OXFORD INSTRUMENTS

Andor Marana sCMOS

Ultimate Sensitivity Back-illuminated sCMOS for Astronomy & Physical Sciences

Key Specifications

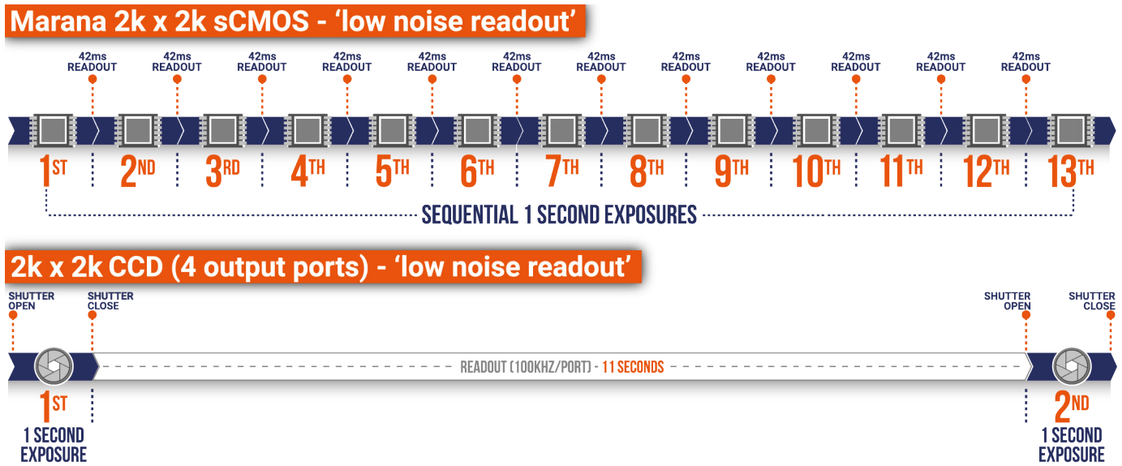
- ✓ High resolution: 4.2 Megapixel
- ✓ High sensitivity: 95% peak QE
- ✓ Fast: Up to 135 fps
- ✓ Capture more: Up to 32 mm sensor
- ✓ Deep cooled: -45˚C cooling
- ✓ Protected: 5 year vacuum warranty
- ✓ Spectroscopy Modes

Key Applications

- ✓ Space debris tracking
- ✓ Quantum gases
- ✓ Near Earth object tracking
- ✓ Tomography
- ✓ Wavefront sensing
- ✓ Spectroscopy
- ✓ Wafer inspection

Introducing Marana

Marana is Andor's flagship high performance, vacuum cooled sCMOS camera platform, specifically for applications within physical sciences and astronomy. Designed from the ground up to deliver market leading performance and versatility. Crucially, Marana sCMOS reads out 4.2 Megapixel high resolution arrays in less than 50 milliseconds while maintaining very low read noise; hundreds of times faster than a similar resolution CCD detector. Marana is ideally suited to applications that require exposure times from microseconds through to several seconds.



The Most Sensitive Back-illuminated sCMOS

Marana 4.2B-11 and **new Marana 4.2B-6** back-illuminated sCMOS cameras feature up to **95% Quantum Efficiency** combined with Andor's unique **vacuum cooling to -45°C**, minimizing noise. Since back-illuminated sensors are chosen specifically for enhanced sensitivity, it makes sense to choose the most sensitive adaption of this high end technology.

How do we benefit from enhanced sensitivity?

- ✓ Space debris & NEO – track smaller objects
- ✓ Detect smaller occultations
- ✓ Lower laser powers – preserve photosensitive samples
- ✓ Shorter exposures – follow fast events, e.g. pulsars and fast reactions
- ✓ Lower detection limits / trace concentrations
- ✓ Higher dynamic range photometry
- ✓ AO wavefront sensing on weaker signals
- ✓ Extremely narrowband filters (e.g. Solar)
- ✓ Fluorescence down to single ultra-cold atoms

Features and Benefits

Feature	Benefit
All Marana Models	
Up to 95% QE & lowest noise	Maximum signal to noise for light starved measurements. Detect smaller orbital debris; BEC fluorescence.
Vacuum cooled to -45°C	Very weak signals require lowest noise floor. Also minimizes population of hot pixels.
4.2 Megapixel	High pixel resolution, maintaining image clarity over an extended field of view.
The ONLY vacuum back-illuminated sCMOS•[1]	Andor's proprietary UltraVac™ technology protects the sensor from (a) QE degradation, and (b) moisture condensation.
Extended Dynamic Range (EDR) Mode	'One snap quantification' across the full dynamic range - perfect for Photometry.
Exposure Flexibility	Ideal for experiments that require exposures from microseconds up to several seconds.
> 99.7% linearity	Market leading quantitative accuracy over the whole signal range.
Fan and liquid cooling as standard	Liquid cooling for maximum sensitivity.
Adaptive Optics Ready	Minimize lag after data collection - transfer of row data immediately after exposing.
Spectroscopy Mode	On-board intelligence delivering spectroscopists-friendly spectra and multi-track data prior to transfer through CoaXPress or USB interface. Upfront data size reduction and easier user data processing.
32-bit Binning Mode	Access huge dynamic range through extensive pixel binning. User-selectable data bit-depth up to 32-bit, transmitted upstream over the camera interface.
NEW Python ready	Python wrapper integration and full supporting documentation in latest camera SDK helps integration and full control of custom-build systems.
USB 3.0 and CoaXPress connectivity options	USB 3.0 provides flexibility. CoaXPress enables the highest speeds to capture the most dynamic events.
Marana 4.2B-11 (11 µm pixels)	
Glow Suppression Technology	Compensates the effects of sensor amplifier glow, allowing access to the full 4.2 Megapixel array.
11 µm pixels and 32 mm sensor diagonal	Largest field of view sCMOS, compatible with wide range of acquisition times. Large sky scanning; Tomography.
Marana 4.2B-6 (6.5 µm pixels)	
6.5 µm pixels	Smaller pixels better suited to some optical systems, e.g. echelle astrospectroscopy and cold atom imaging.
NEW Low Noise Mode	Reduces read noise down to 1.0 e^- at the expense of pixel well depth. Ideal for light starved conditions, when absolute sensitivity is a priority.
NEW High Speed Mode	Acquire images at high speeds of up to 135 fps in full frame 16-bit mode via CoaXPress! Boost speeds even further using regions of interest.
NEW Global Clear Mode•[9]	Purges charge from all rows of the sensor simultaneously at the exposure start. Tight synchronization with pulsed sources.
NEW Long Exposure Capability	Enhanced Glow Suppression Technology enables exposures up to several minutes..

The Marana sCMOS series

Marana 4.2B-11: Superior Field of View

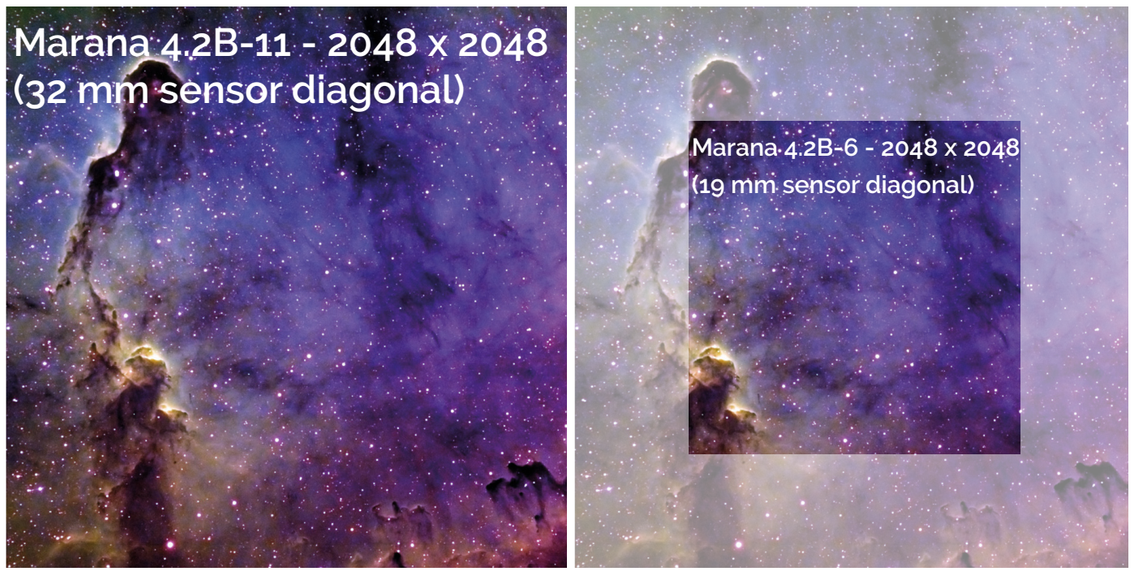
The **Marana 4.2B-11** is the detector of choice when field of view and sensitivity are required. Andor's unique glow suppression approach enables you to usefully and uniquely access the entire 2048 x 2048 pixel array of the GSense 400 BSI sensor, offering an impressive 32 mm sensor diagonal.

Marana 4.2B-11 presents an exclusive solution for capturing a large field of view across a wide range of exposure conditions, **from microseconds up to several seconds**.

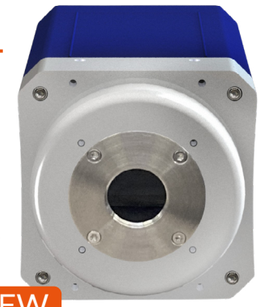
Marana 4.2B-11
- Family Name
- 4.2 Megapixels
- Back-illuminated
- 11 Micron pixel size

How do we benefit from a larger field of view?

- ✓ Search more sky – Space Debris and NEO tracking
- ✓ Capture Sun Spots & Solar Flares
- ✓ Tomography – reconstruct larger objects without sacrificing resolution
- ✓ Wafer inspection with high throughput (266 nm)



NEW Marana 4.2B-6: Extreme Sensitivity, Speed and Long Exposure Capability



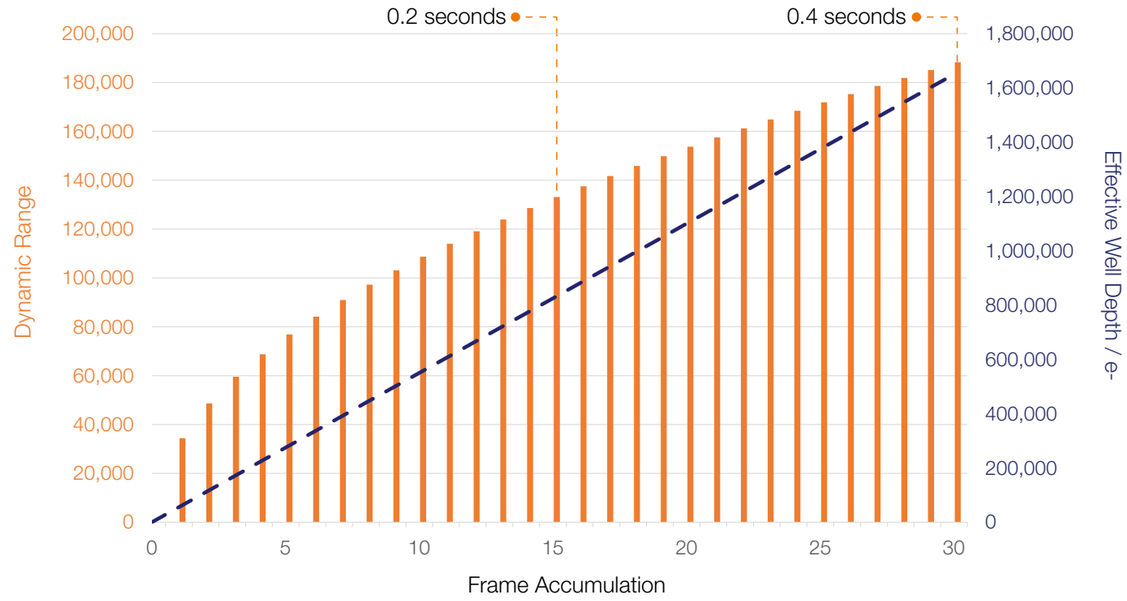
Marana 4.2B-6 is the most sensitive back-illuminated camera available for imaging or spectroscopic applications requiring higher speed, reaching 135 fps. Applications include quantum gas dynamics, fast high resolution spectroscopy, fast image stacking (for further extending dynamic range), hyperspectral imaging and non-destructive imaging of movement via X-ray or Neutron Radiography.

NEW

Marana 4.2B-6
- Family Name
- 4.2 Megapixels
- Back-illuminated
- 6.5 Micron pixel size

The Marana 4.2B-6 also benefits from enhanced Long Exposure Capability. Improved amplifier glow suppression facilitates usage under a broad range of exposure times, from microseconds up to a several minutes. This enhanced exposure flexibility renders the Marana 4.2B-6 model particularly compelling as a flexible workhorse detector solution for astronomy, adaptable to wavefront sensing, fast image stacking, and general photometry or astrometry across a broad range of timescales.

Extend Dynamic Range - Fast Image Stacking

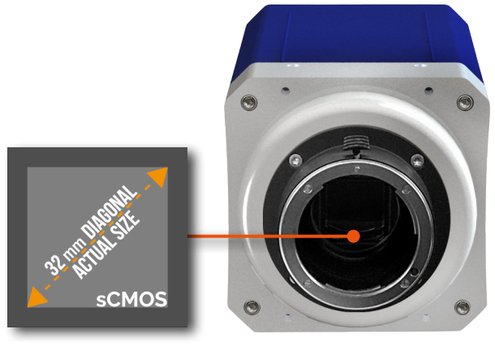


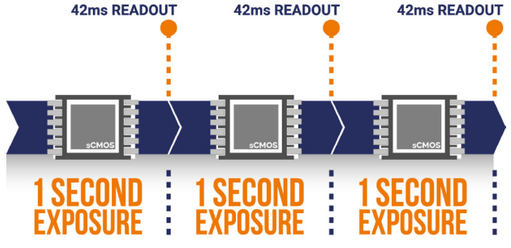
Dynamic Range and Effective Well Depth as a function of the number of stacked (accumulated) frames, plotted for Marana 4.2B-6. A Dynamic Range of 188,280:1, and a corresponding Effective Well Depth of 1,650,000 electrons can be reached with only 30 stacked frames. At maximum frame rate, this number of accumulated frames takes only 0.4 secs to acquire, achieving > 2 fps. This capability is significant for a range of challenges across imaging and spectroscopic characterisations.

Key Features

Large Field of View

The 32 mm sensor diagonal of Marana 4.2B-11 covers more sky at high resolution in astronomical observations, improving statistics of detection and tracking.



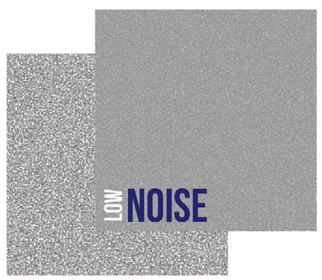


Fast Sensor Readout

Taking only 13.5 milliseconds (4.2B-6) or 42 milliseconds (4.2B-11) per 16-bit full frame readout, Marana can measure photometric variability across a wide range of timescales, ideal for imaging rapid celestial changes and fast measurements of Quantum Gas dynamics.

Extended Dynamic Range

On-chip dual-amplifier design means the whole photometric range, from the noise floor up to the saturation limit, can be captured with one image. The wide dynamic range is complimented by enhanced on-head intelligence to deliver linearity > 99.7%, for unparalleled quantitative photometric accuracy across the full signal range. Combine with 32-bit pixel binning or fast image stacking to extend dynamic range further.

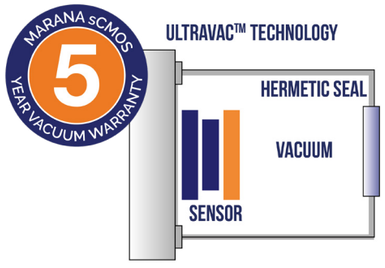


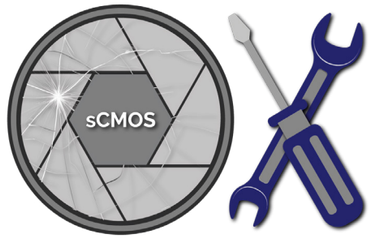
Highly Sensitive

The back-illuminated sensors of Marana ensure a peak QE of 95%, with broad response across the UV-VIS-NIR range. The massively parallel readout architecture and innovative pixel design enables Marana to drive very low read noise performance, < 2 e-, while still achieving maximum readout speed and full dynamic range. Marana 4.2B-6 offers a further low noise mode to achieve 1.0 e- noise at reduced pixel well depth – ideal for fluorescent quantum gas measurements of low atom numbers.

Vacuum Sensor Enclosure

sCMOS cameras from other manufacturers use O-ring sealed, back-filled sensor enclosures, susceptible to moisture ingress and routine factory maintenance. Andor is the only manufacturer of vacuum enclosed sCMOS cameras, based on our proven UltraVac™ process, offering superior cooling and ultimate sensor protection. Expect the vacuum to hold firm, year after year.



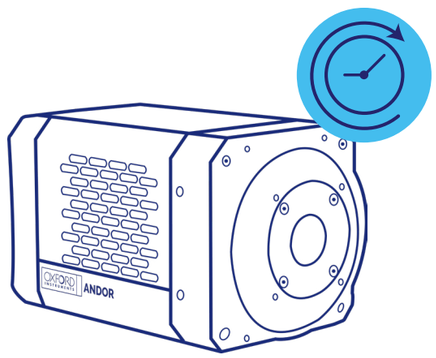


No Mechanical Shutter

Applications that involve frequent cycling of mechanical shutters, such as exoplanet studies or X-ray tomography, require routine shutter replacements and associated down time. Marana offers on-sensor Rolling Shutter, thus overcomes the need for mechanical shutters. Furthermore, this avoids the exposure gradient effects associated with that of an iris shutter, thus much better for accurate photometry.

Low Maintenance Astronomy

The vacuum enclosure and shutter-free longevity benefits of Marana are particularly relevant to the needs of astronomers, where cameras are often in remote unmanned observing locations and need to operate without service intervention, over long durations of time. This ultimately translates not only into greater experimental efficiency, but also into a lower cost of ownership.



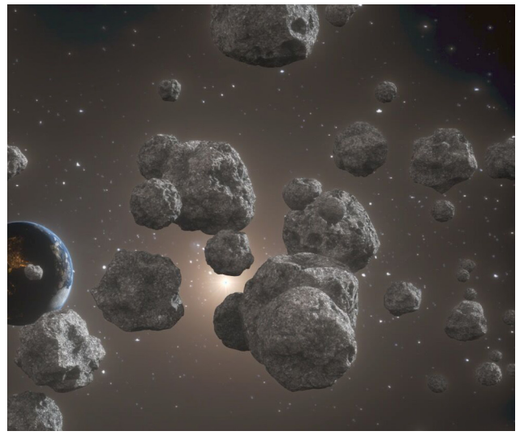
Enhanced Exposure Range

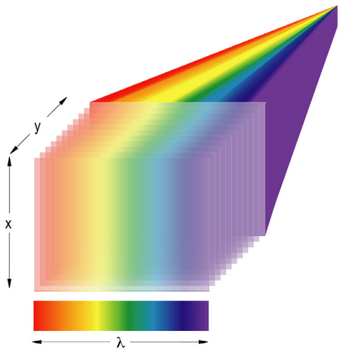
The Marana 4.2B-6 uses enhanced Glow Suppression technology to allow access to longer exposures, up to several minutes. This broadens the application flexibility of this model, making it ideal for a range of photometric and astrometric measurements.

Application Focus

Solar System Objects

A Near-Earth Object (NEO) is any small Solar System body whose orbit brings it into proximity with Earth. Over 20,000 known Near Earth Asteroids have been discovered, of which almost 1000 are larger than 1 km. The inventory is much less complete for smaller objects, which still have potential for large scale damage. While asteroids are constantly being eliminated from our solar system, unfortunately new ones are pulled into orbit. Thus, NEO surveys are required as an ongoing discipline in astronomy. The large field of view, very high sensitivity and fast readout of Marana 4.2B-11 is ideal for enhancing statistics of object detection, either directly visualised or by occultation.





Hyperspectral

Marana is ideal for fast, high dynamic range spectral imaging, either: (a) hyperspectral configurations (push-broom or otherwise), enabling full data cubes to be rapidly acquired, or (b) high density multi-track spectroscopy at fast spectral rates and/or very high dynamic range through image stacking. For example, Marana 4.2B-6 can acquire 10 spectral tracks at almost 1500 fps, and can acquire a single spectrum at up to 25,000 fps.

X-Ray or Neutron Tomography

For high throughout 3D tomography (or even 4D: 3D + time), the high resolution Marana 4.2B-11 or Marana 4.2-6 back-illuminated sCMOS models, featuring low noise, fast readout and 95% QE, present a superb solution. Lens/scintillator coupled tomography using Marana enables reconstruction of large objects without sacrificing resolution and clarity. Lack of mechanical shutter means shutter lifetime is not an issue, reducing downtime.

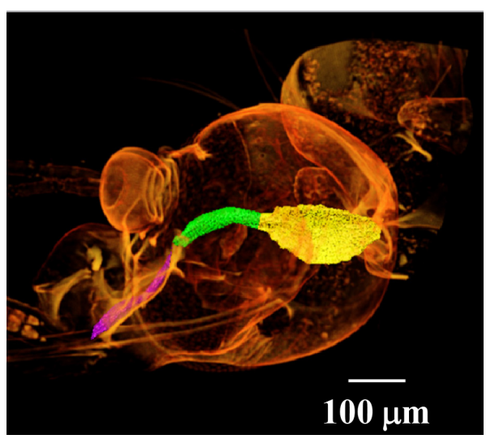
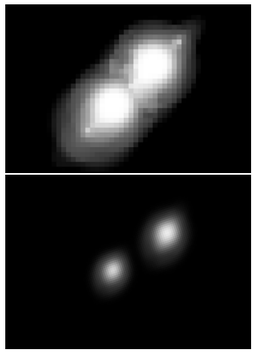


Image courtesy of Prof. S.J. Lee & Dr. Ha, Pohang University of Science and Technology (POSTECH), Republic of Korea.

Quantum Gases

Marana 4.2B-11 or Marana 4.2B-6 can be readily integrated into optical systems for imaging ultracold quantum gases, such as Bose Einstein Condensates. The rapid frame rates of Marana 4.2B-6 is ideal for fast, continuous (not burst) dynamic studies, market-leading sensitivity enabling high SNR capture of even small numbers of trapped atoms.



Resolution Enhancement

Lucky/Speckle Imaging - Marana models can be used for the 'Atmospheric Freezing' techniques of Lucky and Speckle Imaging, enabling resolution enhancement of ground-based astronomy over a large field of view. The 135 fps (full array) with 100% duty cycle of Marana 4.2B-6 means that enhanced resolution images can be generated within a few seconds of acquisition.

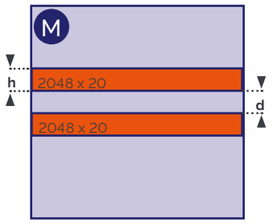
Wavefront Sensing – Marana 4.2B-6 is an ideal fast wavefront sensor for Adaptive Optics. A 128x128 ROI yields 2073 fps, and individual pixel rows can be transmitted immediately after recording for on-the-fly image processing with minimal time lag.

Orbital Debris

Orbital Debris, or Space Debris, are terms for the mass of defunct human-made objects in Earth orbit, such as old satellites and spent rocket stages. There are about 500,000 pieces of 'space junk' down to items about 0.5 inches (1.27 cm) wide in orbit. Of those, about 21,000 objects are larger than 4 inches (10.1 cm) in diameter. Marana 4.2B-11 offers a very large area and is a superb detector solution for ground based Orbital Debris tracking, capable of searching more sky while maintaining high resolving capability. Low noise enables high-quality data capture of even relatively small (and dim) objects, and rapid frame rates enable temporal oversampling of fast moving/rotating objects.

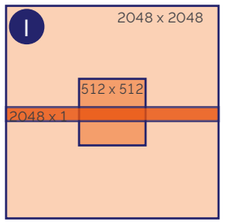
Different Modes for Marana

Multi-track Mode



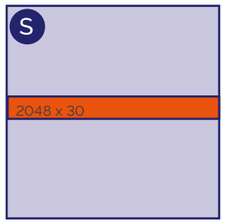
Up to 256 vertically binned tracks can be used for multi-track analysis without sacrificing speed.

Imaging Mode



The array size may be defined for either resolution or maximum speed.

Spectroscopy Mode



A vertically binned track is centred on the sensor enabling the maximum spectral rate to capture dynamic events.

I Imaging Mode 4.2B-11

Frame rate table

ROI Size (W x H)	Max Frame Rate (fps)		ROI area (of sensor)
	16-bit	12-bit (High Speed)	
2048x2048	24	48	22.5 mm x 22.5 mm
1400x1400	34	69	15.4 mm x 15.4 mm
1200x1200	40	81	13.2 mm x 13.2 mm
1024x1024	47	95	11.3 mm x 11.3 mm
512x512	95	189	5.6 mm x 5.6 mm
256x256	189	377	2.8 mm x 2.8 mm
128x128	377	749	1.4 mm x 1.4 mm

M Multi-track Mode 4.2B-11

Vertically binned tracks (overlap ON)

Number of Tracks	Track height (h)		Track separation (d)		Max Acquisition Rate	
	Pixels	µm	Pixels	µm	16-bit	12-bit (High Speed)
2	10	110	10	110	2,320	4,430
2	10	110	0	0	2,320	4,430
2	20	220	10	110	1,188	2,320
6	50	550	40	440	161	322
10	10	110	0	0	482	955
10	20	220	0	0	242	482
10	30	330	30	330	161	323
50	20	220	0	0	48	97
60	20	220	0	0	40	81
100	20	220	0	0	24	48

S Spectroscopy Mode 4.2B-11

Vertically binned tracks (overlap ON)

Array Size (W x H)	Max Spectra Rate	
	16-bit	12-bit (Fast Speed)
any x 1	10222	10900
any x 2	10462	10900
any x 8	5418	7300
any x 1200	40	81
any x 2048	24	48

S Spectroscopy Mode 4.2B-6

Vertically binned tracks (overlap ON)

Array Size (W x H)	Max Spectra Rate USB 3.0 (CXP)		
	16-bit Mono16	12-bit (Low Noise) Mono12 Packed	11-bit (High Speed) Mono12 Packed
any x 1	11511 (9760)	11478 (9720)	11378 (9800)
any x 2	10744 (9130)	11774 (9714)	11204 (9870)
any x 8	6368 (8922)	7609 (7520)	7445 (9107)
any x 1200	73 (126)	74 (74)	98 (230)
any x 2048	43 (74)	43 (43)	57 (135)

I Imaging Mode 4.2B-6

Frame rate table (overlap ON)

ROI Size (W x H)	Max Frame Rate (fps) USB 3.0 (CXP)		
	16-bit Mono16	12-bit (Low Noise) Mono12 Packed	11-bit (High Speed) Mono12 Packed
2048x2046	43 (74)	43 (43)	58 (135)
1400x1400	92 (108)	63 (63)	120 (198)
1200x1200	125 (126)	74 (74)	164 (230)
1024x1024	147 (147)	86 (86)	231 (270)
512x512	294 (294)	173 (173)	536 (539)
256x256	582 (582)	343 (343)	1061 (1061)
128x128	1148 (1148)	676 (676)	2073 (2073)

M Multi-track Mode 4.2B-6

Vertically binned tracks (overlap ON)

Number of Tracks	Track height (h)		Track separation (d)		Max Acquisition Rate: USB (CXP)		
	Pixels	µm	Pixels	µm	16-bit Mono16	12-bit (Low Noise) Mono12 Packed	11-bit (High Speed) Mono12 Packed
2	10	65	10	65	6313 (6313)	3720 (3720)	10600 (9900)
2	10	65	0	0	6313(6313)	3720 (3720)	10600 (9900)
2	20	130	10	65	3443 (3443)	2029(2029)	6038 (6038)
6	50	325	40	260	498 (498)	293 (293)	907 (907)
10	10	65	0	0	1456 (1456)	858 (858)	2620 (2620)
10	20	130	0	0	742 (742)	437 (437)	1348 (1348)
10	30	195	30	195	498 (498)	293 (293)	907 (907)
50	20	130	0	0	151 (151)	89 (89)	276 (276)
60	20	130	0	0	125 (125)	74 (74)	230 (230)
100	20	130	0	0	75 (75)	44 (44)	138 (138)

Note: Frame/spectral rates do not differ whether partial or full rows are selected.

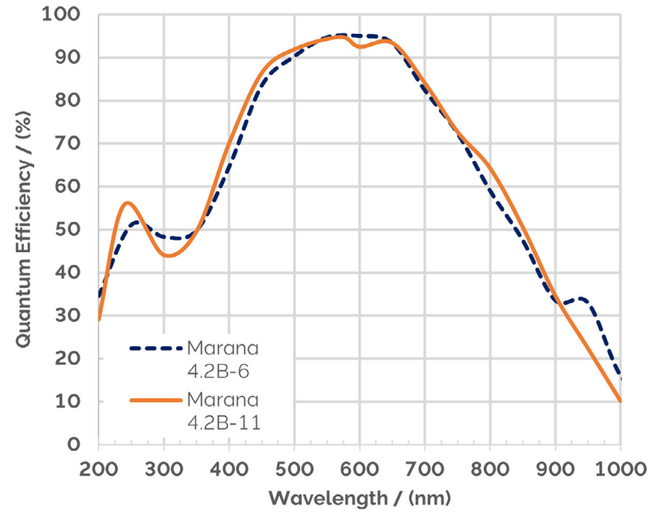
Technical Data•2

Model	Marana 4.2B-11	Marana 4.2B-6
Sensor Type	Back-Illuminated Scientific CMOS	
Array Size	2048 (W) x 2048 (H) 4.2 Megapixel	2048 (W) x 2046 (H) 4.2 Megapixel
Pixel Size	11 x 11 µm	6.5 x 6.5 µm
Image Area	22.5 mm x 22.5 mm (31.9 mm diagonal)	13.3 mm x 13.3 mm (18.8 mm diagonal)
Readout Modes	Rolling Shutter	Rolling Shutter and Global Clear•9
Pixel Readout Rates	100 MHz (High Dynamic Range mode, 16-bit) 200 MHz (High Speed mode, 12-bit)	310 MHz (High Dynamic Range mode, 16-bit) 180 MHz (Low Noise mode, 12-bit)
Quantum Efficiency•3	up to 95%	
Read Noise (e-) median	1.6 e^- (at any readout rate)	1.0 e- (Low Noise, 12-bit) 1.6 e- (High Dynamic Range, 16-bit) 1.9 e- (High Speed, 11-bit)
Sensor operating temperature•4 Air cooled Water/liquid cooled	 +15°C, -25°C +15°C, -25°C, -45°C	 0°C, -25°C 0°C, -25°C, -45°C
Dark Current•5 Air cooled (@-25°C) Water/liquid cooled (@ -45°C)	 0.7 e^-/pixel/s 0.3 e^-/pixel/s	 0.15 e^-/pixel/s 0.10 e^-/pixel/s
Active area pixel well depth	85 000 e^- (High Dynamic Range mode, 16-bit) 2600 e^- (Fast Speed mode, 12-bit)	42 000 e^- (High Dynamic Range mode, 16-bit) 1250 e^- (Low Noise mode, 12-bit) 2100 e^- (High Speed, 11-bit)
Dynamic Range	53 000:1 (High Dynamic Range mode, 16-bit)	26 250:1 (High Dynamic Range mode, 16-bit)
Data Range	16-bit (High Dynamic Range mode) 12-bit (Fast Speed mode)	16-bit (High Dynamic Range mode) 12-bit (Low Noise mode) 11-bit (High Speed Mode)
Linearity•6	> 99.7%	
PRNU	< 0.5% (@ half-light range)	<0.3%
Region of Interest (ROI)	User-definable, 1 pixel granularity, min. size 25 (w) x 1 (h)	User-definable, 1 pixel granularity, min. size 9 (w) x 1 (h)
Pre-defined ROI	1608 x 1608, 1200 x 1200, 1024 x 1024, 512 x 512, 128 x 128	
Pixel Binning (on FPGA)	2 x 2, 3 x 3, 4 x 4, 8 x 8 (user-definable binning also available)	
I/O	O: Fire Row 1, Fire Row n, Fire All, Fire Any, Arm, I: External	
Trigger Modes	Internal, External, External Start, External Exposure, Software	
Software Exposure Events•7	Start exposure - End exposure (row 1), Start exposure - End exposure (row n)	
Image Timestamp Accuracy	FPGA generated timestamp with 25 ns resolution.	
PC Interface	USB 3.0•8 (CoaXPress available on request)	USB 3.0•8 and CoaXPress
Camera Window	AR coated fused silica. For best UV response, please select the UV-responsive window ('VUV-NIR') as part of the order process. See the Camera Window Selector: andor.oxinst.com/camera-window-selector	
Lens Mount	F-mount*	C-Mount

* Optional user-switchable C-Mount accessory available for use with smaller ROI sizes.

Quantum Efficiency •3

All cameras in the Marana platform feature back-illuminated sensor architecture which allows collection of light from the sample without circuitry blocking the photosensitive area of the detector. For best UV response, please select the UV-responsive window ('VUV-NIR') as part of the order process. To see transmission curves for Marana, please access the Camera Window Selector tool: andor.oxinst.com/camera-window-selector



Flexible Connectivity

1 **USB 3.0•8**
A convenient, universally available high speed interface.

2 **TTL / Logic**
Connector type: 15-way D-type to BNC cable with
Fire (Output), External Trigger (Input), Shutter (Output).

3 **CoaXPress (Marana 4.2B-6 only)**
CoaXPress (2 lane) offers the highest speed data interface

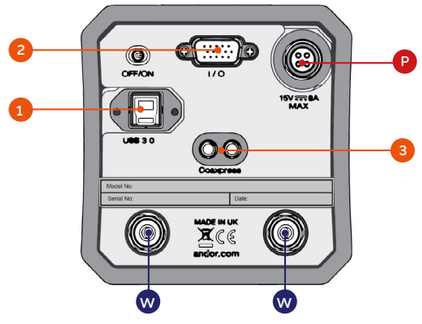
W **Water Cooling**
Connection to recirculator or other water/ liquid cooling system is possible for maximum sensitivity.

P **Power**
Connection to PSU refer to power requirements on page 16.

Notes: Minimum cable clearance required at rear of camera: 100 mm.

Marana 4.2B-6 Purchase Flexibility

Don't want to commit to CoaXPress connectivity from the outset? If preferred, order the less expensive USB 3.0-only version and later avail of a simple in-field upgrade to CoaXPress capability, using the **CHAM-UPG-CXP** code, if and when additional speed is needed. The upgrade includes CoaXPress card, cable and remote session to upgrade camera firmware and unlock CoaXPress capability. Please contact your sales representative for more information.



Creating the Optimum Product for you

Step 1. Choose the camera type

Camera Type

Description	Code
Marana 4.2B-11: 4.2 Megapixel Back-illuminated sCMOS, VIS/NIR optimized, 11 µm pixel, 95% QE, 48 fps, USB 3.0, F-mount	**MARANA-4BV11**
Marana 4.2B-6: 4.2 Megapixel Back Illuminated sCMOS, 6.5 µm pixel, 95% QE, 43 fps, USB 3.0, C-mount	**MARANA-4BV6U**
Marana 4.2B-6: 4.2 Megapixel Back Illuminated sCMOS, 6.5 µm pixel, 95% QE, 135 fps, USB 3.0 and CoaXPress, C-mount	**MARANA-4BV6X**

Marana 4.2B-11 speeds are served by USB 3.0 bandwidth. However, a CoaXpress interface can be provided on request.

Step 2. Select an alternative camera window (optional)

Camera Window

The standard window has been selected to satisfy most applications. However, other options are available. The alternative camera window code must be specified at time of ordering.

To view and select other window options please refer to the Camera Windows Selector Tool. Further detailed information on windows can be found in the technical note – How to Select a Window for your Camera.

Attention: For Marana, please pay careful attention to window choice if you are interested in sensitivity across the UV range. For optimal UV sensitivity we recommend selecting the '**VUV-NIR**' option, order code: **WN50FS(BB-VV-NR)U**.

Step 3. Select the required accessories

Accessories

Description	Order Code
C-mount - convert Marana 4.2B-11 to C-mount (for use with smaller Regions of Interest)	**ACC-MEC-11936**
F-mount - F-mount kit used to convert Marana 4.2B-6 for use with F-mount lenses (e.g. accessing smaller f#)	**F-MOUNT-ADP-KIT**
Mounting flange for Kymera 328i and 193i spectrographs	**MFL-KY-MARANA**
Mounting flange for the Shamrock 500i	**MFL-SR500-MARANA**
Re-circulator for enhanced cooling performance (supplied with 2x2.5 m tubing as standard)	**XW-RECR**
Oasis 160 Ultra compact chiller unit (tubing to be ordered separately)	**ACC-XW-CHIL-160**
6 mm tubing options for Oasis 160 Ultra compact chiller (2x2.5 m or 2x5 m lengths)	**ACC-6MM-TUBING-2X2.5** **ACC-6MM-TUBING-2X5M**
Pair of barbed hose inserts for 6 mm tubing	**6MM-HOSE-BARBS**
CoaXPress cables: 30 m cables (set of 2x individual cables supplied)	**ACC-COAXP-CABLE-2020**

CSR Please contact your local sales representative regarding other options such as different cable lengths, mounting types, camera window options or other customizations you may require for system integration or your specific application.

Step 4. Select the required software

Software

Marana requires one of the following software options:

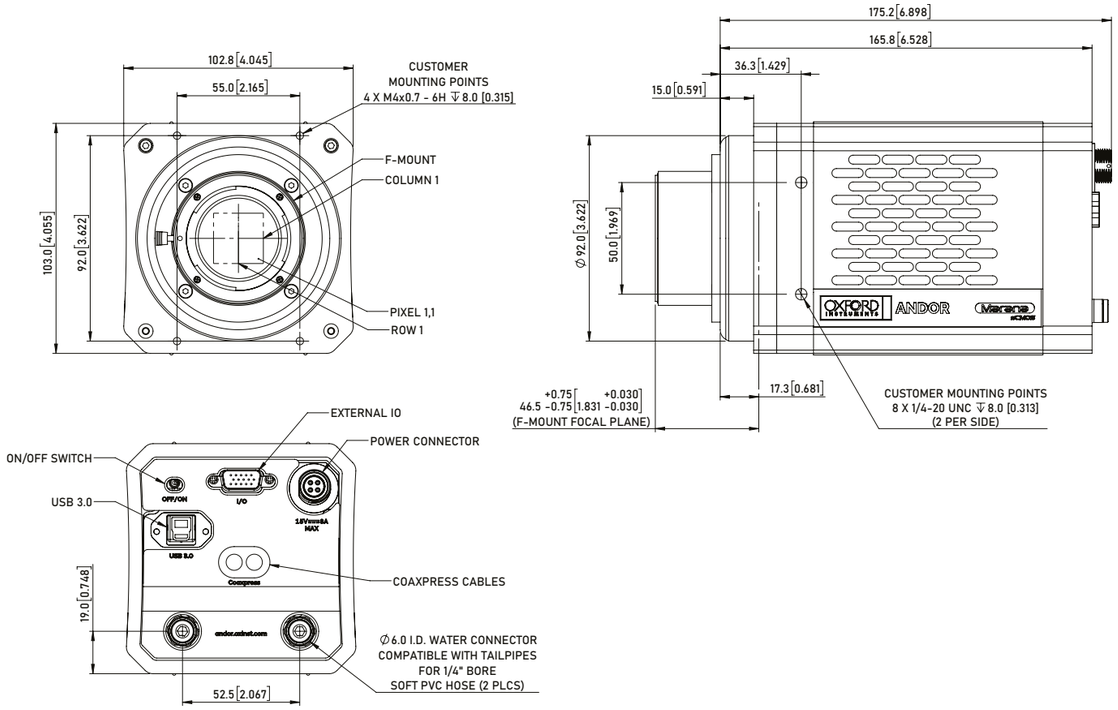
Solis Imaging A 32-bit and fully 64-bit enabled application for Windows (8.1, 10 and 11) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

Andor SDK3 A software development kit that allows you to control Andor sCMOS cameras from your own application. Available as a 32-bit or 64-bit library for Windows (8.1, 10 and 11) and Linux. Compatible with C/C++, LabVIEW, MATLAB and Python.

Third party software compatibility Drivers are available for a variety of third party imaging packages. See Andor website for detail: andor.oxinst.com/third-party-software-matrix

Mechanical Drawings

Dimensions in mm [inches]
(shown for F-mount)



Note: Operational CoaXPress connection only available with **MARANA-4BV6X model.**

Weight: ~3 kg [6.61 lbs] approx.

Have you found what you are looking for?

Need global shutter? The ZL41 Wave sCMOS 5.5 camera offers true Global Shutter exposure functionality, ideal for tight synchronisation and ensuring ensuring temporal correlation across all pixels of the field of view.

Need more sensitivity? The iXon Ultra EMCCD platform offers single photon sensitivity and 95% back-illuminated QE, further boosted by cooling down to -100°C. Ideal for demanding light starved or single photon counting applications such as quantum entanglement studies.

Need better NIR performance? The iKon-M and iKon-L range of CCDs offer NIR-Enhanced QE options ('BR-DD' and 'BEX2-DD'), extending sensitivity deep into the NIR range. Ideal for exoplanet detection on dwarf stars as well as 785 nm laser usages (e.g. BEC and NIR Raman).

Order Today

Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products.

For a full listing of our local sales offices, please see: andor.oxinst.com/contact

Our regional headquarters are:

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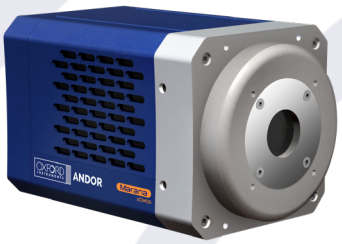
Fax +86 (10) 5884 7901



Items shipped with your camera

1x USB 3.0 PCIe card[•7]
1x USB 3.0 Cable (3 m)[•7]
1x Multi I/O Timing Cable (BNC to D-type: 1.5 m)
1x 15 V PSU
1x Country specific power cord
1x User manuals in electronic format
1x Quickstart Guide
1x Individual system performance booklet
Marana 4.2B-6 with CoaXPress also includes:
1x CoaXPress 3.0 PCIe card with external trigger
1x CoaXPress Cable (3 m)
1x Multi I/O Timing Cable (BNC to SMB: 1.5 m)

Minimum Computer Requirements:

- 3.0 GHz single core or 2.4 GHz dual or quad core processor
- 8 GB RAM
- Hard drive: 850 MB/sec write speed recommended for the data rate associated with the max. frame rates. 250 MB free hard disc to install software
- USB 3.0 slot (or x4 PCIe slot for USB 3.0 card)
- x8 PCIe slot for CXP PCIe card
- Windows (8.1, 10 and 11) or Linux

Operating & Storage Conditions:

- Operating Temperature: 0°C to +30°C ambient
- Operating Altitude: up to 5000 m
- Relative Humidity: <70% (non-condensing)
- Storage Temperature: -10°C to 50°C

Power Requirements:

- 100 - 240 VAC, 50 - 60 Hz
- Power consumption: 40 - 46 W typical / 114 W max (model dependent)

Footnotes: Specifications are subject to change without notice

1. Assembled in a state-of-the-art facility, Andor's UltraVac™ vacuum process combines a permanent hermetic vacuum seal (no O-rings), with a stringent protocol and proprietary materials to minimize outgassing. Outgassing is the release of trapped gases that would otherwise degrade cooling performance and potentially cause sensor failure.
2. Figures are typical and target specifications and therefore subject to change.
3. Quantum efficiency as supplied by the sensor manufacturer.
4. Coolant temperature must be above dew point.
5. Read noise measured at 0°C (Marana 4.2B-6) and 15°C (Marana 4.2B-11).
6. Linearity is measured from a plot of Signal vs. Exposure Time over the full dynamic range.
7. Software Exposure Events provide rapid software notification (SDK only) of the start and end of acquisition.
8. Marana connects to your control PC using a USB 3.0 connection. This may also be referred to as USB 3.1 (Gen 1). Andor provide a USB 3.0 card and cable, and recommend that these are used to ensure optimum performance.
9. 'Global Clear' is an optional keep clean mechanism that can be implemented in rolling shutter mode, which purges charge from all rows of the sensor simultaneously, at the exposure start. The exposure end is still rolling shutter. It can be used alongside the Fire All output of the camera and a pulsed light source to simulate a Global Exposure mechanism. Global Clear can only be used in 'non-overlap' readout mode, i.e. sequential exposure and readout phases, rather than simultaneous. Global Clear is useful for achieving tight synchronisation with pulsed sources, minimising 'dead times'.

MARANAFAMILY SS 0525 R1