TUCSEN
Camera Technology
Focused on Scientific Imaging
and Challenging Inspection

sCMOS Camera Technology
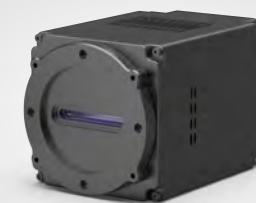
High Speed TDI	High Sensitivity	Soft-Xay / EUV
Global Shutter	Deep Cooling	Large Format

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About Us

A Global Camera Company.

Tucsen designs and manufactures camera technology focused on scientific imaging and challenging inspection. Our job is to create reliable camera devices which allow our customers to answer challenging questions. Engineering talent and relationships with our sensor providers allow us to drive product performance and our business model allows us to also drive a price advantage. With operations in Europe, North America and Asia we help customers in numerous markets across the world helping drive answers to quality, research and medical questions.

Designing and Manufacturing in China.

Tucsen is proud to design and manufacture in the People's Republic of China. With operations in Fuzhou, Chengdu and Changchun we can access a growing talent pool of engineers to drive a pipeline of new technology and ideas into products faster than our competitors. By utilizing our situation as a volume supplier, we can also take advantage of local supply chains to ensure we can manufacture on time and pass on our cost advantage.

Consistently Delivering Value.

Tucsen delivers value. We deliver products that meet our specifications as noted at prices that help our customers achieve their goals. We are not cheap, we provide value, there is a large difference. We do not have to drive a corporate share price; we drive customer value. We do not add unused features to explain pricing, we drive repeatable consistency to allow our customers to hit cost targets or spend their savings on other items. We manage our business for efficiency, we control our business to deliver consistency and we drive the business to deliver constantly.
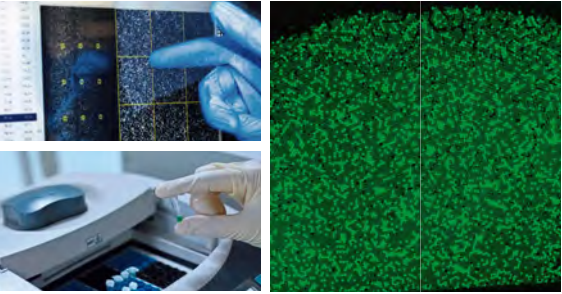
Market

Research

sCMOS technology delivers high QE, low noise and in formats up to 61.4mm x 61.4mm.
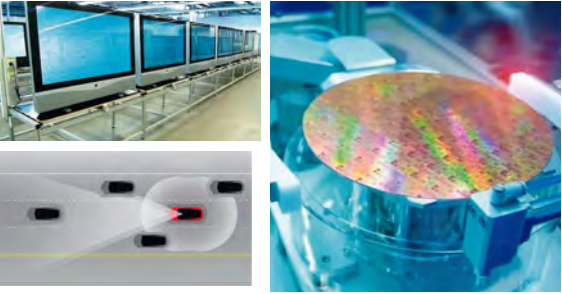
Industrial Inspection

Solutions for integration of advanced imaging technologies for challenging inspections.

Instrumentation (OEM)

High performance CMOS and sCMOS devices designed for integration and operation into small spaces.

Catalogue

Gemini 8KTDI

The Gemini 8KTDI is a new generation TDI camera developed by Tucsen to address the challenges of industrial inspection. The Gemini not only offers outstanding sensitivity in the UV range but also takes the lead in applying 100G CoF technology to TDI cameras, significantly improving line scan rates. Additionally, they features Tucsen's stable and reliable cooling and noise reduction technology, providing more consistent and accurate data for the inspection .

| Key Features	Benefits
180-1100nm	Wide spectral response, especially with higher sensitivity in the ultraviolet range.
256 stages TDI	More TDI stages deliver higher SNR.
1 MHz@ 8K	Double the throughput of our previous generation TDI.[1]
100G CoF Interface	Reduces the need for multi-channel configurations, simplifying system integration.
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.[2]

Typical Applications

- Semiconductor/Wafer Inspection
- Mask Inspection
- FPD Inspection
- Fluorescence Detection
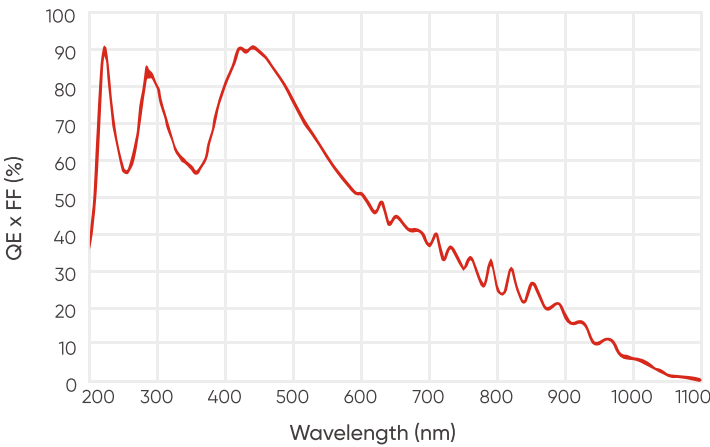- Gene Sequencing
- Spatial Omics

Noted Examples

[1] The Gemini 8KTDI has double the throughput of our previous generation TDI.

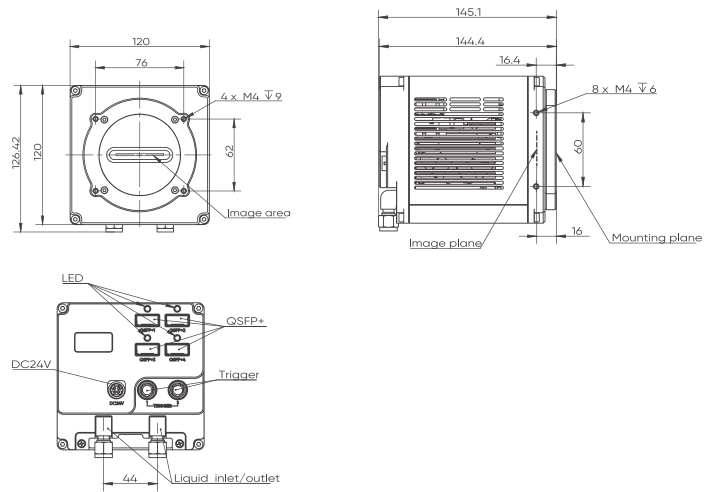| 1 MHz@8 K	8192 Mpixel/s

510 KHz@9 K	4590 Mpixel/s

[2] Tucsen's advanced cooling technology creates a more uniform imaging background, enhancing detection accuracy.
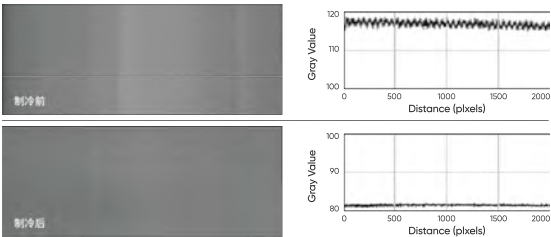
Quantum Efficiency

Dimensions (Unit: mm)

Model	Gemini 8KTDI
Sensor Type	BSI sCMOS TDI
Sensor Model	Gpixel GLT5008BSI_UV
Peak QE	≥ 65%@266 nm, ≥ 92.4%@440 nm
Spectral Range	180 nm - 1100 nm
Color / Mono	Mono
Array Diagonal	41 mm
Resolution	8208
Pixel Size	5 μm x 5 μm
Operation Mode	TDI，Area
TDI Stage	4, 32, 64, 128, 192, 224, 252, 256
Scan Direction	Forward, Reverse, Trigger Control
CTE	≥0.99996
Data Bit Depth	12 bit, 10 bit, 8 bit
Full-Well Capacity	≥ 15 ke-
Dynamic Range	≥ 66 dB@10 bit ADC
Max. Line Rate	1 MHz@8/10bit, 500 kHz@12bit
Readout Noise	＜7.7 e-
Cooling Method	Air, Liquid
Max. Cooling	Air: 10℃@22℃ Ambient, Liquid: 0 ℃@22℃ Liquid Temprature
Binning	1 x 2 (SENSOR BIN), 2 x 2, 4 x 4, 8 x 8 (FPGA BIN)
ROI	Support
Trigger Mode	Trigger Input, Scan Direction Input
Output Trigger Signals	Strobe out
Trigger Interface	Hirose
Timestamp Accuracy	8 ns
Gain	Analog Gain: x 1 ~ x 4, Digital Gain: x0 ~ x 16
Data Interface	QSFP+ / QSFP28
Optical Interface	M72x0.75 / User Customization
Power Supply	24 V / 6.67 A
Weight	＜ 3500 g
Dimensions	120 mm x 120 mm x 144.5 mm
Software	SamplePro
SDK	C, C++
Operating System	Windows 10 X 64/Windows 11 X 64, Ubuntu 20.04, 22.04
Operating Environment	Working: Temp. 0 ℃~40 ℃, Hum. 20%~80%
	Storage: Temp. -20 ℃~60 ℃, Hum. 20%~80%
	Working altitude: 0 ~ 2000 m

Gemini 16KTDI

The Gemini 16KTDI is a new generation TDI camera developed by Tucsen to address the challenges of industrial inspection. The Gemini not only offers outstanding sensitivity in the UV range but also takes the lead in applying 100G CoF technology to TDI cameras, significantly improving line scan rates. Additionally, they features Tucsen's stable and reliable cooling and noise reduction technology, providing more consistent and accurate data for the inspection.

| Key Features	Benefits
180-1100nm	Wide spectral response, especially with higher sensitivity in the ultraviolet range.
256 stages TDI	More TDI stages deliver higher SNR.
1 MHz@ 16K	3.5 times the throughput of our previous generation TDI.[1]
100G CoF interface	Reduces the need for multi-channel configurations, simplifying system integration.
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.[2]

Typical Applications

- Semiconductor/Wafer Inspection
- Mask Inspection
- FPD Inspection
- Fluorescence Detection
- Gene Sequencing
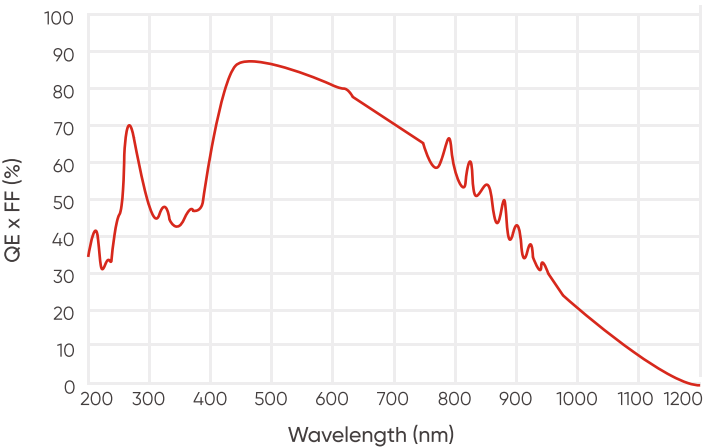- Spatial Omics

Noted Examples

[1] The Gemini 16KTDI has 3.5 times the throughput of our previous generation TDI.

1 MHz@16 K	16384 Mpixel/s

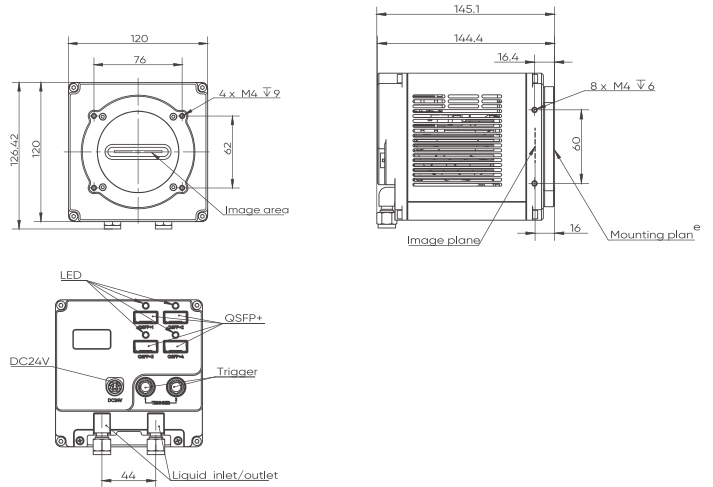| 510 KHz@9 K	4590 Mpixel/s

[2] Tucsen's advanced cooling technology creates a more uniform imaging background, enhancing detection accuracy.
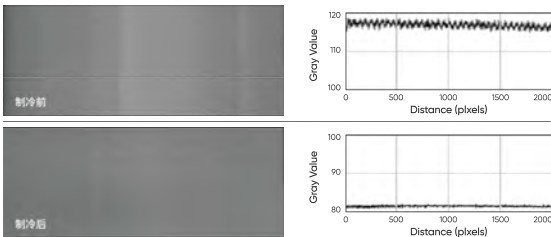
Quantum Efficiency

Dimensions (Unit: mm)

Model	Gemini 16KTDI
Sensor Type	BSI sCMOS TDI
Sensor Model	Gpixel GLT5016BSI
Peak QE	≥ 50% @ 266 nm
Spectral Range	180 nm - 1100 nm
Color / Mono	Mono
Array Diagonal	82 mm
Resolution	16416
Pixel Size	5 μm x 5 μm
Operation Mode	TDI，Area
TDI Stage	4, 32, 64, 128, 192, 224, 252, 256
Scan Direction	Forward, Reverse, Trigger Control
CTE	≥ 0.99993
Data Bit Depth	12 bit, 10 bit, 8 bit
Full-Well Capacity	≥ 15 ke-
Dynamic Range	≥ 60 dB @ 10 bit ADC
Max. Line Rate	500 KHz @ 16K
Readout Noise	＜ 15 e- @ 10 bit
Cooling Method	Air, Liquid
Max. Cooling	Air: 10℃ @ 22℃ Ambient, Liquid: 0℃ @ 22℃ Liquid Temprature
Binning	1 x 2 (SENSOR BIN), 2 x 2，4 x 4，8 x 8 (FPGA BIN)
ROI	Support
Trigger Mode	Trigger Input, Scan Direction Input
Output Trigger Signals	Strobe out
Trigger Interface	Hirose
Timestamp Accuracy	8 ns
Gain	Analog Gain: x 1 ~ x 4, Digital Gain: x0 ~ x 16
Data Interface	COF 4 x QSFP+
Optical Interface	M 90 / User Customization
Power Supply	24 V / 6.67 A
Weight	TBD
Dimensions	TBD
Software	SamplePro
SDK	C, C++
Operating System	Windows 10 X 64/Windows 11 X 64, Ubuntu 20.04, 22.04
Operating Environment	Working: Temp. 0 ℃~40 ℃, Hum. 20%~80%
	Storage: Temp. -20 ℃~40 ℃, Hum. 20%~80%
	Working altitude: 0 ~ 2000 m

Dhyana 9KTDI Pro Series

The Dhyana 9KTDI Pro series TDI cameras have been widely applied in fields such as gene sequencing and semiconductor inspection. They cover a broad spectral range from 180nm to 1100nm, allowing users to choose the best performance in either the visible or UV spectrum based on their application. Additionally, Tucsen's advanced cooling technology ensures more stable and reliable performance for scientific and industrial equipment.

| Key Features	Benefits
180-1100 nm	Wide spectral response across UV / Visible / NIR.
82% Peak QE	High photon collection efficiency for lower illumination intensity.
256 stages TDI	More TDI stages deliver higher SNR.
600 kHz @ 9K	More than 10 times the throughput of a typical sCMOS camera.[1]
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.[2]

Typical Applications

- Semiconductor/Wafer Inspection
- FPD Inspection
- Mask Inspection
- Gene sequencing
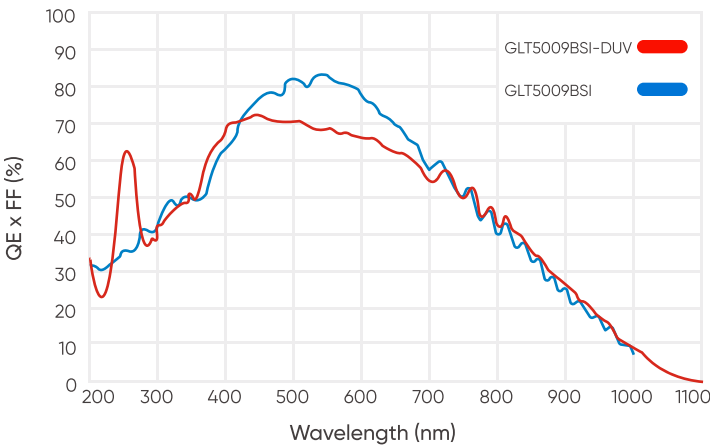- Spatial Omics

Noted Examples

[1] The 9KTDI series can reach 5400 Mpixel/s, more than 10 times that of a typical sCMOS camera.
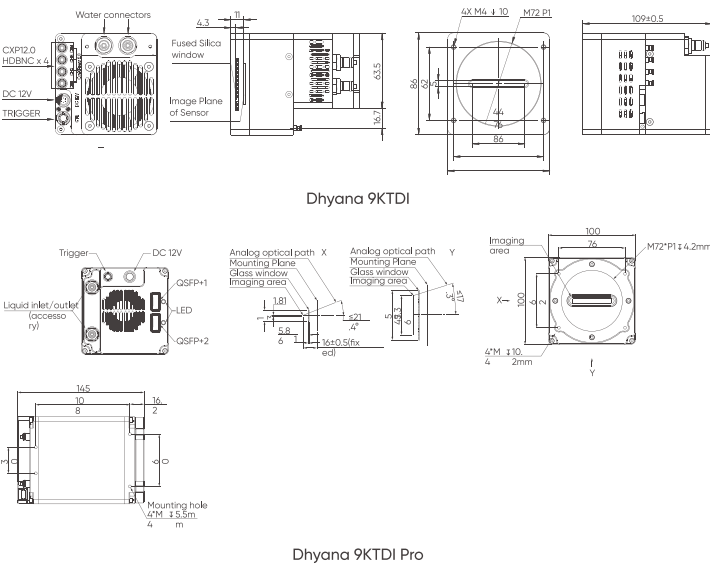
[2] Tucsen's advanced cooling technology creates a more uniform imaging background, enhancing detection accuracy.

Quantum Efficiency
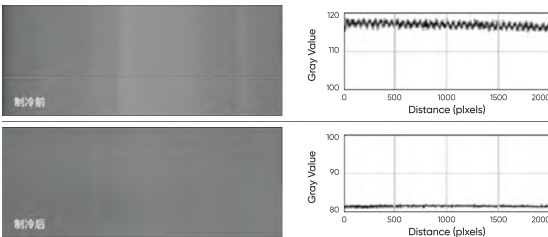
Dimensions (Unit: mm)

Dhyana 9KTDI

Dhyana 9KTDI Pro

Model	Dhyana 9KTDI Pro	Dhyana 9KTDI Pro-UV
Sensor Type	BSI sCMOS TDI	
Sensor Model	Gpixel GLT5009BSI	Gpixel GLT5009BSI-DUV
QE	82%@550 nm, 50%@350 nm, 38%@800 nm	50%@266 nm
Color/Mono	Mono	
Array Diagonal	45.4 mm	
Effective Area	45.36 mm x 1.28 mm	
Resolution	9072 (H) x 256 (V)	
Pixel Size	5 μm x 5 μm	
Operation Mode	TDI，Area	
TDI Stage	4, 8, 16, 32, 64, 96, 128, 160, 192, 224, 240, 248, 252, 256	
Scan Direction	Forward, Reverse, Trigger Control	
CTE	≥ 0.99993	
Data Bit Depth	12 bit, 10 bit, 8 bit	
Full-Well Capacity	Typ. : 15.5 ke- @ 12 bit, 14 ke- @ 10 bit	
Dynamic Range	Typ. : 68.7 dB @ 12 bit, 63.6 dB @ 10 bit	
Max. Line Rate	300 kHz @ 12 bit，600 kHz @ 10 bit，600 kHz @ 8 bit	
Readout Noise	Typ. : 7.2 e- @ 12 bit, 11.4 e- @ 10 bit	
DSNU	Typ. : 1.5 e- @ 12 bit, 3.5 e- @ 10 bit	
PRNU	Typ. : 0.30 %	
Cooling Method	Air, Liquid, Cooling speed 5 ℃ / min	
Max. Cooling	25 ℃ below ambient	
Binning	1 x 2 (SENSOR BIN), 2 x 2, 4 x 4, 8 x 8 (FPGA BIN)	
ROI	Support	
Trigger Mode	Trigger Input, Scan Direction Input	
Output Trigger Signals	Strobe out	
Trigger Interface	Hirose, HR10A-7R-4S	
Timestamp Accuracy	8 ns	
Analog Gain	x2 ~ x8, Step 0.5	
Digital Gain	x0.5 ~ x10, Step 1	
Optical Interface	M72 / Customization	
Data Interface	CoaxPress-Over-Fiber 2 x QSFP+	
Power Supply	12 V / 8 A	
Power Consumption	< 75 W	
Dimensions	100 mm x 100 mm x 145 mm	
Weight	1800 g	
Software	SamplePro	
SDK	C++ (Supports the GenICam standard)	
Operating System	Windows, Linux	
Operating Environment	Working: Temp. 0~40 ℃, HUM 0~85 ℃, Storage: Temp. 0~60 ℃, HUM 0~90%	

LEO 3243

The LEO 3243 is Tucsen's cutting-edge solution for low-light and high-throughput imaging. Powered by the latest stacked BSI sCMOS technology, it delivers exceptional performance with 43 MP HDR imaging at 100 fps, enabled by its high-speed 100G COF interface. Featuring 3.2 μm pixels and 24ke⁻ full-well capacity, the LEO 3243 redefines the balance between pixel size and full-well capacity, making it the ideal choice for today's sophisticated scientific imaging systems.
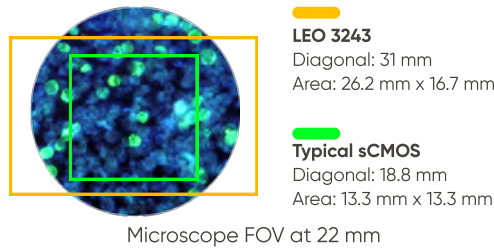
Key Features / Benefits

Key Features	Benefits
Stacked BSI sCMOS	Combines the advantages of high sensitivity, high resolution, and high speed.
100 fps at 43MP	10 times the throughput of a typical sCMOS camera.[2]
3.2 μm pixels	Making an ideal balance for high-precision and high-sensitivity inspection.
100G CoF interface	Reduces the need for multi-channel configurations, simplifying system integration.
Rolling shutter control mode	User-defined row exposure interval and scan direction

Typical Applications

- High Throughput Imaging
- Gene Sequencing
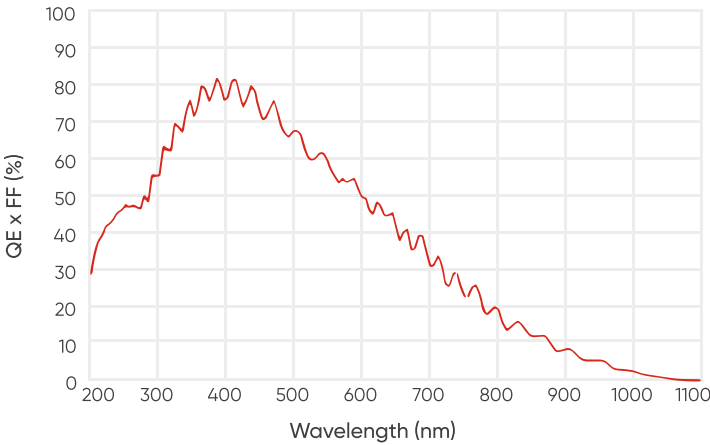- Spaitial Biology
- High Speed Industrial Inspection

Noted Examples

[1] The LEO 3243 has 2.5 times the imaging area of a typical sCMOS, capturing a larger field of view in a single shot.

LEO 3243
Diagonal: 31 mm
Area: 26.2 mm x 16.7 mm

Typical sCMOS
Diagonal: 18.8 mm
Area: 13.3 mm x 13.3 mm

Microscope FOV at 22 mm

[2] The LEO 3243 can reach 4300 Mpixel/s, more than 10 times of a typical sCMOS camera.

100 fps@43 MP

100 fps@4 MP

Quantum Efficiency

QE x FF (%) vs Wavelength (nm)

Dimensions (Unit: mm)

Model	Leo 3243
Sensor Type	Stacked BSI sCMOS
Sensor Model	GSENSE 3243BSI
Shutter Type	Rolling
Pixel Size	3.2 μm x 3.2 μm
Peak QE	> 80%
Color / Mono	Mono
Array Diagonal	31 mm
Effective Area	26.2 mm x 16.7 mm
Resolution	8192 (H) x 5232 (V)
Full-Well Capacity	21 ke- @ Standard Low Gain, 7.2 ke- @ Standard High Gain 19 ke- @ HDR, 19 ke- @ Compressed HDR
Dynamic Range	75 dB
Frame Rate	100 fps @ Standard Low Gain, 100 fps @ Standard High Gain 50 fps @ HDR, 100 fps @ Compressed HDR
Readout Noise	5.7 e- @ Standard Low Gain, 2.0 e- @ Standard High Gain 2.7 e- @ HDR, 2.6 e- @ Compressed HDR
Dark Current	< 1 e-/pixel/s @ 5℃ Air Cool
Cooling Method	Air / Liquid
Cooling Temperature	Regulated @ -5℃ (Liquid), Regulated @ 5℃ (Air)
I/O Output	Exp Start/Exp Out/ Readout / Tirgger Ready / First Raw / All Raw / Any Raw
Trigger Interface	Hirose
Data Interface	100G QSFP28
Data Bit Depth	14 bit, 16 bit
Optical Interface	T/F/C Mount
Dimensions	< 90*90*120 mm
Weight	<1 kg

Dhyana 2100

The Dhyana 2100 is designed to deliver the maximum speed and maximum resolution combination seen yet with a sCMOS sensor. Achieving an amazing 450 frames per second when running in full resolution of 5120 x 4096, it provides amazing high speed data even with low-light signals.

Key Features / Benefits
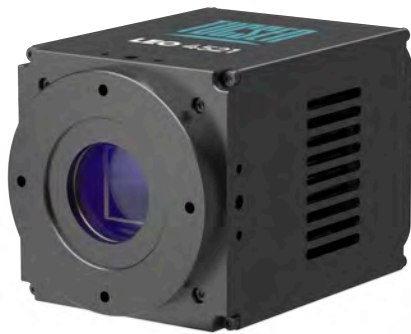
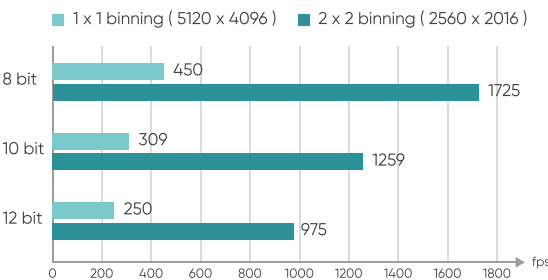| Key Features	Benefits
450 fps @ 21 MP	To allow the observation of fine details at high speed. [1]
Fast Binning Mode	Up to 1725 fps @ 5 MP with high sensitivity and high dynamic range. [2]
Global Shutter	High image quality standard with no artifacts and no distortion.
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.

Typical Applications

- Wafer Inspection
- FPD Inspection
- Aerial Photography
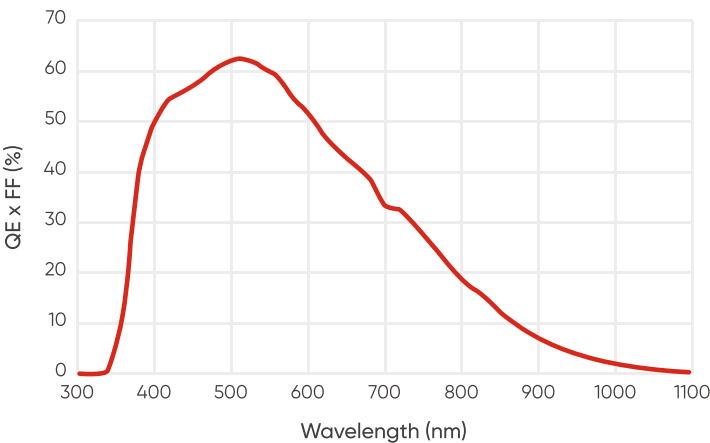- Voltage Sensitive Imaging
- Cardiac Imaging

Noted Examples

[1] High-Speed using global shutter provides clear images from objects moving at speed.
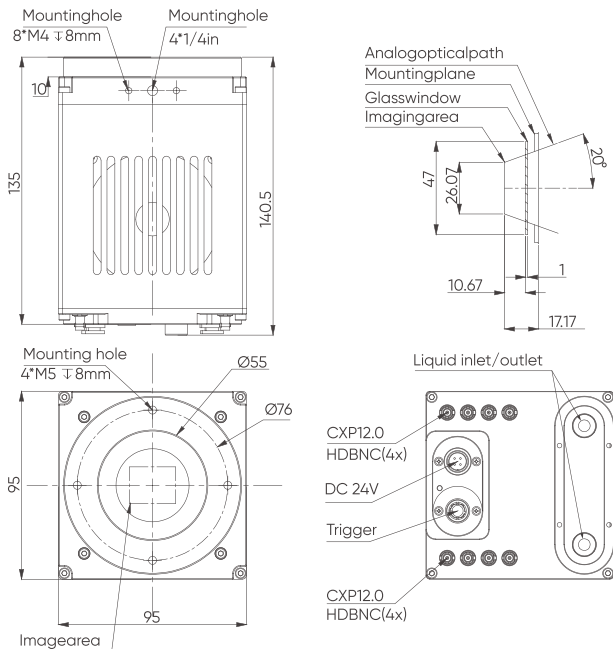
Height: 100m, 120km/h

[2] Speed Comparison in Fast Binning Mode.

- 1 x 1 binning (5120 x 4096)
- 2 x 2 binning (2560 x 2016)

	1 x 1 binning	2 x 2 binning
8 bit	450	1725
10 bit	309	1259
12 bit	250	975

fps

Quantum Efficiency

QE x FF (%) vs Wavelength (nm)

Dimensions (Unit: mm)

Mountinghole 8*M4⊥8mm   Mountinghole 4*1/4in
10
135
140.5

Analogopticalpath
Mountingplane
Glasswindow
Imagingarea
47
26.07
20°
10.67
1
17.17

Mounting hole 4*M5⊥8mm   Ø55   Ø76
95
95
Imagearea

Liquid inlet/outlet
CXP12.0 HDBNC(4x)
DC 24V
Trigger
CXP12.0 HDBNC(4x)

Model	Dhyana 2100
Sensor Type	FSI CMOS
Sensor Model	Gpixel GSPRINT4521
Peak QE	63% @ 520 nm
Color/Mono	Mono
Array Diagonal	29.5 mm
Effective Area	23.04 mm x 18.43 mm
Resolution	5120 (H) x 4096 (V)
Pixel Size	4.5 µm x 4.5 µm
Full-Well Capacity	Typ. : 28 ke- (12 bit Gain 0), 120 ke- (binned)
Dynamic Range	Typ. : 68.8 dB (12 bit Gain 2)
Frame Rate	Full mode：450 fps @ 8 bit，300 fps @ 10 bit，250 fps @ 12 bit Base mode：225 fps @ 8 bit，150 fps @ 10 bit，150 fps @ 12 bit
Readout Noise	Typ. : 3.5 e- (Median)
Shutter Type	Global
Exposure Time	4 µs ~ 10 s
DSNU	1.1 e-
PRNU	Typ. : 0.15 % @ 12 bit gain 0, Typ. : 0.45 % @ 12 bit gain 3
Cooling Method	Air, Liquid
Max. Cooling	30 ℃ below ambient
Binning	2 x 2，4 x 4，8 x 8
ROI	Support
Trigger Mode	Hardware, Software
Output Trigger Signals	Exposure start, Readout end
Trigger Interface	Hirose
Data Interface	Full mode：CXP12 x 8，Base mode：CXP12 x 4
Data Bit Depth	8 bit，10 bit，12 bit
Optical Interface	M58 / F-Mount / User Customization
Power Supply	24 V / 6 A
Power Consumption	≤ 120 W
Dimensions	95 mm x 95 mm x 140.5 mm
Weight	1816 g
Software	SamplePro，LabVIEW，MATLAB,，Micro-Manager 2.0
SDK	C, C++, C#
Operating System	Windows，Linux
Operating Environment	Working: Temp. 0~40 ℃ , HUM 10~85% Storage: Temp. 0~60 ℃ , HUM 0~90%

Aries 6506 / 6510

The Aries 6506 and 6510 achieve perfect combination of sensitivity, large FOV and high-speed performance. The advantages are not only based on the Gpixel Gsense 6510BSI sCMOS sensor, but more importantly, the flexible readout modes and user configurable structure tailored for most challenging scientific applications.

Key Features	Benefits
Ultimate Sensitivity	The Super Sensitivity mode maximizes signal collection power with up to 95% QE, while keeps the noise floor down to 0.7e-, makes them ideal for low light imaging.
Large Field of View [1]	29.4 mm diagonal sensor delivers the largest field of view among scientific cameras with 6.5 μm pixels.
Useable Full Well Capacity for High Speed Acquistion	We use 11-bit and 1,000 e- / 15,000 e- full well data for the high speed mode, resulting higher accuracy on intensity measurements over normal 8-bit data with only 200 e- full well.
Easy-to-use GigE Interface	High quality data without the need for a 3rd party frame grabber or complicated boot sequence.

Typical Applications

- Super Resolution Microscopy
- Low linght Living Cell Imaging
- Fluorescent Slide Scanning
- High Throughput Imaging

Noted Examples

[1] Aries 6510 delivers the largest field of view of 29.4 mm diagonal FOV, while Aries 6506 has an ideal FOV of 22 mm for the most of microscopes.
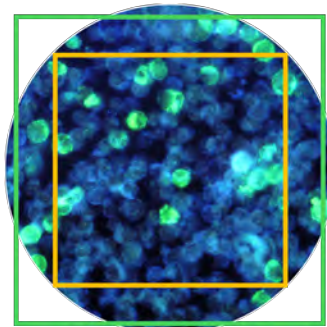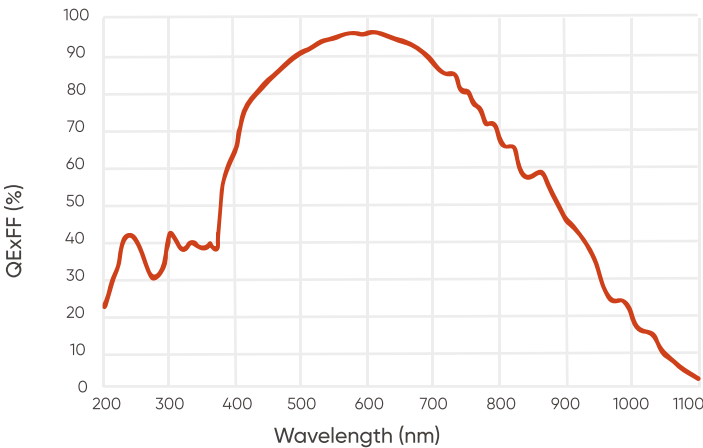
Aires 6506
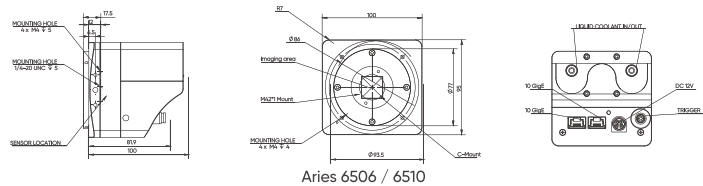Diagonal: 22 mm
Area: 15.7 mm x 15.7 mm

Aires 6510
Diagonal :29.4 mm
Area: 20.8 mm x 20.8 mm

Microscope FOV at 22 mm

Quantum Efficiency

QExFF (%) vs Wavelength (nm)

Dimensions (Unit: mm)

Aries 6506 / 6510

Model	Aries 6510				Aries 6506			
Sensor Type	BSI sCMOS							
Sensor Model	Gpixel GSENSE 6510BSI							
Peak QE	95%							
Color / Mono	Mono							
Array Diagonal	29.4 mm				22 mm			
Effective Area	20.8 mm x 20.8 mm				15.7 mm x 15.7 mm			
Resolution	3200 x 3200				2400 x 2400			
Pixel Size	6.5 μm x 6.5 μm							
Readout Mode	HDR	Speed	Sensitivity	Super - Sensitivity	HDR	Speed	Sensitivity	Super - Sensitivity
Bit Depth	16 bit	11 bit	12 bit	12 bit	16 bit	11 bit	12 bit	12 bit
Frame Rate	83 fps	150 fps	88 fps	5.2 fps	111 fps	200 fps	117 fps	6.9 fps
Readout Noise	1.6 e-	2.0 e-	1.2 e-	0.7 e-	1.6 e-	2.0 e-	1.2 e-	0.7 e-
Dark Current @ 0℃ (e- / P /s)	0.5	1.0	0.5	0.5	0.5	1.0	0.5	0.5
Full Well Capacity	15,000 e-	1,000 e- / 15,000 e-	1,500 e-	1,000 e-	15,000 e-	1,000 e- / 15,000 e-	1,500 e-	1,000 e-
Shutter Mode	Rolling							
Image Correction	DPC							
ROI	Support							
Binning (FPGA)	2 x 2, 4 x 4							
Cooling Method	Liquid Cooling , Air Cooling							
Cooling Temperature	Air: 0℃ @ 25℃ ambient; Liquid: -10℃ @ 20℃ liquid temprature							
Trigger Mode	Hardware, software							
Output Trigger Signals	Exposure start, Global, Readout end, Trigger ready, Global reset, First row, Any row							
Trigger Interface	Hirose							
SDK	C / C++ / C# / Python							
Data Interface	2x10G GigE							
Optical Interface	T / F / C Mount				C Mount			
Power	12 V / 8 A							
Power Consumption	≤ 55 W							
Dimensions	95 mm (H) x 100 mm (W) x 100 mm (L)							
Camera Weight	TBD							
Operating System	Windows / Linux							
Operating Environment	Working: Temperature 0~40 ℃, Humidity 10~85 %							
	Storage: Temperature -10~60 ℃, Humidity 0~85 %							

Aries 16

The Aries 16 is a new generation of BSI sCMOS camera developed exclusively by Tucsen Photonics. With sensitivity which matches EMCCD and surpasses binned sCMOS combined with high full well capacity normally observed in large format CCD cameras, the Aries 16 provides a fantastic solution for both low-light detection and high-dynamic range imaging.
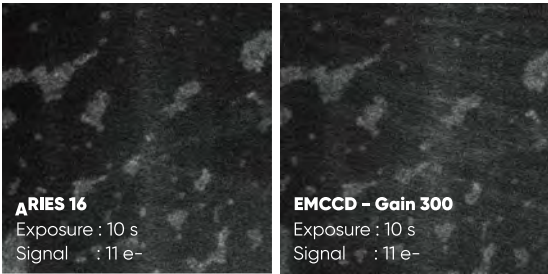
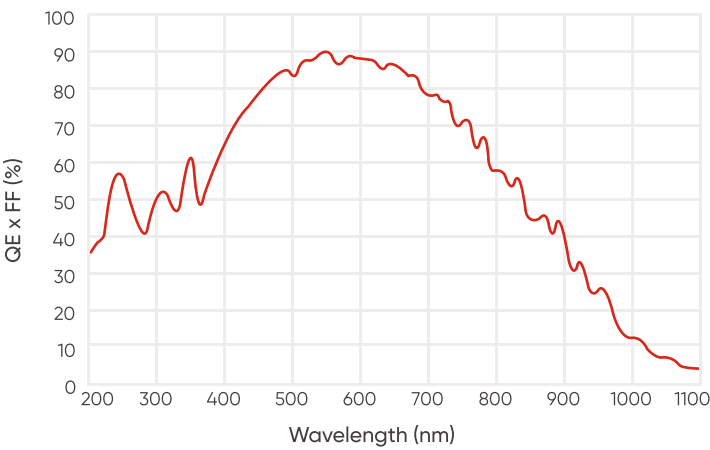| Key Features	Benefits
BSI –sCMOS Technology	16 µm large pixels, 0.9 e- readoutout noise, and up to 90% QE.[1]
Advanced Cooling Technology	To reduce the thermal noise, ensuring high SNR imaging and stable measurement results.
74 ke- Well Capacity	High dynamic range to capture strong and weak signals simultaneously.
HDR & Low Noise Modes	Double modes provide flexibility for high dynamic and low-light applications

Typical Applications

- Cold Atoms
- Quantum Physics
- Super Resolution
- FRET
- FCS
- TIRF
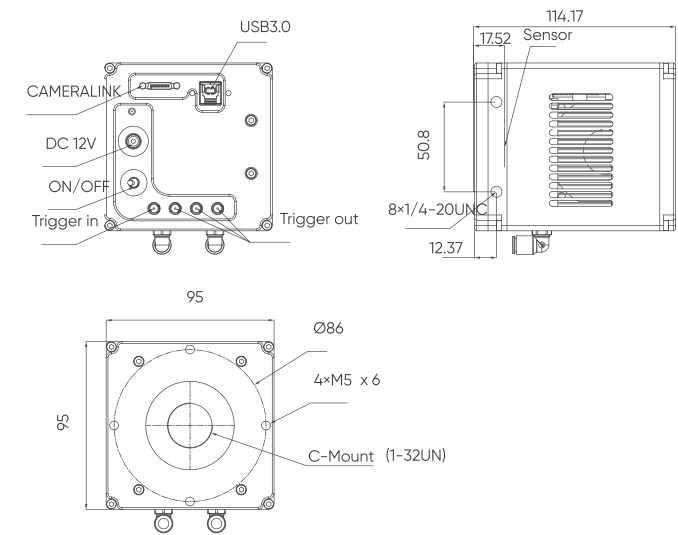- Bioluminescence
- Chemiluminescence

Noted Examples

[1]Aries 16 can replace EMCDD in extreme signal detection fields such as Bioluminescence, and the imaging quality is equivalent.

A RIES 16
Exposure : 10 s
Signal   : 11 e-

EMCCD – Gain 300
Exposure : 10 s
Signal   : 11 e-

Quantum Efficiency

QE x FF (%) vs Wavelength (nm)

Dimensions (Unit: mm)

Model	Aries 16
Color/Mono	Mono
Peak QE	90.7% @ 550 nm
Resolution	800 (H) × 600 (V)
Array Diagonal	16 mm
Pixel Size	16 µm x 16 µm
Effective area	12.8 mm x 9.6 mm
Full well capacity	Typ.: 73 ke-
Dynamic Range	Typ.: 94.8 dB
Readout Rate	60 fps @ HDR mode, 25 fps @ Low noise mode
Readout Noise	Typ. : 1.6 e- @ HDR mode, 0.9 e- @ Low noise mode
Shutter Mode	Rolling / Global reset
Exposure Time	26 µs ~ 60 s
DSNU	0.3 e-
PRNU	0.3%
Cooling Method	Air, Liquid
Cooling Temperature	Air: 50 ℃ below ambient, Liquid: 60 ℃ below ambient
Dark current	0.2 e- / pixel / s
Binning	2 x 2, 4 x 4, Free binning
ROI	Support
Trigger Mode	Hardware, Software
Output Trigger Signals	Exposure start, Global, Readout end, High level, Low level
Trigger Interface	SMA
Timestamp	Support
Data Interface	USB 3.0 & CameraLink
SDK	C , C++ , C#, Python
Bit Depth	12 bit & 16 bit
Optical Interface	C-mount
Power	12 V / 8 A
Power Consumption	38 W
Dimensions	95 mm × 95 mm × 114 mm
Weight	1500 g
Software	Mosaic 3.0，SamplePro，LabVIEW , MATLAB，Micro-Manager 2.0
Operating System	Windows
Operating Environment	Working: Temp. 0~40℃，HUM 0~85% Storage: Temp. 0~60℃，HUM 0~90%

Dhyana 400BSI V3

The Dhyana 400BSI V3 delivers perfect sensitivity and resolution for high NA microscope objectives, being designed lighter, and needing less power, making it ideal for integrating and fitting into small spaces.[1]

Key Features / Benefits

| Key Features	Benefits
95% QE & Lowest Noise	High signal-to-noise ratio across UV / Visible / NIR.
6.5 µm x 6.5 µm Pixel Size	Optimal spatial sampling and sensitivity for 100x, 60x and 40x microscope.
18 mm Array Diagonal	Ideal for the microscopes that have C-mount ports.
Rolling Shutter Control Mode	Allowed to define line time delays or slit heights for scanning systems such as Light-sheet Microscopy. [2]
Camera Link & USB 3.0	While the USB 3.0 is quite flexible and easy to use, the CameraLink is a faster and stable option up to 100 fps @ 4.2 MP.
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.

Typical Applications

- Advanced Microscopy
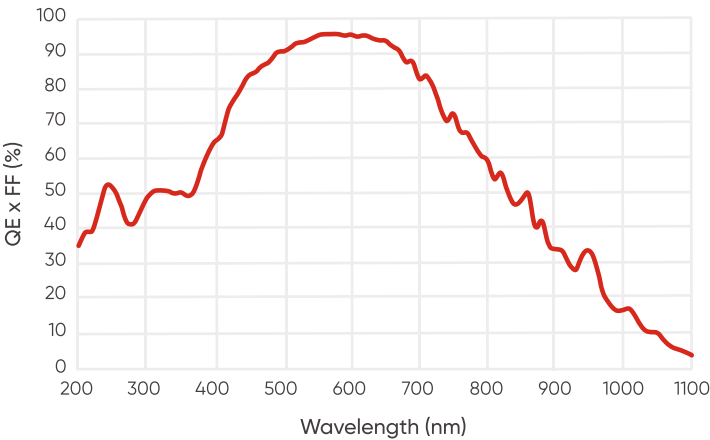- Spectral Imaging
- Astrophysical

Noted Examples
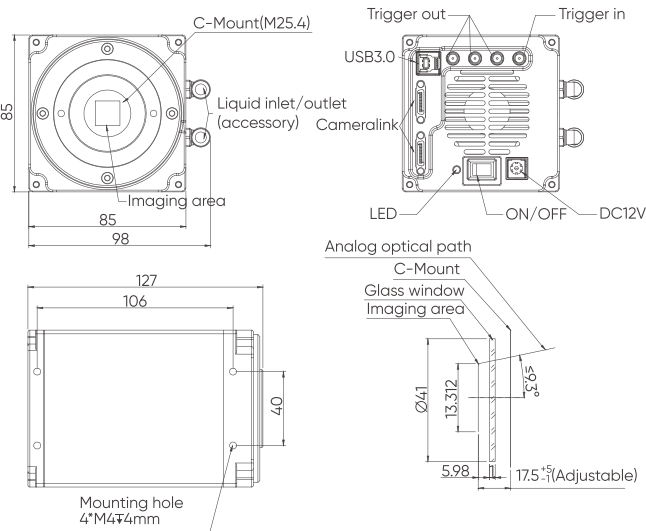
[1] Compact, lighter design requiring less power.
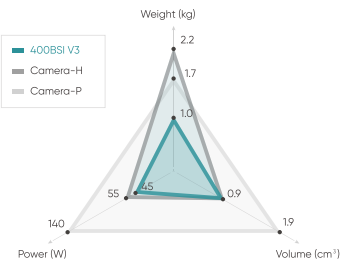
[2] The Rolling Shutter Control Mode applied in Light-sheet Microscopy.

Actively sensing pixels

Rolling shutter movement direction

Readout

Exposure start
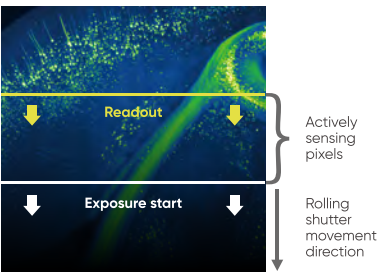
Quantum Efficiency

Dimensions (Unit: mm)

Model	Dhyana 400BSI V3	
Sensor Type	BSI sCMOS	
Sensor Model	Gpixel GSENSE2020BSI	
Peak QE	95% @ 600 nm	
Color/Mono	Mono	
Array Diagonal	18.8 mm	
Effective Area	13.3 mm x 13.3 mm	
Resolution	2048 (H) x 2048 (V)	
Pixel Size	6.5 µm x 6.5 µm	
Full-Well Capacity	Typ. : 45 ke-	
Dynamic Range	Typ. : 90 dB	
Frame Rate	12 bit Firmware HDR: 43 fps @ CameraLink, 43 fps @ USB 3.0 High Speed: 100 fps @ CameraLink, 60 fps @ USB 3.0	11 bit Firmware HDR: 74 fps @ CameraLink, 45 fps @ USB 3.0 High Speed: 100 fps @ CameraLink, 60 fps @ USB 3.0
Readout Noise	CMS(Typ.): 1.1 e- (Median) , 1.2 e- (RMS)	
Shutter Type	Rolling, Global reset	
Exposure Time	6.6 µs ~ 10 s	
DSNU	0.2 e-	
PRNU	0.3%	
Cooling Method	Air, Liquid	
Max. Cooling	45 ℃ below ambient (Liquid)	
Dark Current	0.5 e-/pixel/s @-10℃	
Binning	2 x 2，4 x 4	
ROI	Support	
Timestamp Accuracy	1 µs	
Trigger Mode	Hardware, Software	
Output Trigger Signals	Exposure start, Global, Readout end, High level, Low level, Trigger Ready	
Trigger Interface	SMA	
Data Interface	USB 3.0，CameraLink	
Data Bit Depth	11 bit，12 bit，16 bit	
Optical Interface	C-mount	
Power Supply	12 V / 8 A	
Power Consumption	45 W	
Dimensions	85 mm x 85 mm x 127 mm	
Weight	995 g	
Software	Mosaic 3.0，SamplePro，LabVIEW，MATLAB，Micromanager	
SDK	C，C++，C#，Python	
Operating System	Windows，Linux	
Operating Environment	Working: Temp. 0~40 ℃ , HUM 10~85% Storage: Temp. 0~60 ℃, HUM 0~90%	

Dhyana 95 V2

The Dhyana 95 V2 delivers ultimate sensitivity achieving similar results to EMCCD camera technology without the concerns of signal drift, gain aging, multiplication gain noise (1.4x) and headaches of export control restrictions.[2]

Key Features | Benefits

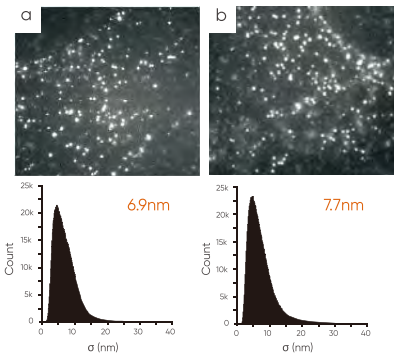| Key Features	Benefits
95% QE & Lowest Noise	Higher SNR than EMCCD when the signal (photon) >3 e-.[1]
11 µm x 11 µm Pixel Size	Large pixels capture 3x the light of standard 6.5 µm pixels to maximize photon detection.
32 mm Array Diagonal	Capture maximum field of views of the large samples.
100 ke- Full-well Capacity	High dynamic range for the measurement of bright and dim signals at the same time.
CameraLink & USB 3.0	Use the flexibility of USB or if additional speed is required move to CameraLink.
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.

Typical Applications

- Advanced Microscopy
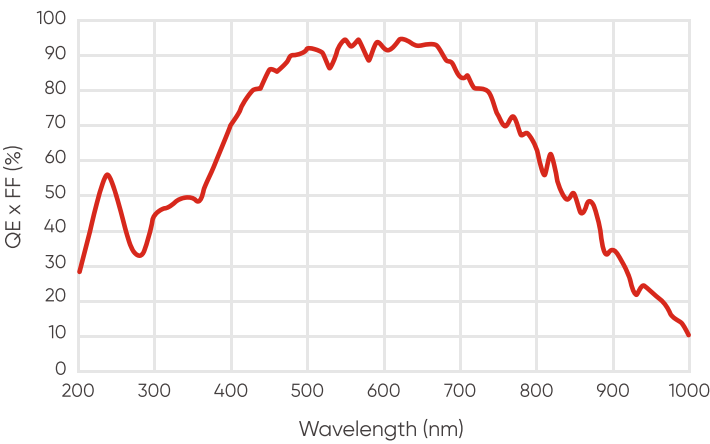- Spectral Imaging
- X-ray Imaging
- Astrophysical

Noted Examples

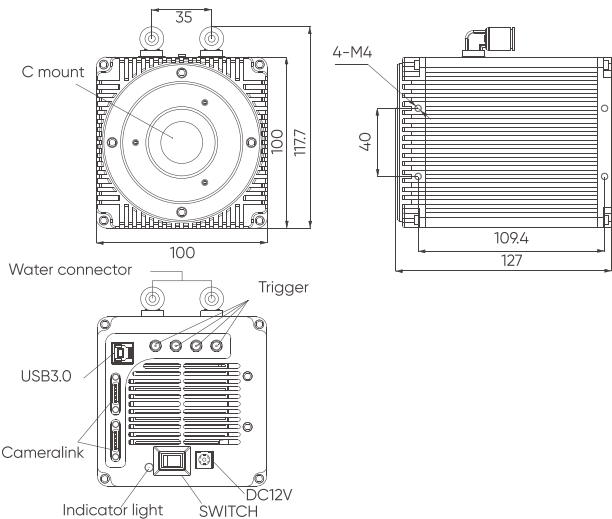[1] The Higher SNR than EMCCD when the signal (photon) > 3 e-.
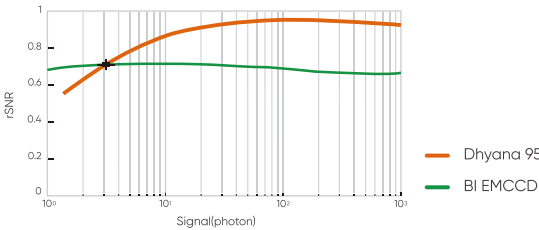
Dhyana 95
BI EMCCD

[2] Dhyana 95 V2 demonstrating higher localization accuracy than EMCCD in single-molecule localization experiments.


6.9nm   7.7nm

a: Dhyana 95

b: BI EMCCD

Quantum Efficiency

Dimensions (Unit: mm)

C mount

Water connector

USB3.0

Cameralink

Indicator light   DC12V SWITCH

Trigger

4-M4

| Model	Dhyana 95 V2
Sensor Type	BSI sCMOS
Sensor Model	Gpixel GSENSE400BSI
Peak QE	95 % @ 560 nm
Color/Mono	Mono
Array Diagonal	31.9 mm
Effective Area	22.5 mm x 22.5 mm
Resolution	2048 (H) x 2048 (V)
Pixel Size	11 µm x 11 µm
Full-Well Capacity	Typ. : 80 ke- @ HDR, 100 ke- @ STD
Dynamic Range	Typ. : 90 dB
Frame Rate	24 fps @ 16 bit HDR, 48 fps @ 12 bit STD
Readout Noise	1.6 e- (Median), 1.7 e- (RMS)
Shutter Type	Rolling
Exposure Time	21 µs ~ 10 s
DSNU	0.2 e-
PRNU	0.3%
Cooling Method	Air, Liquid
Max. Cooling	45 ℃ below ambient (Liquid)
Dark Current	0.6 e-/pixel/s @-10℃
Binning	2 x 2, 4 x 4
ROI	Support
Timestamp Accuracy	1 µs
Trigger Mode	Hardware, Software
Output Trigger Signals	Exposure start, Global, Readout end, High level, Low level, Trigger Ready
Trigger Interface	SMA
Data Interface	USB 3.0，CameraLink
Data Bit Depth	12 bit，16 bit
Optical Interface	C-mount / F-mount
Power Supply	12 V / 8 A
Power Consumption	60 W
Dimensions	C-mount：100 mm x 118 mm x 127 mm；F-mount：100 mm x 118 mm x 157 mm
Weight	1613 g
Software	Mosaic，SamplePro，LabVIEW，MATLAB，Micro-Manager 2.0
SDK	C，C++，C#，Python
Operating System	Windows，Linux
Operating Environment	Working: Temp. 0~40 ℃ , HUM 0~85% Storage: Temp. 0~60 ℃, HUM 0~90%

Dhyana 400D / 400DC

The Dhyana 400D / 400DC are black-and-white and color cameras developed by Tucsen based on front-illuminated sCMOS technology. They provide the sensitivity required for general low-light imaging experiments, with a wide field of view and exceptional dynamic range.
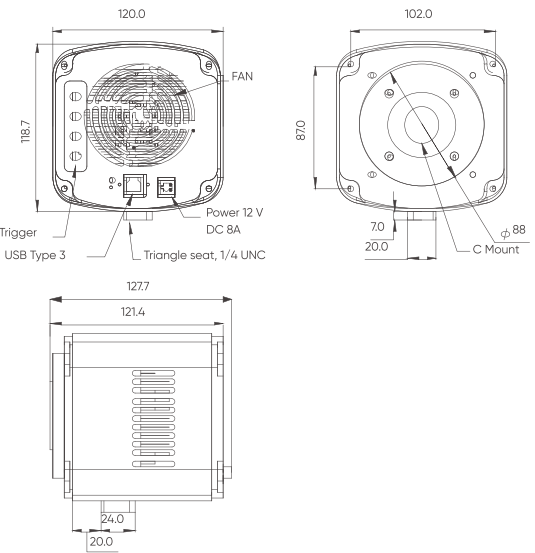
Quantum Efficiency

Application Cases
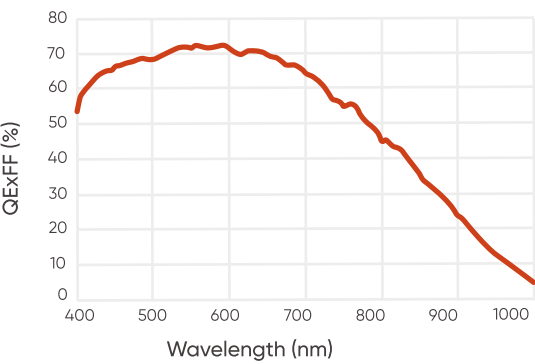
| Dhyana 400D, 40 ms | CCD Camera, 40 ms |
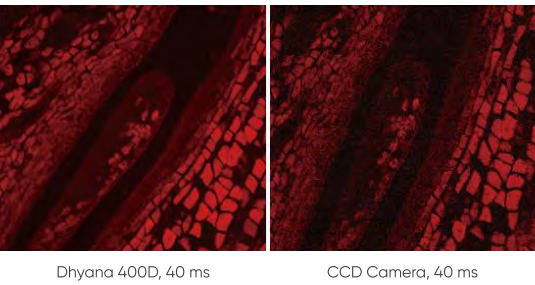
Dimensions (Unit: mm)

Specifications

| Model	400D	400DC
Sensor Type	FSI sCMOS	
Sensor Model	GSENSE2020	GSENSE2020s
Peak QE	72 % @ 595 nm	
Color / Mono	Mono	Color
Array Diagonal	18.8 mm	
Effective Area	13.3 mm x 13.3 mm	
Resolution	2048 (H) x 2040 (V)	
Pixel Size	6.5 μm x 6.5 μm	
Full-Well Capacity	45 ke-	
Dynamic Range	Typ. : 86.6 dB	
Frame Rate	35 fps@16 bit	22 fps@8 bit 16 fps@16 bit
Readout Noise	2 e-	1.7 e-
Shutter Type	Rolling	
Exposure Time	13 μs ~ 10 s	21 μs ~ 10 s
Cooling Method	Air	
Max. Cooling	35 ℃ Below Ambient	
Dark Current	0.12 e-/pixel/s @ -10 ℃	
Binning	2 x 2	
ROI	Support	
Trigger Mode	Hardware, Software	
Output Trigger Signals	Exposure Start, Global, Readout End	
Trigger Interface	SMA	
Data Interface	USB 3.0	
Data Bit Depth	12 bit，16 bit	16 bit
Optical Interface	C-mount	
Power Supply	12 V / 8 A	
Power Consumption	60 W	50 W
Dimensions	120 mm x 119 mm x 121 mm	
Weight	1853 g	
Software	Mosaic, LabVIEW, MATLAB Micromanager 2.0	
SDK	C, C++, C#, Python	C, C++, C#
Operating System	Windows, Linux	
Operating Environment	Working: Temp. 0~40℃ , HUM 10~85%	

Dhyana 401D / 201D

The Dhyana 401D / 201D is the sCMOS answer for system integrators who seek sCMOS performance but want to preserve their instrument cogs / cost. Built in a small package using a front illuminated 6.5 μm pixel sensor, the camera delivers what most systems need cost-effective of other contemporaries.
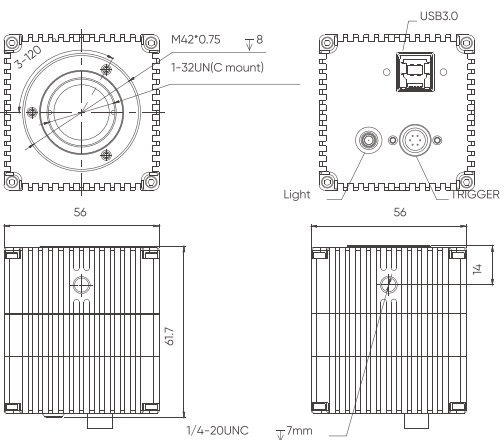
Quantum Efficiency

Application Cases

| Tumor-DOT Detection | Blood-Diffractive Phase Imaging |
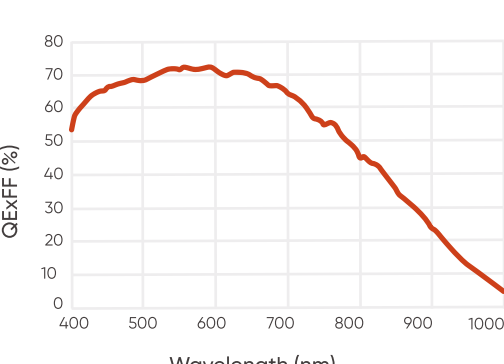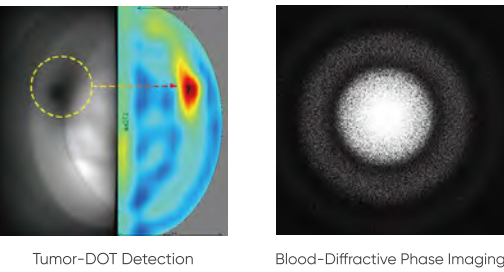
Dimensions (Unit: mm)

Specifications

Model	Dhyana 401D	Dhyana 201D
Sensor Type	FSI sCMOS	
Sensor Model	GSENSE2020	GSENSE2011
Peak QE	72% @ 595 nm	
Color/Mono	Mono	
Array Diagonal	18.8 mm	15.3 mm
Effective Area	13.3 mm x 13.3 mm	13.3 mm x 7.5 mm
Resolution	2048 (H) x 2048 (V)	2048 (H) x 1152 (V)
Pixel Size	6.5 μm x 6.5 μm	
Full-Well Capacity	Typ. : 43 ke-	Typ. : 45 ke-
Frame Rate	40 fps @ 16 bit, 45 fps @ 8 bit	70 fps @ 16 bit, 80 fps @ 8 bit
Readout Noise	Typ. : 2.1 e- (Median)	
Shutter Type	Rolling	
Exposure Time	10 μs ~ 10 s	
Binning	2 x 2, 4 x 4	
ROI	Support	
Trigger Mode	Hardware, Software	
Output Trigger Signals	Exposure Start, Readout End Trigger Ready	Exposure Start, Readout End
Trigger Interface	Hirose	
Data Interface	USB 3.0	
Data Bit Depth	8 bit, 12bit, 16 bit	
Optical Interface	C-mount	
Power Supply	USB 3.0	
Power Consumption	< 4 W	
Dimensions	56 mm x 56 mm x 61.7 mm	
Weight	305 g	
Software	Mosaic, LabVIEW, MATLAB Micro-Manager 2.0, SamplePro	
SDK	C, C++, C#, Python	
Operating System	Windows, Linux	
Operating Environment	Working: Temp. 0~40℃ , HUM 10~85% Storage: Temp. 0~60℃ , HUM 0~90%	

Dhyana 4040 V2 / 4040BSI

The Dhyana 4040 V2 / 4040BSI brings the speed and dynamic range to large format imaging missing from previous CCD technology.[1] With a 52 mm diameter, high quantum efficiency and 9-micron pixels size, it is well suited to scientific applications in areas such as Astronomy and Physics.

Key Features

| Key Features	4040 V2 / 4040 BSI	Benefits
Field of View	36.9 mm x 36.9 mm	Large field of view from 16 MP, 9 μm pixel size sensor.
Quantum Efficiency	74 % QE / 90% QE	High photon collection efficiency for lower illumination intensity.
Frame Rate	16.5 fps	Faster data rates than the previous CCD technology.
Full-well Capacity	70 ke- / 39 ke-	High dynamic range for the measurement of bright and dim signals at the same time.
Cooling Method	Air & Liquid	Maintains low dark noise, minimizes vibration, and aids thermal stability.

Typical Applications

- Space Debris Detection
- Solar Astronomy
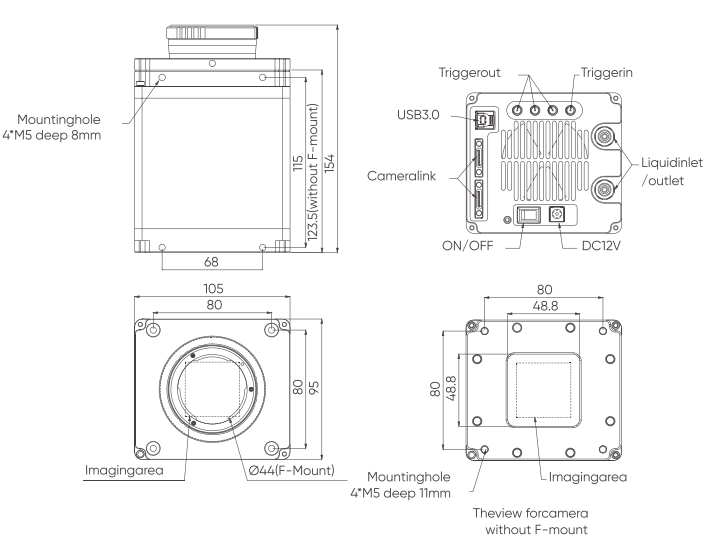- X-ray Detection
- Quantum Optics

Noted Examples

[1] Large sCMOS technology can be used in a wide range of applications previously limited by CCD technology.

Space Debris

Salar

X-ray
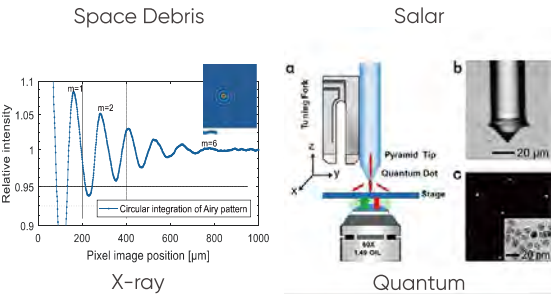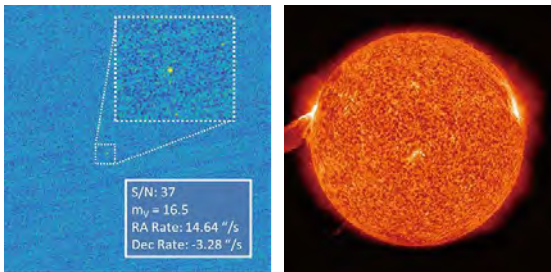
Quantum

Quantum Efficiency
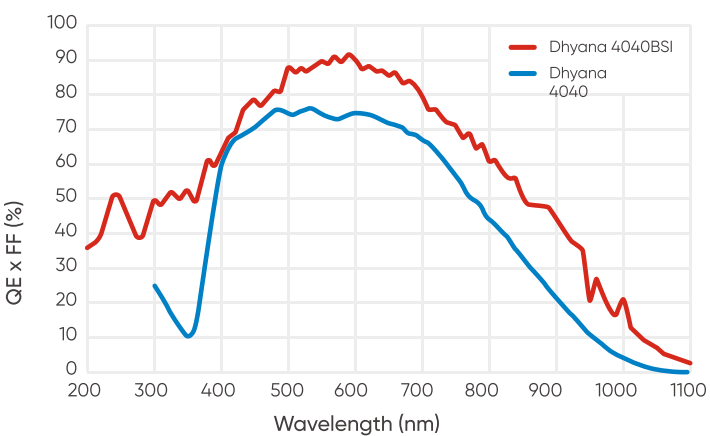
Dimensions (Unit: mm)

Model	Dhyana 4040 V2	Dhyana 4040BSI
Sensor Type	FSI sCMOS	BSI sCMOS
Sensor Model	Gpixel GSENSE4040	Gpixel GSENSE4040BSI
Peak QE	74 % @ 600 nm	90 % @ 550 nm
Color/Mono	Mono	
Array Diagonal	52.1 mm	
Effective Area	36.9 mm x 36.9 mm	
Resolution	4096 (H) x 4096 (V)	
Pixel Size	9 μm x 9 μm	
Full-Well Capacity	Typ. : 70 ke-	Typ. : 39 ke-
Dynamic Range	Typ. : 86 dB	Typ. : 85 dB
Frame Rate	16.5 fps @ CameraLink, 9.7 fps @ USB 3.0	
Readout Noise	Typ. : 3.6 e- (Median)	Typ. : 2.3 e- (Median)
Shutter Type	Rolling	
Exposure Time	10 μs ~ 3600 s	
DSNU	0.5 e-	
PRNU	0.2%	
Cooling Method	Air, Liquid	
Max. Cooling	45 ℃ below ambient (Liquid)	
Dark Current	Air: 0.15 e-/pixel/s, Liquid: 0.1 e-/pixel/s	Air: 0.2 e-/pixel/s, Liquid: 0.1 e-/pixel/s
Binning	2 x 2，4 x 4	
ROI	Support	
Timestamp Accuracy	1 μs accuracy	1 μs
GPS	8 ns accuracy	8 ns
Trigger Mode	Hardware, Software	
Output Trigger Signals	Exposure start, Global, Readout end, High level, Low level	
Trigger Interface	SMA , CameraLink CC1	
Data Interface	USB 3.0，CameraLink	
Data Bit Depth	12 bit，16 bit	
Optical Interface	F-Mount / User Customization	
Power	12 V / 8 A	
Power Consumption	＜ 45 W	
Dimensions	105 mm x 95 mm x 123.5 mm	
Weight	2 kg	
Software	Mosaic 3.0, SamplePro, MAXIMDL, LabVIEW, MATLAB	
SDK	C, C++, C#, Python	
Operating System	Windows，Linux	
Operating Environment	Working: Temp. -25~45 ℃，HUM 0~95%	
	Storage: Temp. -35~60 ℃，HUM 0~95%	

Dhyana 6060 / 6060BSI

The Dhyana 6060 / 6060BSI brings the speed and dynamic range to large format imaging missing from previous CCD technology.[1] With a massive 86 mm diameter, high quantum efficiency and 10-micron pixels size, it is well suited to scientific applications in areas such as Astronomy and Physics.

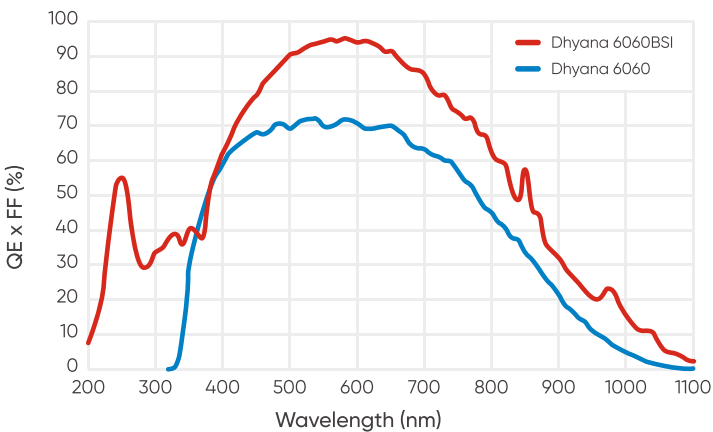| Key Features	6060 / 6060BSI	Benefits
Field of View	61.4 mm x 61.4 mm	Very large field of view from 36 MP, 10 μm pixel size sensor.
Quantum Efficiency	72 % QE / 95% QE	High photon collection efficiency for lower illumination intensity.
Frame Rate	44 fps / 26.4 fps	Faster data rates than the previous CCD technology.
Full-well Capacity	123 ke- / 102 ke-	High dynamic range for the measurement of bright and dim signals at the same time.
Cooling Method	Air & Liquid	Maintains low dark noise, minimizes vibration, and aids thermal stability.

Typical Applications

- Space Debris Detection
- Solar Astronomy
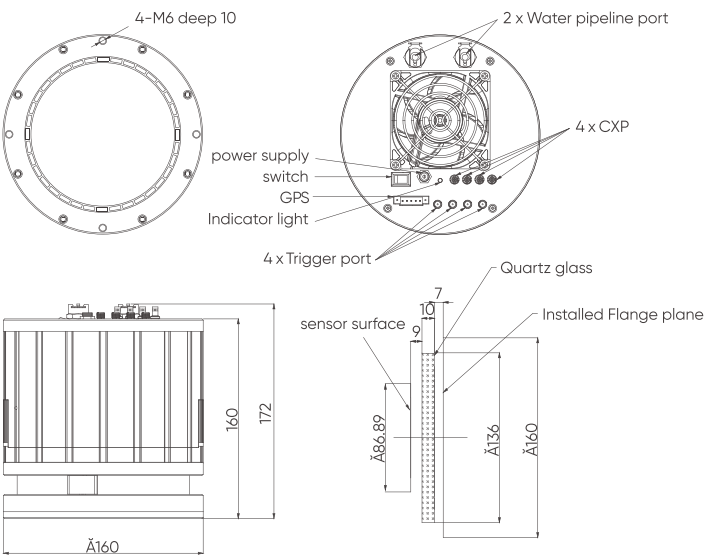- X-ray Detection
- Quantum Optics

Noted Examples

[1] Large sCMOS technology can be used in a wide range of applications previously limited by CCD technology.

Space Debris   Salar

X-ray   Quantum
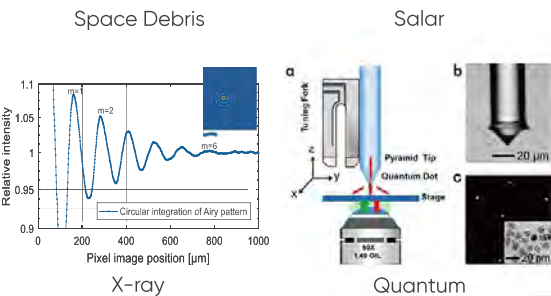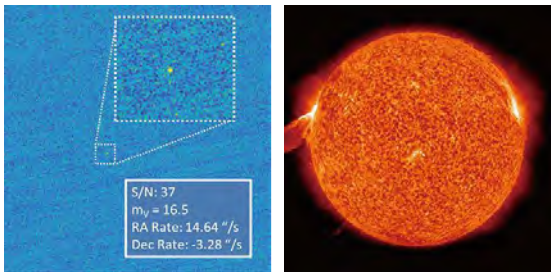
Quantum Efficiency

Dimensions   (Unit: mm)

Model	Dhyana 6060	Dhyana 6060BSI
Sensor Type	FSI sCMOS	BSI sCMOS
Sensor Model	Gpixel GSENSE6060	Gpixel GSENSE6060BSI
Peak QE	72 % @ 550 nm	95 % @ 580 nm
Color/Mono	Mono	
Array Diagonal	86.8 mm	
Effective Area	61.4 mm x 61.4 mm	
Resolution	6144 (H) x 6144 (V)	
Pixel Size	10 μm x 10 μm	
Full-Well Capacity	Typ. : 123 ke-	Typ. : 102 ke-
Dynamic Range	Typ. : 91 dB	Typ. : 90 dB
Frame Rate	44 fps @ 12-bit STD, 19 fps @ 16-bit HDR, 14 fps @ 14-bit STD	26.4 fps @ 12-bit STD, 11.3 fps @ 16-bit HDR, 8.6 fps @ 14-bit STD
Readout Noise	Typ. : 3 e- (Median)	
Shutter Type	Rolling	
Exposure Time	7 μs ~ 300 s	12 μs ~ 300 s
DSNU	1.5 e-	
PRNU	0.2 %	
Cooling Method	Air, Liquid	
Max. Cooling	45 ℃ below ambient (Liquid)	
Dark Current	Air: 0.25 e-/pixel/s, Liquid: 0.15 e-/pixel/s	
Binning	2 x 2，4 x 4	
ROI	Support	
Timestamp Accuracy	1 μs	
GPS	Support	
Trigger Mode	Hardware, Software	
Output Trigger Signals	Exposure start, Global, Readout end, High level, Low level	
Trigger Interface	SMA	
Data Interface	CoaxPress 2.0	
Data Bit Depth	12 bit，14 bit，16 bit	
Optical Interface	User Customization	
Power Supply	12 V / 10 A	
Power Consumption	＜ 100 W	
Dimensions	φ 160 mm x 164 mm	
Weight	4 kg	
Software	SamplePro , MAXIMDL , LabVIEW , MATLAB, EPICS	
SDK	C , C++ , C#，Python	
Operating System	Windows，Linux	
Operating Environment	Working: Temp. -35~45 ℃ , HUM 0~95 % Storage: Temp. -35~60 ℃ , HUM 0~95 %	

Dhyana XF95 / XV95

Dhyana XF95 has a high QE up to nearly 100% in 80eV-1000eV with a new technology of BSI sCMOS without anti-reflection coating, which can bring more professional soft X-ray and EUV imaging performance and higher radiation damage resistance. [1]

Key Features / Benefits
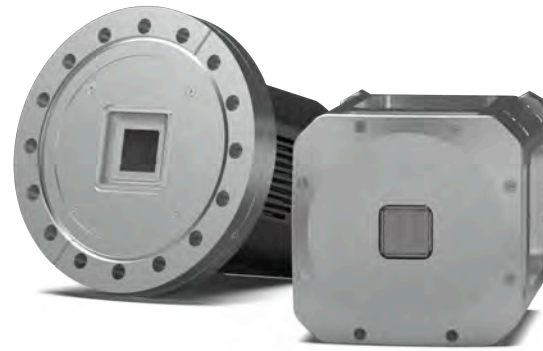
Key Features	Benefits
~100% Peak QE @ 80-1000 eV	Excellent soft x-ray and extreme ultraviolet imaging performance.
95% Peak QE @ 200-1100 nm	Supports more spectral analysis and imaging applications.
100 ke- Full Well Wapacity	High dynamic range for the measurement of bright and dim signals at the same time.
48 fps @ 4.2 MP	Dozens of times the speed of CCD cameras.
Air & Liquid Cooling	Maintains low dark noise, minimizes vibration, and aids thermal stability.

Typical Applications

- Soft X-ray Scattering / Spectroscopy
- Extreme Ultraviolet Spectroscopy
- Layered Diffraction Imaging
- High Harmonic Generation Radiation

Noted Examples

"Backside-illuminated sCMOS technology is very attractive for cost-adapting to specific applications, and overall shows good dynamic range, which can significantly reduce acquisition time for imaging applications compared to commonly used classical backside-illuminated CCD cameras ."
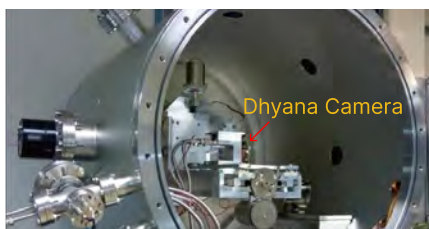—— Journal of Synchrotron Radiation, 2020.

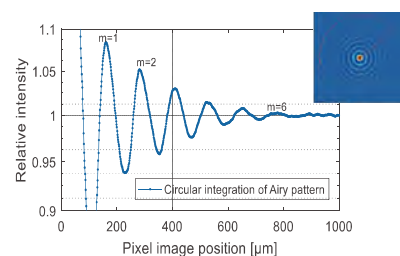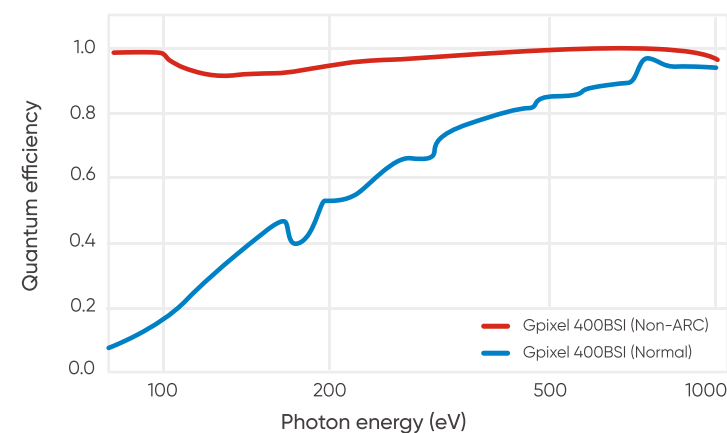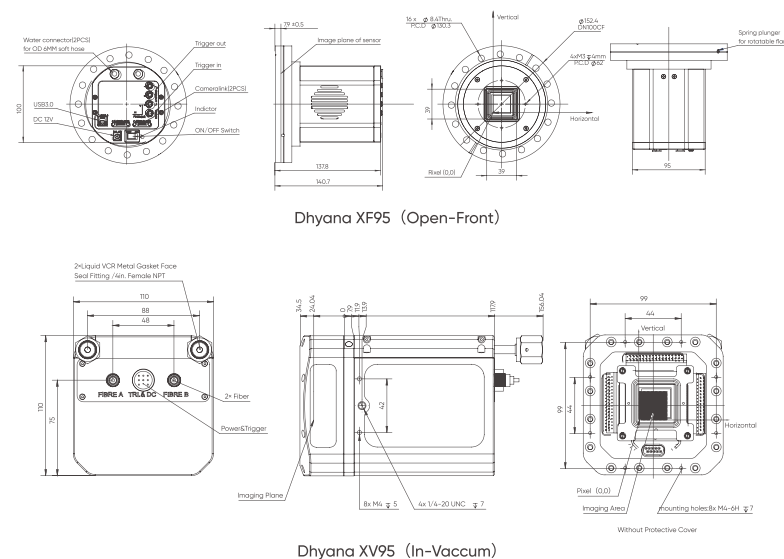Figure 1 Beamline Hutch at The SOLEIL Synchrotron Facility, France

Figure 2 Diffraction Pattern of a 186 eV Beam

Quantum Efficiency

Dimensions (Unit: mm)

Dhyana XF95（Open-Front）

Dhyana XV95（In-Vaccum）

| Model	Dhyana XF95 (Open-Front)	Dhyana XV95 (In-Vaccum)
Sensor Type	GSENSE 400BSI-PS / GSENSE 400BSI	
Sensor Model	Non Anti-Reflection Coating BSI / BSI	
Peak QE	~100%	
Color / Mono	Mono	
Array Diagonal	31.9 mm	
Effective Area	22.5 mm x 22.5 mm	
Resolution	4 MP，2048 (H) x 2048 (V)	
Pixel Size	11 μm x 11 μm	
Full Well Wapacity	Typ.: 90 ke-	Typ.: 85 ke-
Dynamic Range	90 dB	
Frame Rate	HDR：24 fps；STD：48 fps	
Readout Noise	Typ.: 1.6 e- (Median)	
Shutter Mode	Rolling	
Exposure Time	21 μs ~ 300 s	
Linearity	> 99 %	
DSNU	0.2 e-	
PRNU	0.3%	
Bit Depth	12 bit，16 bit	
Cooling Method	Water Cooling, Air Cooling	Water Cooling
Cooling Temperature	60℃ Below Ambient Temperature (Max)	
Dark Current	0.3 e-/pixel/s@-40℃	
Vacuum Compatibility	10^{-7} Pa (Max)	10^{-6} Pa
Binning	2 x 2，4 x 4	
ROI	Support	
Timestamp Accuracy	1 μs	
Trigger Mode	Hardware Trigger, Software Trigger	
Output Trigger Signals	Exposure Start, Simulated Global, Readout End, High level, Low Level	
Trigger Interface	SMA	Hirose
Data Interface	CameraLink，USB 3.0	USB 3.0
Flange Size	DN100CF / Customization	Feedthrough DN100CF / Customization
Power	12 V / 8 A	
Power Consumption	100 W	
Dimensions	152.4 mm x 152.4 mm x 140.7 mm	110 mm x 110 mm x 156 mm
Camera Weight	~3700 g	~2600 g
Software	Mosaic，SamplePro，LabVIEW，MATLAB，Micro-Manager	
SDK	C，C++，C#	
Operating System	Windows，Linux	
Operating Environment	Working: Temperature: 0~40℃, Humidity 0~70%　　Baking Temperature: ＜70℃	

Dhyana XF／XV400BSI

The 400BSI series soft X-ray camera is developed based on the mature technology platform of the 95 series. The smaller 6.5μm pixel size enhances imaging resolution while maintaining high dynamic imaging performance with a 45Ke- full well depth. This offers significant advantages in imaging experiments such as scattering.
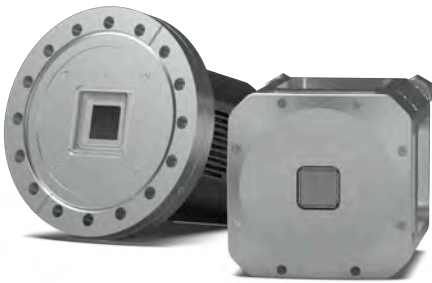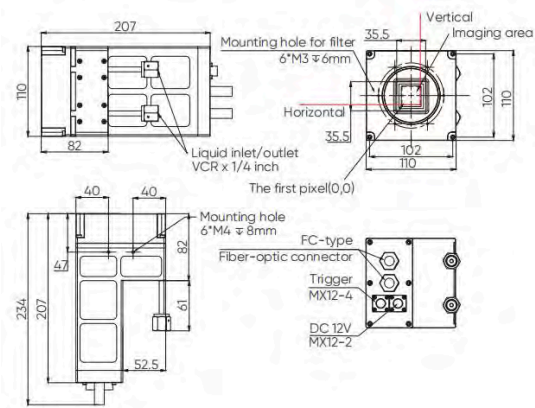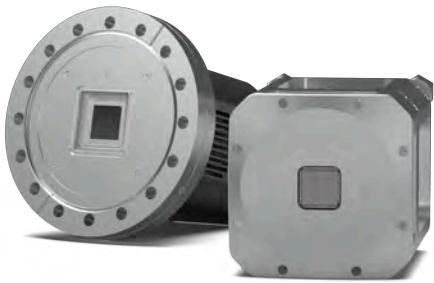
Quantum Efficiency

Quantum efficiency vs Photon energy (eV)
- Gpixel 400BSI (Non-ARC)
- Gpixel 400BSI (Normal)
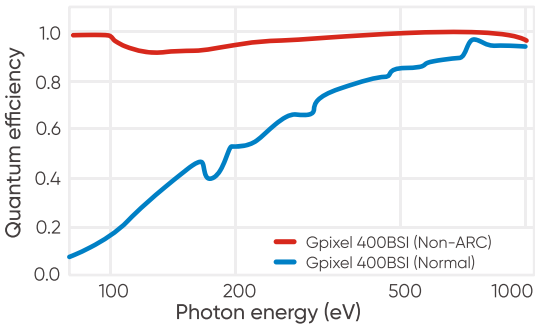
Dimensions　(Unit: mm)
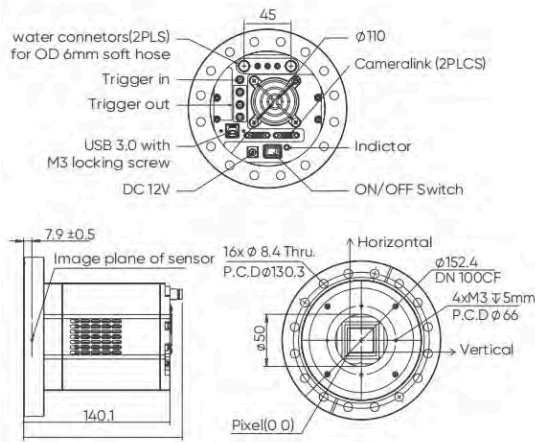
Dhyana XF 400BSI

Dhyana XV 400BSI

Specifications

Model	XF400BSI	XV400BSI
Sensor Type	GSENSE2020BSI-PS / GSENSE2020BSI	
Sensor Model	Non Anti-Reflection Coating/Standard back-illuminated sCMOS	
Peak QE	~100%	
Color / Mono	Mono	
Array Diagonal	18.8 mm	
Effective Area	13.3 mm x 13.3 mm	
Resolution	4 MP, 2048 (H) x 2048 (V)	
Pixel Size	6.5 μm x 6.5 μm	
Full-Well Capacity	Typ. : 45 ke-	
Dynamic Range	90 dB	
Spectral Range	80 ~ 1000 eV / 200 ~ 1100 nm	
Frame Rate	40 fps@USB 3.0; 100 fps@CameraLink	
Readout Noise	Typ.: 1.1 e- (Median)	
Shutter Mode	Rolling, Global Reset	
Exposure Time	6.6 μs ~ 300 s	
Linearity	> 99%	
DSNU	0.2 e-	
PRNU	0.3%	
Bit Depth	11 bit, 12 bit, 16 bit	
Cooling Method	Water Cooling, Air Cooling	
Cooling Temperature	Below Ambient Temperature 60℃	
Dark Current	0.5 e-/pixel/s@-40℃ Chip Temperature	
Vacuum Compatibility	10^{-7} Pa (Max)	10^{-6} Pa (Max)
Binning	2 x 2, 4 x 4	
ROI	Support	
Timestamp Accuracy	1 μs	
Trigger Interface	SMA	Hirose
Data Interface	CameraLink , USB 3.0	USB 3.0
Flange Size	DN100CF /Customization	
Power	12 V/ 8 A	AC Power Supply
Power Consumption	≤ 75W	
Camera Weight	~3900 g	~2600 g
Software	Mosaic, SamplePro, LabVIEW MATLAB, Micro-Manager	
SDK	C, C++, C#,Python	

Dhyana XF／XV4040BSI

The 4040BSI series soft x-ray cameras is developed based on the mature technology platform of the 95 series , featuring a larger sensor design. It is particularly suited for applications requiring higher precision, higher resolution, and larger research areas, such as materials science, nanotechnology, and semiconductor inspection.

Quantum Efficiency

Quantum efficiency vs Photon energy (eV)
- Gpixel 4040BSI (Non-ARC)
- Gpixel 4040BSI (Normal)
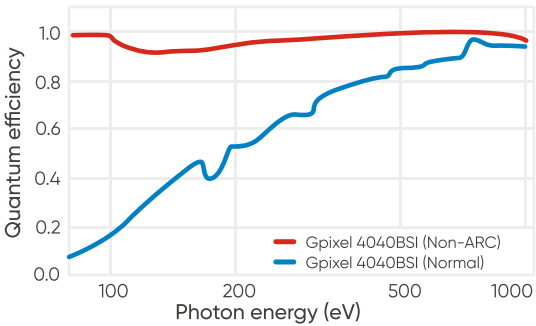
Dimensions　(Unit: mm)

Dhyana XF 400BSI

Dhyana XV 400BSI

Specifications
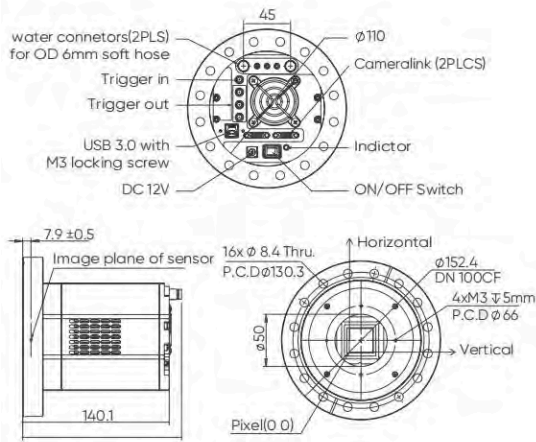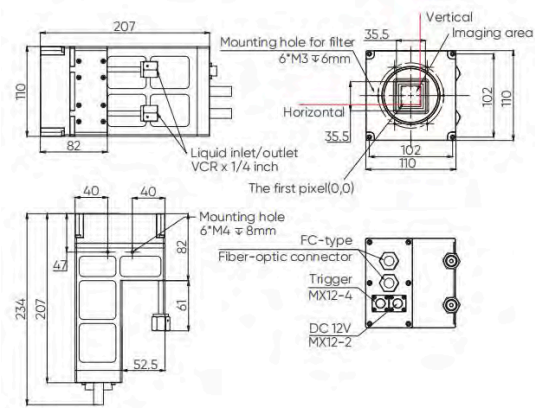
Model	Dhyana XF4040BSI	Dhyana XV4040BSI
Sensor Type	GSENSE4040BSI-PS / GSENSE4040BSI	
Sensor Model	Non Anti-Reflection Coating/Standard back-illuminated sCMOS	
Peak QE	~100%	
Color / Mono	Mono	
Array Diagonal	52.1 mm	
Effective Area	36.9 mm x 36.9 mm	
Resolution	4096 (H) x 4096 (V)	
Pixel Size	9 μm x 9 μm	
Full-Well Capacity	Typ. : 37 ke-	
Dynamic Range	80 dB	
Spectral Range	80 ~ 1000 eV / 200 ~ 1100 nm	
Frame Rate	16.5 fps @ CameraLink, 9.7 fps @ USB 3.0	
Readout Noise	Typ.: 2.8 e- (Median)	
Shutter Mode	Rolling	
Exposure Time	10 μs ~ 300 s	
Linearity	> 99%	
DSNU	0.5 e-	
PRNU	0.2%	
Bit Depth	12 bit, 16 bit	
Cooling Method	Water Cooling, Air Cooling	
Cooling Temperature	Below Ambient Temperature 60℃	
Dark Current	0.02 e-/pixel/s@-40℃ Chip Temperature	
Vacuum Compatibility	10^{-7} Pa (Max)	10^{-6} Pa (Max)
Binning	2 x 2, 4 x 4	
ROI	Support	
Timestamp Accuracy	1 μs	
Trigger Interface	SMA	Hirose
Data Interface	CameraLink , USB 3.0	USB 3.0
Flange Size	Customization	Feedthrough DN100CF
Power	12 V/ 8 A	AC Power Supply
Power Consumption	T.B.D	≤ 63 W
Camera Weight	~4300 g	~3100 g
Software	Mosaic, SamplePro, LabVIEW MATLAB, Micro-Manager	
SDK	C, C++, C#,Python	

Libra 3405M/3412M

Libra 3405M/3412M are two global shutter mono camera developed by Tucsen for instrument integration. They utilize front-illuminated sCMOS technology, offering broad spectral response (350 nm~1100 nm) and high sensitivity in the near-infrared range. Equipped with global shutter and GigE interface, They provide faster speed for instruments, enhancing overall system performance.
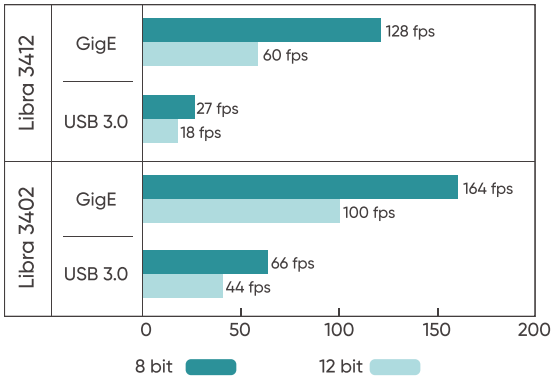
Key Features / Benefits

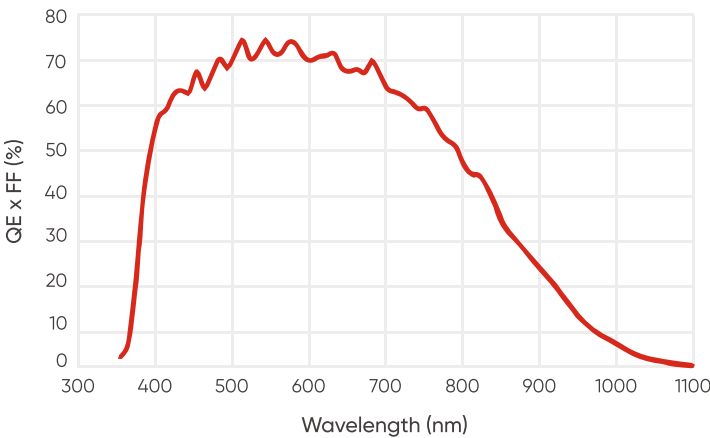| Key Features	Benefits
High-Speed & Global Shutter[1]	Ideal for high speed slide scanning.
High Resolution	3.4 µm pixel size is good for 20x - 40x objective resolution.
Enhanced NIR Sensitivity	For multichannel fluorescent imaging.
Cooling for Low Light	Provides uniform imaging background and clean fluorescence images.
10G GigE & Compact Design	Conducive to the integration of instrument systems.

Typical Applications

- Slide Scanning
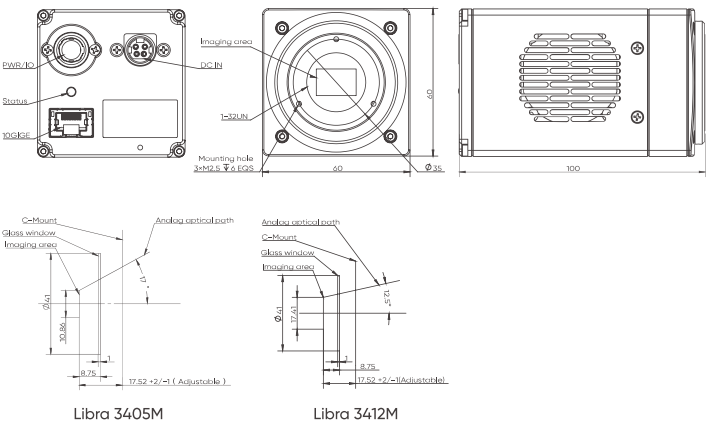- Advanced Microscopy Imaging
- Industrial Inspection

Noted Examples

[1] The global shutter is conducive to capturing fast-moving objects, while the 10G GigE provides several times the speed compared to USB 3.0.

Libra 3412 GigE: 128 fps / 60 fps
Libra 3412 USB 3.0: 27 fps / 18 fps
Libra 3402 GigE: 164 fps / 100 fps
Libra 3402 USB 3.0: 66 fps / 44 fps
8 bit / 12 bit

Quantum Efficiency

QE x FF (%) vs Wavelength (nm)

Dimensions (Unit: mm)

Libra 3405M   Libra 3412M

Model	Libra 3405M		Libra 3412M	
Sensor Type	FSI CMOS			
Sensor Model	Gpixel GMAX 3405		Gpixel GMAX 3412	
Color / Mono	Mono			
Array Diagonal	10.9 mm (2/3")		17.4 mm (1.1")	
Effective Area	8.3 mm x 7.0 mm		14.0mm x 10.5mm	
Pixel Size	3.4 µm × 3.4 µm			
Effective Resolution	2448 (H) x 2048 (V)		4096 (H) x 3072 (V)	
Peak QE	75%@540 nm; 33%@850 nm			
Dark Current	3 e-/p/s@25℃			
Gain Mode	Standard (12 bit), Speed (8 bit)			
Full Well Wapacity	12 bit: 8.7 ke-@Gain 1, 0.5 ke-@Gain 2		12 bit: 9 ke-@Gain 1, 0.6 ke-@Gain 2	
Bit Depth	8 bit	12 bit	8 bit	12 bit
Frame Rate	164 fps	100 fps	128 fps	60 fps
Readout noise	12 bit: 3.9 e-@Gain 1, 1.6 e-@Gain 2		12 bit: 3.6 e-@Gain 1, 1.9 e-@Gain 2	
Shutter Mode	Global Shutter			
Exposure Time	12.2 µs ~ 10 s			
AI White Blance	Support			
Image correction	DPC			
ROI	Support			
Binning (FPGA)	1 x 1 , 2 x 2 , 4 x 4			
Cooling Method	TEC			
Cooling Temperature	Passive cooling: Chip is stable at 25℃@25℃(ambient); Air cooling: 10℃@25℃ (ambient)			
Trigger Mode	Hardware, Software			
Output Trigger Signals	Exposure start, Exposure, Readout end, Contrast			
Trigger Interface	SMA			
SDK	C, C++, C#, Python			
Data Interface	10G GigE			
Optical Interface	C-Mount/Customizable			
Power	12 V/6A			
Power Consumption	T.B.D			
Dimensions	60 mm x 60 mm x 100 mm			
Camera Weight	T.B.D			
Camera Software	SamplePro, Mosiac V3, LabVIEW, MATLAB, Micro-Manager 2.0			
Operating System	Windows/Linux			
Operating Environment	Working: Temp. 0~40℃, HUM 10~85% Storage: Temp. -10~60℃, HUM 0~85%			

Libra 3405C/3412C

Libra 3405C/3412C are two global shutter color camera developed by Tucsen for instrument integration. They utilize front-illuminated sCMOS technology, offering broad spectral response (350 nm~1100 nm) and high sensitivity in the near-infrared range. Equipped with global shutter and GigE interface, they provide faster speed for instruments, enhancing overall system performance.

Key Features / Benefits

Key Features	Benefits
High-Speed & Global Shutter	Ideal for high speed slide scanning.
High Resolution	3.4 µm pixel size is good for 20x - 40x objective resolution.
AI Color Correction[1]	Superior color quality for pathology application.
Enhanced NIR Sensitivity	For multichannel fluorescent imaging.
Cooling for Low Light	Provides uniform imaging background and clean fluorescence images.
10G GigE & Compact Design	Conducive to the integration of instrument systems.

Typical Applications

- Slide Scanning
- Advanced Microscopy Imaging
- Industrial Inspection

Noted Examples

[1] The AI Color Correction woks on the camera itself, requiring no upgrades to the host configuration.
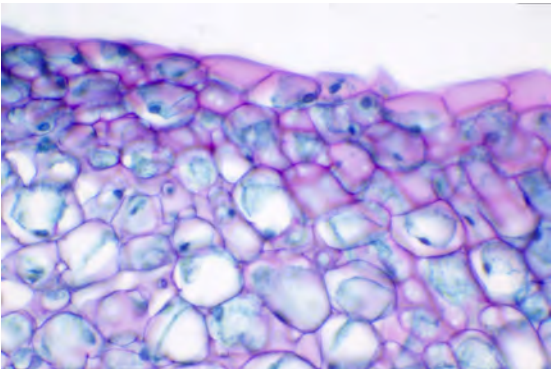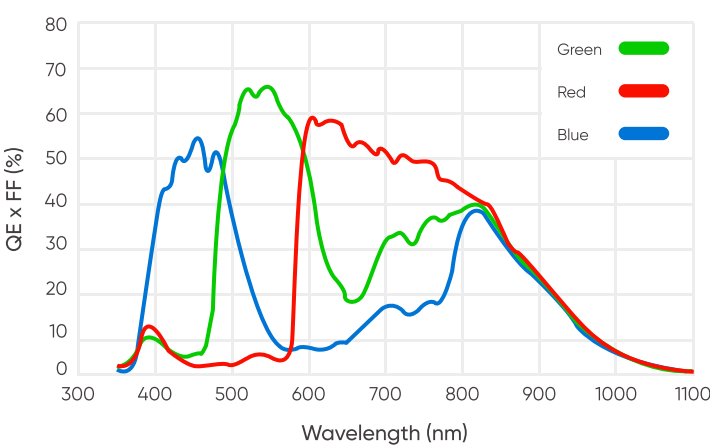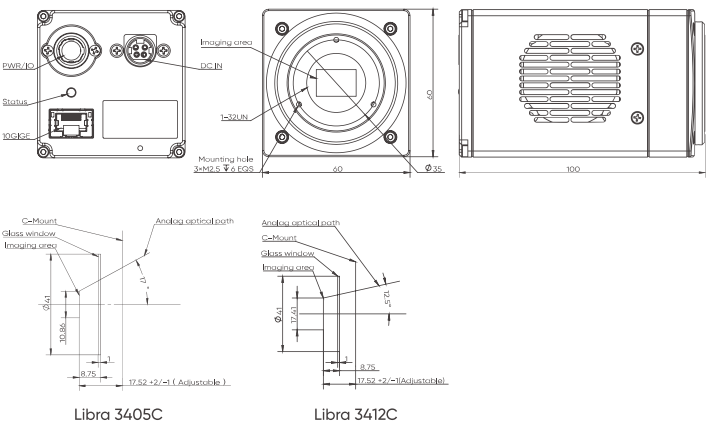

Figure 1: A 40x pathological photo taken by the AI Color Correction function, showing clear cellular details and distinct color gradations.

Quantum Efficiency

Dimensions (Unit: mm)

Libra 3405C   Libra 3412C

Model	Libra 3405C		Libra 3412C	
Sensor Type	Color CMOS			
Sensor Model	Gpixel GMAX 3405		Gpixel GMAX 3412	
Color / Mono	Color			
Array Diagonal	10.9 mm (2/3")		17.4 mm (1.1")	
Effective Area	8.3 mm x 7.0 mm		14.0mm x 10.5mm	
Pixel Size	3.4 µm × 3.4 µm			
Effective Resolution	2448 (H) x 2048 (V)		4096 (H) x 3072 (V)	
Peak QE	Refer to QE curve			
Dark Current	3 e-/p/s @25℃			
Gain Mode	Standard (12 bit), Speed (8 bit)			
Full Well Wapacity	12 bit: 8.7 ke-@Gain 1, 0.5 ke-@Gain 2		12 bit: 9 ke-@Gain 1, 0.6 ke-@Gain 2	
Bit Depth	8 bit	12 bit	8 bit	12 bit
Frame Rate	164 fps	100 fps	128 fps	60 fps
Readout noise	12 bit: 3.9 e-@Gain 1, 1.6 e-@Gain 2		12 bit: 3.6 e-@Gain 1, 1.9 e-@Gain 2	
Shutter Mode	Global Shutter			
Exposure Time	12.2 µs ~ 10 s			
AI White Blance	Support			
Image correction	DPC			
ROI	Support			
Binning (FPGA)	1 x 1 , 2 x 2 , 4 x 4			
Cooling Method	TEC			
Cooling Temperature	Passive cooling: Chip is stable at 25℃@25℃(ambient); Air cooling: 10℃@25℃ (ambient)			
Trigger Mode	Hardware, Software			
Output Trigger Signals	Exposure start, Exposure, Readout end, Contrast			
Trigger Interface	SMA			
SDK	C, C++, C#, Python			
Data Interface	10G GigE			
Optical Interface	C-Mount/Customizable			
Power	12 V/6A			
Power Consumption	T.B.D			
Dimensions	60 mm x 60 mm x 100 mm			
Camera Weight	T.B.D			
Camera Software	SamplePro, Mosiac V3, LabVIEW, MATLAB, Micro-Manager 2.0			
Operating System	Windows/Linux			
Operating Environment	Working: Temp. 0~40℃, HUM 10~85% Storage: Temp. -10~60℃, HUM 0~85%			

Libra UV / 536

The Libra UV/536 is a global shutter CMOS camera developed by TUCSEN for high-speed industrial inspection. This series delivers outstanding UV/VIS/NIR wide-spectrum imaging. The integration of global shutter technology and a 10G GigE interface ensures exceptional high-speed performance, reaching up to 100 fps at 12-bit and 152 fps at 8-bit at full 8.1 MP resolution.
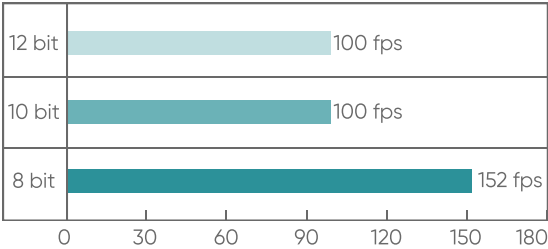
Key Features / Benefits

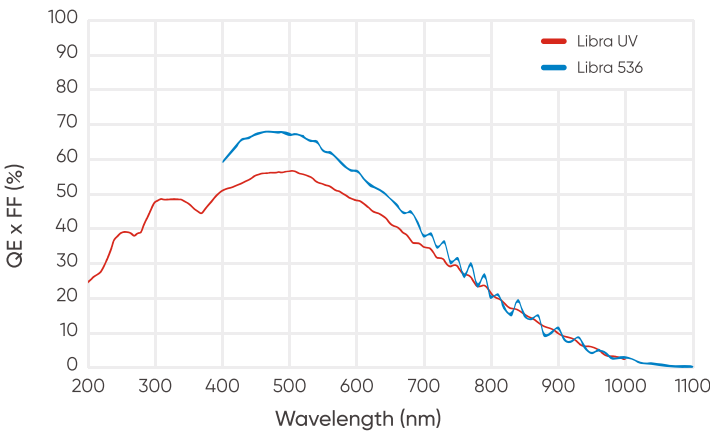| Key Features	Benefits
200 nm-1000 nm	The Libra UV is more sensitive in the UV, while the Libra 536 excels in the visible.
High Speed	The full resolution speed can reach up to 100 fps@12-bit and 152 fps@8-bit.
Global Shutter	High image quality standard with no artifacts and no distortion.
10G GigE Interface	High-quality data without needing a third-party frame grabber or complex boot sequence.
Compact Design	Facilitates instrument system integration.

Typical Applications

- Semiconductor
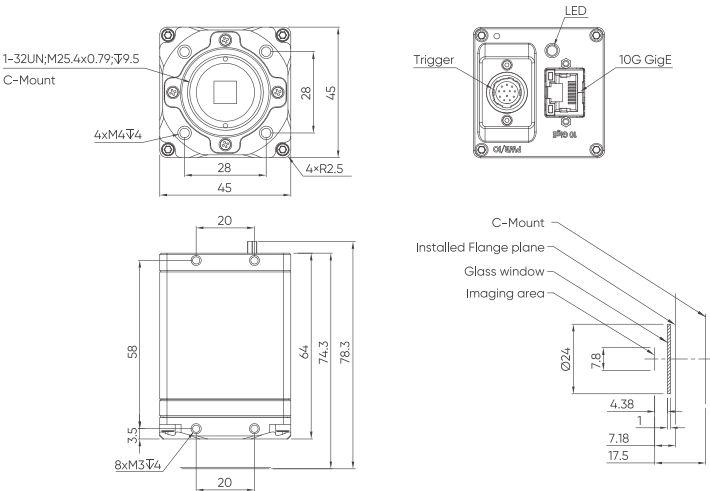- Material classification
- Life Sciences

Noted Examples

[1] The global shutter is conducive to capturing fast-moving objects, while the 10G GigE provides several times the speed compared to USB 3.0.

12 bit	100 fps
10 bit	100 fps
8 bit	152 fps

0   30   60   90   120   150   180

Quantum Efficiency

QE x FF (%) vs Wavelength (nm)
Libra UV
Libra 536

Dimensions (Unit: mm)

Model	Libra UV	Libra 536
Sensor Model	IMX487	IMX536
Color / Mono	Mono / Ultraviolet Sensing	Mono
Shutter Mode	Global Shutter	
Array Diagonal	11 mm (2/3")	
Effective Area	7.8 mm x 7.8 mm	
Pixel Size	2.74 µm x 2.74 µm	
Resolution	2856 (H) x 2848 (V)	
Peak QE	56%@500 nm，48%@365 nm	T.B.D
Dark Current	4 e-/pixel/s@60℃	0.5 e-/pixel/s
Bit Depth	8 bit / 10 bit / 12 bit	
Gain Mode	Analog Gain: 0-24dB, Digital Gain: 24-48dB	
Frame Rate	152 fps@8 bit 100 fps@10 bit 100 fps@12 bit	
Full Well Wapacity	10 ke-	
Readout Noise	2.3 e-	
Exposure Time	3.5 us ~ 10 s	T.B.D
Image Correction	DPC	
ROI	Support	
Binning	2 x 2 (SENSOR BIN), 3 x 3, 4 x 4 (FPGA BIN)	
Trigger Mode	Hardware, Software	
Output Trigger Signals	Readout, Exposure Out , Trigger Ready	
Trigger Interface	Hirose 12-Pin	
SDK	Support	
Data Interface	10G GigE	
Optical Interface	C-Mount / Window Removal	C-Mount
Power	12-24V, POE support	
Power Consumption	≤12W	
Dimensions	45 mm × 45 mm × 75 mm	
Operating System	Windows /Linux	
Software	SamplePro	
Operating Environment	Working: Temperature -10~50 ℃, Humidity 0~85% Storage: Temperature -20~60 ℃, Humidity 0~85%	

FL 26BW

FL 26BW 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 26BW is able to capture clean and even images for up to 60 minutes exposure time.

Key Features — Benefits

Key Features	Benefits
SONY BSI 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 ℃ @ 22 ℃, no condensation or other problems.
Compact Design	Conducive to instrument system integration.

Typical Applications

- Chemiluminescence
- Bioluminescence
- dPCR
- Fluorescence Imaging

Noted Examples

 [1] The FL 26BW has excellent background uniformity, as it has basically eliminated the bad factors such as amplifier grow and bad pixels.
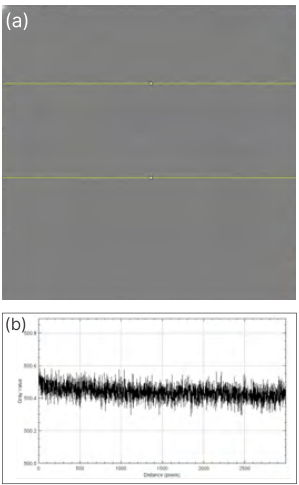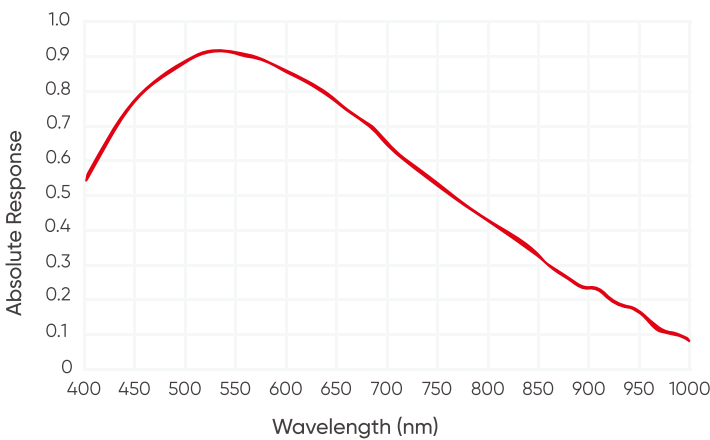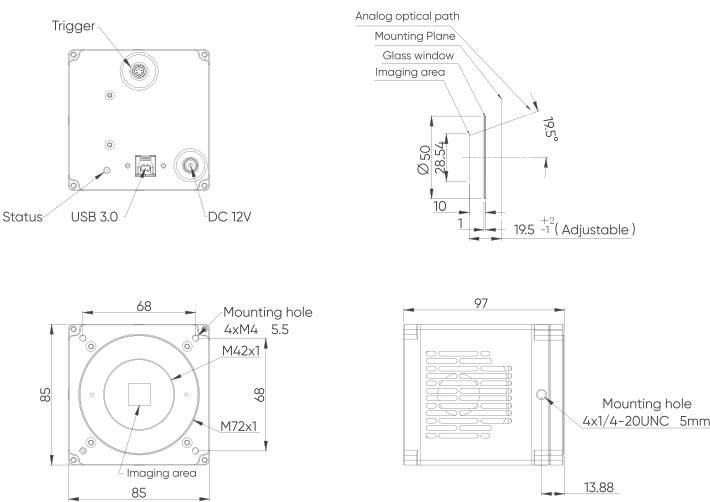

Figure (a) is the background image taken by FL 26BW with 600s exposure.
Figure (b) is the grayscale intensity curve corresponding to the yellow region, showing excellent background uniformity.

Quantum Efficiency

Dimensions (Unit: mm)

Model	FL 26BW			
Sensor Type	BSI CMOS			
Sensor Model	SONY IMX571BLR-J			
Color/Mono	Mono			
Array Diagonal	28.3 mm（1.8"）			
Effective area	23.4 mm x 15.6 mm			
Pixel Size	3.76 µm × 3.76 µm			
Resolution	6244 x 4168			
Peak QE	92 % @ 530 nm			
Dark Current	< 0.0005 e-/p/s			
Bit Depth	16 bit			
Gain Mode	Gain 0	Gain 1	Gain 2	Gain 3
Full well capacity	50 ke- @ Gain 0	15 ke- @ Gain 1	7.8 ke- @ Gain 2	3 ke- @ Gain 3
Readout noise	2.7 e- @ Gain 0	1.0 e- @ Gain 1	0.95 e- @ Gain 2	0.85 e- @ Gain 3
Frame Rate	6.5 fps			
Shutter Mode	Rolling			
Exposure Time	34 µs ~ 60 min			
Image Correction	DPC			
ROI	Support			
Binning	2 x 2，3 x 3，4 x 4，5 x 5，6 x 6，8 x 8，16 x 16			
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#			
Software	Mosaic , SamplePro, LabVIEW, MATLAB, Micro-Manager			
Data Interface	USB 3.0			
Optical Interface	M42，Customizable			
Power	12 V / 8 A			
Power Consumption	≤ 50 W			
Dimensions	85 mm x 85 mm x 97 mm			
Weight	945 g			
Operating System	Windows / Linux			
Operating Environment	Working: Temp. -25~45 ℃, HUM 0~95 % Storage: Temp. -35~60 ℃, HUM 0~95 %			

FL 9BW / 9BW LT

FL 9BW / 9BW LT 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. It is able to capture clean and even images for up to 60 minutes exposure time.

FL 9BW

Key Features — Benefits

Key Features	Benefits
Scientific Grade CMOS	Low readout noise and no glow.
Dark Current	Equivalent to the cooled CCD for long exposure imaging.
16000 : 1 Dynamic Range	More than 4 times that of the CCD.
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℃@ 22℃, 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.
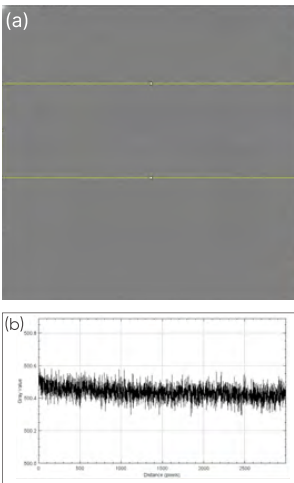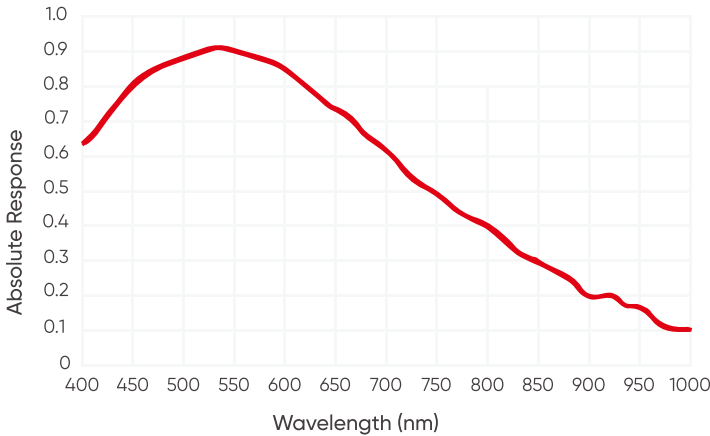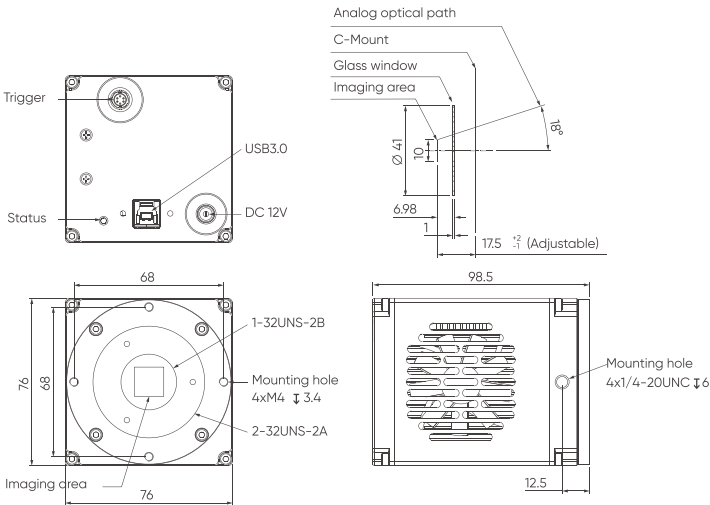
(a)

(b)

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)

Trigger
USB3.0
Status
DC 12V

Analog optical path
C-Mount
Glass window
Imaging area

17.5 (Adjustable)
6.98
98.5

68
76
68
1-32UNS-2B
Mounting hole 4xM4 ↧ 3.4
2-32UNS-2A
Imaging area
76

Mounting hole 4x1/4-20UNC ↧ 6
12.5

Model	FL 9BW		FL 9BW LT	
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		< 0.008 e-/p/s	
Gain Mode	Gain 0 - HFWC	Gain 1 - Balance	Gain 2 - High Sensitivity 1	Gain 3 - High Sensitivity 2
Full Well Wapacity	47 ke- @ bin1	16 ke- @ bin1	8 ke- @ bin1	3ke- @ bin1
Readout Mode	Standard，Low-Noise			
Readout Noise (Standard)	3.0 e- @ Gain 0 0.95 e- @ Gain 2	1.1 e- @ Gain 1 0.8 e- @ Gain 3	3.2 e- @ Gain 0 1.1 e- @ Gain 2	1.2 e- @ Gain 1 1 e- @ Gain 3
Readout Noise (LowNoise)	2.5 e- @ Gain 0	1.0 e- @ Gain 1	0.85 e- @ Gain 2	0.75 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	DPC			
ROI	Support			
Binning	2 x 2 , 3 x 3 , 4 x 4 , 6 x 6 , 8 x 8 , 12 x 12 , 16 x 16 , 24 x 24			
Cooling Method	Air			
Cooling Temperature	55℃ Below Ambient Temperature		Regulated @ 0℃	
Trigger Mode	Hardware, Software			
Output Trigger Signals	Exposure Start, Global, Readout End,High Level, Low Level			
Trigger Interface	Hirose			
SDK	C, C++, C#, Python			
Data Interface	USB 3.0			
Software	Mosaic, SamplePro, LabVIEW, MATLAB, Micro-Manager 2.0			
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: Temp. 0~45 ℃, HUM 10~85%		Working: Temp. 0~45 ℃, HUM 10~95%	
	Storage: Temp. -10~60 ℃, HUM 0~85%		Storage: Temp. -10~60 ℃, HUM 0~85%	

Mosaic 3.0 Camera Control and Analysis Software

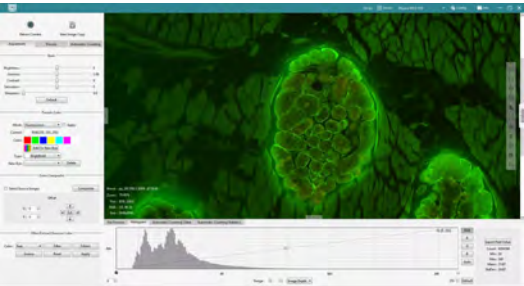**1) Precision imaging control**

Precision control, process, and analysis on imaging parameters

2) Advanced image processing

Rich real-time analysis tools and computational imaging functions.

3) Customizable interface

Create custom layouts and workflows on your own tasks.

SDK for Developers

Tucsen SDK kit is powerful and easy to develop in multiple systems.

1) SDK dynamic library files, development instruction and MFC/C# sample source code.
2) Windows, Mac and Linux support using the same interface to develop
3) GeniCam support using standard protocol and general port and function calling
4) C/C++/C#/Python support
5) Multi-camera support, integration and development
6) Rapid support of newly released product features

Microsoft
Windows　**Macintosh**　**Linux**

Third-party Software

Tucsen supports a wide variety of third party software packages allowing us to support a wide number of markets and applications.

1) Scientific software: Micro-Manager/MATLAB/LabVIEW/ImagePro/Visitron
2) Astrophysical software: MAXIMDL/Epics
3) Medical health protocol: Directshow/Twain
4) Machine vision software: Halcon

OEM / ODM

Tucsen Photonics is an OEM/ODM provider. Thousands of units each year leave our factory to be used in various markets across the world helping drive answers to quality, research, and medical questions. Whether your target is new-product development, upgrading an existing product or simply a cost-cutting exercise on an existing product line, we can help.
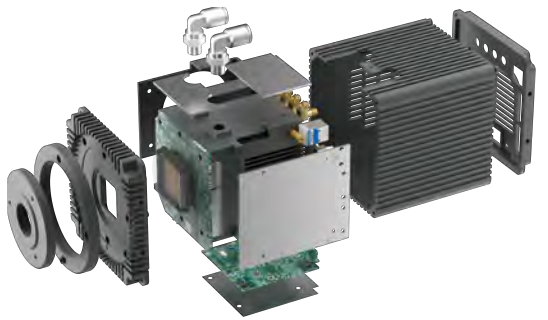
Benefits of Working With Us

1) Take First Mover Advantage

We introduce industry leading technologies every year, such as sCMOS, BSI TDI, large formats, soft X-ray variations. By rapidly incorporating the latest technology we help our partners expand their product capabilities helping them take first mover advantage in their own markets.

2) Maintain Quality Consistency

We manage our business efficiently to ensure we constantly deliver consistency. Our advanced manufacturing facilities and China supply chains which means you're worry-free even in a tight supply and demand situation.

3) Save Switching Time and Costs

We can provide rapid customization using a series of core technical platforms developed over the past 10 years of OEM project experience. We understand your space limitations, software needs, as well as technical and quality requirements.

4) Efficient Support

We offer a global support network ensuring you can get information on your own time zone. These teams work quickly and efficiently with our factory teams to ensure we get you the answers to questions you have relating to product functionality or delivery/shipments status.

Customer Cases

| Life Science | Material Research | Chemiluminescence | Spectral Analysis | Microchip Inspection |