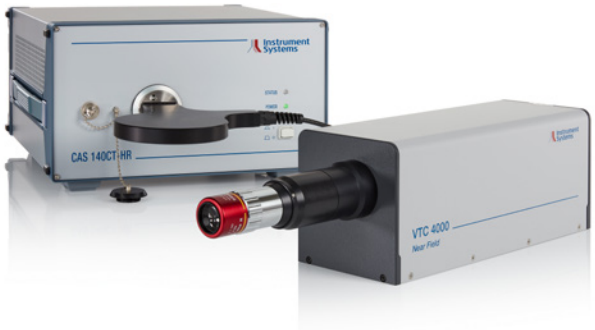
Instrument Systems
KONICA MINOLTA Group

VTC 4000

Near-field analysis of VCSEL arrays

Key features at a glance

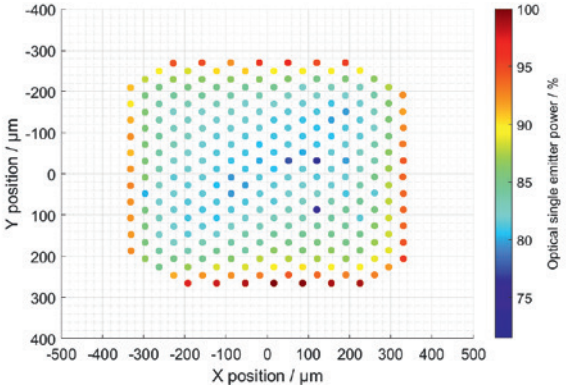
- 2D measurement solution for near field characterization of VCSEL arrays
- Radiant power, polarization, position, divergence and peak wavelength for all single emitters
- Flat-field and absolute power calibration, traceable to national metrology standards
- Easy software integration by LumiSuite SDK



The VTC 4000 is Instrument System's VCSEL testing camera for comprehensive near-field analysis of complete VCSEL arrays. It enables the absolutely calibrated, traceable and polarization-controlled 2D characterization of all relevant parameters for every single emitter on the array. The VTC 4000, consisting of a camera and corresponding microscope optics, is capable of simultaneously determining position, radiant power and polarization of single emitters on a VCSEL array in a single-shot camera measurement. This allows quick and easy detection of defect emitters on the array. The integrated polarization analysis ensures an unprecedented radiant power measurement accuracy with minimal error budget.

\\ SINGLE EMITTER BEAM WAIST AND SPECTRAL ANALYSIS

By implementation of a z-translation stage, the camera enables the characterization of the single emitter beam profiles. In this way, the single emitters can be characterized in terms of beam waist, numerical aperture and M^2 value. For analysing the spectral parameters, the camera is optionally available in a version with fiber output. Connecting the VTC 4000 to a high-resolution CAS spectroradiometer enables measuring the peak wavelength of every single emitter.
The VTC 4000 can be easily integrated into handler systems with x-, y- and z- translation stages. This enables automated characterization of complete VCSEL arrays.



2D power measurement of single emitters on a VCSEL array.

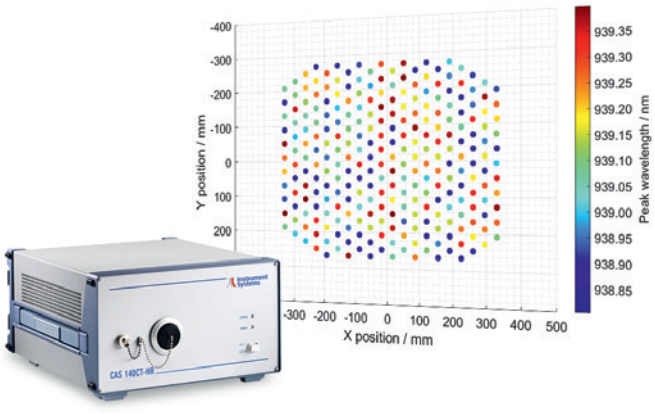
\\ MEASUREMENT RESULTS

For each single emitter:

- Position (x and y)
- Radiant flux
- Polarization angle and degree
- Defect emitter analysis

With translation stages / optional features:

- Waist
- Numerical aperture
- M^2 value
- Focus position
- Peak wavelength



2D peak wavelength analysis of single emitters on a VCSEL array with the VTC 4000 version incl. fiber output. A high-resolution CAS spectroradiometer and an xy-translation stage is required.

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\\ TECHNICAL SPECIFICATIONS

	VTC 4000-100	VTC 4000-200
General		
Fiber output (for connection of a CAS spectrometer)	No	Yes
Dimensions (L x W x H) (including objective lens, no handle)	462 mm x 112.6 mm x 121 mm	462 mm x 185 mm x 121 mm
Weight	Approx. 3.6 kg	Approx. 4.2 kg
Power Supply	24 V	
Operating temperature range	15 – 35 °C	
Interface	Ethernet	
Trigger I/O	Yes	
Camera system		
Camera sensor	12 Megapixel CMOS	
Camera spectral range	400 – 1000 nm	
OD Filter	Standard OD9 (optimized for 650 – 1000 nm), others on request	
Calibration	Possible in the range of 910 to 980 nm (e.g. 940 ±3 nm)	
Digital resolution	0.35 µm	
Optical resolution	2.2 µm (at 940 nm)	
Field of View	1.4 mm x 1.0 mm	
NA	0.26	
Integration times	100 µs – 10 s	
Measurement range power (per pixel) [1]	30 pW – 585 µW	60 pW – 1.17 mW
Measurement range power (typ. VCSEL single emitter) [2]	20 nW – 385 mW	40 nW – 770 mW
Radiometric measurement accuracy [3]	6 %	
Instrumental precision (typ. VCSEL single emitter) [4]	< 0.20 %	
Polarization angle accuracy	5°	
Polarization degree accuracy	0.1	
Typical acquisition time [5]	~700 ms	
Wavelength measurement with high-resolution CAS spectrometer [6] (optional, for peak wavelength measurement)		
Spectral range	–	800 nm – 1000 nm
Spectral resolution (typical)	–	0.12 nm – 0.4 nm
Data point interval (typical)	–	0.05 nm – 0.16 nm
Filter wheel with optical density filters (typical)	–	OD 0.5/1/1.5/2/2.5
Measuring ranges (typical)	–	80 nm – 160 nm
Wavelength accuracy	–	±0.05 nm
Integration time	-	4 ms – 65 s
Spatial resolution	–	Diameter 20 µm

[1] With factory calibration traceable to PTB. Lower measurement limit based on a signal to noise ratio of 10:1 for maximum exposure time of 10 s for standard OD filter (OD 9) at 940 nm. Upper measurement limit based on a minimum exposure time of 100 µs for standard OD filter (OD9) at 940 nm.

[2] Values calculated for standard OD filter (OD9) and a typical VCSEL single emitter at 940 nm. with circular shape and 10 µm diameter.

[3] With factory calibration traceable to PTB.

[4] 2σ of repeated radiometric measurements of one instrument.

[5] Including data processing and transfer time per image. Depends on integration time, device settings and performance of operating computer / system.

[6] Exact specifications depend on the chosen high-resolution CAS model.

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