

Hitachi High-Tech

HITACHI

Transmission
Electron
Microscope

HT7700



with options

The HT7700 : a user-friendly, ergonomic digital TEM



with options

User-Friendly Design

Ambient light operation.
Multiple automated functions for alignment, focus and stigmation as standard features.

► P3

Premium Image Quality

Fully integrated, large format digital camera as a standard feature. Newly developed algorithm for fully automated serial image acquisition and seamless panoramic images.

► P7

Outstanding Performance

Unique Double-Gap objective lens design for high contrast and high resolution imaging.

► P9

The HT7700 features superior high contrast and high resolution image quality and analytical capabilities for biomedical, pharmaceuticals, food industry, agriculture, polymer, chemistry and nanomaterials applications.

Biomedical

Nanomaterial

Pharmaceuticals
Food and
Agriculture

Polymer
Chemistry



with options

Advanced Applications

Optimized Hitachi 3D tomography, BF/DF STEM capability, EDX microanalysis, EXALENS for superior high resolution imaging. Unique specimen holders designed for advanced applications.

▶ P10

Environmentally Friendly

Clean turbopump vacuum system. 30 % reduction in CO₂ emissions as compared to previous model (H-7650, 2010).

▶ P13

HT7700

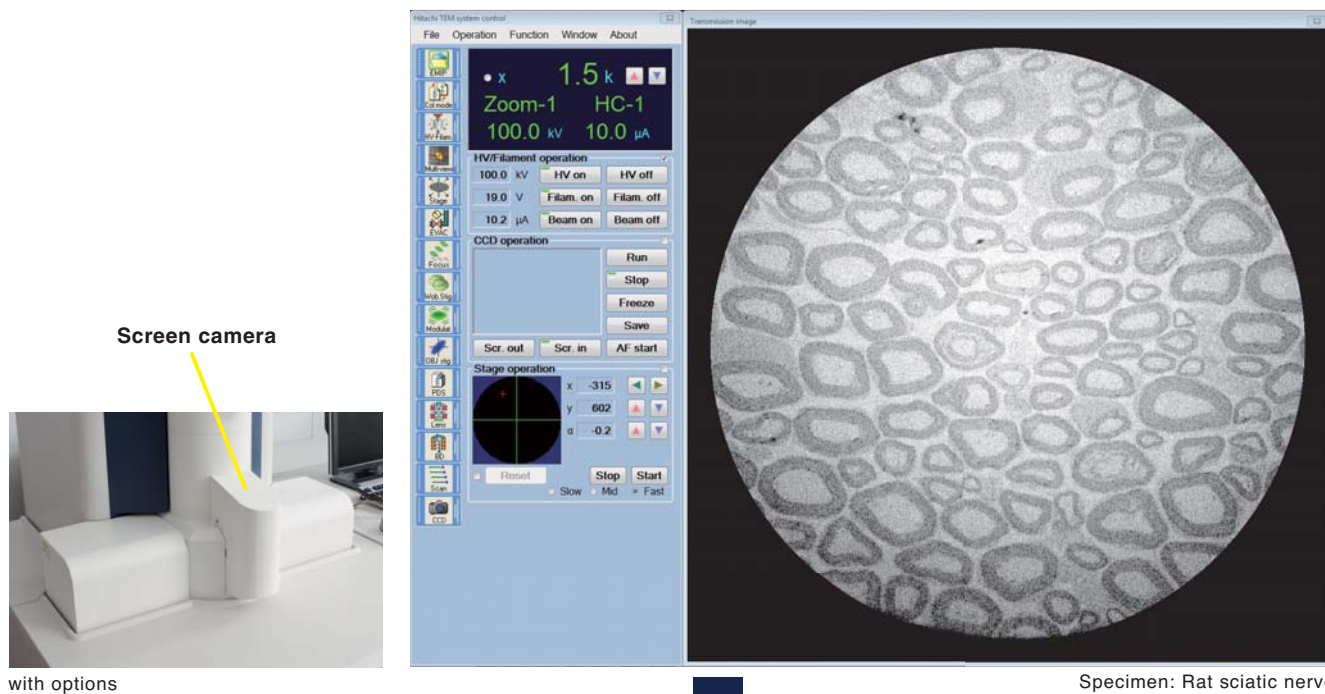
Transmission Electron
Microscope

User-Friendly Design

Operation in Ambient Light is Possible

Screen Camera and Main Camera

Critical sample features can be easily identified in the viewing screen camera image on the LCD monitor while operating in ambient light.

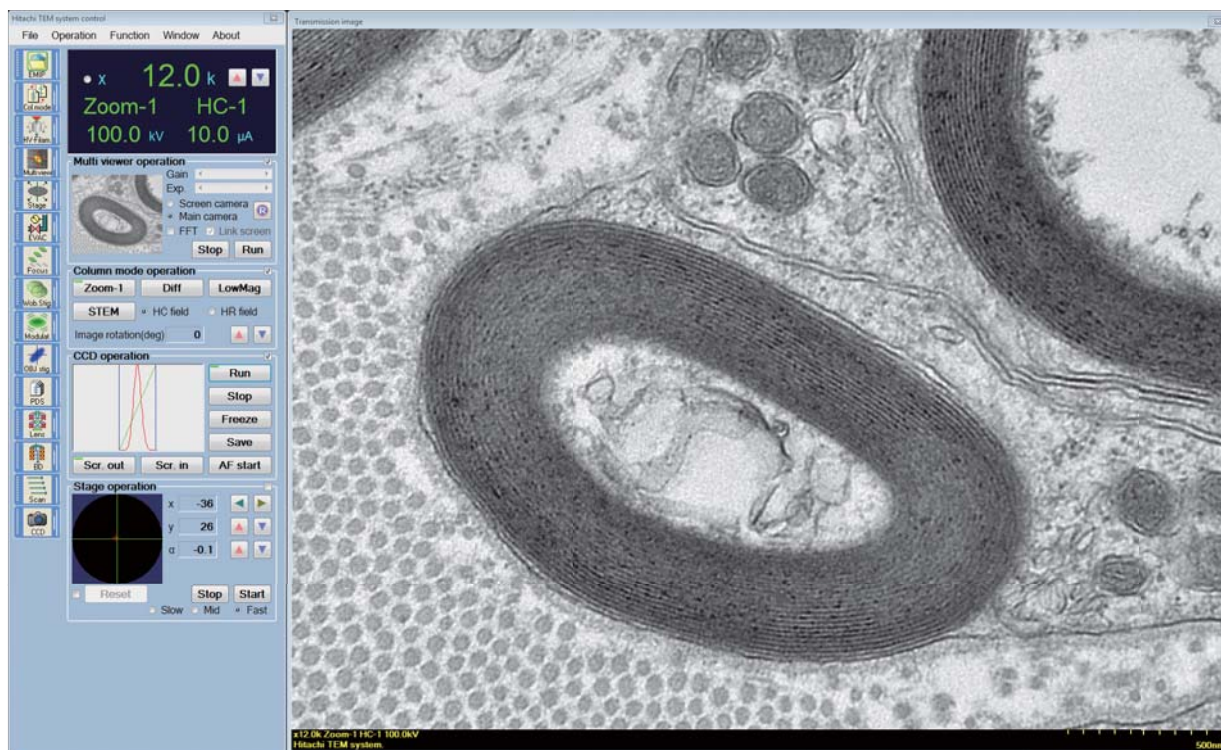


Screen camera

with options

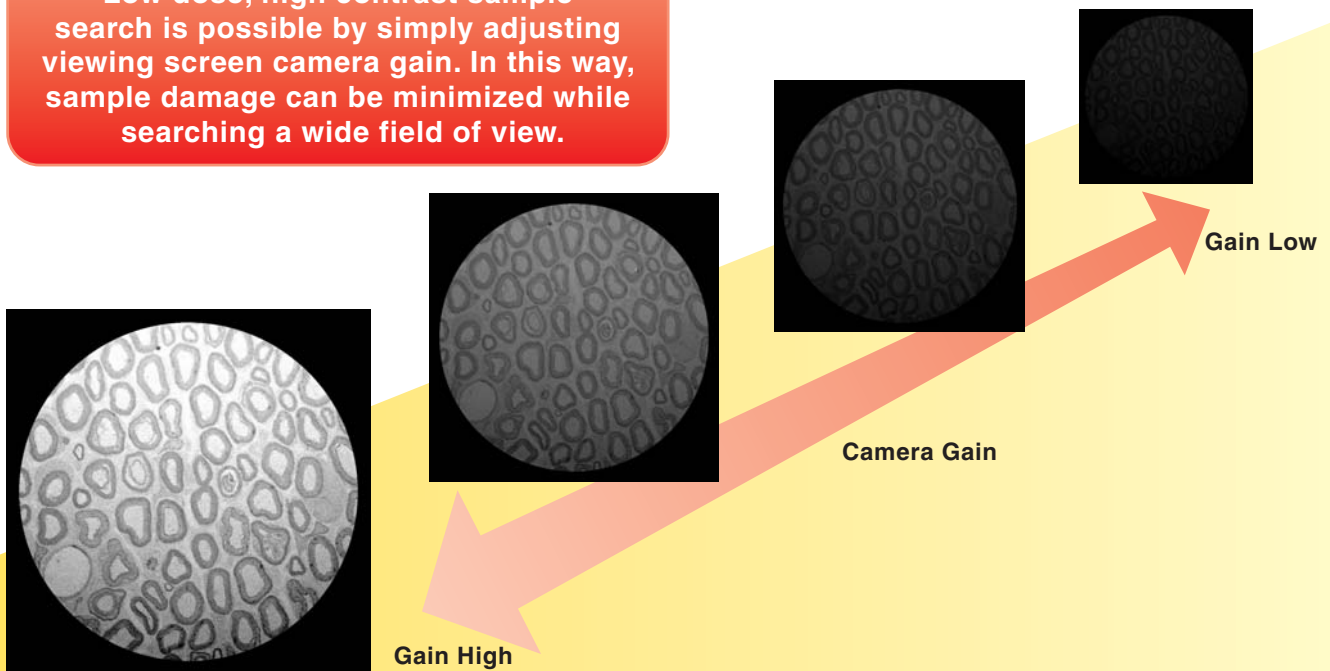
Specimen: Rat sciatic nerve

Switch from the screen camera to the main camera with ease and use the auto-focus and image capture functions for fast results.



Specimen: Rat sciatic nerve

Low dose, high contrast sample search is possible by simply adjusting viewing screen camera gain. In this way, sample damage can be minimized while searching a wide field of view.



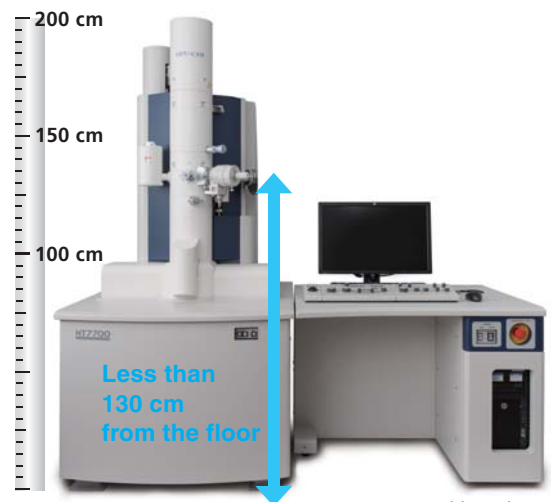
Placement of Apertures and Specimen Holder

Seated operators have easy access to the HT7700's apertures and specimen holder due to its ergonomic design. The overall instrument height is less than 200 cm (6' 7") and the objective aperture and specimen holder are less than 130 cm (4' 3") above the floor.



with options

Embedded TEM GUI



with options

Auto Drive Function for High-Speed Recall of Specific Area of Interest

All saved images are stored in an image database where the thumbnail of the image can be viewed. Each thumbnail image contains the microscope settings used when the image was captured. When the operator clicks on any thumbnail image and selects "auto drive", the specimen stage is automatically driven to the position where the image was captured.

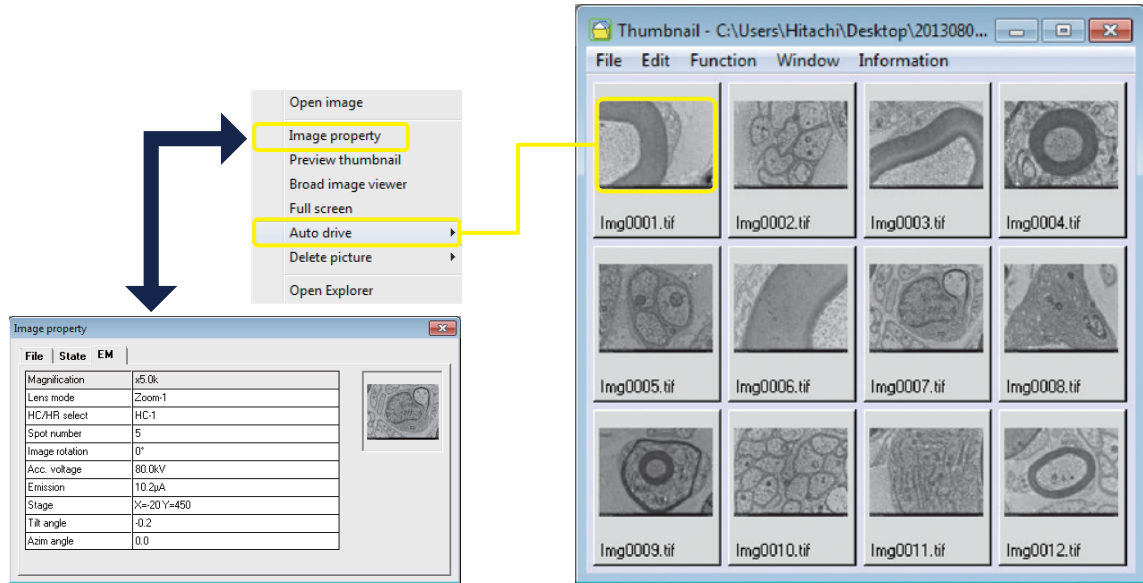
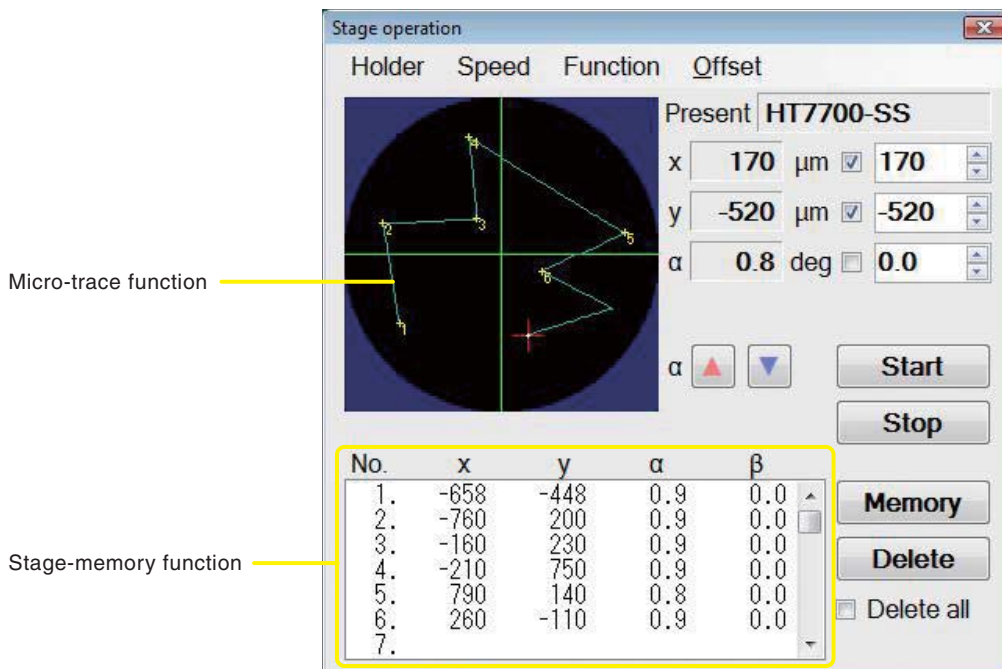


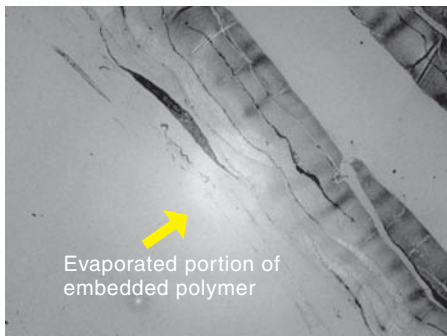
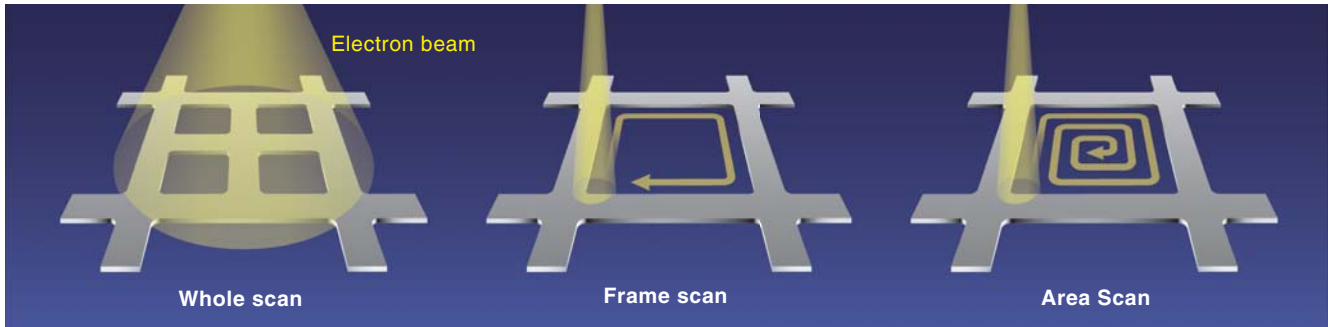
Image Navigation and Micro-Trace Function

Image navigation allows the storage of up to 100 stage coordinate positions and tilt angles. When a saved location is recalled, the instrument drives the specimen stage to the saved coordinate position and tilt angle. The micro-trace function stores stage movement and displays the movement path using a line. This allows the operator to easily differentiate between examined and unexamined areas of the specimen.

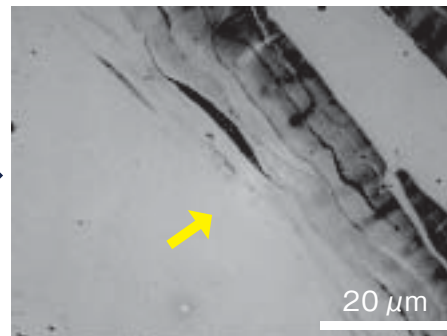


Auto Pre-Irradiation, API

API is essential for imaging beam-sensitive specimens and for stabilizing specimens to prevent drift. Operators can select from several modes, as shown below (Whole scan, Frame scan, and Area Scan), to optimize sample stabilization results.



Before API (TEM image)

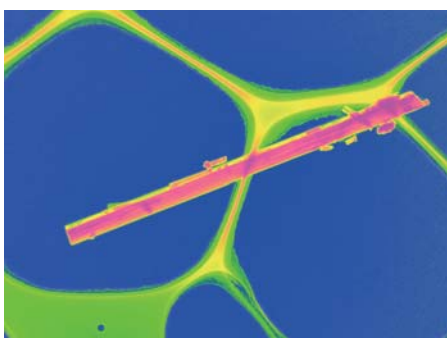
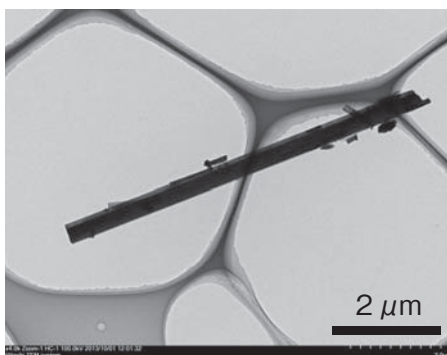


After API (TEM image)

By means of API, the contrast of examined areas (left) matches the surrounding embedded tissue and resin (right). API effectively minimizes damage and specimen drift during observation.

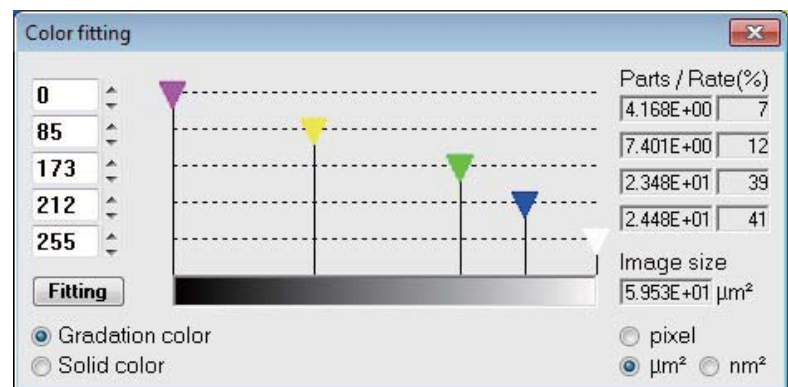
Specimen:
Resin-embedded
biological tissue

Color Fitting Function



Specimen: Asbestos (crocidolite)

Greyscale images can be displayed with pseudo coloring for visual impact. By assigning color to segments of the greyscale, the relative proportion of critical structures can be emphasized and compared. An example of asbestos analysis using the color fitting function is shown at left.

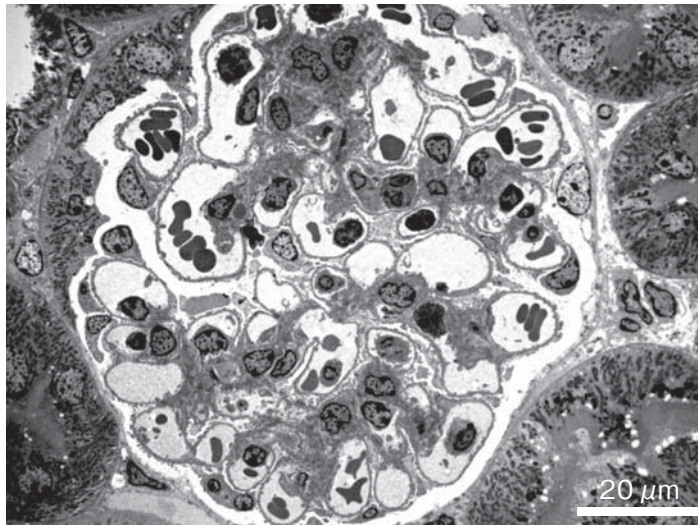


Premium Image
Quality

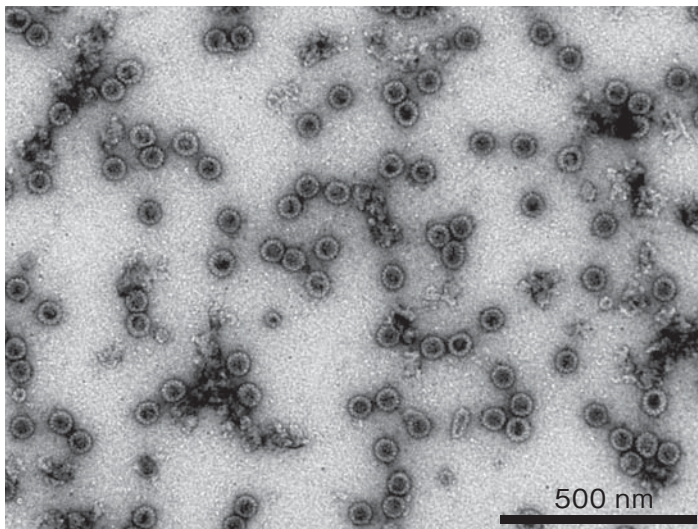
Fully Integrated camera and Newly Developed serial image acquisition and Seamless Panorama

Improved Main Camera Design

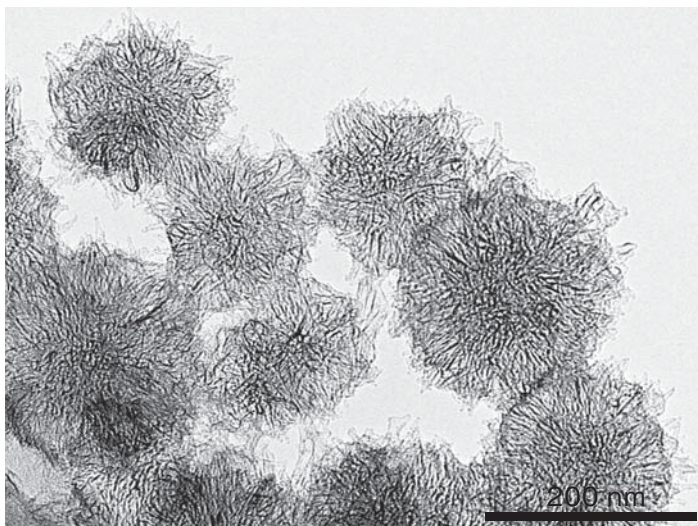
Fully integrated new 8 M pixel camera as the standard main camera for easy collection of high quality images.



Specimen : Rat kidney
Accelerating voltage : 100 kV



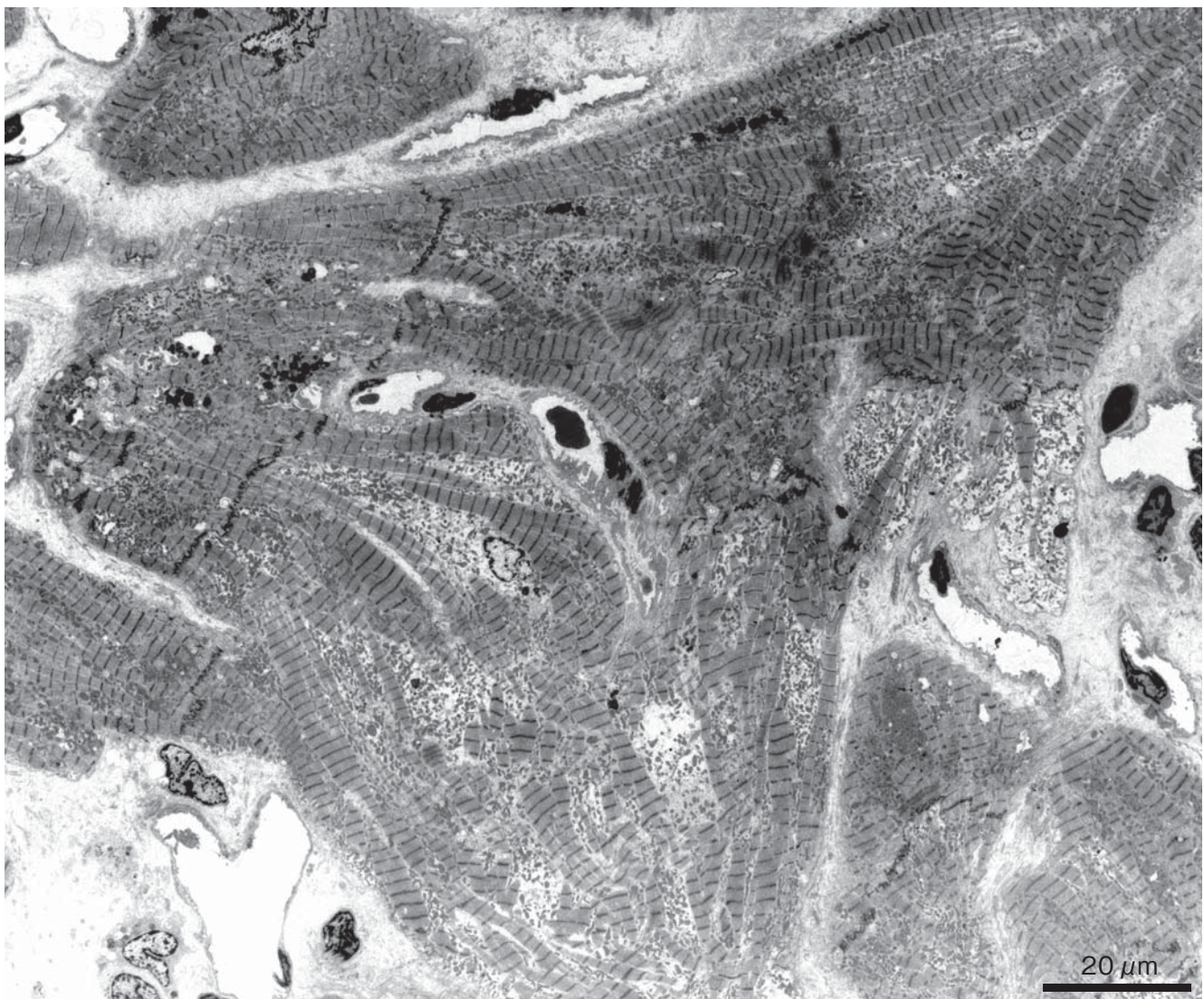
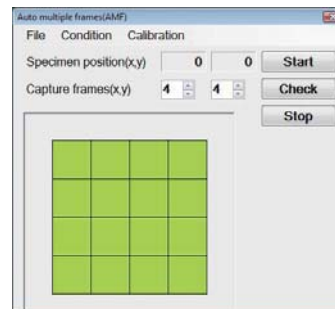
Specimen : Human papilloma virus
(Negative stained)
Accelerating voltage : 100 kV,
Sample courtesy :
National Institute of Infectious Diseases



Specimen : Carbon nanohorn
Accelerating voltage : 100 kV,
Sample courtesy : NEC Corporation

Auto multiple frame function and Auto panoramic function capture and delineate seamless panoramic images for large format results.

- Continuous images can be collected, saved and stitched automatically.
- Images are automatically collected with high precision through the use of image shift or stage shift.
- Newly developed stitching algorithm combines automatically captured images into one panoramic view with the highest possible accuracy.

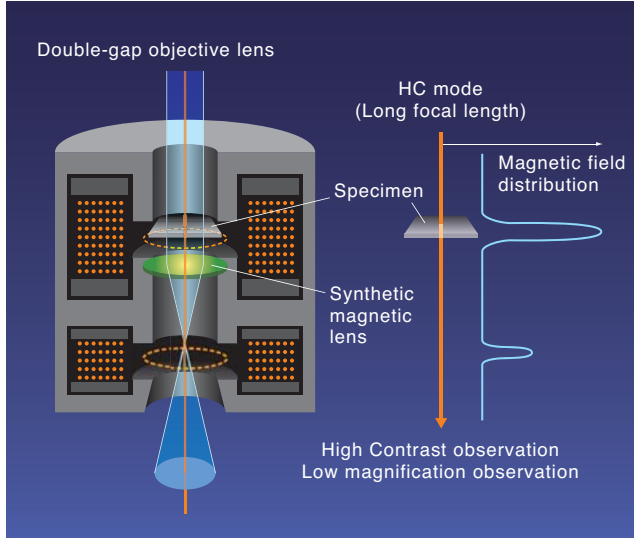


Specimen : Human heart (by 8 M pixel camera, 4x4, 16 images)
Accelerating voltage : 100 kV,
Sample courtesy :
Koichi Kawamura,
Akita University Graduate School of Medicine

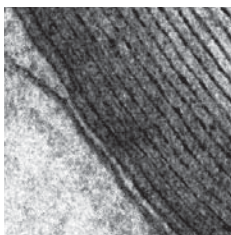
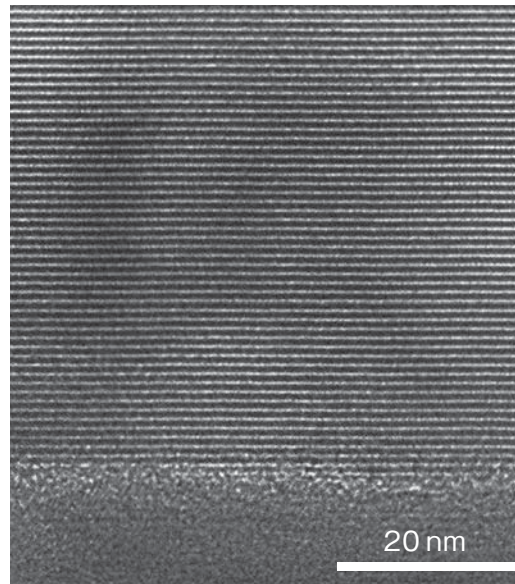
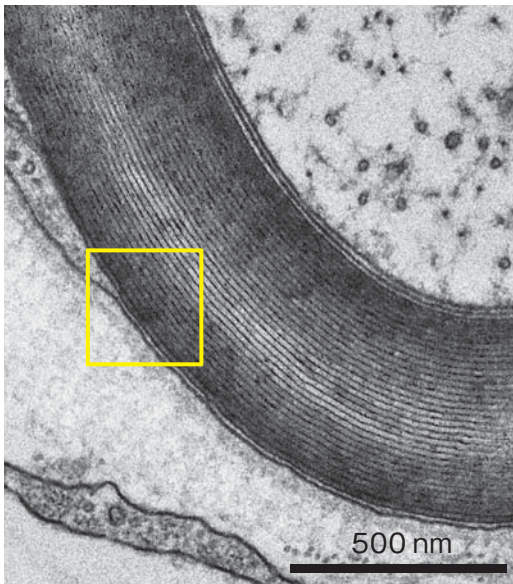
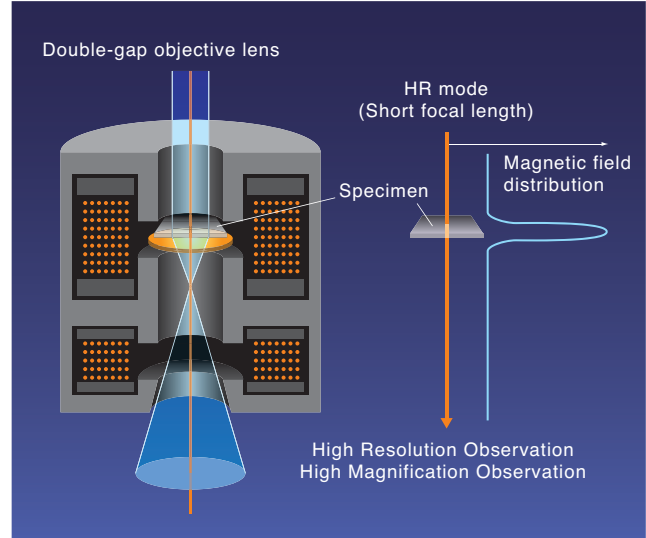
Double-Gap Objective lens design for HC and HR

- Hitachi's unique Double-Gap Objective lens design can be used to generate a long focal length for High Contrast (HC) imaging or a short focal length for High Resolution (HR) imaging.
- With a simple software selection, the HT7700 operator can easily switch between High Contrast (HC) or High Resolution (HR) imaging mode based on sample requirement.

● HC Mode (Long Focal Length)



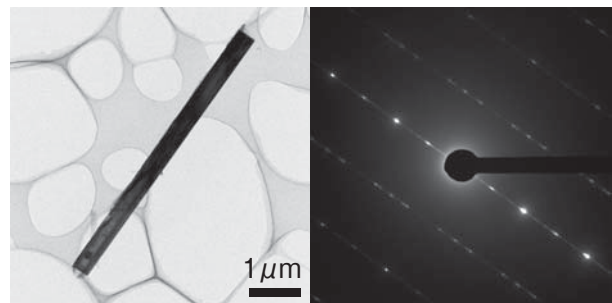
● HR Mode (Short Focal Length)



HC mode is especially effective for observation of biospecimens with high contrast.

Specimen : Rat sciatic nerve (unstained)
Accelerating voltage : 80 kV

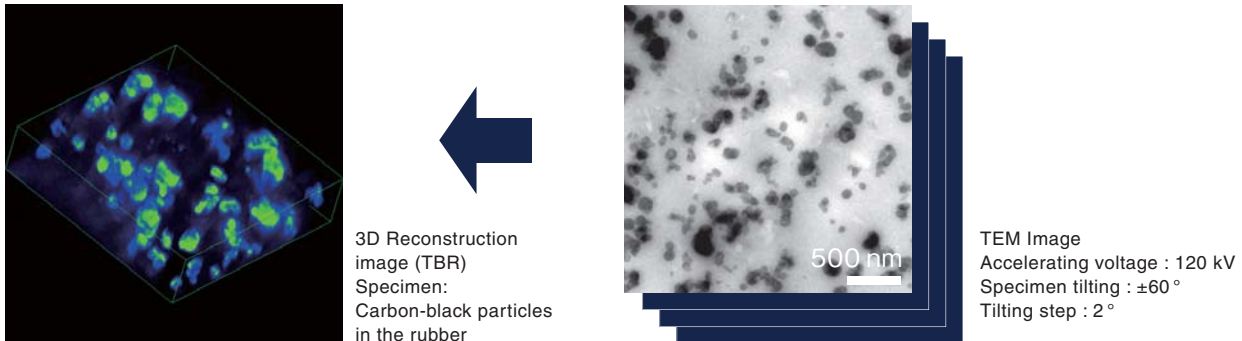
100 nm



Specimen : Asbestos (anthophyllite)
Accelerating voltage : 120 kV

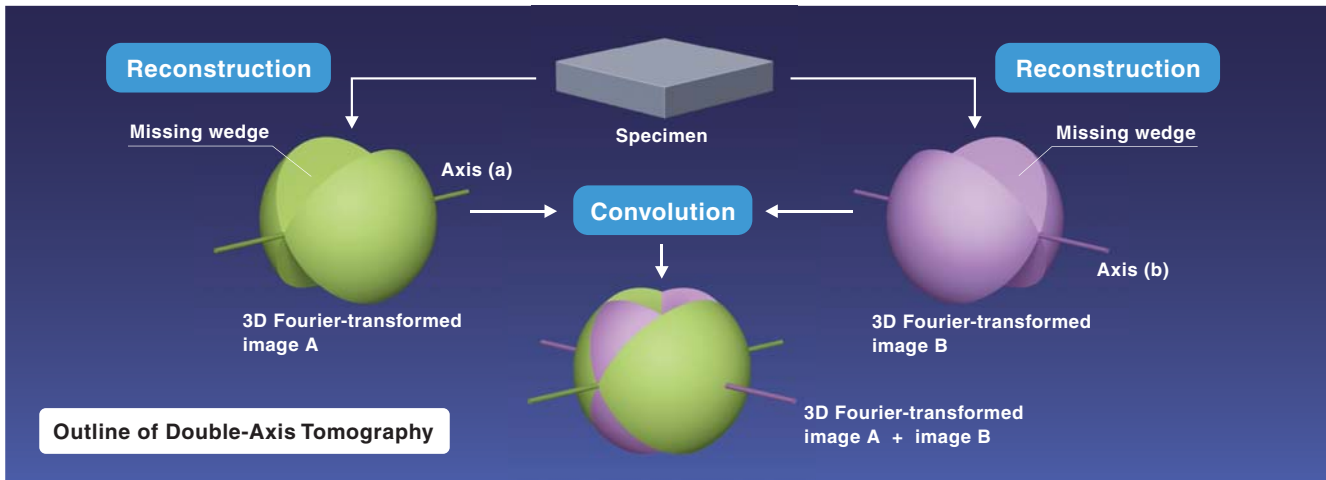
Electron Beam Tomography (optional)

The highly stable Hyper stage of the HT7700 with $\pm 70^\circ$ automated tilt capability, coupled with Hitachi's unique reconstruction algorithms – including Topography Based Reconstruction (TBR) - can be used to create high quality tomographic reconstructions.

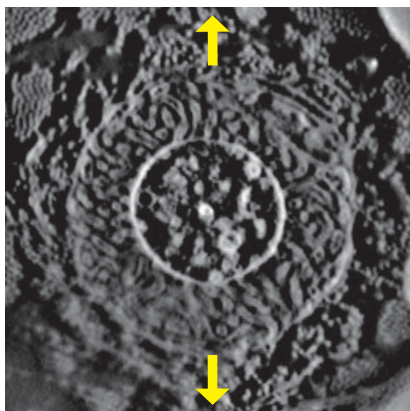


Double-Axis Tomography (optional)

The combination of double-axis tomography and Hitachi's unique reconstruction software can be used to achieve 3D reconstructions with fewer artifacts and more accurate results.

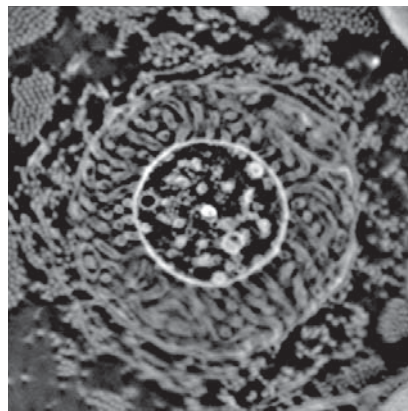


Single-Axis Tomography (Axis a)
Image extended in vertical direction due to missing information

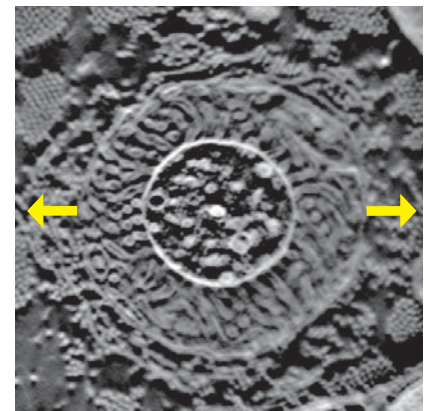


Cross-section of 3D image obtained by Double-Axis Tomography and reconstructed by TBR method

Double-Axis Tomography
An exact circular reconstruction is obtained



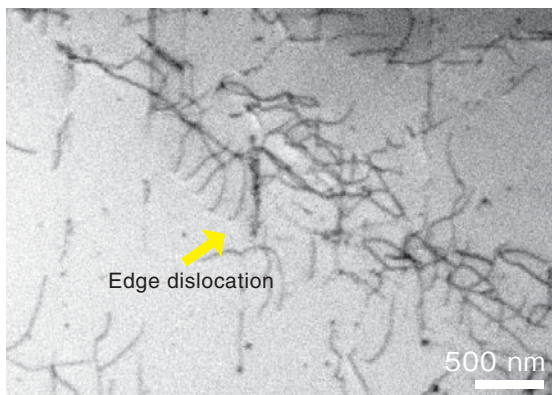
Single-Axis Tomography (Axis b)
Image extended in horizontal direction due to missing information



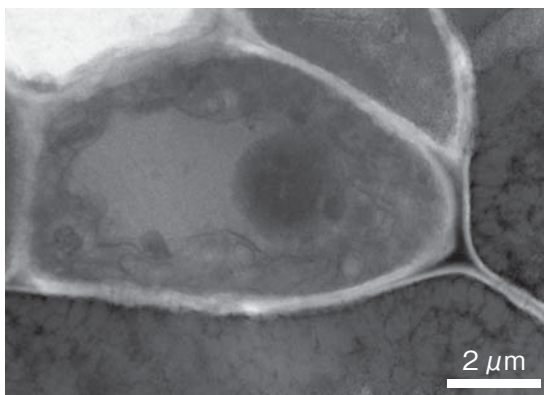
Specimen : Rat sciatic nerve, node of Ranvier
Sample courtesy : Kinji Ishida, Koujiro Tohyama, Iwate Medical University, EMBIR

Scanning Transmission Electron Microscope (STEM) (optional)

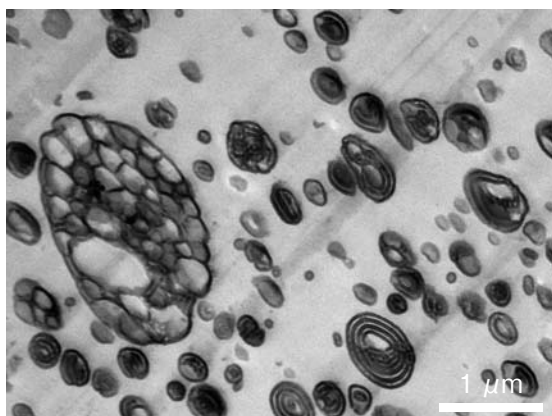
Both Bright Field (BF) and Dark Field (DF) detectors can be added to the HT7700 for STEM analysis. BF-STEM provides better contrast and image sharpness due to reduced chromatic aberration. Furthermore, scattered electrons are detected with high sensitivity by means of DF-STEM, resulting in better contrast for low-Z specimens. When an EDX detector is included, multiple elemental maps can be recorded simultaneously.



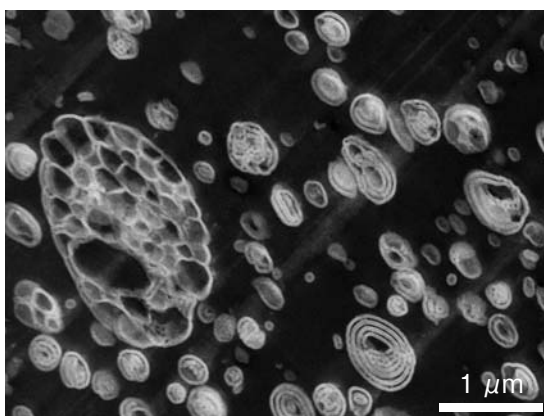
BF-STEM Image Specimen : Stainless steel, Thickness : 0.2 μm
Accelerating voltage : 100 kV



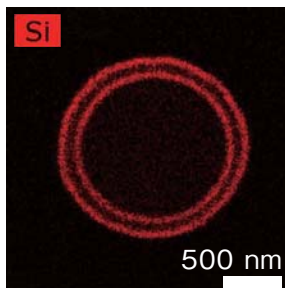
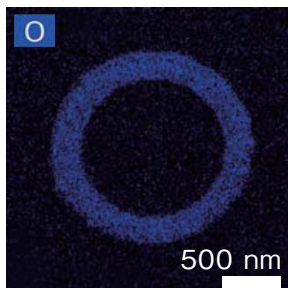
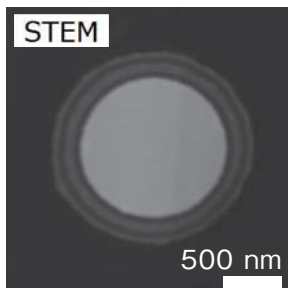
BF-STEM Image Specimen : Sprout seed leaf (unstained),
Thickness : 1 μm , Accelerating voltage : 100 kV



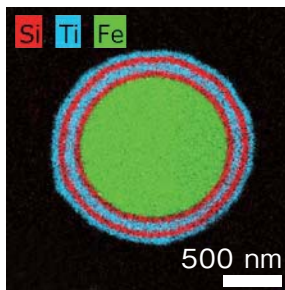
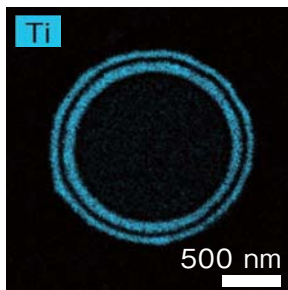
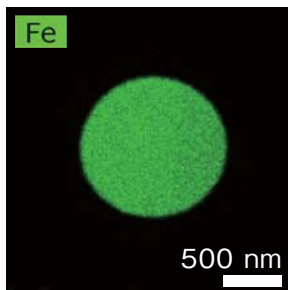
BF-STEM Image Specimen : High Impact Polystyrene (HIPS) (stained)
Specimen thickness : 0.1 μm , Accelerating voltage : 100 kV



DF-STEM Image Specimen : High Impact Polystyrene (HIPS) (stained)
Specimen thickness : 0.1 μm , Accelerating voltage : 100 kV



DF-STEM and Elemental mapping images



Specimen : Functional nano-particle
Accelerating voltage : 120 kV
Sample Courtesy :
Kazuyuki Tohji,
Dean, Graduate School
of Environmental Studies,
Tohoku University

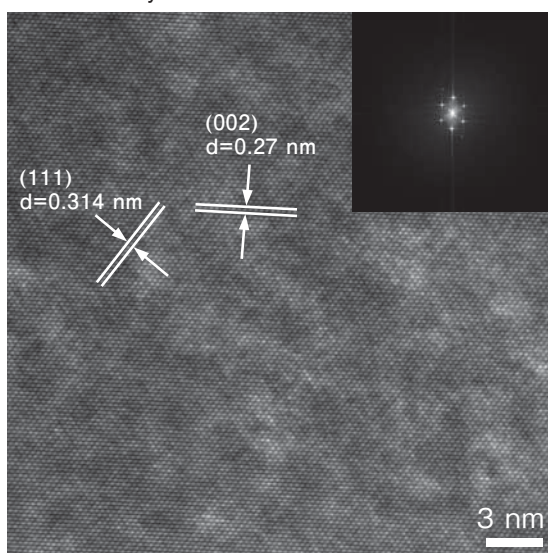
High Resolution Lens EXALENS (optional)

EXALENS is a newly designed objective lens for the HT7700. By achieving a smaller spherical aberration coefficient (C_s), a resolution of 0.144 nm (lattice, accelerating voltage : 120 kV) is obtained. EXALENS excels at high resolution imaging at lower accelerating voltage, facilitating analyses of soft materials, carbon-based nanomaterials and polymers.

High Resolution Imaging

● Si single crystal

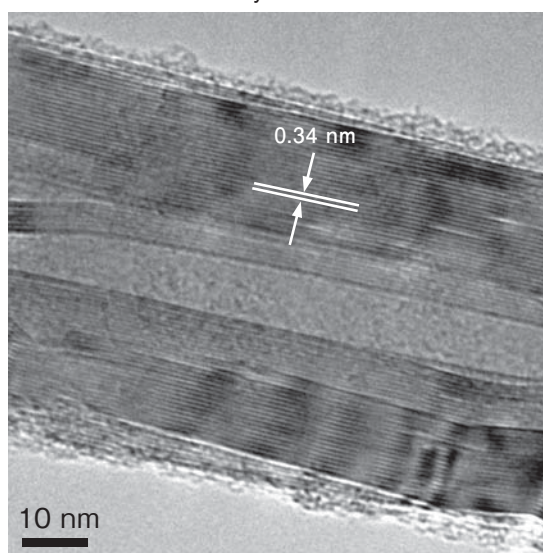
0.27 nm (002), 0.314 nm (111) lattice images can be clearly observed.



Accelerating voltage : 120 kV
Lens mode : HR mode

● Carbon Nanotube

0.34 nm lattice image of multiwall carbon nanotube can be clearly observed.

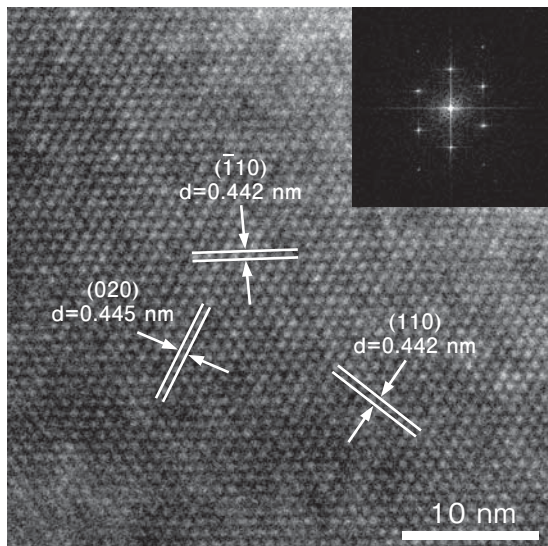


Accelerating voltage : 120 kV
Lens mode : HR mode

Low Accelerating Voltage Imaging

● Pyrophyllite

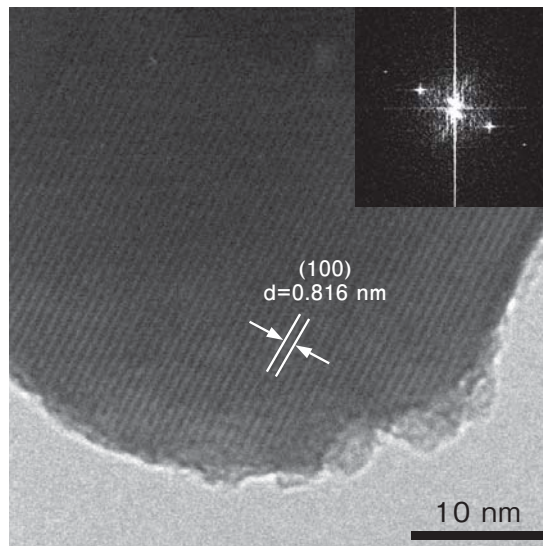
0.442 nm (110), 0.445 nm (111) lattice images can be clearly observed at accelerating voltage of 60 kV.



Accelerating voltage : 60 kV
Lens mode : HR mode

● Hydroxyapatite

0.816 nm lattice image can be clearly observed at an accelerating voltage of 40 kV.



Accelerating voltage : 40 kV
Lens mode : HR mode

Specimen Holders for a Variety of Advanced Applications (optional)

In addition to various Hitachi holders (below), specialty holders for low temperature, heating, in-situ and other experiments are available from several manufacturers.

One Touch Single Tilt Holder



Double Tilt Holder



One Touch Three Specimen Holder



Powder Heating Holder



Rotation Holder



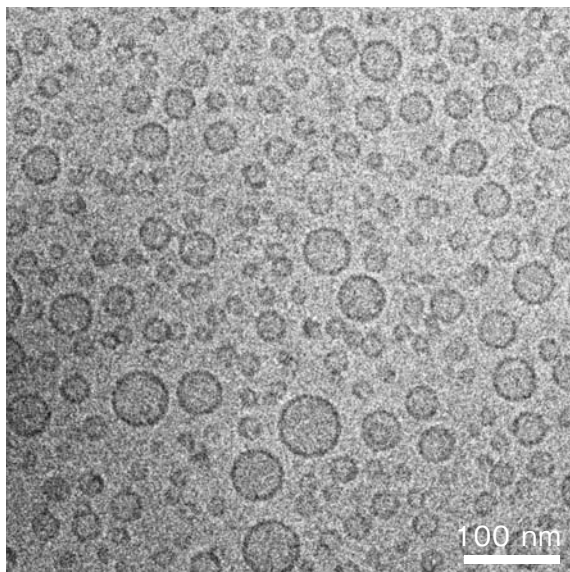
Three Specimen Holder



X-ray Analysis Holder



Cryo Microscopy



Cryotransfer holder (Gatan Inc.)

Specimen : Ice-embedded liposomes
 Accelerating voltage : 120 kV
 Temperature : -175 °C

- The turbomolecular pump is a key component of the HT7700 vacuum system. It facilitates a cleaner column and reduction in power consumption of 30 % (operational mode) and 70 % (static mode) compared to the previous model, the H-7650 TEM (2010).
- HT7700 is an environmentally-friendly “Eco Product” designated by Hitachi Ltd.

Essential specifications (TEM)

Resolution (lattice)	0.204 nm (100 kV) [0.144 nm (120 kV) for EXALENS:Optional]	
Magnification	Zoom	x200~x200,000 (HC mode) x4,000~x600,000 (HR mode) (Non-rotating zoom system) [x200~x300,000 (HC mode) x2,000~x800,000 (HR mode) for EXALENS:Optional]
	Low Mag	x50~x1,000
Accelerating voltage	40~120 kV (100 V/step variable)	
Field rotation	x1,000~x40,000 (HC Mode) ±90° 15° step	
Specimen stage	Eucentric goniometer stage	
	Stage traverse	X, Y: ±1 mm, Z: ±0.3 mm
	Maximum tilt	±30°:standard, ±70°:optional [±30°, for EXALENS:Optional]
Main camera	8 M pixel (vertical to horizontal ratio = 3:4) Other cameras are also available.	
Standard features	Auto focus, Microtrace, Autodrive, Autophoto, Auto-gun alignment, Live FFT display, Measurement function (manual/automatic distance measurement), Low dose, API (auto pre-irradiation), Scope unit with mild baking function	

Installation site conditions

Power	Voltage	Single phase AC 100 V ±10 % (Step down transformer is required for AC 115, 200, 220 and 240 V:Optional)
	Frequency	50/60 Hz
	Capacity	4 kVA at most (with STEM)
	Grounding	Independent grounding with a resistance of 100 Ω or less
Cooling water (Use a circulator)	Temperature	15 to 20 °C (Stability at ±0.1 °C (for 30 minutes))
	Flow	1.8~2.2 L/min
	Pressure	Approx. 0.05~0.15 MPa
	Inlet	Rc 3/8 (female) x 1
	Drain	Rc 3/8 (female) x 1
Compressed Air	Air pressure	0.35~0.5 MPa
	Diameter of connection Tube	Outer diameter 8 mm Inner diameter 5 mm
Stray magnetic field	1.5x10 ⁻⁷ T or less	
Floor vibration	Frequency	Amplitude
	Less than 1 Hz	2 μmp-p or less
	1 Hz till less than 3 Hz	0.8 μmp-p or less
	3 Hz till less than 10 Hz	2 μmp-p or less
	10 Hz till less than 20 Hz	4 μmp-p or less
20 Hz or more	6 μmp-p or less	
Acoustic level	C characteristic	70 dB or less
Room	Ceiling height	220 cm or more (height of instrumentation is 199 cm)
	Temperature	15~23 °C
	Humidity	30~60 %RH

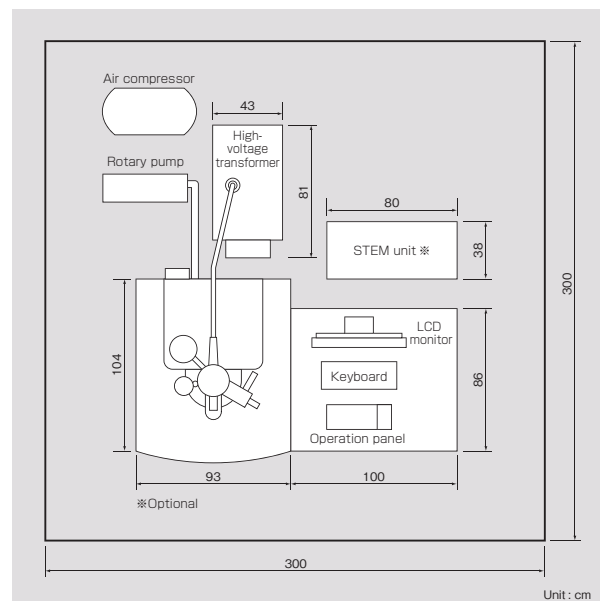
Optional accessories

STEM High Resolution Lens EXALENS 3D tilt image acquisition function 3D reconstruction software EDX system LaB ₆ filament ^{※1}	Beam stopper ^{※1} Cold finger Foot switch Selected area aperture ^{※1} Etc. ^{※1} included in EXALENS
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Essential specifications (STEM):Optional

Image resolution	1.5 nm (BF-STEM, 100 kV, defined by measuring the gap of sputtered gold particles)
Detector	BF-STEM DF-STEM ^{※2}
Magnification	x1,000~x800,000 (High Mag mode) x1,000~x100,000 (Normal mode) x100~x2,000 (Low Mag mode)
Scanning mode	Normal scan Selected area scan Line scan Point scan Area scan Digital scan ^{※2}
Data format	TIFF, BMP, JPEG
Data bit	16 bits (TIFF)
Image recording resolution	640x480 pixel
	1,280x960 pixel
	2,560x1,920 pixel
	5,120x3,840 pixel

※2 In addition to STEM option, other preparation is necessary.



Notice: For correct operation, follow the instruction manual when using the instrument.
Specifications in this catalog are subject to change with or without notice, as Hitachi High-Technologies Corporation continues to develop the latest technologies and products for our customers.
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