



## SOPHIA: 2048B

The SOPHIA™: 2048B camera from Princeton Instruments (PI) is fully integrated, ultra-low noise 2048 x 2048, 15 μm pixel CCD camera designed expressly for the most demanding quantitative scientific applications from astronomy to x-ray imaging. Designed utilizing our exclusive ArcTec™ thermoelectric cooling technology, SOPHIA is the only camera that offers cooling down to -90° C just with air assist. The all-metal, hermetically sealed design, with the industry's only lifetime vacuum guarantee, ensures maintenance-free operation. High QE and ultra-low-noise electronics make the SOPHIA: 2048B camera ideal for demanding, low light applications. The eXcelon and back-illuminated technology of the camera delivers the highest sensitivity while reducing etaloning that occurs in standard back-illuminated CCDs. Multiple speed operations up to 16 MHz allow these cameras to be used for steady state as well as fast kinetics studies.

FEATURE	BENEFITS
eXcelon® technology	Higher QE in the UV and near IR regions; Extremely low etaloning: 100x lower dark charge than back-illuminated deep depletion.
2048 x 2048 imaging array; 15.0 μm x 15.0 μm pixels. Scientific grade CCD	> 3 fps at 16 MHz for rapid image acquisition and large field of view Low noise, few defects, linear response.
All-metal, hermetic vacuum seals; Lifetime vacuum guarantee	No out-gassing (as in epoxy seals) which can compromise vacuum performance; Worry free operation.
Deep cooling with ArcTec™ technology	Low dark noise allows detection of faint signals
Single fused silica vacuum window	Minimizes reflection losses from UV to IR; No optical losses due to multiple optical surfaces; Optional AR coating and wedge windows available.
Optional UV phosphor coatings	Enhances sensitivity throughout the UV to below 200 nm.
Large 45 mm integrated shutter	No vignetting even at low f-numbers. Easily acquire bias and dark reference.
Low noise electronics	Best performance for low light level applications.
Flexible readout design	Three readout speeds and three readout (single, dual and quad) configurations for utmost flexibility for highest SNR and fastest image acquisition
Software selectable system gains	Flexibility to optimize signal-to-noise ratio and dynamic range.
Kinetics	Custom readout mode offers microsecond resolution.
USB3.0 data interface	Plug-and-play operation with desktops or laptops; Optional fiber optic interface for remote operation.
<b>Optional:</b> LightField® (for Windows 10/8/7, 64-bit)	Flexible software packages for data acquisition, display and analysis; LightField offers intuitive, cutting edge user interface, IntelliCal®, easy LabVIEW® and MATLAB integration, and more.
PICAM (64-bit) / PICAM (32-bit) software development kits (SDKs)	Compatible with Windows 10/8/7 (64-bit), and Linux (contact factory for an update) Universal programming interfaces for easy custom programming.

**Applications:** semiconductor failure analysis, astronomy, photometry, laser beam profiling, luminescence and fluorescence imaging, and Bose-Einstein Condensate (BEC)

	<b>SOPHIA: 2048B eXcelon</b>	<b>SOPHIA: 2048B</b>
Features	Back-illuminated CCD. Highest sensitivity in the visible region. High sensitivity in the NIR. Extremely low etaloning. 100x lower dark charge than the BR.	Back-illuminated CCD. Highest sensitivity in the visible region.
CCD Image Sensor	Princeton Instruments' proprietary CCD, grade 1, AIMO	e2v CCD 230-42 back-illuminated, grade 1, AIMO
Dark current e-/p/s @ -90°C	0.00025	0.00025
CCD UV coating	Optional UV coating	
Quantum efficiency	See graph, next page	
CCD format	2048 x 2048 imaging pixels; 15.0 x 15.0 μm pixels; 100% fill factor	
Imaging area	30.7 x 30.7 mm (optically centered)	
Lens mount	F-mount with integral 45 mm shutter	
Deepest cooling temperature	< -90°C (typical), with OASIS 3 liquid circulator < -90°C (typical), with air	
Thermostating precision	±0.05°C	
Cooling method	Thermoelectric air or liquid cooling (OASIS 3 required)	
Full well:	Single pixel	150 ke- (typical)
	Output node	1000 ke- (typical)
ADC speed/16 bits*	16 MHz , 4 MHz and 400 KHz	
System read noise per port @ 100 kHz	4.5 e- rms (typical)	
@ 1 MHz	8.5 e- rms (typical)	
@ 4 MHz	22 e- rms (typical)	
Vertical shift speed	24 μsec/row (programmable)	
Non-linearity	<2% @ 100 kHz	
Software selectable gains	1, 2, 4 e-/ADU (low noise input) (typical)	
Data interface	USB3.0 (5m interface cable provided); Optional Fiberoptic interface is available for remote operation	
I/O signals	Two MCX connectors for programmable frame readout, shutter, trigger in	
Operating environment	+5 to +30°C non-condensing	
Certification	CE	
Dimensions / Weight	251.6 mm (9.91") x 129 mm (5.08") x 142.8 mm (5.62") (L x W x H) / 6.5 kg (14.3 lbs)	

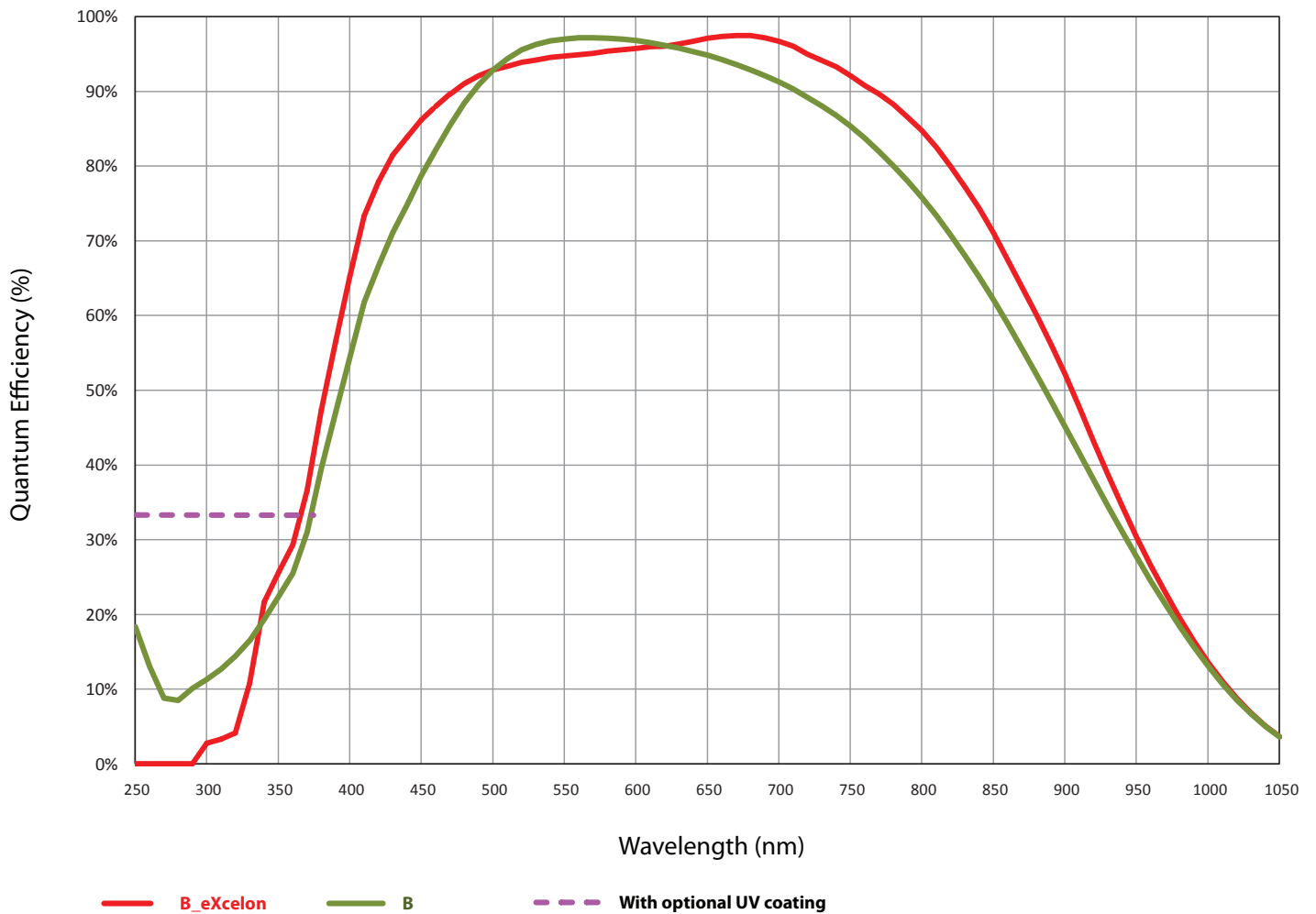
## READOUT TIME\*

	@ 16 MHz	@ 4 MHz	@ 400 kHz	
Binning	1 x 1	0.311	1.1	11.07
	2 x 2	0.135	0.345	3.025
	4 x 4	0.070	0.130	0.948
	8 x 8	0.045	0.065	0.344
	16 x 16	0.035	0.042	0.150

\*with 4-port readout

All specifications subject to change

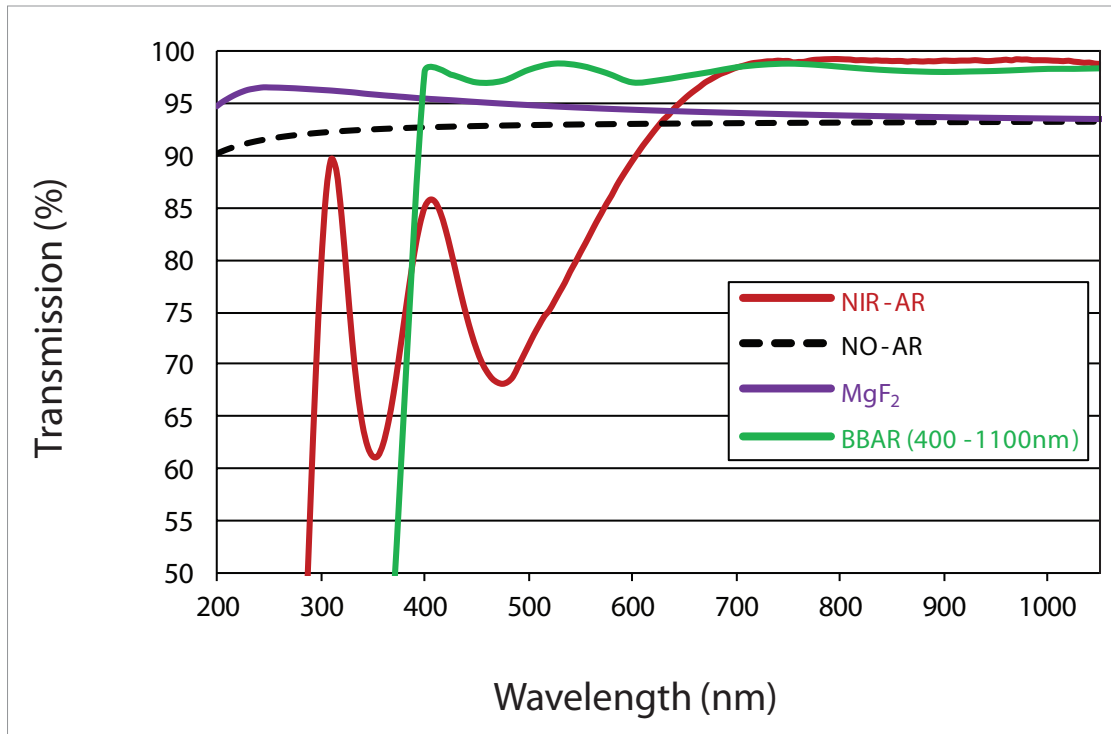
Contact your local sales representative for information on the availability of the BR model.



**NOTE:**

Graph shows typical Quantum Efficiency (QE) data measured at - 25°C. QE decreases at normal operating temperatures. For the best results for your application, please discuss the specific parameters of your experiment with your sales representative.

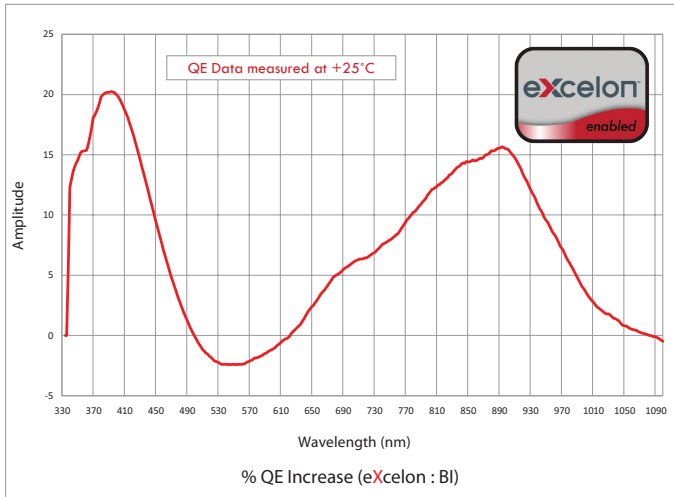
## VACUUM WINDOW AR COATINGS



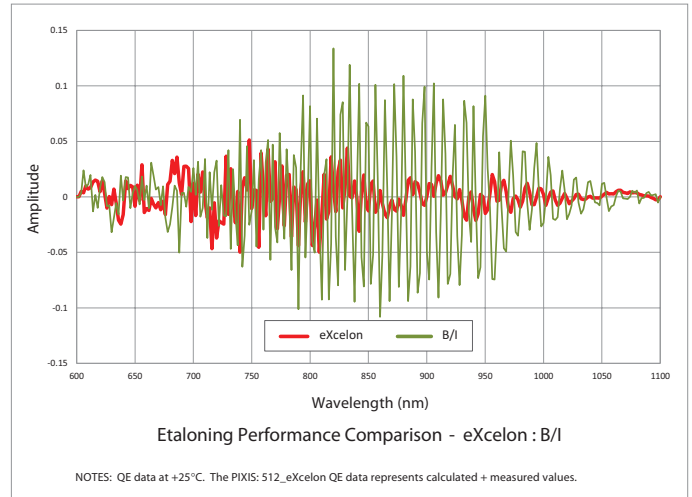
**NOTES:**

- Standard anti-reflection (AR) coating options shown on graph
- Designed by Acton Optics, our BBAR coating offers unmatched performance for 400 nm - 1100 nm
- Custom wedge window options and other AR coatings are also available

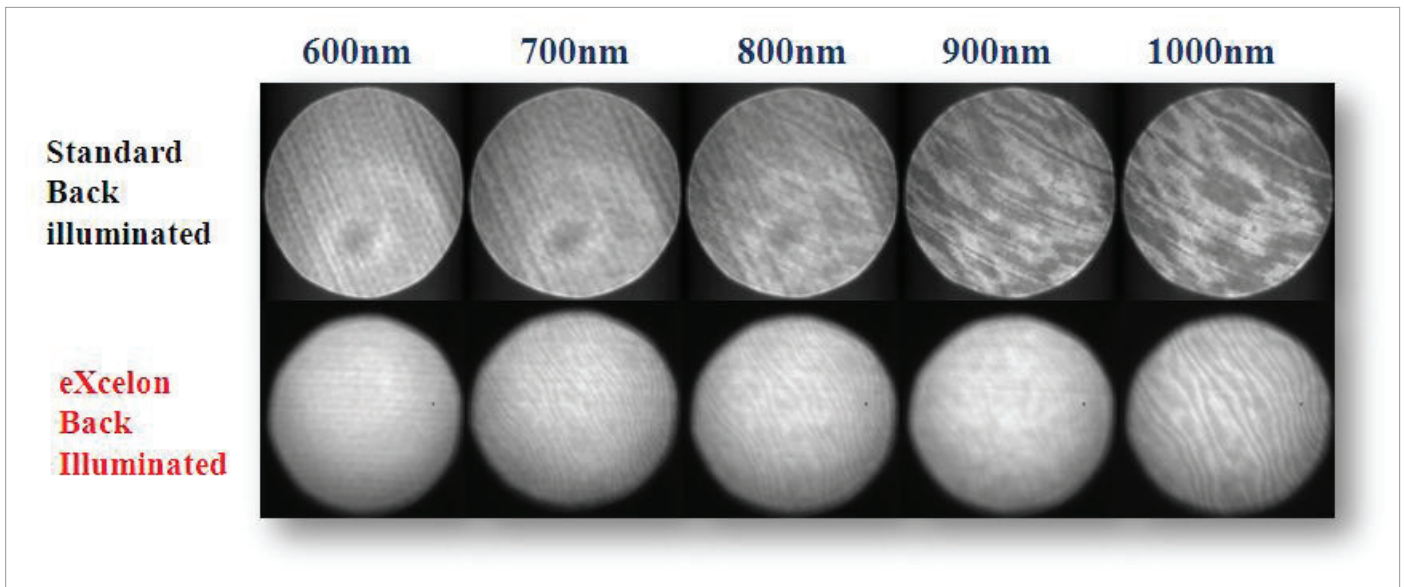
*Contact your local sales representative for more information*



B\_eXcelon provides superior QE over the standard back illuminated ("B") version in the UV-NIR range.

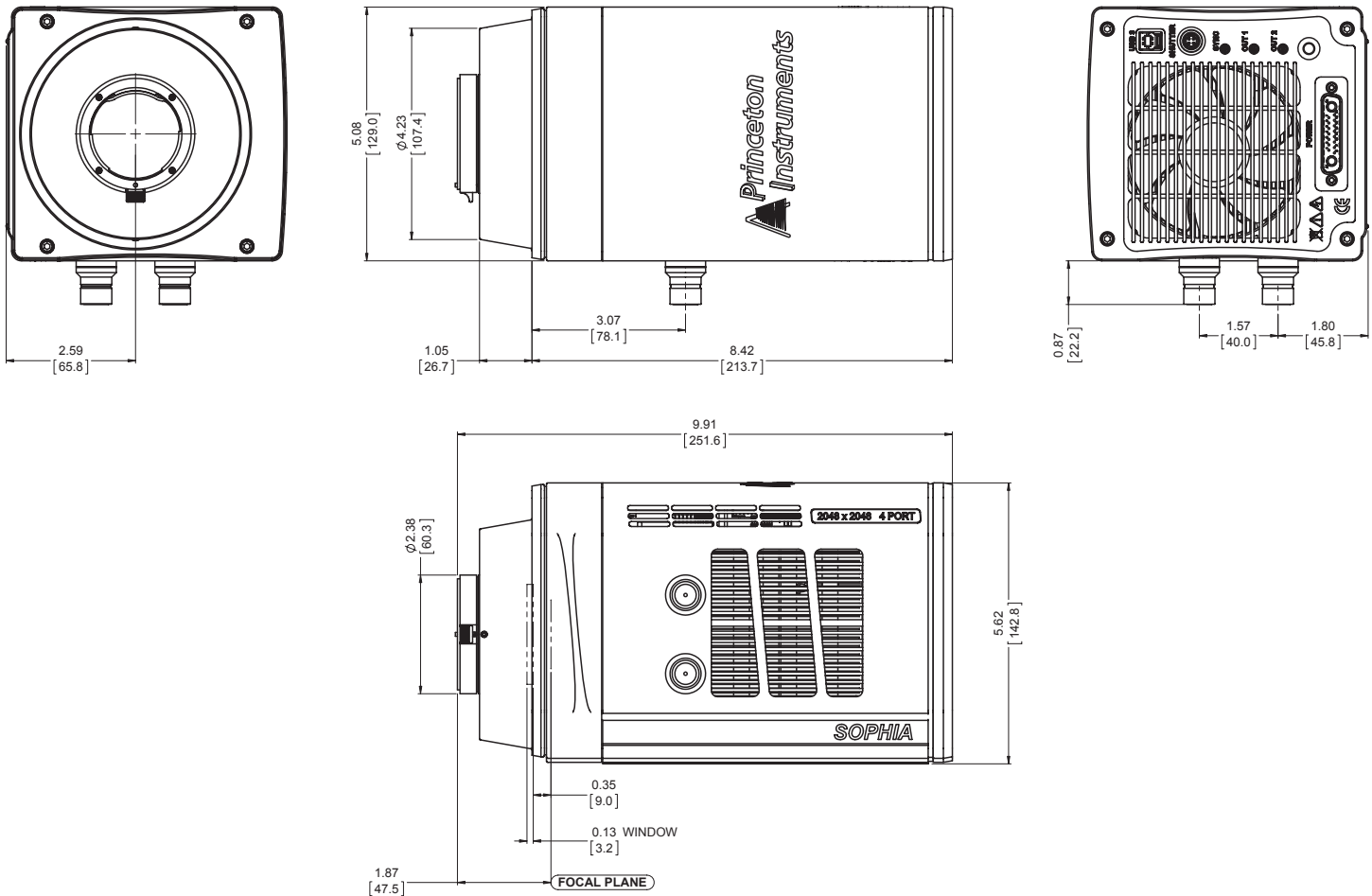


B\_eXcelon provides significantly lower etaloning (unwanted fringes) compared to standard back illuminated ("B") version.



Data taken with white light source through a monochromator comparing etaloning performance of eXcelon vs. back-illuminated CCDs.

### SOPHIA: 2048 (AIR/LIQUID COOLED)



Weight: 6.5 kg (14.3 lbs)