



PI•LCX:400

1340 x 400 imaging array | 20 x 20- μ m pixels

The PI•LCX:400 from Princeton Instruments is a high-sensitivity, high-resolution camera system designed for very low x-ray flux imaging and spectroscopy. With 20 x 20-micron pixels and 100% fill factor, this system provides high spatial resolution. A thin beryllium window in front vacuum seals the unit for deep cooling, protects the CCD, and reduces background by filtering low-energy x-rays. The thermoelectrically cooled option delivers maintenance-free operation, whereas the LN-cooled option provides extremely low dark current for long exposures. The software-selectable gains, output amplifiers, and readout speeds offer users highly flexible configuration capabilities to optimize system performance.

Features	Benefits
1340 x 400 imaging array 20 x 20- μ m pixels	"Princeton Instruments exclusive" CCD ideal for spectroscopy Optimal pixel size for maximum full well and high spectral resolution
Direct-detection technology	Provides very low x-ray flux imaging (photon counting) and high spatial resolution
Deep-depletion technology	Highest sensitivity
Dual-speed, 16-bit digitization	High-speed readout for rapid spectral acquisition Slow-speed readout for high sensitivity with wide dynamic range, high signal-to-noise ratio (SNR), and excellent energy resolution
Flexible binning and readout	Increases frame rate and SNR
Cryogenic cooling option (liquid nitrogen)	Allows long exposures and very low dark current
Thermoelectric cooling option	Allows maintenance-free operation
Software-selectable gains, readout speeds, and output amplifiers	Allows optimization of system performance (lowest noise to widest dynamic range)
"USB 2.0 interface" configuration	Seamless, plug-and-play connection to PC notebooks and desktops Easy OEM integration
"PCI interface" configuration	Industry standard for fast data transfer over long distances
WinSpec/WinView and PVCAM®	Offers powerful, easy-to-use set of Windows® GUI controls Automates data acquisition, analysis, and display
Linux® drivers and SITK™ plug-in for National Instruments' LabVIEW™	Extends system utility

Specifications

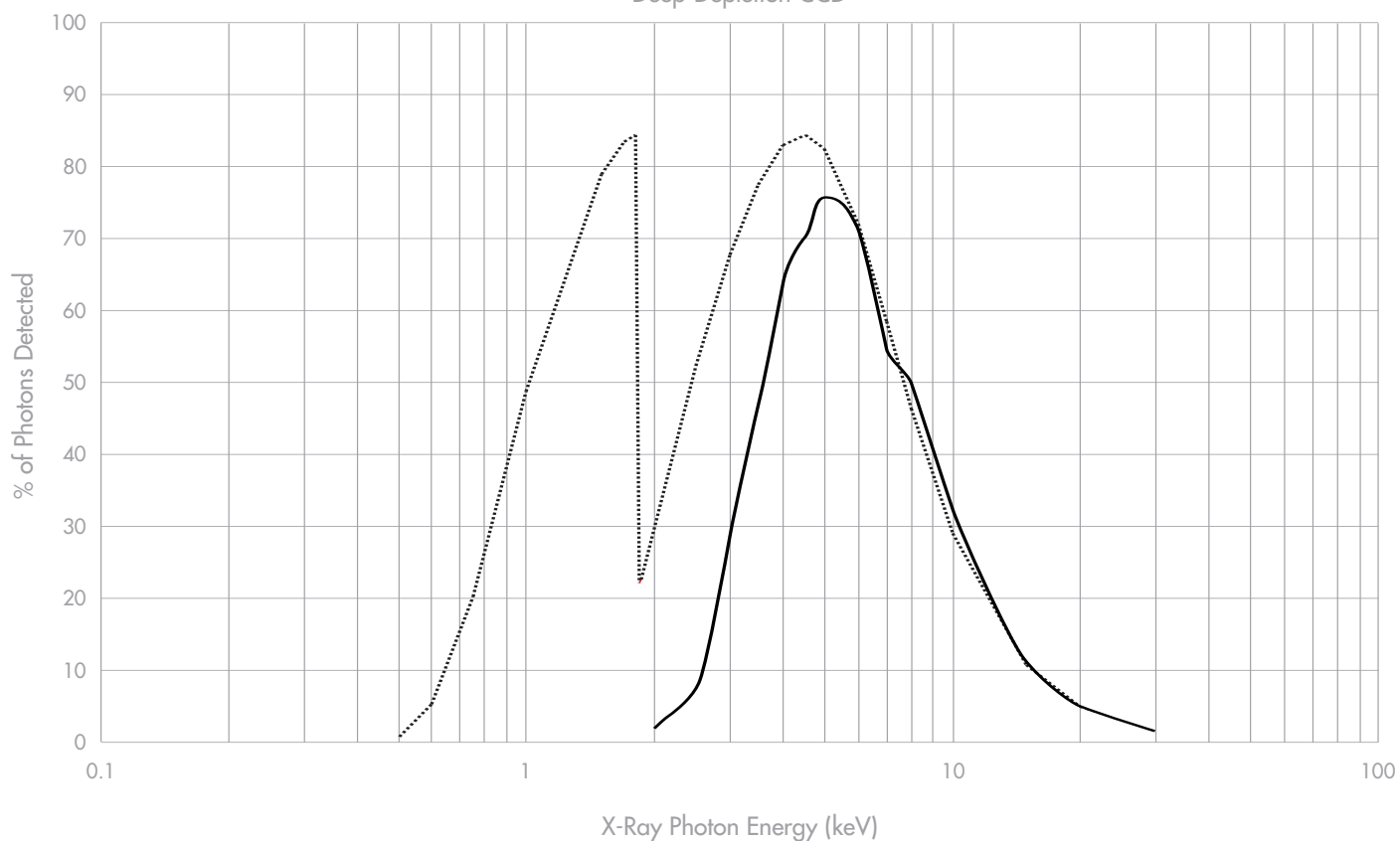
CCD image sensor	Princeton Instruments exclusive; front-illuminated, scientific-grade, non-MPP, deep-depletion device				
CCD format	1340 x 400 imaging pixels 20 x 20- μ m pixels 100% fill factor 26.8 x 8.0-mm imaging area (optically centered)				
Grade	Grade 1				
	Minimum		Typical		Maximum
			low noise	high capacity	low noise high capacity
CCD read noise			2 e- rms	6 e- rms	4 e- rms 8 e- rms
System read noise @ 50-kHz digitization @ 100-kHz digitization @ 1-MHz digitization			4 e- rms 5 e- rms 8 e- rms	6 e- rms 10 e- rms 18 e- rms	5 e- rms 8 e- rms 6 e- rms 12 e- rms 10 e- rms 20 e- rms
Single-pixel full well	200 ke-		400 ke-		
Output amplifier	low noise	high capacity	low noise	high capacity	
	200 ke-	800 ke-	250 ke-	1 Me-	
Dark current @ -40°C operation @ -110°C operation			100 e-/p/s 11 e-/p/hr		200 e-/p/s 36 e-/p/hr
Deepest cooling temperature thermoelectric (air) thermoelectric (+5°C liquid) cryogenic (liquid nitrogen)	-40°C -45°C -100°C		-45°C -55°C -110°C		
Outputs	Low-noise (high-sensitivity) or high-capacity amplifier; user selectable*				
Software-selectable gains	1.2 e-, 2.5 e-, 5 e- (low-noise mode) 2.5 e-, 5 e-, 12 e- (high-capacity mode)				
Nonlinearity @ 100 kHz	<2%				
Dynamic range	16 bits				
Scan rates	"100 kHz / 1 MHz" or "50 kHz / 1 MHz"				
Thermostating precision	\pm 0.05°C across entire temperature range				
LN hold time	>25 hours				

Note: Specifications are subject to change.
*Applies to thermoelectric head only.



Princeton Instruments PI•LCX: 400

Deep-Depletion CCD



— [1] Percent of incident photons detected with Be window ····· [2] Percent of incident photons detected without Be window

Readout Rates

Binning	@ 1 MHz	@ 100 kHz
1 x 1	0.55 sec	5.5 sec
1 x 2	0.28 sec	2.7 sec
1 x 400	7.95 msec	24 sec