



Product Information

RADIUS 2.1

Acquisition and Control Software

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EM SIS GmbH.

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EM SIS GmbH, Mendelstraße 17, D-48149 Münster,
Phone: +49 (0) 251 297962-0, Fax: +49 (0) 251 297962-90

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1. About this Product Information

1.1. Documentation overview

Product Information This Product Information is intended for sales and application personnel only. It contains additional information about selling points, sales compatibility, features and bugs, etc. Details of technical specifications are included as well as ordering conditions.

Additional documents Additional documentation are available with the software and are available as printed material and on the RADIUS setup DVD:

- *User Manual* is intended for users who work with RADIUS 2.0. It describes how to use and operate the software.
- The *Installation manual* guides qualified users through the installation, initial starting-up, and subsequent maintenance of the RADIUS software.

Other documentation Other documentation such as application images, official presentations are provided on request by EMSIS GmbH or her affiliates.

2. Introduction

Slogan Our slogan for RADIUS is: "Ready for the Future"

The RADIUS software In the last couple of years RADIUS evolved a lot and replaced its predecessor iTEM almost completely, due its full 64-bit compatibility, comprehensive camera and microscope control and last but not least to its seamless combination of live and offline image control and processing.

A number of unique selling points with respect to image improvement like online sharpness filter, smart averaging, offline drift correction and more are also responsible for the fast and broad acceptance of RADIUS, even for long standing analySIS and iTEM users.

Measurements are truly interactive and can be used both in real and reciprocal space with virtually no limitation. Fourier is now up to a new level, with up to four ROIs, discrete Fourier transformation, visualization enhancements, filters and inverse Fourier transformations.

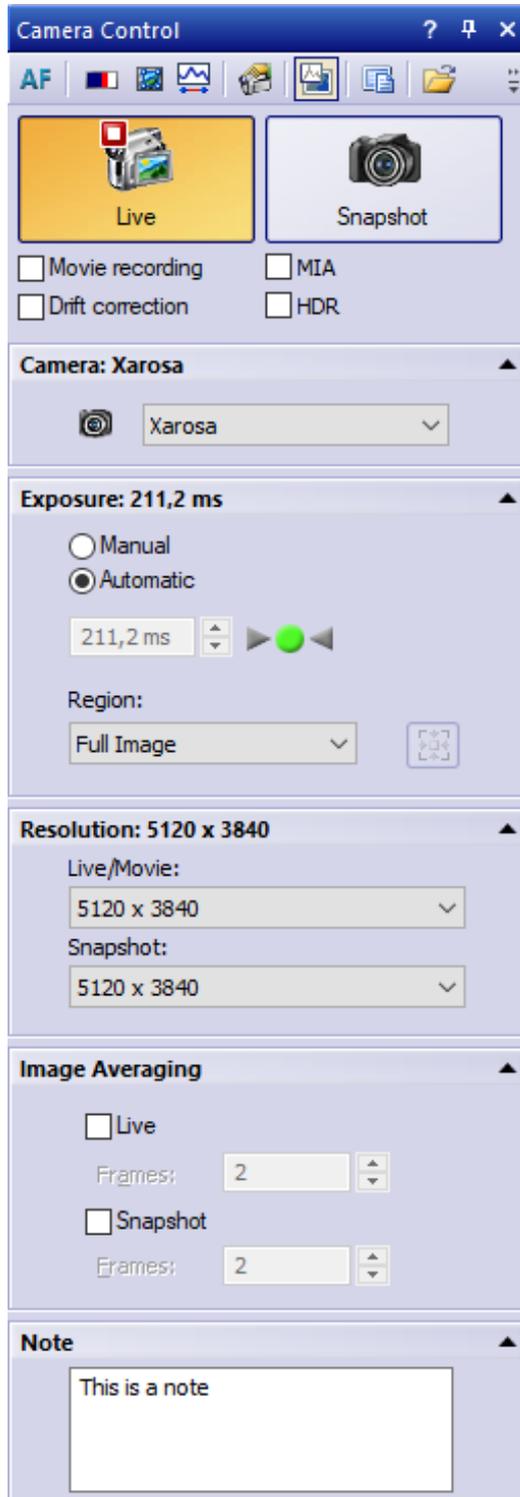
Additional features are high dynamic range images (HDRI), TEM control with the mouse, support of even **more TEMs (new and legacy)**, ...

The new RADIUS 2.1 version contains a lot of major and minor improvements, bug fixes and features you may notice or which simply improves the workflow and image quality "silently".



3. Highlighted Features

3.1. Camera Control



The camera control tool window of RADIUS provides all important camera controls conveniently on the top most level

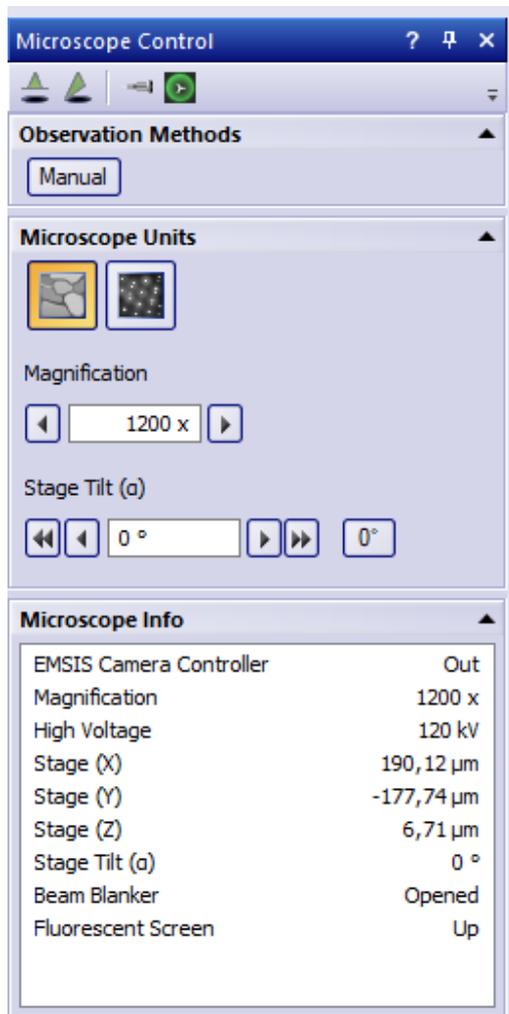
High quality movies can be recorded by a mere click of a button. Also, smart features like snapshot drift correction are easy to access; if activated it will perfectly correct the snapshot for any drift, hence eventually providing a razor-sharp final image without a trace of drift blur left. The high-dynamic range (HDR) image feature helps to acquire images with higher dynamics, perfectly suited e.g. for diffraction images.

Exposure time is calculated automatically for the final high quality snapshot, however if needed for special applications, the exposure time can be set manually on the fly.

Between camera resolutions can be switched on the fly during live.

The smart image averaging automatically detects for sample movement and will pause the averaging during movement in order to avoid movement smearing.

3.2. Microscope Control



RADIUS provides not only the well thought concept of an easy camera control but also incorporates a convenient control of major microscope features, such as controlling the beam blanker and/or the fluorescent screen (depending on TEM).

If the TEM allows to remotely controlling switching between the different imaging modes like Imaging (bright field) and Diffraction, RADIUS provides the respective controls on the top most level.

In order to avoid mouse mileage and provide easiest access to major microscope controls, both the magnification and a possible goniometer tilt (depending on TEM and goniometer; including β -tilt, if available) are controllable from here.

The accessible microscope info data is easily discernible.

3.3. Solutions

3.3.1. Solution Detection

The RADIUS Solution Detection offers as a chargeable add-on:

Particle analysis

Threshold-based image evaluation of particles with the following properties: particle formation based on the detection and vectorization of particle outlines. Calculation of particle properties such as area, size, shape, position, density and intensity. Display of all data in sheets and overlay objects within the image.

Visualization of connection between measurement result and measurement object in the image. Evaluation of measurement results according to ROI or class.

Morphological filters

Complete set of morphological filters for preparing particle detection. Primary methods are erosion, dilatation along with combinations and modifications of these methods. The filter matrix is user definable (rectangular as well as hexagonal).

3.4. Multiple Image Alignment (MIA)

MIA improved a lot, so that you are working with MIA on supported TEMs like with a standard snapshot: choose the respective matrix (from 1x1 to 5x5) and RADIUS MIA is doing the rest for **you automatically. It's nothing** more than a mere click of the MIA Snapshot button and you will receive stunning results.

Automatic acquisition of mosaic/ tiled images and subsequent seamless stitching is now possible with RADIUS. Most current TEMs are supported, using their image shift function as well as the goniometer/ stage for low and mid-range magnifications. The stitching algorithm is much improved, resulting in up to 5x5 MIA (multiple image alignment) mosaics on the fly.

3.5. Diffraction and Fourier Measurement Tools

Diffraction images ('Diffractogram') or Fourier transforms need very precise measurements, for e.g. determining the crystal structure or doing exact measurements in the high magnification/ high resolution range.

Here is where software must **show its strength, and that's what RADIUS is** doing in perfection:

More data behind the image

Although a standard PC monitor cannot present the "data behind" an image document in its whole depth, RADIUS has access to the raw, the original data of the image document, to the value of every single pixel; hence detecting e.g. the very brightest pixel, finding the real center of symmetry should be a standard task by a perfect image analysis software.

RADIUS performs this task perfectly, with some new, exclusive measurement tools:

Find Center of Symmetry

Once activated RADIUS determines automatically, reliable and reproducibly the center of symmetry of any image, even if the center may be covered by a TEM's beam stopper. Even more, when it is, detected, all measurements available are measured automatically towards the center, hence simplifying these sometime tedious tasks.

Snap to Bright/Dark

If activated, RADIUS automatically determines the very brightest pixel in the direct surrounding of the area where the starting mouse click of the measurement has been done - reproducible, reliable, with sub-pixel accuracy. This perfect measurement helper tool does not only work on Fourier transforms and/ or diffractograms, but on all other standard images.

With these two powerful measurement tools the measurement on and analysis of Fourier transforms and diffractograms are now performed with great accuracy and at the same time extremely easy.

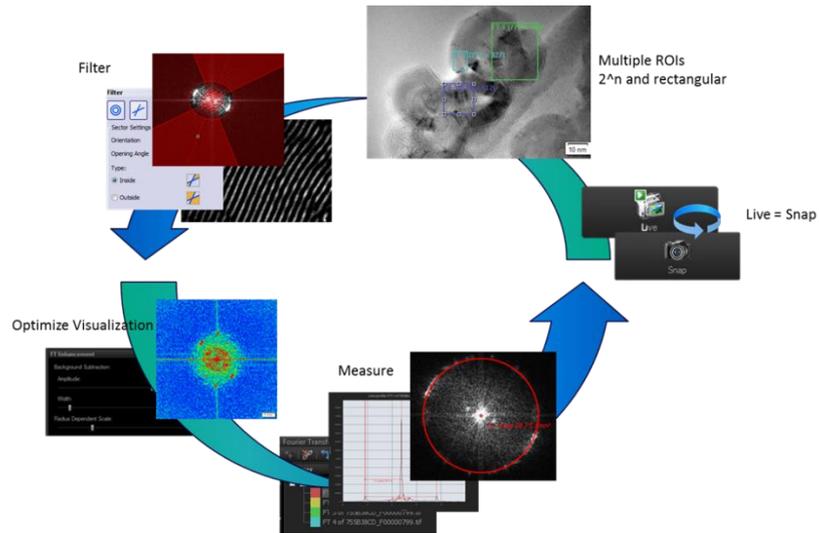
3.6. Fourier analysis

RADIUS provides an easy handling of Fourier space images. As with any other image document in RADIUS there is *no difference anymore between live and snapshot images*, i.e. all functionality what is provided for offline images is also available for live images processing and vice versa. RADIUS fully utilizes the available Fourier command sets of modern CPUs.

ROIs

Up to 4 *regions of interest* (ROI) can be applied to one single bright field image (live or offline), dragged, resized, move etc. without virtually no limitation – also during live. The resulting Fourier space image/s is/are *dynamically linked* with the origin: when the ROI is resized or moved the resulting Fourier image changes on-the-fly.

DFT There is virtually no limitation in size and shape: next to the basic power of two FFT, the DFT (discrete Fourier transformation) is standard since early RADIUS 1.x versions, thus allowing any *rectangular shaped areas* of interest. In order to provide the best perceptibility of the Fourier results, RADIUS includes a number of Fourier display enhancements, like radial enhancement, logarithmic scaling and background subtraction. A full set of convenient and smart filters are included. (<https://www.youtube.com/watch?v=vnYjDpULbXs>)



4. Functions Overview

Group	Feature	ITEM	RADIUS 2.1	RADIUS Desktop
Image Acquisition	Standard Live and Snap functions	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Identical handling of Live and Snap		<input checked="" type="radio"/>	
	Smart Exposure	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Sharpness filter (Live/ Snap)		<input checked="" type="radio"/>	
	Smart live image averaging	<input type="radio"/>	<input checked="" type="radio"/>	
	Snapshot drift correction		<input checked="" type="radio"/>	
	Video recording and streaming	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Movie acquisition	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Automatic calibration of images	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Automatic calibration of diffraction images		<input checked="" type="radio"/>	
	Online histogram	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
Device Control	Multiple Image Aligment (MIA)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Autofocus, stigmator correction	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Eucentric height, Coma free alignment		<input checked="" type="radio"/>	
	EM control (magnification, goniometer, stage, ...)		<input checked="" type="radio"/>	
	"Click-to-center"		<input checked="" type="radio"/>	
	"Satellite" remote control - OS independent		<input checked="" type="radio"/>	
	Virtual EM control for non-remotable EMs		<input checked="" type="radio"/>	
	Image and device properties	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Info Stamp		<input checked="" type="radio"/>	
Image Processing	Image navigator and gallery	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Standard image filters	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Extended image filters	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Morphological filters	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
	Extended filter preview		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Image geometry	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Interactive measurements: 1-dimensional only		<input checked="" type="radio"/>	
	Interactive measurements: complete	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Interactive measurements: reciprocal space	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Export of measurement results	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Line profiles: averaging, multiple lines, ...		<input type="radio"/>	<input type="radio"/>
	Fourier: single ROI only, 2 ⁿ only	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
	Fourier: multiple ROIs, 2 ⁿ and rectangular		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Fourier: line profiles		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Fourier: dynamically linked with origin		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Fourier: filters/ masking		<input checked="" type="radio"/>	<input checked="" type="radio"/>
Image layers		<input checked="" type="radio"/>	<input checked="" type="radio"/>	
Archiving	Automatic image naming		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Export to document formats (Excel, PDF, ...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Annotations: text	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Annotations: text, arrows, misc. labels	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Miscellaneous	64bit OS/ > 3 GB system memory		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Windows 10		<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Script and macro recorder	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Layout management	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Expandable via Solutions	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Dark application skin		<input checked="" type="radio"/>	<input checked="" type="radio"/>
Licensing	License key file		<input checked="" type="radio"/>	<input checked="" type="radio"/>

5. Detailed Function List

5.1. Function List

Group	Title	Description
Acquisition	"Click to Center"	The specimen can be centered by a clicks to the desired position within the image. A smart algorithm decides automatically whether either stage or image shift will be used. This feature is only available on supported TEMs.
Acquisition	Fast Live	The live image feature "Fast Live" replaces the "intX" functionality known from anaP (ITEM). Fast Live differs from intX, in such that it provides a seamless integration of short exposure time features of cameras for higher live frame rates into the general image acquisition of RADIUS.
Acquisition	Identical handling of live and offline images	RADIUS provides a major improvement of the handling of images, as there is virtually no difference anymore between a live image and a offline image. All image handling and processing tools, such as interactive measurements, filters, line profiles can be applied identical with their full scope on both live images and offline images.
Acquisition	Image averaging for live and snapshot	RADIUS supports the acquisition and averaging of a defined number of images in order to reduce the noise in respective images significantly. The user can define the number of images and starts the acquisition of the averaged image like a standard live image or standard snapshot. The average counts can be easily set in the top control level. The smart handling of live averaged images ("smart averaging") detects whether a specimen is moving and consecutively deactivates the averaging for the time of movement and activates it back again, once the image is stable again.
Acquisition	Movie recording	Movies can be acquired with a mere click of a button in the simplified camera control
Acquisition	Online sharpness filter	RADIUS provides an automatic sharpness enhancement for live and snap of all supported EM cameras. Two different methods (NxN or Gaussian) are available for the sharpness filter. Per default NxN is applied. The user can deactivate the sharpness filter and can also edit and reset parameters. A reset to default parameters is also a mere click of a button.
Acquisition	Smart image zoom	RADIUS enables the mouse wheel for simple and convenient zooming in images, both in live and offline images
Acquisition	Software clipping for EMSIS TEM cameras	TEM camera field of views can be adapted by software clipping, to e.g. avoid dark edges caused by the TEM.
Acquisition	TEM camera control	The TEM camera control interface of RADIUS is much enhanced and provides ease of use. All functions which are necessary to easily acquire high quality images can be reached in close vicinity and on top level. In addition it can be switched between the different camera resolution modes and also between two cameras connected during live, "on the fly", without the necessity to stop the camera(s) in forehand. The live image document always shows the current image based on WYSIWYG, hence providing always the possibility to e.g. secure and store the current live image easily

Group	Title	Description
Devices	Basic TEM control	Within RADIUS it is now possible to conveniently control basic functions of remotely connected TEMs, such as magnification, beam blanker and/or shutter on/off, goniometer tilt, viewing screen up/down. Prerequisite is, that the respective TEM remote interface supports the remote control of the aforementioned functions.
Devices	Calibration of TEM camera lengths	Camera length calibrations are fully integrated within RADIUS and are handled identically to standard magnification/ pixel calibrations.
Devices	Support of TEMs without remote access	Older TEMs with no remote access possibilities can easily be used with RADIUS via a "virtual EM" dashboard, with e.g. predefined magnification ranges etc.
Devices	TEM Alignment	RADIUS provides a number of TEM alignment procedures: <ul style="list-style-type: none"> - Autofocus - Astigmatism correction - Eucentric height setting - Coma free alignment - Rotational alignment
Documents	Comprehensive online help	RADIUS provides a comprehensive and easy to use online user help, including a complete glossary. The online help is smartly supplemented by informative tool tips while hovering over specific buttons of interest
Documents	Image Navigator and Image Gallery	RADIUS provides an easy handling of image documents with an improved image navigator and a Windows-File Explorer like image explorer, including an easy to handle image gallery.
Documents	Image properties and info stamp	Images in RADIUS can be supplied with an info stamp, providing the simple possibility to display basic meta data in the image document
General	Dark application skin	The skin of RADIUS can be switched between the standard bluish one and a dark skin, which is very helpful for darker environments normally used in EM laboratories. The skin change is applied after a restart of the software.
General	Script recorder	RADIUS provides a simple script recorder in order to record and re-use standard processes within the image platform.
General	User access control	RADIUS knows three different user roles: Administrator, Power user, Standard user. RADIUS identifies the current Windows user as user of the software system. The user who installed the system is an RADIUS Administrator. Administrators can assign roles and capabilities to other RADIUS users. Super users can configure devices. Standard users can use the software, but cannot change settings of devices. If more than one role is assigned to a user, the user can select with which role he would like to start the system. The default role for new users is Power user.
Imaging	Automatic naming and batch saving of images	Images can be named automatically according to specified image and/ or acquisition parameters and saved single or as batch
Imaging	Drift correction	The drift correction of RADIUS detects drift in images during snapshot and corrects it automatically. The resulting images are sharper and are showing reduced blurring artifacts, which is cropped also accordingly.
Imaging	Fourier: Additional display settings parameters	To improve visibility of high frequencies in Fourier images it is now possible to apply a radius depending gain. Intensities are amplified by a parable function (ar^2). It is also possible to automatically fit and subtract the background.

Group	Title	Description
Imaging	Fourier: Calibrate images	Images can be calibrated within the Fourier space.
Imaging	Fourier: Complex image formats	Complex image format (32 bit floating point) for e.g. Fourier transformed images.
Imaging	Fourier: Discrete Fourier transformation (DFT)	RADIUS offers the DFT (discrete Fourier transform), that is, any Fourier region of interest (ROI) is can be set to virtually any arbitrary, rectangular shape, hence not anymore restricted to the FT 2^n shape. It can be easily changed between DFT and FFT by using the Shift key. Respective preferences can be set.
Imaging	Fourier: Enhanced analysis and handling with multiple ROIs	An FT can be applied to both live images and snapshot with the same full functionalities Up to 4 ROIs can be applied per image and will show 4 respective dynamically linked FT images The FT ROIs can be easily dragged and resized and the respectively linked FT image will be updated on the fly Line profiles can be drawn in live and snap identically FT images will be saved as 32-bit complex TIFF images FT images are ready calibrated, based on the origin image
Imaging	Fourier: Filters	<p>The Fourier image, the filter and the filtered images are dynamically linked, that is, all changes in the filters are displayed in the filtered image on the fly. Moreover the filter can be applied to live images as well as to offline documents.</p> <p>Filters can be applied 'inclusive' or 'exclusive', can be logically combined, and are editable on the fly.</p> <p>Fourier transform filters are completed by the two shapes Blob and Lattice.</p> <p>Blob shape: Two circular blobs to be placed symmetrically with regards to the image center. Positions and blob radii are definable.</p> <p>Lattice shape: A mesh of circular blobs. Positioning of two blobs defines the base vectors for the mesh. Additionally, the radius is definable.</p> <p>As with almost any other image analysis tool, the filters can be applied both in live and snapshot, making it very convenient to apply them during a live session.</p>

Group	Title	Description
Imaging	Fourier: 'Find Center of Symmetry' and 'Snap measurements' (also for Diffractograms)	<p>Diffractograms (Diffractograms) or Fourier transforms need very precise measurements and very often measurements are referenced to their center of symmetry.</p> <p>Thus, simplifying these tasks and providing a most precise measurement, RADIUS now provides two new measurement tools:</p> <p>Find Center of Symmetry:</p> <ul style="list-style-type: none"> - Once activated RADIUS determines automatically and very reliable the center of symmetry of the respective image, even if its covered in diffractograms e.g. the TEM's beam stopper. - Once the center of symmetry is defined, all measurements available measure automatically towards the center. <p>Snap to Bright/ Dark</p> <ul style="list-style-type: none"> - If activated, RADIUS automatically determines the very brightest pixel in the direct surrounding of the area where the starting mouse click of the measurement has been done - reproducible, reliable, with sub-pixel accuracy. - This perfect measurement helper tool does not only work on Fourier transforms and/ or diffractograms, but on all other standard images. - For completeness, on inverted (dark reflexes on bright background) images the inverse function "Snap to Dark" should be used. - The Snap functionality is available also in the respective calibration wizard for camera lengths. <p>With these two powerful measurement tools the measurement on and analysis of Fourier transforms and diffractograms are now performed with great accuracy and at the same time extremely easy.</p>
Imaging	Fourier: Inverse Transform	<p>An inverse Fourier transform can be applied on both, filtered and unfiltered Fourier documents.</p> <p>Changes performed on the source documents are dynamically reflected on the inverse Fourier image.</p>
Imaging	Fourier: Measurements	<p>The interactive measurements are fully functional also on images in reciprocal space.</p>
Imaging	Fourier: Non-linear rainbow LUT	<p>To ease the detectability of peaks in a Fourier image a look up table (LUT) is available. The color spectrum at high intensities is spread on a logarithmic scale.</p> <p>The LUT does not change the raw image data, but is used as an opaque layer.</p>
Imaging	Interactive measurements	<p>RADIUS provides real interactive measurements, in both live and offline image documents. Measurements can be fully edited afterwards, even if the image has been reopened. Interactive measurements can be applied in both real space as well as reciprocal space. The measurement results can be exported to CSV spread sheets.</p>
Imaging	Line Profile: Averaging and Snap Rotation	<p>The line profile is extended twofold:</p> <p>An averaging perpendicular to the line profile is now available; the direction and width of them are interactively definable.</p> <p>The line profile offers an "snap and rotation" mode, that is, it can be rotated in fixed 45° steps, whilst the Shift key is pressed, and freely whilst the Shift key is not pressed.</p>

Group	Title	Description
Imaging	Line Profile: Complex type images	Line profiles are fully functional on images of complex type (e.g. Fourier space).
Imaging	Line Profile: Data export	The line profile data can be exported to *.csv format.
Imaging	Line Profile: Position synchronized between measurement and image	When choosing a certain position within a line profile chart, this position is synchronously shown in the line profile within the image - and vice versa.
Imaging	Preview for all image filters	All image filters in RADIUS have an unified user interface, with multiple options like preview with zoom, parameters changes, etc.
User Interface	Pre-defined and user-defined layouts	RADIUS has various pre- defined layouts, which guarantee workflow optimized tool window and document layouts, adapted to the main applications, like image acquisition or image processing. In addition users can define and store their own layouts easily, adapted to their specific user needs.

6. Release Notes

6.1. RADIUS 2.0, build 14586 (July 2018)

ID	Group	Sub	Type	Description
38	Devices	Remotes	Improvement	Correct handling of lens and BD values during remote initialization of HT7700
119	Devices	Veleta G3	Improvement	Faster switch between binning modes
120	Devices	Veleta G3	Improvement	Increased switch time from snapshot after live
133	Devices	XAROSA	Feature	10 seconds exposure time maximum
154	System	System	Improvement	The system information saved is now complete
166	Devices	Remotes	Improvement	Correct remote initialization with HT7800
176	Devices	Remotes	Feature	HT7800 screen camera does not during RADIUS startup with side entry camera
178	Devices	XAROSA	Feature	Improved handling of exposure time
181	Devices	XAROSA	Feature	Improved performance
183	Devices	XAROSA	Improvement	Improved handling of clipping
188	Imaging	Fourier	Feature	New maximum ROI size of 8,192 x 8,192 pixels
195	Devices	TEM Cameras	Improvement	Improved automatic exposure time behavior
195	Devices	Morada G3	Improvement	Better auto exposure time with live averaging and clipping
201	Devices	XAROSA	Improvement	All binning modes are fully functional
207	Imaging	Filter	Feature	The sharpness filter is disabled per default for EMSIS bottom mount cameras
235/ 236	Devices	Tengra/ Quemesa	Improvement	Improved image quality

6.2. RADIUS 2.0, build 14681 (Nov 2018)

ID	Group	Sub	Type	Description
39	Devices	Remotes	Improvement	Hitachi HT7700: The spot size is correctly handled when starting RADIUS
107	System	File Export	Improvement	Data from RADIUS workbooks can be exported to *.csv files
180	Devices	Remotes	Feature	Hitachi HT7800: The functions Eucentric Height and Astigmatism are obsolete
233	System	System	Improvement	The function System Restore Point is repaired
248	Devices	Veleta G3	Improvement	The combination of Drift Correction and longer exposure time is working
253	System	System	Improvement	The function Darken Monitor is repaired
56, 59, 63, 71, 127, 255, 258	Devices	Remotes	Feature/Improvement	<p>The JEOL JEM remote is now relying on the 64-bit version of the TEM External from JEOL. It is now fully notification event based and not polling anymore. As a consequence the RADIUS Satellite is obsolete and hence not provided anymore.</p> <p>The following JEOL TEMs are affected:</p> <ul style="list-style-type: none"> • JEOL JEM-1400 series • JEOL JEM-2100 series • JEOL JEM-F2 series <ul style="list-style-type: none"> • In the TEM mode <i>low mag</i> the magnification is now correctly read out • There is no piezo stage movement anymore when starting RADIUS • The JEOL JEM-F200 remote is correctly initialized

6.3. RADIUS 2.1, build 20150 (Mar 2020)

ID	Group	Sub	Type	Description
21	Devices	Remotes	Feature	The legacy Hitachi TEMs H-7500, H-7600 and H-7650 are now supported by a standard remote interface. Main data like magnification, high-tension and stage-position can be read out. TEM control is not possible.
100	System	Setup	Feature	The license file is installed during the setup procedure. No manual file edit necessary anymore.
101	Devices	Setup	Improvement	Device restore corrected
128	Devices	Simulator	Improvement	Simulator files complete
154	System	Setup	Improvement	No missing files when saving system information
187	Devices	Remotes	Improvement	HT7800: Beam blanker works
196	Devices	Remotes	Improvement	Improved handling of legacy JEOL JEM-1010/1011 remote
220	System	Movie	Improvement	The maximum pixel number of AVI is 4,096 x 4,096
233	System	System	Improvement	System restore point is written correctly
259	Devices	Remotes/ Cameras	Feature	Full integration of XAROSA with HT7800 TEM Software
263	Devices	Cameras	Improvement	LUTs are available
264	Devices	Cameras	Feature	PHURONA: camera available
273	Devices	Cameras	Improvement	XAROSA: Improved movie handling
298	System	Movie	Improvement	Movies are handled correctly
299	Devices	MIA	Feature	MIA images are now saved with automatic file names
301	Devices	Cameras	Feature	Windows Power Scheme tweak for EMSIS high performance cameras
305	UI	Cameras	Feature	Redesign of Camera Control tool window, with easy access to HDR
309	Devices	Remotes	Feature	Import filter for Hitachi TM 4000 Plus images
313	System	Application	Improvement	Measurement parameter sets can be saved and reloaded
328	Devices	Cameras	Improvement	Manually typed exposure times are accepted
338	Devices	Cameras	Improvement	Driver improvement

350	System	System	Improvement	Non-admin Windows users can acquire reference images with Power User role
352	System	Setup	Improvement	Correct versioning
354	Devices	Remotes	Change	HT7800: TCP/IP default port changed to 12066
355	System	Application	Improvement	Line Profile measurements are exportable
357	UI	Application	Obsolete	Tool window File Explorer is not available anymore
358	Devices	Remotes	Feature	Magnification dependent shading correction for legacy Hitachi TEMs (see ID 21)
362	Devices	Remotes	Feature	Shading Images Magnification Dependent: Enable for JEOL JEM-1010/1011, JEM-2010/2011
322, 380	System	Application	Obsolete	The RADIUS Solution Database is discontinued
347, 349, 348	System	Setup	Improvement	User roles can be defined correctly

7. Compatibility

7.1. Camera Compatibility

The following chart shows the current compatibility of EMSIS TEM cameras with RADIUS.

Camera compatibility chart

EMSIS Camera	RADIUS 1.4 (Win 7, 32/ 64 bit)	RADIUS 2.0 (Win 7/ 10, 64 bit)	RADIUS 2.1 (Win 10, 64 bit)
MegaView G2 (discntd.)	✓	✓	✓
MegaView G3	✓	✓	✓
Veleta (discntd.)	✓	✓	✓
Veleta G3	✗	✓	✓
PHURONA	✗	✗	✓
Morada G2 (discntd.)	✓	✓	✓
Morada G3 (discntd.)	!	✓	✓
KeenView G2 (discntd.)	✓	✓	✓
Tengra	✓	✓	✓
Quemesa	✓	✓	✓
XAROSA	✗	✓	✓

Morada G3

The Morada G3 works only on 64 bit operating systems.

XAROSA: min. build 14438

A RADIUS 2.0 build number greater-than-or-equal to 14438 is required for the XAROSA camera.

PHURONA: min. build 14784

A RADIUS 2.0 build number greater-than-or-equal to 14784 is required for the PHURONA camera.

Legacy cameras

Legacy cameras (e.g. former SIS and/or Olympus-SIS cameras) which are not listed here are not supported anymore by RADIUS 2.1.

7.2. TEM Compatibility

The following chart shows the current (Spring 2019) TEM compatibility with RADIUS.

TEM compatibility chart

Manufacturer	Type	RADIUS basic remote	RADIUS remote control
FEI	EM Series	✗	✗
	CM Series	✓	✗
	Tecnai Series	✓	✓
	Talos	✗	✗
JEOL	previous to JEM-1010	✗	✗
	JEM-1010/1011 Series*	✓	✗
	JEM-1400/2100 Series	✓	✓
	JEM-F200	✓	✓
Hitachi	H-7500/H-7600	✓	✗
	H-7650	✓	✗
	HT7700	✓	✓
	HT7800	✓	✓
	HT7800 Integration	✓	✓
ZEISS	previous to Libra	✗	✗
	Libra Series*	✗	✗

Basic remote The *RADIUS basic remote* comprises reading of magnification and high voltage and -depending on TEM type- limited stage control. MIA might not be available.

Remote control The *RADIUS remote control* includes additionally to the *RADIUS basic remote* auto alignment procedures, such as eucentric height, autofocus, **astigmatism correction**, "Click-to-center" and MIA functionality.

8. System requirements

System Part	Details
PC / CPU	Intel Xeon®, or Intel Core™ i5 (or compatible) processor For high performance acquisition: QuadCore
Operating System	Microsoft® Windows® 10 Professional (64-bit)
System Language	English
Memory	16 GB recommended
Hard disk	1 GB for installation, 2 TB for data Performance of HDD could be limiting factor for image acquisition speed. For high performance acquisition: SSD system disk
Graphics Board Monitor	1920 x 1200 (WUXGA) resolution, dedicated memory (min. 1,024 MB) 27" (68.6 cm) TFT
Optical Drive	DVD-DL-ROM, or burner for data backup
Interfaces	2x USB 2.0 for external devices 1x USB 3.0 for resp. EMSIS cameras 1x FireWire IEEE1394a for resp. EMSIS cameras 1x Thunderbolt™ for resp. EMSIS cameras 1x Serial port (COM) for camera controllers Serial/ Ethernet port for remote connection to TEM
PC Input Devices	3-button wheel-mouse, with mouse wheel Standard EN keyboard

EMSIS strongly recommends avoiding low budget models due to use of low-performance parts. Notebook/ laptop computers are inferior to their desktop counterparts. Systems with integrated on board graphics adapters, shared memory or similar shall be avoided.

9. Licensing

9.1. Software protection

RADIUS' software protection is based on license keys, which are supplied together with the respective software, so that every license is independent one from each other. It is for instance possible to remove a Solution or to replace it with another one.

The respective license key file simply needs to be copied in the respective RADIUS directory and the software can be used.

9.1.1. License types

Customer (regular) Licenses

- Main License
 - Standard RADIUS image analysis software license
 - Only one installation allowed on one PC
- Desktop License
 - Standard non-acquisition RADIUS license
 - Only one installation allowed on one PC

Special (demo) Licenses

- Internal License
 - Intended use: for sales force and application people only
 - The internal license shall not be installed on a customer PC.
 - ⚠ An installation on a customer PC will infringe the license agreement!

In case any support is needed with respect to the RADIUS license keys get in contact directly with us: +49 (0)251 297962-0, E-mail: support@emsis.eu

10. Ordering

Product	Article Code	Note
RADIUS 2.1 Main License	SRD-0510-00	
RADIUS 2.1 Desktop License	SRD-0511-00	
Update iTEM Main to RADIUS 2.1	SRD-0512-00	S/N of eligible iTEM license needed
Update iTEM Desktop to RADIUS 2.1 Desktop	SRD-0513-00	S/N of eligible iTEM license needed
RADIUS 2.1 Solution Detection	SRD-0516-00	
Update RADIUS 1.4 Main to RADIUS 2.1 Main	SRD-0518-00	
Update RADIUS 1.4 Desktop to RADIUS 2.1 Desktop	SRD-0519-00	



EMSIS GmbH
Mendelstraße 17, 48149 Münster, Germany
Phone: +49 (0) 251 297962-0, Fax: +49 (0) 251 297962-90
info@emsis.eu