11.28 mm | | | |
| Pixel Size | 3.76 μm × 3.76 μm | | | |
| Resolution | 3000 × 3000, 9 MP | | | |
| Peak QE | 92% @ 540 nm | | | |
| Dark Current | < 0.0005 e-/p/s | | | |
| Gain Mode | Gain 0 - HFWC | Gain 1 - Balance | Gain 2 - High Sensitivity 1 | Gain 3 - High Sensitivity 2 |
| Full Well Wapacity | Gain 0：47 ke- @ bin1;<br>binning > 180 ke- | Gain 1：16 ke- @ bin1;<br>binning > 64 ke- | Gain 2：8 ke- @ bin1;<br>14 bit binning > 32 ke- | Gain 3：3ke- @ bin1；<br>14 bit binning > 12 ke- |
| Readout Mode | Standard，Low-Noise | | | |
| Readout Noise (Standard) | 3.2 e- @ Gain 0 | 1.2 e- @ Gain 1 | 1.0 e- @ Gain 2 | 0.95 e- @ Gain 3 |
| Readout Noise (LowNoise) | 2.5 e- @ Gain 0 | 1.0 e- @ Gain 1 | 0.9 e- @ Gain 2 | 0.85 e- @ Gain 3 |
| Frame Rate | 19 fps @ Standard Mode, 12 fps @ Low Noise Mode | | | |
| Shutter Mode | Rolling | | | |
| Exposure Time | 15 μs ~ 60 min | | | |
| Image Correction | DDFC, DPC | | | |
| ROI | Support | | | |
| Binning | 2，3，4，6，8，12，16，24 | | | |
| Cooling Method | Air | | | |
| Cooling Temperature | Cooled to -25 ℃ @ ambient temperature (22 ℃) | | | |
| Trigger Mode | Hardware, Software | | | |
| Output Trigger Signals | Exposure start, Global, Readout end,High level, Low level | | | |
| Trigger Interface | Hirose | | | |
| SDK | C，C++，C# | | | |
| Data Interface | USB 3.0 | | | |
| Software | Mosaic, SamplePro, LabVIEW, MATLAB, Micromanager | | | |
| Optical Interface | C-Mount, Customizable | | | |
| Bit Depth | 14 bit, 16 bit | | | |
| Power | 12 V / 6 A | | | |
| Power Consumption | ≤ 40 W | | | |
| Dimensions | 76 mm x 76 mm x 98.5 mm | | | |
| Weight | 835 g | | | |
| Operating System | Windows / Linux | | | |
| Operating Environment | Working: Temperature 0~45 ℃, Humidity 10~85%<br>Storage: Temperature -10~60 ℃, Humidity 0~85% | | | |