Dhyana XV Series In-Vacuum Soft X-ray sCMOS Camera, 2K to 6K, 10^{-6} Pa

Model Dhyana XV · waveqvanta.com/products/dhyana-xv-scmos-camera

Liquid-cooled BSI sCMOS cameras that operate inside the vacuum chamber for direct soft X-ray and EUV detection.



The Dhyana XV series are sCMOS cameras designed to work entirely inside a high-vacuum chamber, down to 10^{-6} Pa, so the detector can be positioned where the experiment needs it. Back-illuminated sensors detect soft X-ray photons directly, data leave the chamber over fiber to USB 3.0 through a DN100CF feedthrough, and liquid cooling keeps dark current low. The series covers 2K, 4K and 6K sensor formats on one hardware platform.

Key features

- Four sensor variants: XV95 (2048 × 2048, 11 µm), XV400BSI (2048 × 2048, 6.5 µm), XV4040BSI (4096 × 4096, 9 µm) and XV6060BSI (6144 × 6144, 10 µm)
- Every camera is tested in vacuum together with its liquid cooling lines, feedthroughs and electrical cables
- Specified peak QE of ~100% from 80 to 1000 eV, plus response from 200 to 1100 nm
- Fiber-to-USB 3.0 data link with the fiber routed inside the vacuum; feedthrough DN100CF flange, customizable
- Vacuum compatible to 10^{-6} Pa; XV95 bake-out temperature below 70°C
- Liquid cooling; dark current down to 0.01 e^-/pixel/s at -45°C (XV4040BSI)
- Frame rates up to 48 fps (XV95), 40 fps (XV400BSI) and 9.7 fps (XV4040BSI); SDK for C, C++, C# and Python

Specifications

Sensor Type	Standard BSI sCMOS (in-vacuum)
Sensor	XV95: GSENSE400BSI
Peak QE	~100% (80–1000 eV)
Spectral Range	80–1000 eV; 200–1100 nm
Resolution	XV95, XV400BSI: 2048 × 2048; XV4040BSI: 4096 × 4096; XV6060BSI: 6144 × 6144
Pixel Size	XV95: 11 µm; XV400BSI: 6.5 µm; XV4040BSI: 9 µm; XV6060BSI: 10 µm
Effective Area	XV95: 22.5 × 22.5 mm; XV400BSI: 13.3 × 13.3 mm; XV4040BSI: 36.9 × 36.9 mm
Array Diagonal	XV95: 31.9 mm; XV400BSI: 18.8 mm; XV4040BSI: 52.1 mm
Full-Well Capacity	XV95: 85 ke^-; XV400BSI: 45 ke^-; XV4040BSI: 37 ke^- (typical)
Readout Noise	XV95: 1.6 e^-; XV400BSI: 1.1 e^- (CMS); XV4040BSI: 2.8 e^- (typical, median)
Dynamic Range	XV95: 90 dB; XV400BSI: 90 dB; XV4040BSI: 80 dB
Frame Rate	XV95: 48 fps (STD), 24 fps (HDR); XV400BSI: 40 fps; XV4040BSI: 9.7 fps
Shutter Type	Rolling (XV400BSI: rolling, global reset)
Exposure Time	XV95: 21 µs–300 s; XV400BSI: 6.6 µs–300 s; XV4040BSI: 10 µs–3600 s
Binning	2 × 2, 4 × 4
ROI	Supported

Cooling Method	Liquid cooling
Cooling Temperature	XV95: -45°C @ 20°C water; XV400BSI, XV4040BSI: 60°C below ambient
Dark Current	XV95: 0.3 / XV400BSI: 0.5 e^-/pixel/s @ -40°C; XV4040BSI: 0.01 @ -45°C
DSNU / PRNU	XV95, XV400BSI: 0.2 e^- / 0.3%; XV4040BSI: 0.5 e^- / 0.2%
Bit Depth	12 bit, 16 bit (XV400BSI also 11 bit)
Data Interface	USB 3.0 over fiber (fiber inside the vacuum)
Trigger	Hardware, software (Hirose)
Vacuum Compatibility	Up to 10^{-6} Pa
Flange Size	Feedthrough DN100CF; customization available
Power Supply	AC power
Power Consumption	XV95: < 65 W (incl. control box); XV4040BSI: ≤ 63 W
Dimensions	XV95: 110 × 110 × 191 mm (H × W × L)
Weight	XV95: ~2600 g (camera body); XV400BSI: ~2600 g; XV4040BSI: ~3100 g
Operating Environment	XV95: 0°C to 40°C, 0–70% RH non-condensing; bake-out below 70°C
Software / SDK	Acquisition and analysis software, LabVIEW, MATLAB, EPICS; C/C++/C#/Python SDK

Typical applications

- Fourier transform holography (FTH)
- Soft X-ray ptychography
- Small-angle X-ray scattering (SAXS)
- High-harmonic generation (HHG) EUV detection
- Soft X-ray scattering and spectroscopy
- EUV spectroscopy