Electron Microscopy

RADIUS

Control & Imaging Software

RADIUS - The way forward in electron microscopy

THE ESSENCE OF ELECTRON MICROSCOPY: RADIUS

RADIUS is the visionary software for electron microscopy (EM) requirements both today and tomorrow. RADIUS uniquely revolutionizes day-to-day work on the electron microscope. For decades, our competence in electron microscopy has driven success in optics, microscopy, imaging and analysis software, and RADIUS combines this with the current challenges of electron microscopy to create a new kind of product family.

RADIUS is a high-performance, forward-looking product. This completely new EM imaging software is the interface between microscope, camera and specimen. As the central integrator, RADIUS guides you systematically through every working step with clearly-organized layouts and defined workflows - starting with system control, moving on to image capture and further processing, finally covering documentation and distribution of the results. RADIUS elegantly simplifies the working processes and applications of electron microscopy even as they become more and more complex.

RADIUS guarantees performance, scalability and modularity with the future built in. Its unlimited 64-bit compatibility means that RADIUS knows no bounds, whether working in live mode or with regard to image size. RADIUS already provides interfaces for virtual microscopy and for mobile distribution of results.

Meet RADIUS now. The way forward in electron microscopy.

IMAGING SOLUTIONS FOR ELECTRON MICROSCOPY. BASED ON OPTO-DIGITAL KNOW-HOW. DESIGNED BY CUSTOMER REQUIREMENTS.


CREATE
SHARE

ONE SOFTWARE.

Camera control

RADIUS and our TEM cameras are perfectly matched. It is extremely simple to capture perfect, detailed images with RADIUS. The clearly-structured camera control dialog is characterized by intuitive operation. In live mode, there is direct access to all the important camera functions, such as exposure times, resolutions, camera change and averaging. Every setting change is executed „on-the-fly". If required, numerous extra real-time functions such as online histogram, live shading correction, automatic sharpness filter or automatic exposure control can be switched on. If live image averaging is combined with intelligent offline drift correction, outstanding images can be obtained even from specimen which
are otherwise difficult to visualize. The digital zoom using the mouse wheel allows rapid checking of sharpness and resolution in the live image before the image is finally captured.

Microscope control

The integration of electron microscopes in RADIUS is unique. As with camera control, the user has direct access from RADIUS to the motorized and controllable components of modern (and in some cases older) electron microscopes. Depending on the remote control capability of the electron microscope, it is possible to switch the beam blanker and the shutter, to set enlargement, to switch between normal bright field imaging and diffraction mode or to use microscope alignment. All the microscope parameters which can be read out are automatically included and clearly presented. The implementation of microscopes in RADIUS expands both application potential and spheres of application to a huge extent, guarantees outstanding precision and reproducibility and ensures efficient working. For electron microscopes without remote control capability, RADIUS provides manual microscope control. Enlargement and high voltage data are interrogated automatically and used to calibrate the images captured.

Stage control

RADIUS also controls the motorized stages and image shift of the electron microscopes. This makes it perfectly straightforward to record high-resolution panoramas automatically. Integrated navigation functions help the user find his
or her way easily around the large (often huge) images.

… COMPLETE CONTROL.

RADIUS is fascinating in terms of system integration. Working with RADIUS means working on the live image in real time. Microscope, camera, motorized stage, goniometer, image/beam shift - there is hardly a system component which is not integrated in RADIUS and accessible in direct live mode. Clear dialog windows provide immediate access to adjustable parameters. Any kind of modification is instantly shown in the live image.

Whether you are working in live mode or using the recording process, whether in actual or reciprocal space: RADIUS guarantees the perfect image. This is ensured by numerous real-time functions, together with the microscope's remote control capability and extra functions such as live image averaging which can be switched on. Even samples with poor contrast or none at all can be visualized and captured with perfect resolution and focus. All the system and image parameters are automatically saved with the image. An image in RADIUS is always calibrated and perfectly focused.

With new kinds of live functions such as click-to-center or the digital zoom, RADIUS is a modern, forward-looking way of working on the electron microscope. You can zoom into your sample in the live image and examine sample details of interest more closely, make annotations or perform interactive measurements. A simple click captures high-quality individual images, high-resolution panoramas or high-quality videos.

The system control GUI of RADIUS sets a new standard with its enticingly intuitive user operation.

CREATE VIEWS, RESULTS AND DATA.

Image processing

RADIUS includes a variety of advanced image processing techniques. These include sophisticated filtering methods and efficient arithmetical filter techniques. As a consequence, two images can be added to amplify the signal at low intensities or e.g. two images subtracted to visualize differences.

Measuring and dimensioning

RADIUS provides a variety of options for measuring and dimensioning. Intervals, angles, rectangles, circles, ellipses and polygons can be determined interactively. Orthogonal lines support the user. The measurement data are stored with the image and listed in a table. RADIUS can be expanded by high-performance multi-phase analysis including object counting, which can be restricted to regions of interest (ROIs). An automatic threshold value algorithm ensures rapid results. The result of multi-phase analysis is in each case the absolute and percentage value for area, proportion of area and number of objects.

Object analysis and classification

Object analysis delivers highly detailed information about specific image elements. RADIUS can be expanded by a unique detection process. RADIUS Solution Detection uses a new kind of dynamic threshold value method to separate objects – particles of gold, for example – from the background. In order to be able to deal with the variable issues and often very different types of particle, object classification provides over 50 different parameters for geometry (shape, size, position) and pixel properties (intensity, gray value). These parameters can be linked together using logical and arithmetical operations to define specific object classes. The software outputs these data in tabular form and compiles object class diagrams. (*)

Automation

Many image analysis tasks require more than just a single image operation to achieve the final result. The RADIUS macro recorder can be used to record consecutive image operations and assign them to a button. The advantage: once defined, even complex tasks can be performed efficiently and reliably by inexperienced users.

(*= may require other EMSIS GmbH products, some of which may be chargeable and may not be included in the normal RADIUS scope of supply).

… GET THE MOST OUT OF YOUR IMAGES.

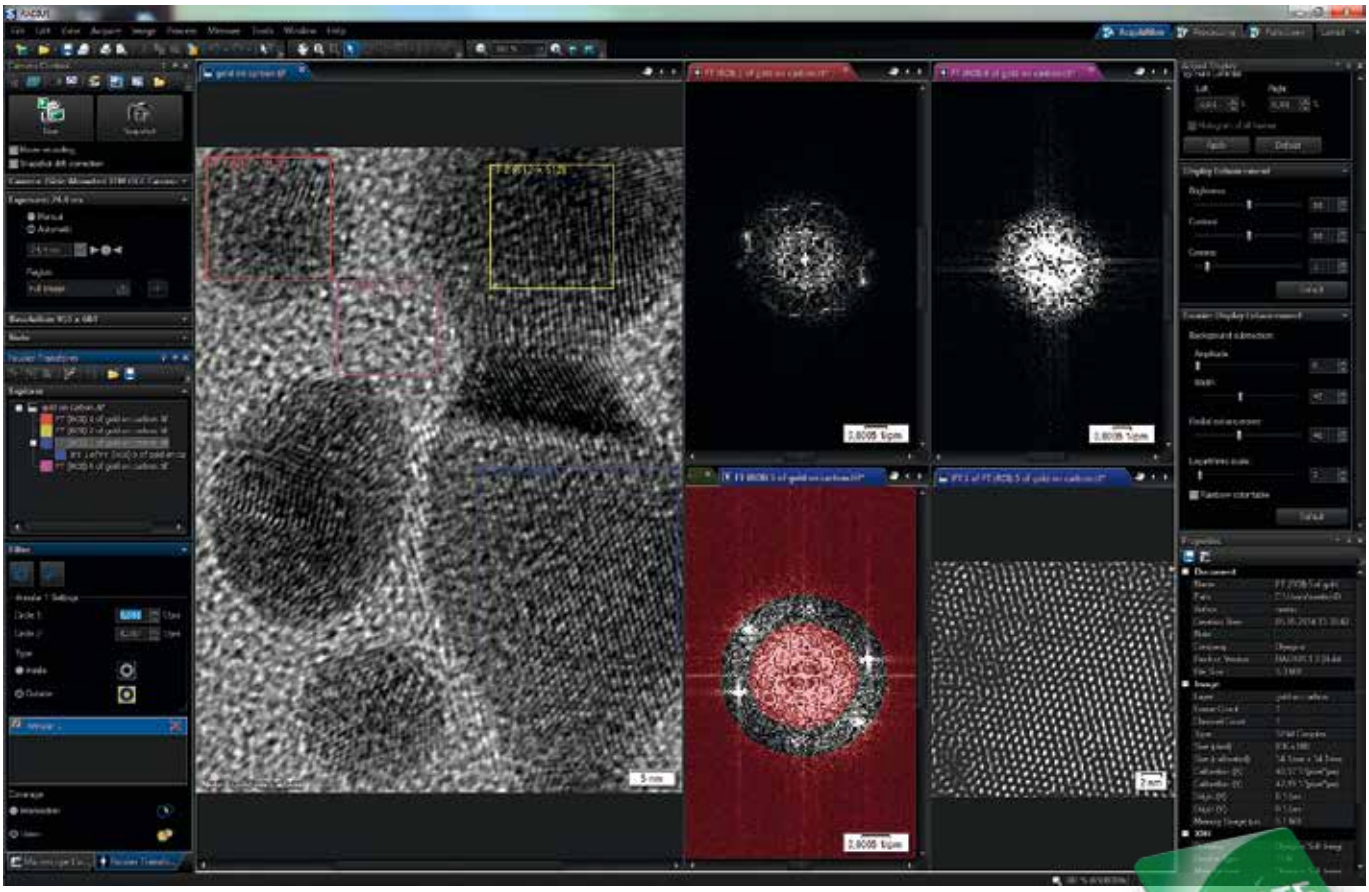
Give your creativity free rein when continuing to edit your images and data. RADIUS provides you with a wide variety of options for this. Provide your images with explanatory annotations, edit the images and data using the numerous integrated filters, measure your images or analyze them automatically. Virtually all the functions can also be used in live image mode.

A special type of analysis and filtering is integrated Fourier transformation. Intelligent use of modern PC architecture completely eliminates the old 2^n limitation of FFT: Fourier analysis can be made in any rectangle you like with RADIUS, almost without size restriction and with full functionality in the live image. Any change is shown immediately, not only in the reciprocal image, but also in the filtered image. Up to four ROI (region of interest) rectangles can be defined simultaneously.

RADIUS includes numerous interactive one and two-dimensional measuring functions, as well as variable line profiles which are available to the user in both the live image and in the saved image. The measuring results are displayed in live overlay and can be exported directly for further evaluation.

RADIUS can be expanded in many areas, for example in the automatic analysis of images and series of images. The RADIUS Solution Detection add-on permits complex object analyses - in immunogold staining applications, for example - to be performed quickly and intuitively.

Example of RADIUS user interface, showing the use of the Fourier transformation, including different ROIs and filtering.



SHARE YOUR RESULTS.

Digital reporting

Professional reports are quick and easy to compile using RADIUS. The documentation options implemented in the further expansion stages of RADIUS work on the basis of user-specific templates. These templates, which can also be created directly in Microsoft Word, ensure a uniform appearance. Combining the many different image processing options in RADIUS with the enormous functionality of Microsoft Word provides hitherto undreamed-of options when compiling professional reports and documentation - which are then extremely simple and easy to adapt. This is because images, tables and evaluation data can be ‚dragged & dropped' into the selected report template and transferred to Microsoft Word at the click of a mouse. (*)

Structured data filing

The quantity of data increases with every image recorded. This leads to greater requirements and demands being placed on archiving and search routines, as well as on data security. A rudimentary data filing arrangement is often inadequate, whereas client/server-based solutions guarantee a built-in future for database management. RADIUS provides a variety of different expansion stages - from simple file management to an integrated client/server-based database solution. RADIUS not only provides you with EM software for smooth recording and analysis processes, but simultaneously with versatile and likewise simple-to-operate solutions in the sphere of structured archiving. (*)

Mobile data distribution

OlyVIA is a viewer for microscope imaging applications. This free image viewer allows images captured with RADIUS and stored in an NIS-SQL database to be opened from outside. This provides many advantages, in training for example. The success of mobile technologies - due not least to the explosion in the use of Smartphones - has led to increased demand for a mobile OlyVIA solution. OlyVIA mobile is the associated iPad app and can be obtained free from the iTunes App Store. OlyVIA mobile allows you to call up images and results directly online and to discuss them with other experts. (*)

(*= may require other EMSIS GmbH products, some of which may be chargeable and may not be included in the normal RADIUS scope of supply).

… ARCHIVING. DOCUMENTATION AND DATA ACCESS.

RADIUS supports the unique Olympus image format for virtual microscopy (VSI – Virtual Sample Image). This allows enormous, high-resolution images of complete samples to be managed, stored and analyzed. Images of this type place considerable demands on data archiving and data access. The perfect memory management of RADIUS in conjunction with modern 64-bit operating systems gets round any kind of limitation, with the result that even in uncompressed format, the huge images are easy to capture and edit.

RADIUS is capable not only of capturing, processing and analyzing enormous images and quantities of data; it also provides extensive options for recording and archiving this information and sending it to different recipients.

Various database options for archiving images and data are available - from a simple document management option to a client/server-based variant. This guarantees the best-possible performance without any kind of restriction with regard to memory capacity, speed of access and data exchange.

RADIUS provides a variety of options for documenting and passing on investigation results professionally. Mobile solutions in data distribution are becoming increasingly important in microscopy. RADIUS is already taking account of this demand with a special mobile tablet application. No matter where you are, you always have access to your images and data. (*)

The OlyVIA mobile app completes the future-ready scope of RADIUS.

A PERFECT TEAM.

SIDE-MOUNTED TEM CAMERA SOLUTIONS

MegaView G3
Very high speed side-mounted TEM Camera

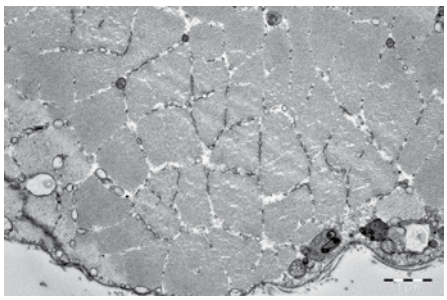
- Lens-optical 2.8 Megapixel side-mounted CCD camera system
- More than 150 fps @ binning 4x and more than 55 fps at full resolution
- Patented rigid coupled scintillator-lens-CCD combination

Veleta
Mid-range to high-end 4 Megapixel side-mounted TEM Camera

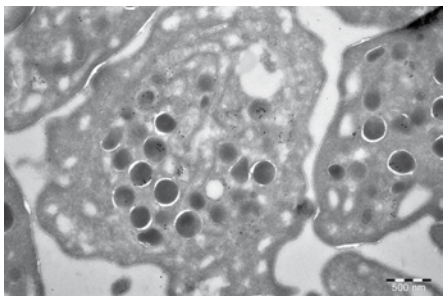
- Lens-optically coupled 2k x 2k, side-mounted CCD camera
- More than 19 fps at 4x binning and of 5 fps at full resolution
- Great sensitivity and high signal-to-noise ratio

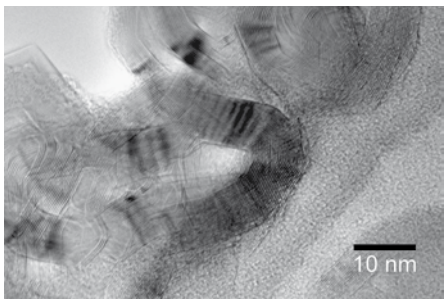
Morada G3
High-resolution 16 Megapixel side-mounted TEM Camera

- Largest field of view available for current side-mounted CCD cameras
- High contrast, high sensitivity and superior resolution
- High-precision, rigid, patented mechanics using a custom-made lens



Human muscle cells, 6,800x (Morada G3) Bone marrow, immuno gold, Tokuyasu embedding, 13,000x, Courtesy of Dr. Zeuschner, MPI Muenster, Germany (Morada G2)





Carbon black, 180,000x (Quemesa)

… RADIUS AND EMSIS TEM CAMERAS.

EMSIS supplies a comprehensive portfolio of TEM cameras for the 35 mm port and the on-axis position. Each of these camera solutions is fully integrated in RADIUS. The results are perfect images which satisfy every requirement for brilliance, sharpness, contrast and dynamics. In combination with RADIUS, however, the cameras also play to their strengths in live mode.

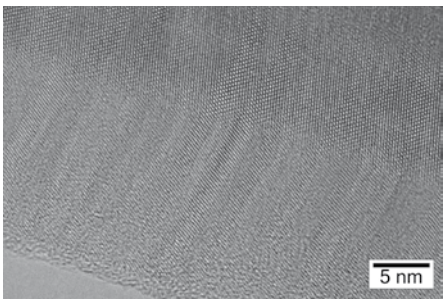
BOTTOM-MOUNTED TEM CCD CAMERA SOLUTIONS

Tengra
5.3 Megapixel bottom-mounted TEM Camera

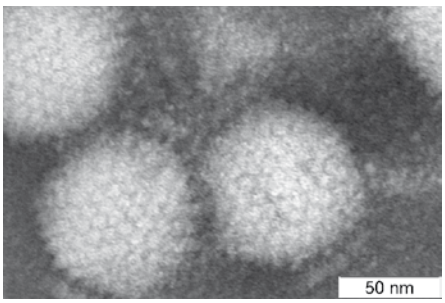
- Fiber-optically 5.3 MegaPixel bottom-mounted CCD camera
- High readout speed of more than 12 fps @ binning 4x
- Large field of view

Quemesa
High-end 11 Megapixel bottom-mounted TEM Camera

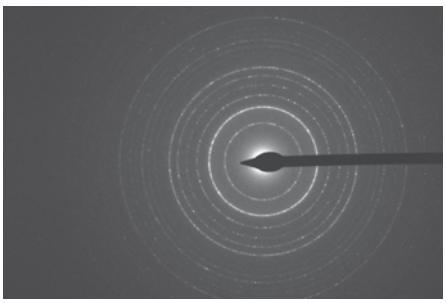
- Fiber-optically coupled bottom-mounted CCD camera with 18 µm x 18 µm pixel
- Extremely high resolution, very high sensitivity, superior contrast, large field of view
- High frame rates of more than 12 fps @ binning 4x



Alloy, 800,000x (Quemesa)



Adeno viruses, 120,000x (Tengra)



Diffractogram of aluminum powder (Veleta)

RADIUS specifications

Item	Specification
Image Acquisition	Standard and enhanced live and snapshot functions
	Identical handling of live and snapshot
	Smart exposure
	Smart live image averaging
	Sharpness filter (live / snapshot)
	Smart drift correction
	Movie acquisition
	Automatic calibration of bright field and diffraction images
	Online histogram
	Live line profile with averaging
	Information stamp
	Full display of device properties
	Averaging of snapshots
Device Control	Multiple Image Alignment (MIA)*
	TEM alignments (autofocus, stigmator, eucentricity, coma-free)
	TEM control (magnification, goniometer, stage, image mode...)
	"Click-to-center"
	Virtual EM control for EMs without remote control capability
Image Processing	Image navigator and gallery
	Full set of image filters with extended preview
	Morphological filters*
	Image geometry
	Comprehensive interactive measurements
	Interactive measurements available in reciprocal space
	Export of measurement results
	Line profile with averaging
	Image layers
Fourier Transformation	Online and Offline Fourier analysis
	Multiple ROIs (max. 4), 2^n and arbitrary rectangular (DFT/FFT)
	Line profile in Fourier space
	Filtered and inverse Fourier transformations dynamically linked with origin
	Filtering in Fourier space (band pass, sector, blob*, lattice*)
Image Export	Automatic image naming
	Calibration report*
	Export to document formats (Excel, PDF, …)
	Annotations: text, arrows, misc. labels
Archiving & Database	Document Storage
	SQL-based server version (*)
	Tablet viewer via iTunes (OlyVIA mobile)
Report*	Report Generator*
	Microsoft Word templates via Word-add in*
	Export to Microsoft Word/ PDF*
Macro Recording	Script recorder
Miscellaneous	64-bit OS > 3 GB system memory
	Layout management
	Expandable via Solutions*
	Dark application skin
	Multiple language versions (EN, DE, JP, CN)
Licensing	License key card based software protection
	Floating license server*

(*= may require other EMSIS products, some of which may be chargeable and may not be included in the normal RADIUS scope of supply or available with forthcoming RADIUS versions).

Specifications are subject to change without any obligation on the part of the manufacturer.

EMSIS GmbH
Mendelstrasse 17
48149 Münster
Germany
Phone: +49 (160) 742 41 61

info@emsis.eu