LV-16 Camera System

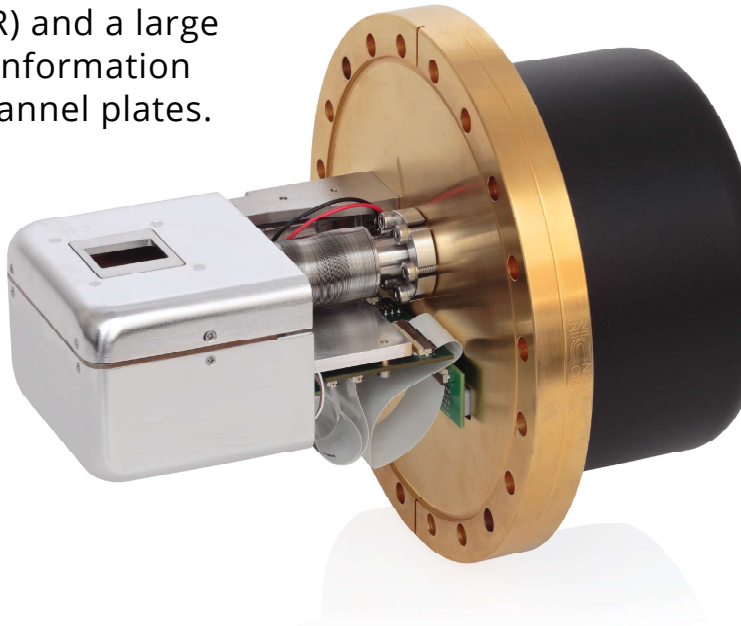
stunning clarity for LEEM/PEEM

delivering | bigger | better | faster | cameras for electron microscopy

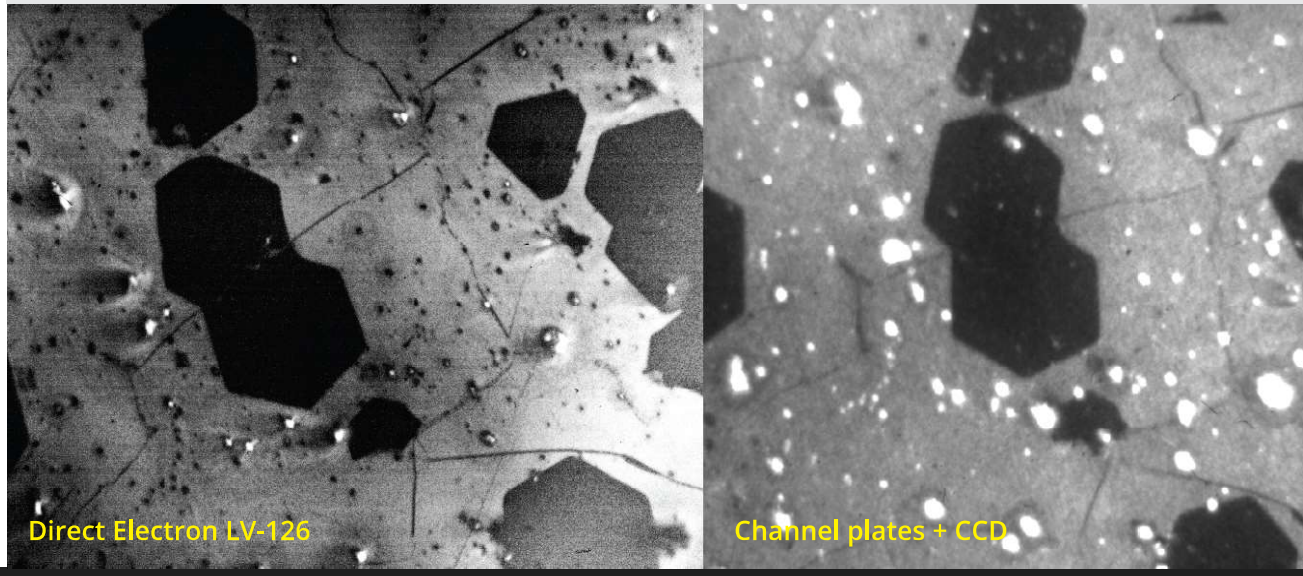
Direct Electron®
INNOVATION PROPELLING DISCOVERY

Direct Detection for Low-Energy Electron Microscopy

- Direct detection of low-energy primary electrons—a revolutionary advancement for LEEM/PEEM.
- High signal-to-noise ratio (SNR) and a large field-of-view delivers >6× the information content compared to microchannel plates.
- 4k × 4k (16.8 million) pixels.
- Extensible & open software to easily integrate with custom workflows.
- Movie-mode imaging of dynamic specimens and motion-correction.
- Unrivaled features, with an integrated Faraday plate.
- The largest impact hardware upgrade you can make per dollar.



Comparison between the LV series (left) and conventional channel plates + CCD (right). The images show cropped images of graphene layers on copper substrate, collected in PEEM mode. The bias voltage was set so that the monolayer of graphene appears bright while the bilayers appear dark.
Courtesy of Rudolf Tromp, (IBM, Yorktown Heights, NY, USA).



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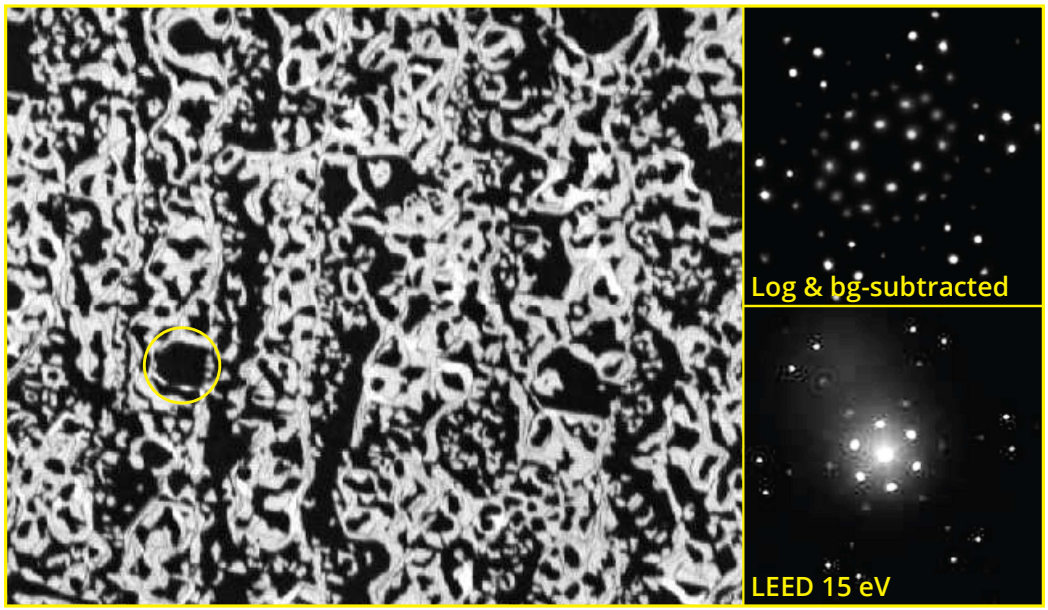
electron energy	optimized for 10 - 40 keV
pixel array specification	4096 × 4096 (16.8 million pixels) | 6.5 µm pixel pitch
single electron SNR	~10:1 (15 kV)
sensor design	>3T pixel design with on-chip correlated double sampling (CDS) backthinned | radiation hardened
acquisition frame rate	92fps max, unbinned full-frame | 281 fps max, binned-2× full-frame subarray readout up to 4,237 fps (2048 × 128) | user-selectable hardware frame rate
mounting position	optionally fully retractable | CF (ConFlat) flange | custom mounting options
exposure measurement	integrated Faraday plate for exposure measurement with each acquisition
sensor protection	integrated sensor protection shutter | TEM blanking/shuttering | failsafe software
computer system	high-performance computer | Windows 10 | NVidia GPU(s) | up to 58 TB storage
image format	non-proprietary to ensure broad compatibility | TIFF, MRC, AVI, MP4, etc.
acquisition software	image acquisition: DE-IM (full-featured, modern GUI) | ImageJ / µManager streaming acquisition: DE-StreamPix (realtime, continuous display and recording) customization: software development kit (SDK) for integration with custom software



Left: Cropped image of graphene on SiC, imaged in LEEM mode at 11.3 eV (detected at 15 keV).
Right: A selected-area LEED diffraction pattern for the crystal circled above. Courtesy of Rudolf Tromp, IBM.

Specifications and performance are subject to change.
Example images of various camera applications were collected by researchers using one of Direct Electron's cameras (not necessarily the LV-16).