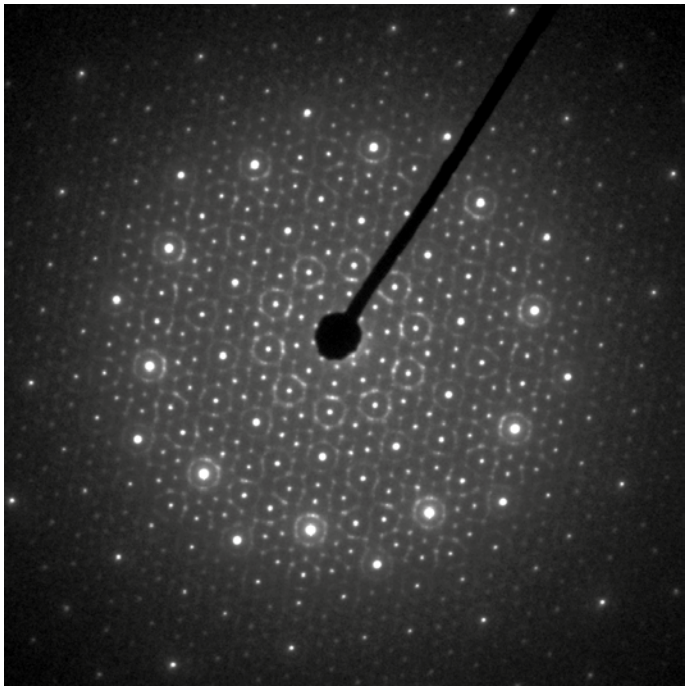
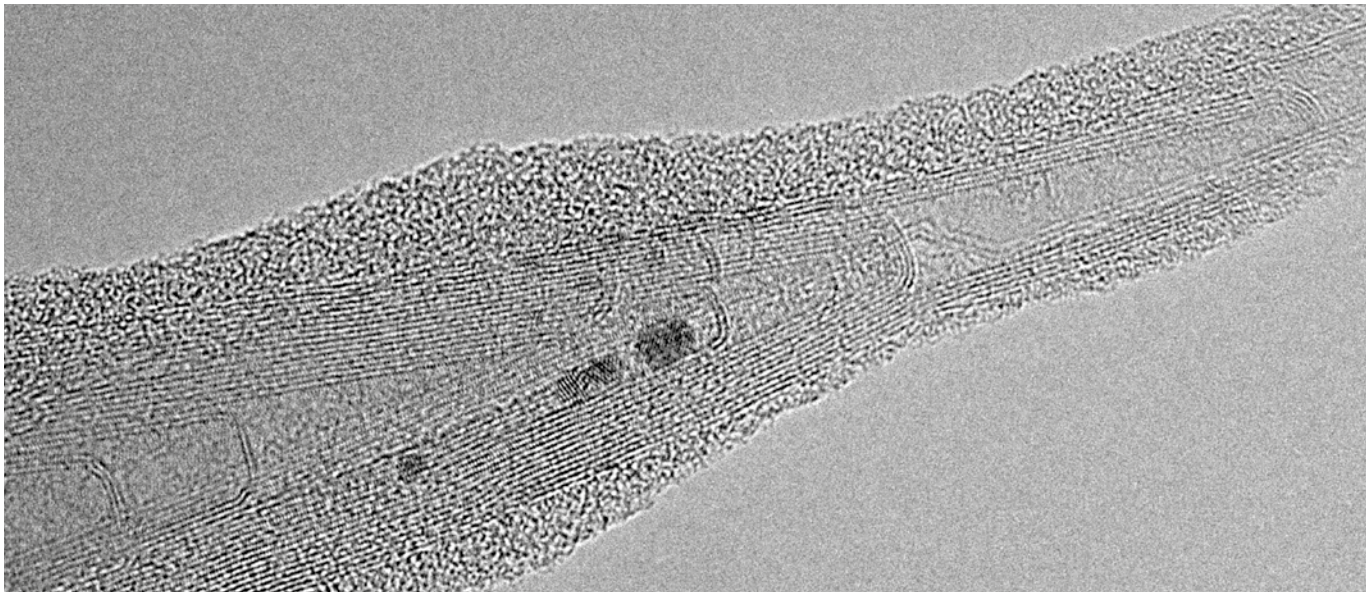


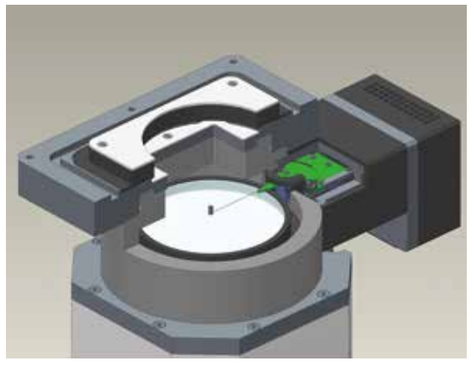


Complete solution for TEM imaging

> CAMERAS
> IMAGE PROCESSING
> STEM

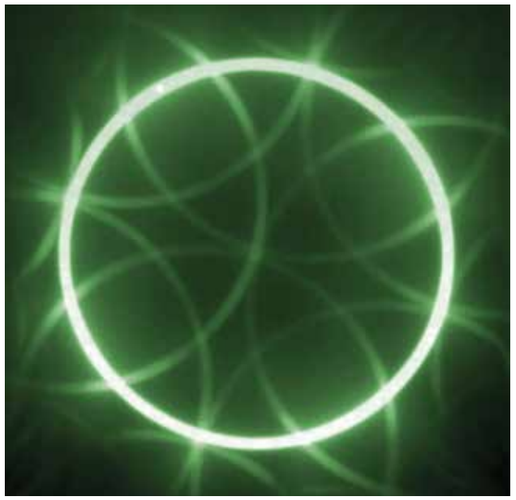
TVIPS
TIETZ VIDEO AND IMAGE PROCESSING SYSTEMS

TVIPS CAMERAS
CMOS CAMERAS FOR
ALL APPLICATIONS
PAGE 4

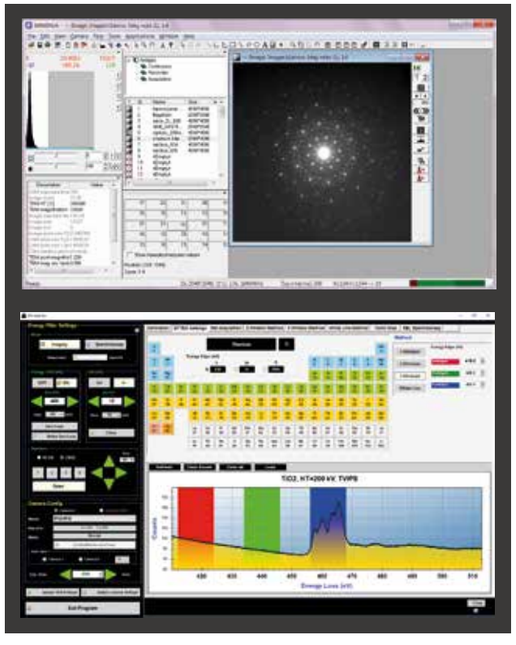


MOTORIZED BEAMSTOP
NEXT-LEVEL DIFFRACTION
DATA ACQUISITION
PAGE 7

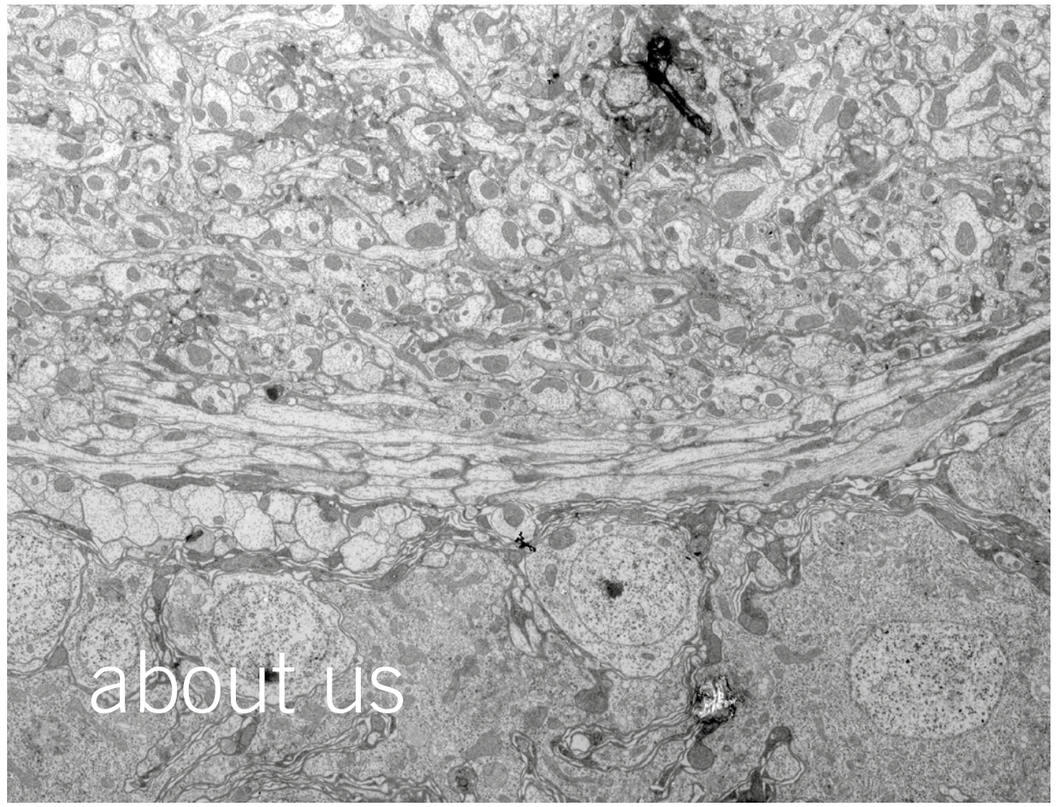
Cover, top right:
Nat Protoc. 2016 May;11(5):895-904.
doi: 10.1038/nprot.2016.046



UNIVERSAL SCAN GENERATOR
MANIPULATE THE BEAM FOR
ADVANCED ANALYSES
PAGE 6

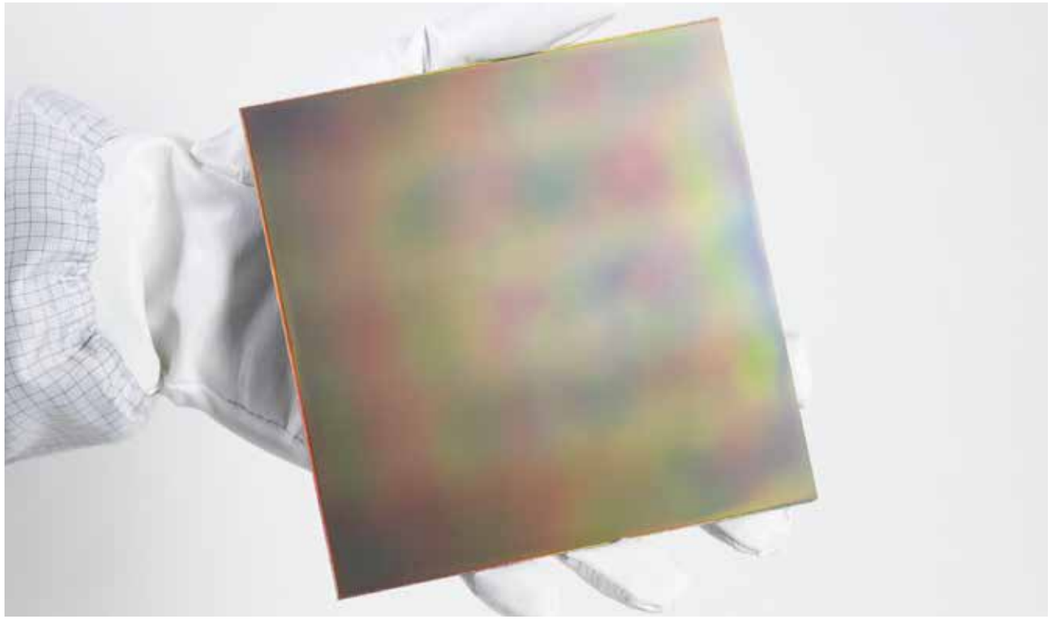


IMAGING SOFTWARE
FULL CONTROL OF CAMERA AND TEM,
AUTOMATIZATION AND ANALYSIS
PAGE 8



about us

2017	ADVANCED 4k CMOS CAMERA **(TemCam-XF416)**
2014	MOTORIZED BEAMSTOP / DIFFRACTION TOMOGRAPHY
2012	RELEASE OF UNIVERSAL SCAN GENERATOR (USG)
2011	2k CMOS CAMERA **(TemCam-F216)**
2009	4k CMOS CAMERA **(TemCam-F416)**
2006	WORLD'S FIRST 8k CAMERA **(TemCam-F816)**
2001	4k SLOW-SCAN CCD
1996	FIRST COMMERCIAL 2K SLOW-SCAN CCD
1993	FIRST COMMERCIAL TOMOGRAPHY SOFTWARE PACKAGE
1991	FIRST COMMERCIAL 1k SLOW-SCAN CCD
1987	FOUNDED BY HANS R. TIETZ IN GAUTING (MUNICH) GERMANY



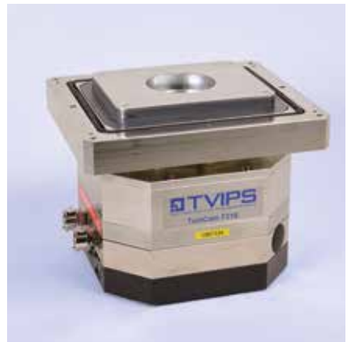
A NEW GENERATION OF CMOS-BASED TEM CAMERAS

	F216 (2K)	XF416 (4K)	F816 (8K)
Sensor Size	2048 × 2048 pixel	4096 × 4096 pixel	8192 × 8192 pixel
Pixel Size	15.6 × 15.6 µm²	15.5 × 15.5 µm²	15.6 × 15.6 µm²
Field of View	31.9 × 31.9 mm²	63.5 × 63.5 mm²	127.8 × 127.8 mm²
Read out Rate	2 × 10 megapixel/sec (16 bit)	32 × 16 megapixel/sec (16 bit)	8 × 10 megapixel/sec (16 bit)
Dynamic Range (max/noise)	10 000:1	20 000:1	10 000:1
Signal/Noise*	~14:1 (120 kV) ~12:1 (200 kV)	~14:1 (120 kV) ~12:1 (200 kV)	~10:1 (120 kV) ~8:1 (200 kV)
Resolution* (NTF @ Nyquist)	~15 % (200 kV)	~15 % (200 kV)	~10 % (200 kV)
Mounting Position	on-axis	on-axis, rotatable	on-axis
HT Range	20–300kV	20–300kV	20–300kV
Frame Rates	**1.8 fps,** *full resolution* **8.5 fps,** *subarea, 2k × 1k, RS*	**25 fps,** *full resolution* **200 fps,** *subarea, 4k × 0.5k*	**0.4 fps,** *full resolution* **8.5 fps,** *subarea, 8k × 1k, RS*

Depending on scintillator
Data in this brochure are typical and not binding.

OUR CAMERA SYSTEMS ARE COMPATIBLE WITH TEMS FROM ALL MAJOR MANUFACTURERS, I.E. *JEOL, FEI/PHILIPS, HITACHI* AND *ZEISS.* OUR CAMERAS SUPPORT SEVERAL THIRD PARTY SOFTWARES, E.G. *SERIAL-EM* AND *LEGINON.* BESIDES OUR OWN CAMERAS, EM-MENU ALSO SUPPORTS *FEI FALCON* CAMERAS AND IMAGING SYSTEMS BY *DIRECT ELECTRON.*

2K



TemCam-F216

The TemCam-F216 is TVIPS' smallest and most cost-efficient camera, featuring 4 MegaPixels in a 2k × 2k configuration.

It shares the same custom pixel design as the **F816** and the now-retired **F416** models with the same performance figures regarding sensitivity and dynamic range.

The high signal-to-noise ratio allows clear detection of single-electron events.

As all TVIPS cameras, the **F216** is equipped with a robust fiber-optically coupled scintillator. Upon request, its thickness can be adapted to the application's needs to optimize either resolution or sensitivity.

4K

TemCam-XF416

The TemCam-XF416 is TVIPS' newest development featuring an entirely new sensor design. While maintaining the single-electron sensitivity of the previous models, it excels with an extended dynamic range and a ten-times faster acquisition rate!

With the generous field-of-view of **63.5 × 63.5mm²** structured in 4k × 4k pixels, the **XF416** is the ideal camera for various applications. The high frame rate allows dose-fractioning and in-situ experiments. Get a clear view of your unstable samples by using the real-time drift-correction feature at full resolution and readout rate.

Extend the dynamic range by frame averaging while maintaining a normal beam intensity.

8K

TemCam-F816

Meet the TemCam-F816, the world's first digital camera with an active area larger than that of a sheet-film camera. With its impressive size of 128 × 128 mm² in an 8k × 8k configuration it clearly surpasses the performance of photo plates.

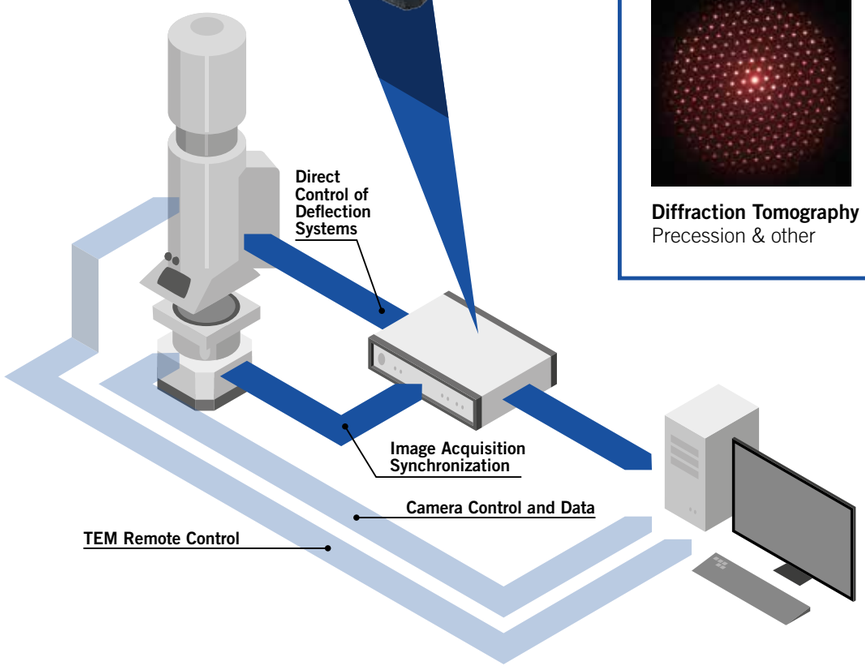
This camera opens up extraordinary possibilities for high-throughput applications such as single-particle data collection or rapid screening of serial sections. In a single exposure both a large field of view and high-resolution information is recorded for maximum insight into your sample.

USG

The Universal Scan Generator is a powerful tool to gain complete control of the electron beam. Simultaneous access of deflectors and camera enables a quick succession of data acquisition, paving the way for STEM, EELS datacubes and sophisticated diffraction applications like MicroED.

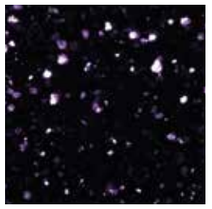
USG

UNIVERSAL SCAN GENERATOR WITH SYNCHRONIZED DATA ACQUISITION

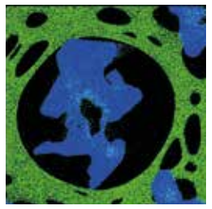


STEM Imaging
(BF, DF, HAADF)

STEM Tomography
(BF, DF, HAADF)



Dark Field
3D Orientation Map



Spectroscopy
(EELS/EDX-3D-DataCube)

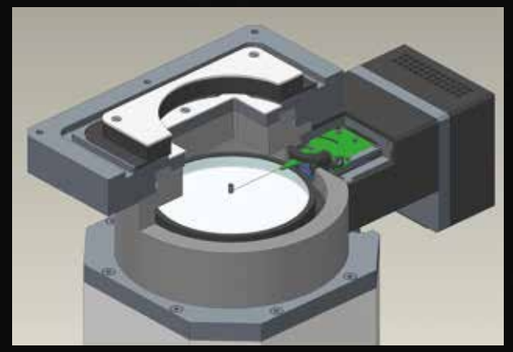
Diffraction Tomography
Precession & other

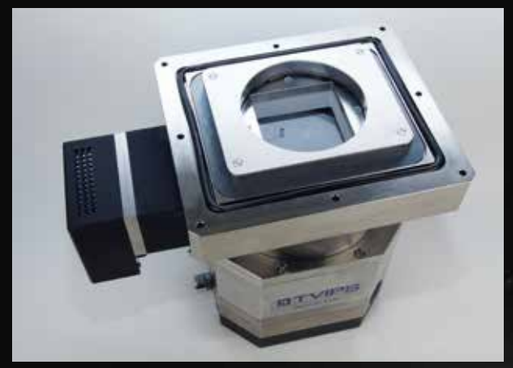
EM-CONOS
Precession Diffraction

Beamstop & USG
MicroED Series

MOTORIZED BEAMSTOP

TVIPS newly developed motorized beam stop takes acquisition of diffraction images to the next level with significantly fewer obstructions and integrated measurement of the beam current.





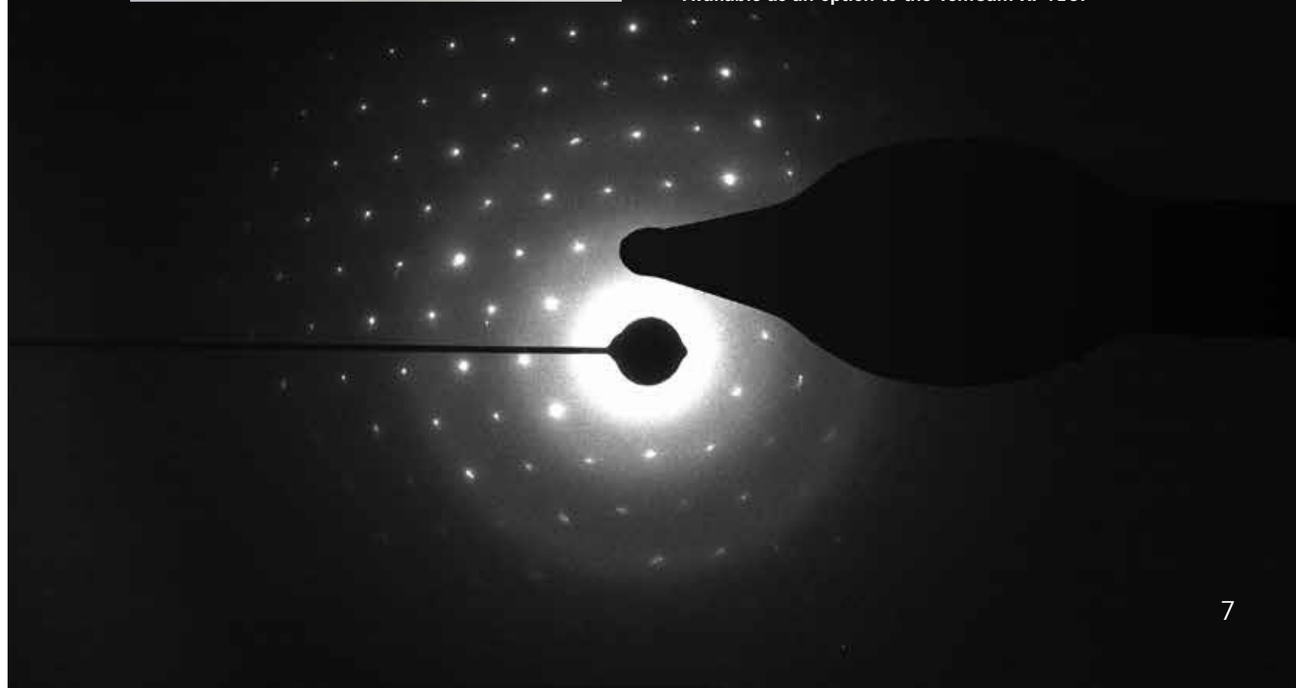
The device uses fast piezo actuators controlled by absolute position encoders to ensure fast (<1s) and accurate positioning of the beam stop.

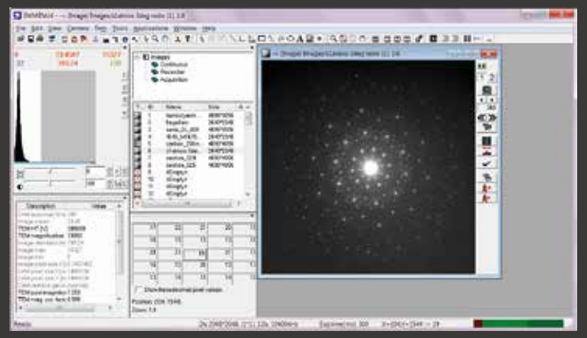
Since it is located only a few millimeters above the scintillator and thanks to its delicate support, the obstructions in the diffraction patterns are kept minimal.

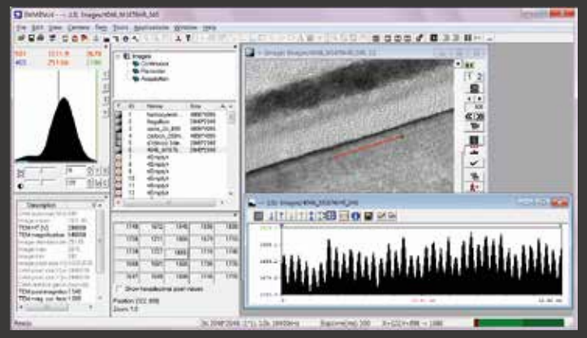
The integrated Faraday cup enables online measurement of the intensity of the zero order beam right with the exposure, with the result stored to the image's metadata. This enables quantitative measurements of diffraction spot intensities across several images, e.g. to compensate for the varying intensity in diffraction tomography experiments.

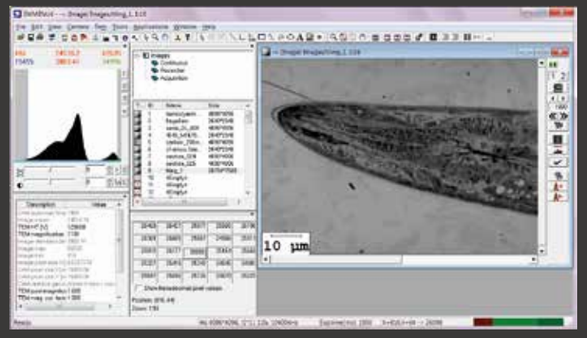
The user-friendly GUI supports manual and automated positioning of the beam stop. Several positions can be defined and accurately revisited afterwards. An easy-to-use API allows the integration of the beamstop into your custom acquisition schemes.

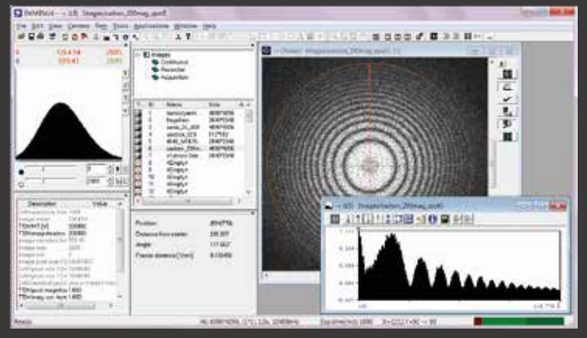
Available as an option to the TemCam-XF416.

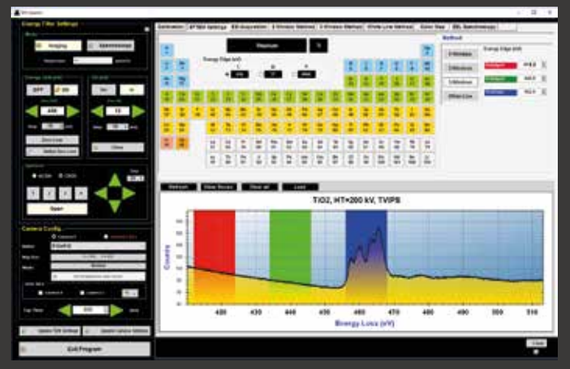


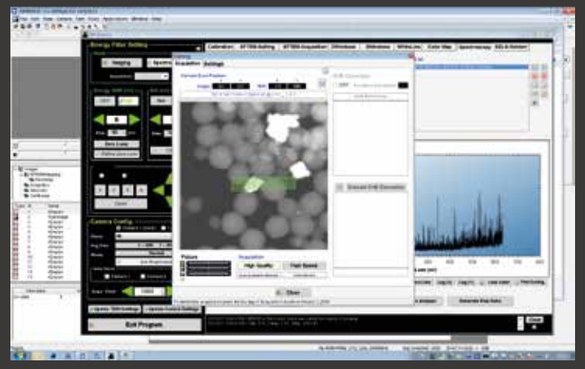












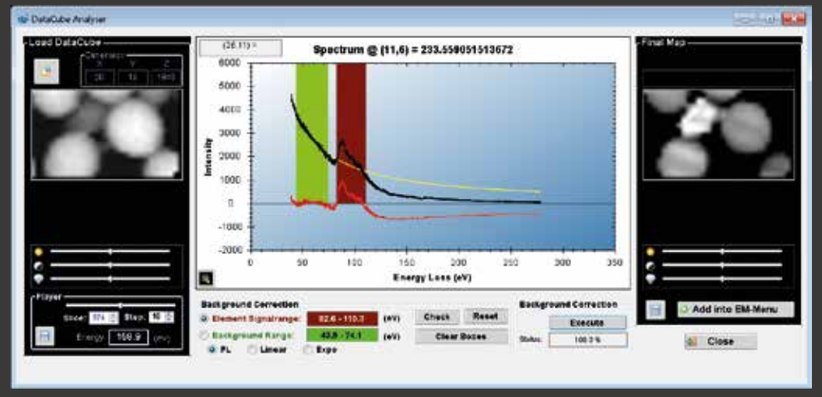


IMAGE ACQUISITION AND ANALYSIS

EM-MENU is the central hub managing the raw data from the cameras and providing a higher-level core application for the more specialized software products. It presents a highly configurable interface to each camera's individual feature set.

- Unique flatfield algorithm for high linear detector response
- Clutter-free presentation of still and live images in configurable viewports
- Flexible mapping of high dynamic range image data to monitor's color depth
- Neatly organized access to all images recorded within the microscopy session
- Image data saving in 8 or 16-bit tiff format, annotated with rich information about microscope state and camera configuration at the time of exposure
- Powerful calibration and measurement tools in image, fourier and diffraction domain
- Dedicated shutterbox hardware for precise beam blanker and shutter control, enabling pre-exposure acquisition schemes
- Series acquisition (time delay/dose, beam/stage tilt, defocus)
- Burst mode for fastest camera read-out
- Automatic tiling and image alignment
- Autofocus, navigator and center detail functions
- Real-time drift correction
- Movie recording to mass storage at readout rate for in-situ experiments
- Extensible scripting interface via COM and VBScript

ONE-STOP SOLUTION FOR EFTEM

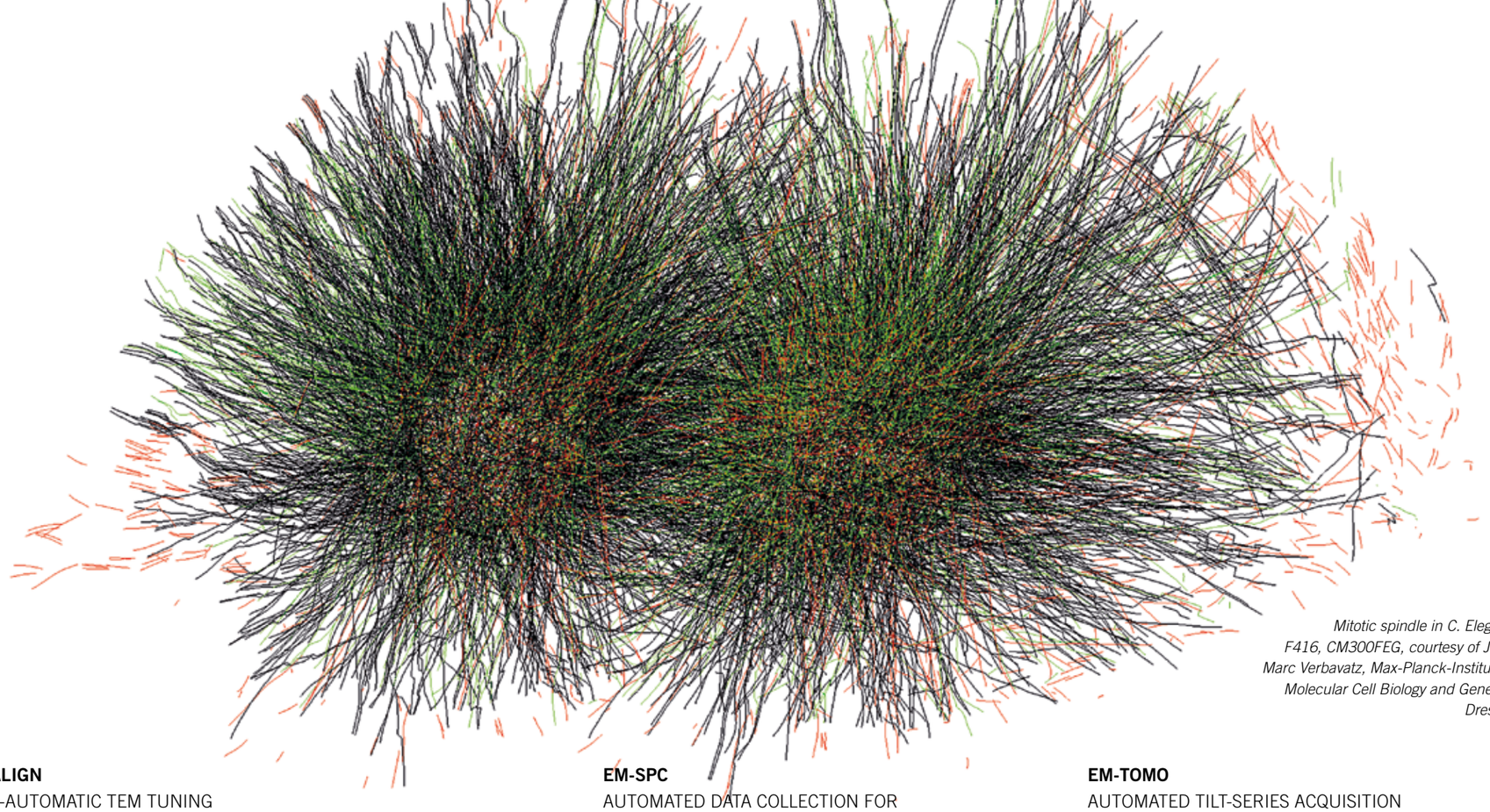
EM-SPECTRO enables getting the most analytical insight out of your in-column energy filter. Its intuitive and user-friendly interface facilitates advanced acquisition schemes in both Electron Spectroscopic Imaging (ESI) and Electron Energy-Loss Spectroscopy (EELS) mode.

- Intuitive calibration routines
- Automatic zero-energy calibration
- Spectrum autodetection
- Plain-text spectrum data export
- Support of usual ESI acquisition schemes e.g. 2/3 Windows, Thickness Map
- Automatic alignment of ESI data
- EELS data processing directly during microscopy session e.g. Background Subtraction, Fourier Filtering/Deconvolution
- Fast data cube acquisition using the camera's syncronization signal
- Drift correction for STEM-EELS acquisition
- Long-range spectrum acquisition for enhanced resolution and extended span

EM-TOOLS

Sophisticated software package low-dose imaging and automation

EM-TOOLS consists of 4 modules developed with the needs for automated low-dose data collection in mind. There are modules for navigation across multiple scales, TEM auto-tuning and automated collection of single-particle data or tomographic tilt series.



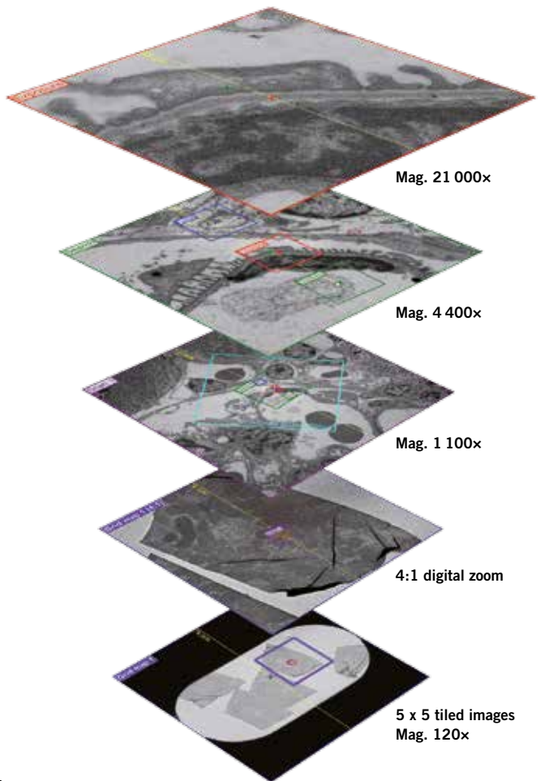
Mitotic spindle in C. Elegans, F416, CM300FEG, courtesy of Jean-Marc Verbavatz, Max-Planck-Institute of Molecular Cell Biology and Genetics, Dresden

EM-NAVI

NAVIGATION FOR LOW-DOSE APPLICATIONS

Especially developed for low-dose applications, this module enables finding the area of interest while keeping the specimen's exposure to the electron beam minimal. This is done by subsequent refinement of the target positions across multiple scales. Focusing and tracking can be done away from the area of interest, avoiding excess beam exposure of the final image.

- Built-in navigation for low-dose applications
- Compensation of each magnification's displacement
- Automated focusing, beam centering and eucentric height correction
- Supports TEM and STEM acquisition, also in mixed-mode



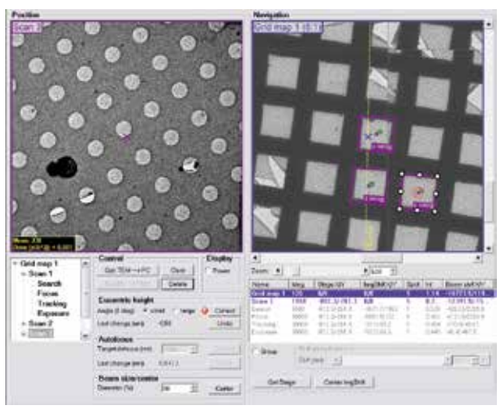
Left: Multi-scale navigation scheme

EM-ALIGN

FULL-AUTOMATIC TEM TUNING

To optimize the image quality, it is necessary to align the beam path to the coma-free axis. EM-ALIGN measures the aberrations of the optical system and optimizes the beam path.

- Zemlin tableau recording and determination of the aberrations
- Correction of twofold astigmatism and alignment to the coma-free axis



Screenshot user interface

EM-SPC

AUTOMATED DATA COLLECTION FOR SINGLE-PARTICLE PROJECTS

This module was developed for the automated and mostly unattended collection of the large data sets required for the single-particle method. The target positions for the collection can be either selected manually or automatically by defining limits to the desired ice thickness and the acceptable homogeneity.

- Automated data collection including auto-eucentricity and drift-check
- Auto-focusing and target centering with an accuracy to within 100nm
- Optional manual target definition by a single mouse-click
- Flexible target pattern geometry (rectangular, hexagonal and triangular)
- Focus and time-series acquisition (focal pair, beam-induced movement)
- Online auto-tuning at regular intervals for compensating TEM instabilities (illuminated area, astigmatism, coma-free alignment)
- Operates on regular and irregular support films, e.g. Quantifoils and Lacey carbon films
- Supports internal and retrofit automated LN_2 refill systems (www.simpleorigin.us)

EM-TOMO

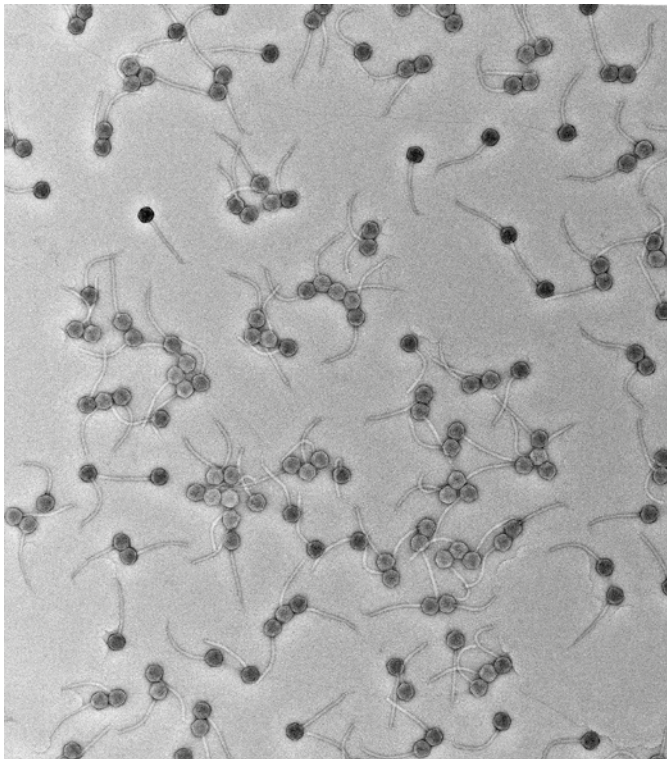
AUTOMATED TILT-SERIES ACQUISITION

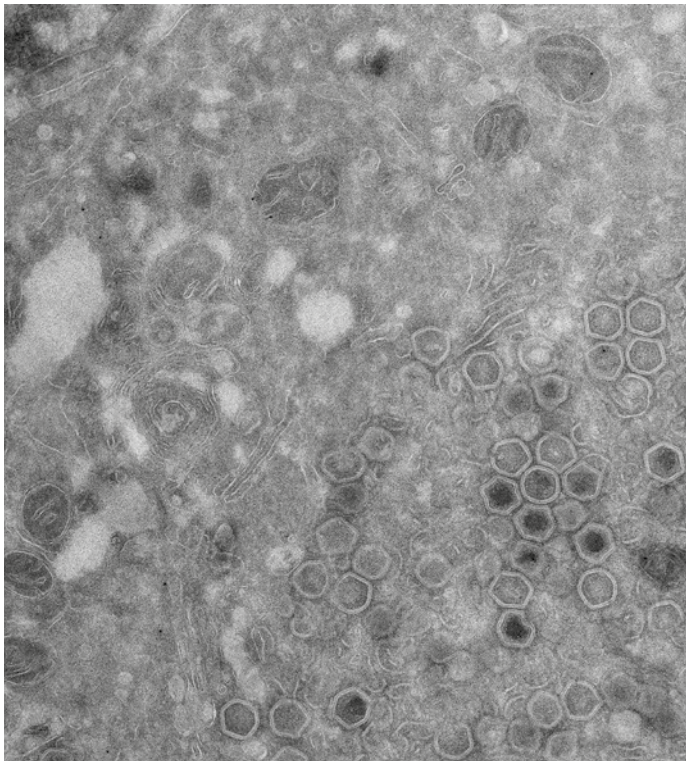
Module for automated acquisition of tomographic tilt-series under low-dose conditions.

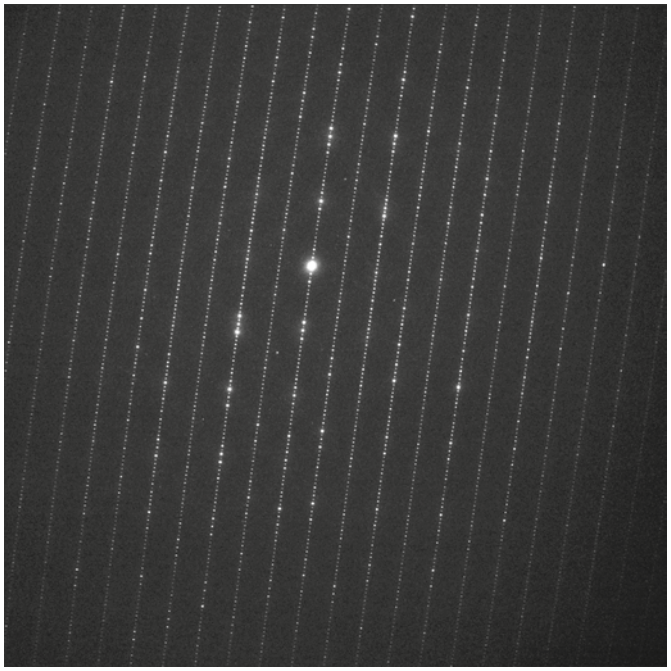
- Collection of tomographic tilt-series
- Compensation of tilt-induced specimen moving
- Works in either TEM or STEM mode
- Auto-focusing, beam centering and accurate eucentric height correction
- Flexible tilt schemes: linear, Saxton, user-defined
- Batch tomography of multiple target sites
- Tiled image-acquisition for increased resolution and extended field-of-view
- Supports internal and retrofit automated LN_2 refill systems (www.simpleorigin.us)

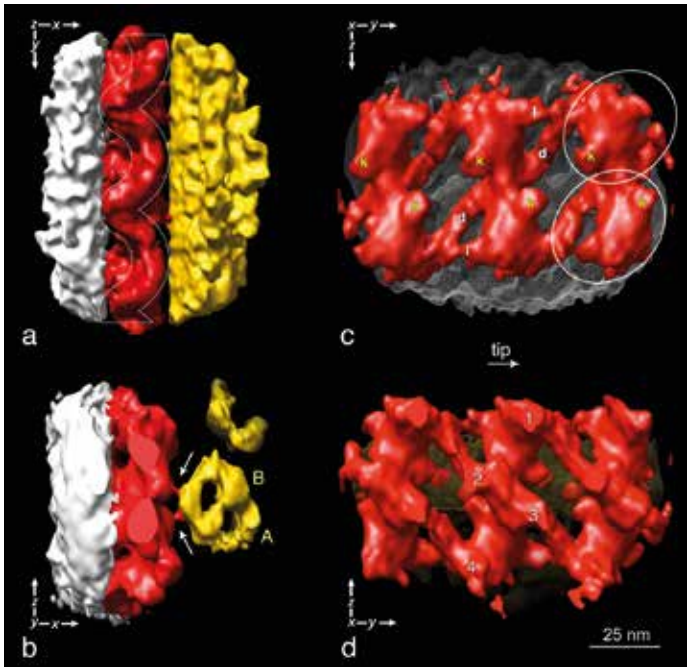
STEM tomogram of amyloid fibers

Scientific Reports
doi: 10.1038/SREP43577









TVIPS GmbH
Eremitenweg 1
82131 Gauting, Germany
Phone +49 89 850 65 67
Fax +49 89 850 94 88
E-mail: info@tvips.com
www.tvips.com

TVIPS
TIETZ VIDEO AND IMAGE PROCESSING SYSTEMS