

Carmina

Tunable IR Light-source

IR Light-source for the Combination with s-SNOM and AFM-IR Microscopes

- APE offers an automated IR light-source with a tuning range of up to 2.15 μm ... 15 μm . Carmina provides unique capabilities in near-field IR spectroscopy – including s-SNOM and AFM-IR – by combining broadband spectroscopy and narrowband chemical imaging to advance new nanoscale chemical applications.



s-SNOM
AFM-IR
Edition

At a Glance

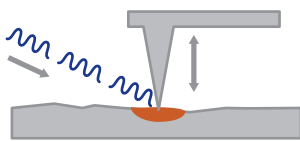
- Spectroscopy & Imaging of organic & inorganic samples with a single laser-source
- Complementary nanoscale IR-techniques covered: s-SNOM and AFM-IR
- Narrowband ($\sim 20 \text{ cm}^{-1}$) and broadband ($> 300 \text{ cm}^{-1}$) operation
- High output power level up to 300 mW
- Continuous sweep mode for fast scanning
- User friendly turnkey operation incl. automated wavelength tuning
- Wavelength tuning broadband: from 2.15 μm ... 15 μm (4650 cm^{-1} ... 670 cm^{-1})
- Wavelength tuning narrowband: from 5.0 μm ... 15 μm (2000 cm^{-1} ... 670 cm^{-1})

Application Examples

Spectroscopy & Imaging with a Single Light-Source

- The fully automated IR-source sets new standards in terms of flexibility and tuning range thanks to its OPO/DFG architecture. With the unique combination of $> 300 \text{ cm}^{-1}$ broadband and 20 cm^{-1} narrowband emission, the complementary nanoscale IR techniques s-SNOM Imaging, Spectroscopy and AFM-IR are now covered with a single light-source. A triggered pulsed mode is available for AFM-IR applications.

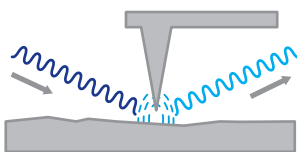
AFM-IR Photothermal AFM



- **IR pulsed**

Available for broadband & narrowband
Pulsed mode (burst mode) with 50% duty cycle
Continuous wavelength sweep in narrowband mode
($> 30 \text{ cm}^{-1}/\text{s}$) for fast spectroscopy

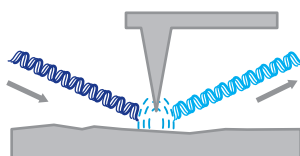
s-SNOM Imaging



- **IR narrowband quasi-cw**

Narrowband mode $\sim 20 \text{ cm}^{-1}$
Wavelength tuning $5.0 \mu\text{m} \dots 15 \mu\text{m}$ ($2000 \text{ cm}^{-1} \dots 670 \text{ cm}^{-1}$)
Fast continuous sweep mode in less than 30 seconds for scanning
from $1000 \text{ cm}^{-1} \dots 1800 \text{ cm}^{-1}$

s-SNOM Spectroscopy



- **IR broadband quasi-cw**

Broadband mode $> 300 \text{ cm}^{-1}$
Wavelength tuning $2.15 \mu\text{m} \dots 15 \mu\text{m}$ ($4650 \text{ cm}^{-1} \dots 670 \text{ cm}^{-1}$)

Carmina Broadband & Narrowband Specifications

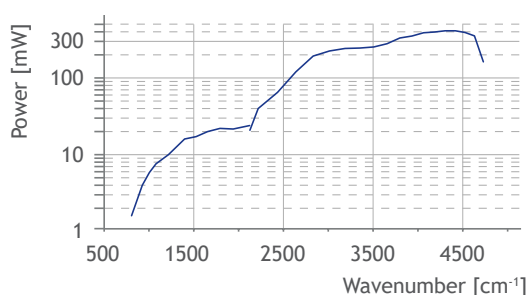
Available Configurations

	Version A *	Version B *	Version C
Broadband quasi-cw	■	■	■
Narrowband quasi-cw	■	■	-
Broadband Pulsed Mode	■	-	-
Narrowband Pulsed Mode	■	-	-

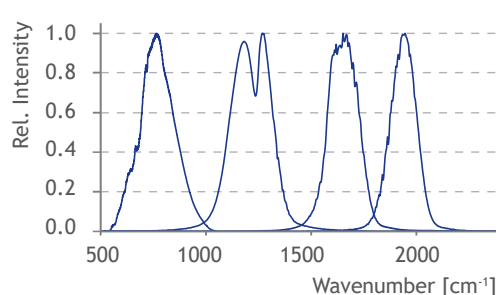
Broadband Operation

Tuning Range	2.15 μm ... 15 μm (4650 cm^{-1} ... 670 cm^{-1})
Wavelength Tuning	Fully automated, no user adjustment required
Step- and Settle Time	< 2 s
Power	> 15 mW at 1600 cm^{-1}
Bandwidth Typical	> 300 cm^{-1} (FWTM, 10 dB level), 170 cm^{-1} (FWHM)
Beam Quality M^2	< 1.3 at 1600 cm^{-1} , typ. < 1.3 over complete tuning range
Polarization	Horizontal
Beam Diameter at Exit	Typ. 5 mm at 1600 cm^{-1}

Broadband Operation Power (typical)



Broadband Operation Spectra (typical)

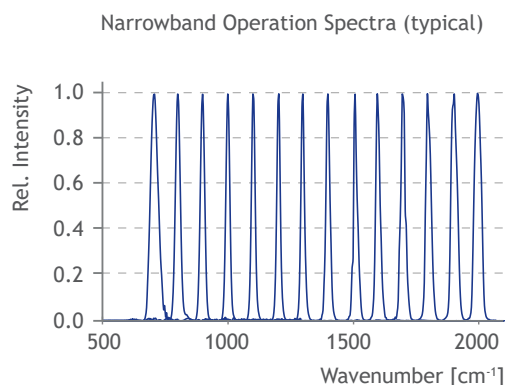
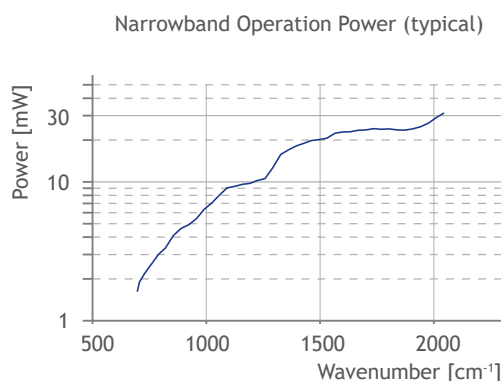


Narrowband Operation

Tuning Range	5 μm ... 15 μm (2000 cm^{-1} ... 670 cm^{-1})
Wavelength Tuning	Fully automated, no user adjustment required
Step and Settle Time	< 2 s
Sweep Mode	Continuous sweep Max. speed > 30 cm^{-1}/s , speed and range software adjustable
Power	> 15 mW at 1600 cm^{-1}
Bandwidth	Typ. 20 cm^{-1} (FWHM) for 1000 cm^{-1} ... 1800 cm^{-1}
Beam Quality M^2	< 1.3 at 1600 cm^{-1} , typ. < 1.3 over whole tuning range
Polarization	Horizontal
Beam Diameter at Exit	Typ. 5 mm at 1600 cm^{-1}

* Versions A and B are distributed exclusively by Bruker if the purchase of Carmina is associated with the purchase of a new near field microscope (i.e. s-SNOM or AFM-IR / Photothermal AFM Instruments).

...Specifications



Quasi-cw Mode

Repetition Rate 40.5 MHz \pm 0.5 MHz

Pulsed Mode

Frequency Modulation 50 kHz ... > 1.5 MHz externally triggered via TTL signal (BNC)

Duty Cycle 50%

Energy per Cycle > 15 nJ at 1600 cm⁻¹ at 500 kHz

Further Specifications and Requirements

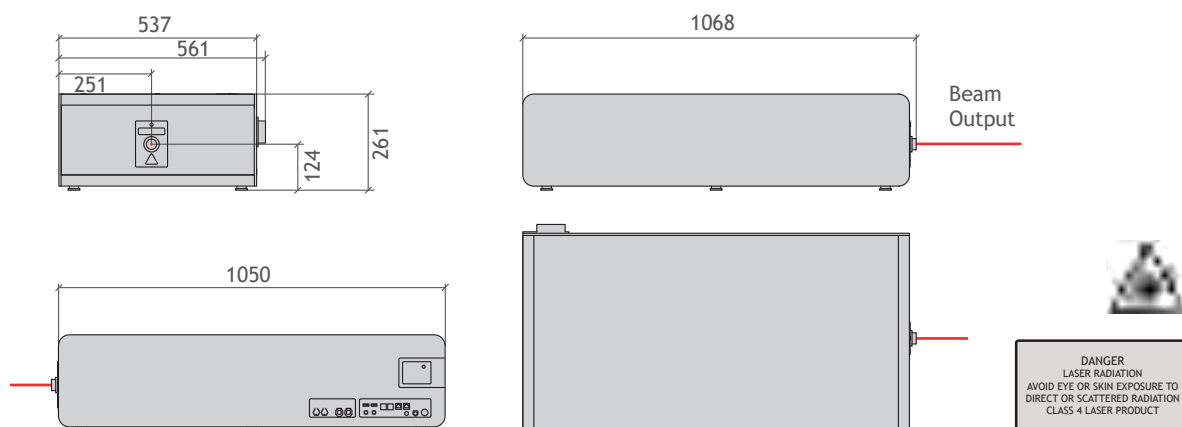
Dimensions & Weight Laser: 537 mm x 1068 mm x 261 mm, 105 kg

Electronics: 3U x 482.5 mm x 389.5 mm, 11 kg

Electrical Supply 110 - 240 V, 50 - 60 Hz, max. 4.5 A (at 110 V)

Cooling Unit (Included) Water cooling ~ 22°C, max. 6 A (at 110 V)

Purging Unit (Included) Purging gas for H₂O and CO₂ removal



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