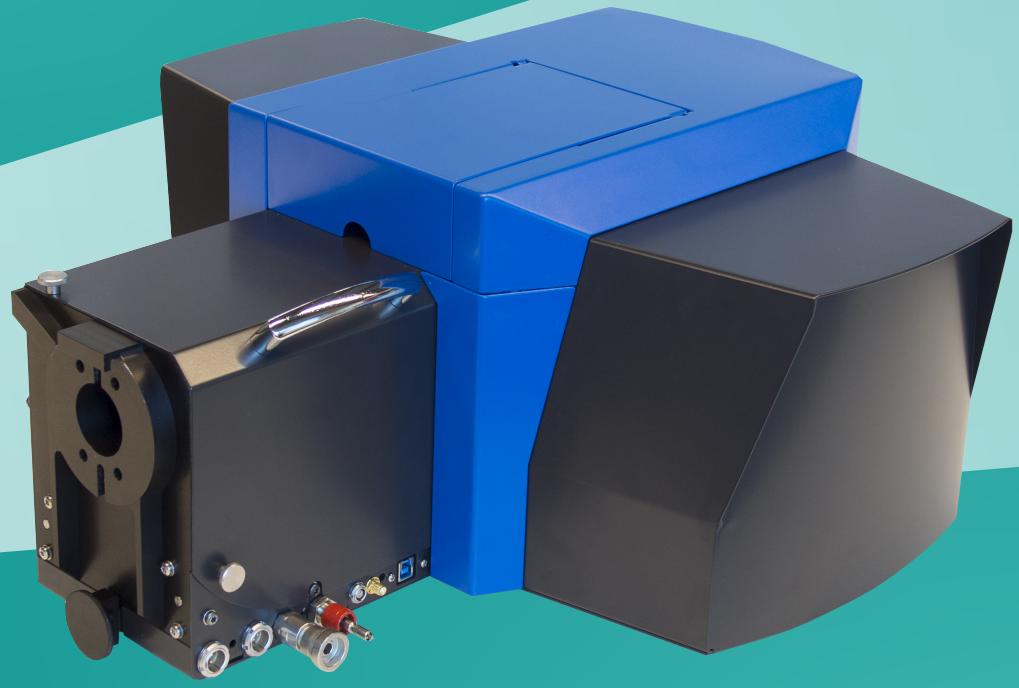
specification sheet | sparc spectral

SPARC Spectral specifications sheet

Obtain measurements quickly and analyse data easily with our user-friendly, flexible and powerful cathodoluminescence (CL) detection system



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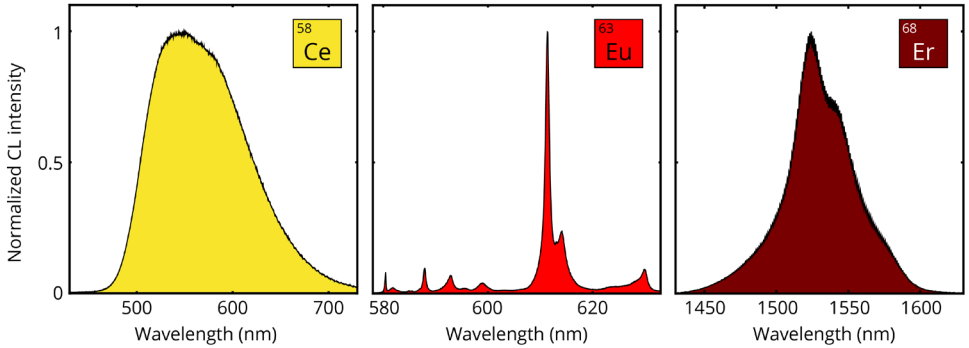
V01-04 2024-06-19

Introduction

The SPARC Spectral system is a unique cathodoluminescence (CL) solution which allows you to acquire high-quality CL data in a fast and simple manner. The system is flexible, modular and can be customized according to your research needs. The hardware's functionality can be extended easily with current and future add-ons, while the free open-source software constantly offers new updates and plugins. This provides the user with ample freedom to tailor the system for specific applications and experiments.

The SPARC Spectral offers up to six different CL imaging modes allowing detailed analysis of samples. Additionally, its broad spectral range, unsurpassed sensitivity, automated alignment procedure and ultra flat parabolic mirror ensure the best data quality. The CL system is compatible with SEMs from all the major brands and can be installed on a new SEM or retrofitted to an existing SEM platform. The installation of the system is done by experienced Delmic engineers. They explain and show the possibilities of the system to make sure you acquire the highest quality results of the structural composition and luminescent properties.



CL Spectral data from different phosphor materials. Europium sample courtesy of Dr. Jens Adam (Leidnitz-Institut für Neue Materialien).

Key benefits

SEM Integration

The SPARC system is easily integrated with a SEM of your choice.

Align easily

Our ODEMIS software makes the procedure of alignment easy and straightforward.

Customize your system

Modify the SPARC system in a matter of minutes with exchangeable modules, gratings and mirrors.

Enhance your research

Understand the structural composition and luminescence properties simultaneously.

Analyze easily and acquire insights

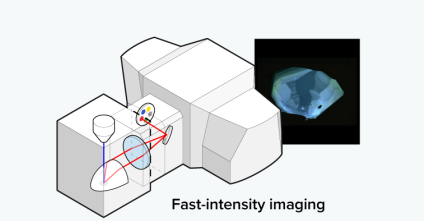
Open-source free software ODEMIS makes data acquisition and analysis painless and easy.

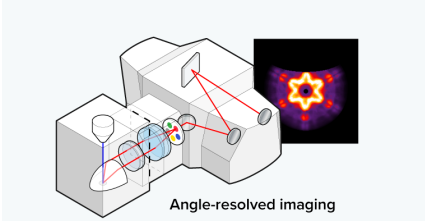
Reproduce and compare measurements

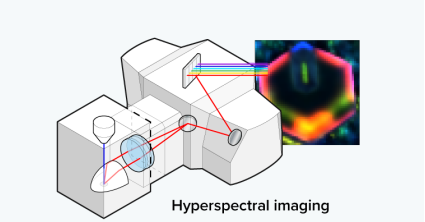
Fully motorized mirror stage and automatic alignment.

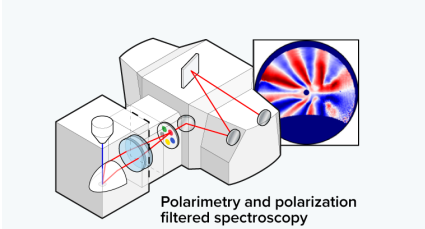
Imaging modes

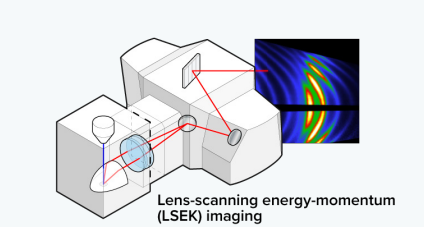
Start experimenting with data acquisition. Choose an imaging mode and perform fast intensity imaging, angle-resolved imaging, polarimetry and polarization-filtered spectroscopy, hyperspectral imaging, lens-scanning energy-momentum (LSEK) imaging and time-resolved imaging. Use different modes to obtain a more complete overview of your sample's properties!

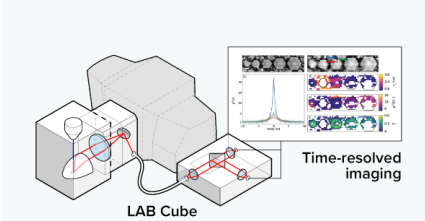












Application areas

Geology

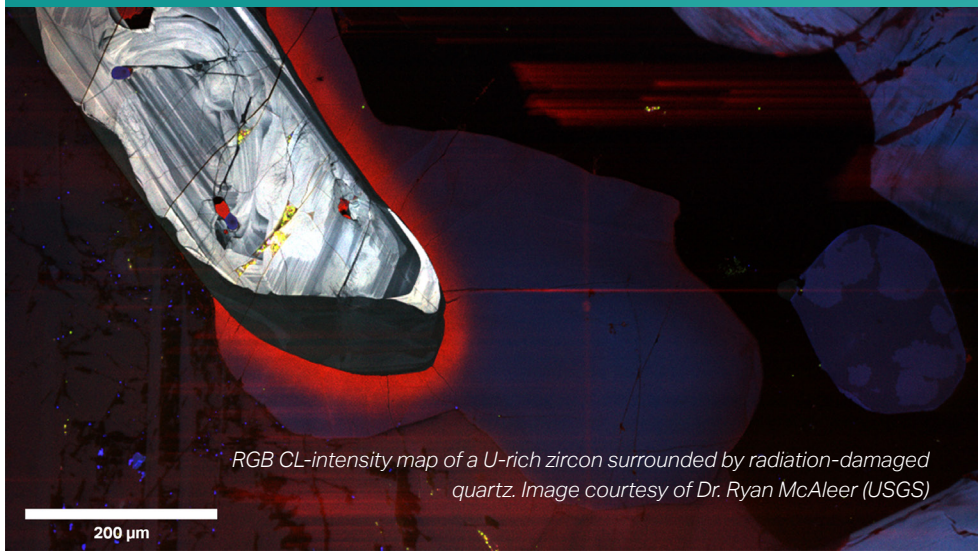
- Zircons
- Sedimentary Rocks
- Microorganisms
- Meteorite Impacts
- Gemstones

Nanophotonics

- Quantum emitters
- Plasmonics/ Metamaterials
- Dielectric Photonics

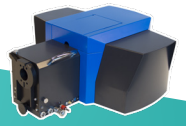
Materials science

- LEDs
- PV Materials
- Plastics/ Polymers
- Paints
- Medicine
- Phosphors
- Oxides



RGB CL-intensity map of a U-rich zircon surrounded by radiation-damaged quartz. Image courtesy of Dr. Ryan McAleer (USGS)

CL Solutions products



	SPARC Spectral	SPARC Compact	JOLT
Panchromatic intensity mapping	✓	✓	✓
RGB (colour-filtered) intensity mapping	✓	✓	✓
Spectroscopy	✓	—	—
Angle-resolved imaging	✓	—	—
Polarimetry and polarization-filtered spectroscopy	✓	—	—
Hyperspectral imaging	✓	—	—
Lens-scanning energy-momentum (LSEK) imaging	✓	—	—
Time-resolved imaging	✓	—	—
Compatibility	With all SEMs	With all SEMs	With all SEMs
Light-collection geometry	Paraboloid mirror	Paraboloid mirror	In-chamber CL detector
Software	Open-source free software ODEMIS	Open-source free software ODEMIS	App combined with the SEM control computer
Application fields	Geology, materials sciences, nanophotonics	Geology, materials sciences	Geology, materials sciences

Understand more about your sample in less time with a compact, easy-to-use, turnkey cathodoluminescence detector.

LEARN MORE

Fastest and simplest way to inspect geological, optoelectronic and other materials with cathodoluminescence detection.

LEARN MORE

System specifications

Feature	SPARC Spectral
Wavelength range	185-1700 nm[1]
Wavelength resolution	0.1 nm, 0.03 nm with external spectrometer
Field of view[2]	1 mm^2 intensity mapping, 60,000 μm^2 spectroscopy
Sample size	Unlimited
Parobolic mirror collection efficiency	89% [3]
Acceptance angle (NA)	1.49π sr (NA = 0.97)*
Mirror positioning accuracy	< 1 µm
Angular resolution	down to 0.1 degree (1.7 mrad) [4]
Exchangeable mirrors[5]	yes
Stage tiling and stitching	yes*
Decoupled light collection and detection	yes
Use with in-lens SEM detector	yes*
Compatible with EBIC measurements	yes*
Digital electron microscope control[6]	yes*
Open-source software and open data	yes*

Imaging modes	
Panchromatic CL intensity mapping	yes
Wavelength-filtered CL intensity mapping	yes
Hyperspectral CL imaging	yes
Angle-resolved CL imaging	yes
(Lens scanning) energy momentum imaging (LSEK)	yes
Polarization filtered CL imaging	yes*
Polarimetry experiments	
Angle-resolved polarimetry	yes*
Polarization filtered spectroscopy	yes*
Energy-momentum polarimetry	yes*
Time-resolved CL imaging	
$g^{(2)}$ imaging	yes*
Pulsed $g^{(2)}$ imaging[7]	yes*
Lifetime imaging[7]	yes*
Hyperspectral lifetime imaging[7]	yes*
Pump-Probe CL imaging[7]	yes*
Time resolution	
Decay trace imaging[8]	50 ps
Time-resolved spectroscopy[8]	25 ps
$g^{(2)}$	71 ps

* *Specification requires appropriate options.*

Footnotes:

[1] With possibilities to be extended to IR by request

[2] Field of view is defined as the area from which signal can be collected with at least 90% of peak collection efficiency

[3] For a Lambertian source

[4] Angular resolution depends on position of parabolic mirror. Resolution also depends on the camera array used.

[5] Different mirror designs are available

[6] Control over beam energy, sample stage, magnification etc

[7] This mode requires a pulsed electron microscope

[8] Overall time resolution of the system also depends on the electron pulse duration and the triggering scheme used

System specifications

Software

Open-source and free software ODEMIS is a powerful tool for (RGB) intensity data visualization. Easily overlay intensity data with SEM images. Move on with further data processing by exporting data to analysis software packages such as MATLAB, Python, ImageJ, Photoshop, Origin, or Excel.

- Output in either HDF5, PNG, OME-TIFF, or raw txt files.
- Acquisition of intensity maps based on point-by-point scans
- Photomultiplier tube for fast intensity mapping -> spectral differentiation based on filters in a filter wheel
- Drift correction
- Visualize intensity data as false color RGB image
- Overlay intensity data and SEM images
- Subtraction/manipulation of image file (such as system response) to view corrected spectra
- Export of data to software such as MATLAB, Python, Origin or Excel or imaging processing software for further analysis.

Installation

The retrofit will be done by an authorized DELMIC Microscopy service engineer and includes

- Mounting of system on SEM instrument
- Alignment of mirror stage
- Demonstration of operation
- Two days of on-the-job training

Interested?

For more information on this topic visit **www.delmic.com**

About

Delmic is a passionate high-tech company based in Delft, the Netherlands that develops powerful and user-friendly solutions for light and electron microscopy. Our systems are used by researchers and companies all over the world in fields ranging from life sciences, geology, material sciences to nanophotonics.

The SPARC Spectral system is a unique cathodoluminescense (CL) solution which allows you to acquire high-quality CL data in a fast and simple manner. The system is flexible, modular and can be customized according to your research needs.

Stay up to date

Subscribe to our newsletter to stay up to date with our latest CL developments

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DELMIC B.V.
Kanaalweg 4
2628 EB Delft
The Netherlands
www.delmic.com
info@delmic.com
+31 1574 401 58