LIGHT CONVERSION

Product Catalog

# Spectroscopy Systems

lightcon.com

2026

LIGHT CONVERSION is a global leader in ultrafast technology, designing and manufacturing femtosecond lasers, wavelength-tunable sources, optical parametric chirped-pulse amplifiers, spectroscopy systems, and microscopy sources.

The comprehensive portfolio represents the best-in-class lasers tailored for industry, science, and medicine.

| 10 000 | 17 500 | 800 |
| --- | --- | --- |
| Femtosecond laser systems installed worldwide | Square meters designated for manufacture and R&D | Employees, of whom 15% focus on R&D |

## About Us

Founded in 1994, LIGHT CONVERSION has evolved into a leading company in ultrafast laser technology with over 10 000 systems installed worldwide and 800 employees, 15% of whom focus on R&D. The company's lasers are used by all of the world's top 50 universities, highlighting its commitment to state-of-the-art research, while also ensuring the reliability and performance in 24/7 industrial applications. With international offices in the US, China, and Korea, along with a global representative network, the company ensures worldwide sales and service.


AVOID EXPOSURE
DANGER

# Spectroscopy Systems

HARPIA ultrafast spectroscopy systems perform a variety of sophisticated time-resolved measurements within a compact footprint. With an intuitive user experience and easy day-to-day operation, they meet the demands of modern scientific applications.

Complete single-supplier solutions for sophisticated measurements

Compact and robust systems, powered by industrial-grade lasers

High-level automation and software control

## HARPIA | TA

The system, built around the transient absorption spectrometer, can be expanded with additional modules, including time-correlated single-photon counting, Kerr gate and fluorescence upconversion, and third beam delivery.

## HARPIA | LIGHT

NEW

The transient absorption spectroscopy system, classified as a Class 1 laser product, combines accessibility, versatility, and unparalleled performance in a compact, single-box design.

# HARPIA | TA

## Ultrafast Spectroscopy Systems

- Excellent performance at high repetition rates
- Measurement range from UV to MIR
- Market-leading sensitivity
- Modules for time-resolved and multi-pulse experiments
- High-level automation in a compact footprint




Layout example

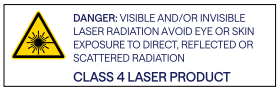
## Specifications

| Configuration | UV-VIS | UV-VIS-NIR | MIR |
|---|---|---|---|
| Probe spectral range | 350 – 1100 nm [1] | 350 – 1600 nm [1] | 2000 – 13 000 nm [2] |
| Pump range | 240 – 2200 nm [2] | | 450 – 2200 nm [3] |
| Delay range (resolution) | 8 ns (8.3 fs) | | 4 ns (4.2 fs) |
| Temporal resolution | ≤ laser pulse duration | | |
| Laser repetition rate | 1 – 100 kHz | | |
| Maximum data acquisition rate | 3850 Hz | | 100 kHz |
| Modes | Reflection and transmission | | |

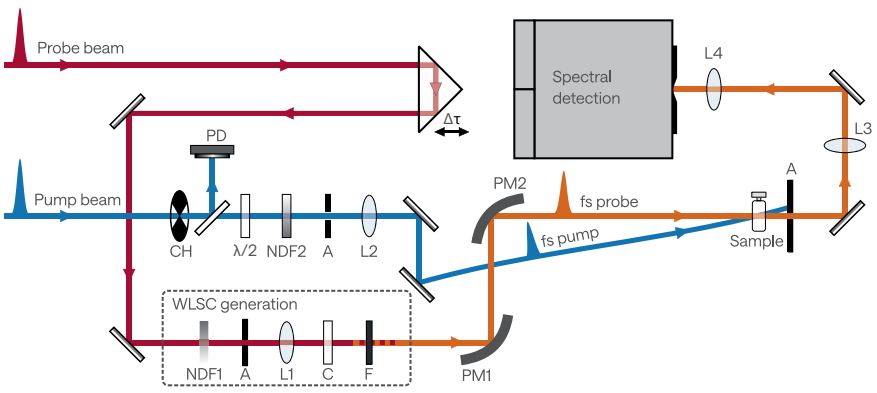
[1] *Pump–probe measurements using Yb-based laser systems may exhibit blind spots at 515 nm and 1030 nm, corresponding to the second harmonic and fundamental wavelength of the laser, where strong pump scattering can interfere with accurate detection.*

[2] *The range is determined by the OPA's output spectrum.*

[3] *The wavelength range is configurable to 240 – 700 nm. Contact sales@lightcon.com for more details.*




**HARPIA-TA** optical layout for pump-probe experiments




| | |
|---|---|
| A | – aperture |
| C | – crystal |
| CH | – chopper |
| F | – filter |
| L | – lens |
| PD | – photodiode |
| PM | – parabolic mirror |
| NDF | – neutral density filter |
| WLSC | – white light supercontinuum |
| Δτ | – delay |
| λ/2 | – half-wave plate |

# HARPIA | TF Time-Resolved Fluorescence Module

**Kerr gate**
Ideal for femtosecond fluorescence measurements.
Simpler alignment and maintenance.
The entire spectrum is measured at once.

**Fluorescence upconversion (FU)**
Better temporal resolution for measuring fast fluorescence events.

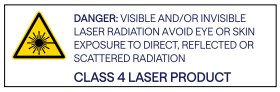
**Time-correlated single-photon counting (TCSPC)**
Fluorescence lifetime measurements are extendible to measure phosphorescence signals.

Time-resolved fluorescence spectroscopy provides valuable insights into molecular processes occurring in the excited states. The **HARPIA-TF** module combines different measurement modes, enabling the observation of fluorescence dynamics across different time scales. By employing high-repetition-rate **CARBIDE** or **PHAROS** lasers, fluorescence dynamics can be measured while exciting the samples with pulse energies as low as several nanojoules.

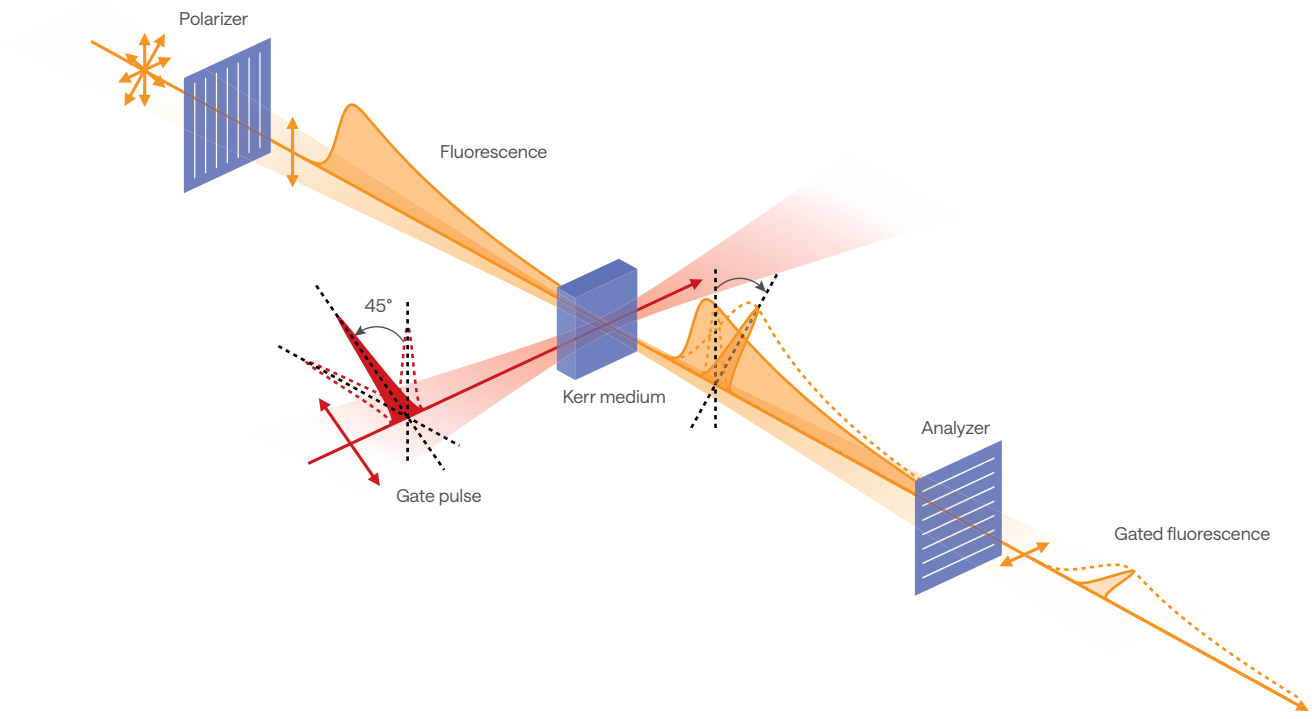
## Specifications

| Module | HARPIA-TF | | |
|---|---|---|---|
| Measurement technique | Kerr gate | Fluorescence upconversion | TCSPC |
| Spectral range | 380 – 1000 nm | 330 – 820 nm [1) 2)] | 220 – 820 nm [3)] |
| Pump range | 240 – 2200 nm [4)] | | |
| Temporal resolution | ≤ 1 ps | ≤ 1.4 x laser pulse duration | < 180 ps or < 50 ps |
| Delay range (resolution) | 8 ns (8.3 fs) | | 5 µs [5)] |
| Compatible with | TCSPC | | Kerr gate or fluorescence upconversion |
| Detector | CCD | PMT | |
| Modes | Transmission | | Reflection and transmission |

1) *The fluorescence detection range is extendable up to 1600 nm. Contact sales@lightcon.com for more details.*
2) *Fluorescence detection may exhibit blind spots at 343 nm, 515 nm, and 1030 nm due to harmonic overlap.*
3) *The spectral range is extendable with an additional NIR detector (measurement range 1000 – 1700 nm). Contact sales@lightcon.com for more details.*
4) *The range is determined by the OPA's output spectrum.*
5) *Using FIFO-based acquisition, the temporal window can be extended up to ~1 s for monitoring longer-timescale processes.*




Principle of Kerr gate spectroscopy



# HARPIA | TA-FP Flash Photolysis – Nanosecond TA Module

The flash photolysis experiment is designed to measure the long-lived states of molecular systems. Its principle is analogous to the femtosecond transient absorption (TA) experiment but with a delay in the nanosecond to millisecond range.

In femtosecond transient absorption, the delay between pump and probe pulses is controlled by moving a mechanical delay stage. In contrast, flash photolysis employs a delayed probe pulse generated by an electronically triggered external probe laser – a broadband nanosecond photonic crystal fiber (PCF) laser.

## Specifications

| Module | HARPIA-TA-FP | | HARPIA-TA-FP-UV | |
|---|---|---|---|---|
| HARPIA-TA configuration | UV-VIS | UV-VIS-NIR | UV-VIS | UV-VIS-NIR |
| Probe spectral range [1] | 450 – 1100 nm | 450 – 1600 nm | 350 – 1100 nm | 350 – 1600 nm |
| Pump range | 240 – 2200 nm [2] | | | |
| Delay range | up to 485 µs | | | |
| Temporal resolution | 2 ns | | 1 ns | |
| Probe laser repetition rate | 1850 Hz | | | |
| Maximum data acquisition rate | 3850 Hz | | | |
| Modes | Reflection and transmission | | | |

[1] *Pump–probe measurements using nanosecond laser systems may exhibit blind spots at 1064 nm, corresponding to the fundamental wavelength of the laser.*

[2] *The range is determined by the OPA's output spectrum.*

# HARPIA | TB Third Beam Delivery Module

When standard spectroscopy tools are not enough to unravel the intricate ultrafast dynamics of photoactive systems, multi-pulse time-resolved spectroscopic techniques can be utilized to yield additional insight.

The **HARPIA-TB** module includes a Berek compensator for polarization control, a continuously variable neutral density filter for automated intensity control, and a delay line with a range of up to 4 ns.

### Femtosecond stimulated Raman scattering (FSRS)

Delivering frequency-narrowed picosecond pulses enables FSRS measurements, a relatively recent yet increasingly adopted time-resolved spectroscopy technique for observing changes in the vibrational structure of optically excited molecular systems.

### Multi-pulse time-resolved transient absorption

Enables control over photochemical reactions and access to higher excited states. Precisely timed pulse sequences can initiate a photoreaction and perturb it at defined moments during its evolution. In some cases, an additional pump pulse can re-excite molecules, with the delay between several pump pulses influencing the reaction's outcome.

## Specifications

| Module | HARPIA-TB | |
|---|---|---|
| Measurement technique | FSRS [1] | Pump for multi-pulse experiments |
| Probe spectral range | 350 – 1100 nm [2] | Depends on the HARPIA-TA configuration |
| Raman spectral range | 700 - 2000 $cm^{-1}$ | n/a |
| Acceptable wavelength range | 450 – 2200 nm [3] | |
| Delay range (resolution) | 4 ns (4.2 fs) | |
| Modes | Transmission | |

[1] *The results were obtained using a specific system configuration: a PHAROS femtosecond laser, an ORPHEUS-HE OPA, and an SHBC combined with an ORPHEUS-PS OPA. Measurements were performed at a 10 kHz repetition rate with a 540 nm actinic pump and a 450 nm Raman pump. β-carotene was used as the sample. Contact sales@lightcon.com for more details.*

[2] *The system may exhibit blind spots at 515 nm and 1030 nm, corresponding to the second harmonic and fundamental wavelength of the laser, where strong pump scattering can interfere with accurate detection.*

[3] *The wavelength range is configurable to 240 – 700 nm. Contact sales@lightcon.com for more details.*

## Options



### Cryostat Mounting

**HARPIA-TA** supports cryostats that can be mounted externally or internally.



### Sample Stirrer

Liquid samples are mixed to avoid overexposure and ensure fresh samples.



### Motorized Pump Mirror

Used to automatically optimize pump and probe overlap.



### External Beam Steering

To lock the optical beam paths for OPA wavelenghts (350 – 1100 nm).



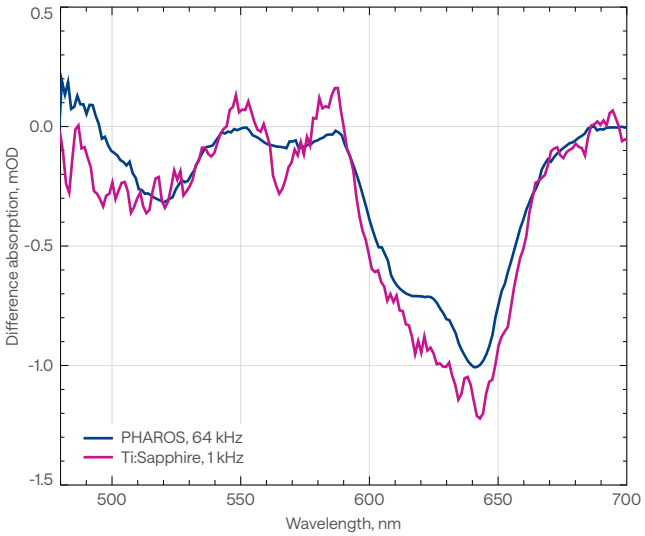
### Beam Profiler

For checking beam shape/size at any position before/after measurement inside **HARPIA.**

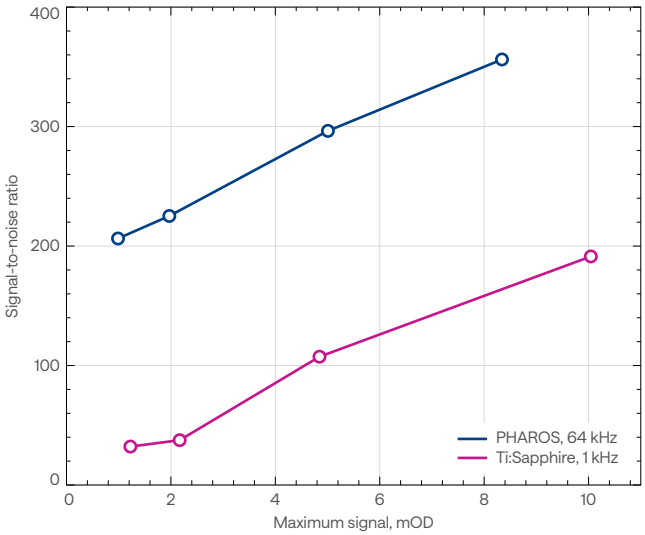
## Performance at high repetition rates

The **HARPIA** spectroscopy system achieves an excellent signal-to-noise ratio at high repetition rates and low energy excitation conditions. The graphs below compare the signal-to-noise ratio (SNR) of difference absorption spectra obtained with a Ti:Sapphire laser operating at 1 kHz and a **PHAROS** laser operating at 64 kHz with the same acquisition time.

Measured difference absorption spectra of CdSe/ZnS quantum dots using low- and high-repetition rate lasers with 5 s acquisition time




Best-effort SNRs, achieved with **HARPIA-TA** spectrometer driven by a Ti:Sapphire laser at 1 kHz (magenta) and a **PHAROS** laser at 64 kHz (blue)



Software

# HARPIA Service App

## Control and data acquisition software

**A single software solution for all measurement modes, featuring:**

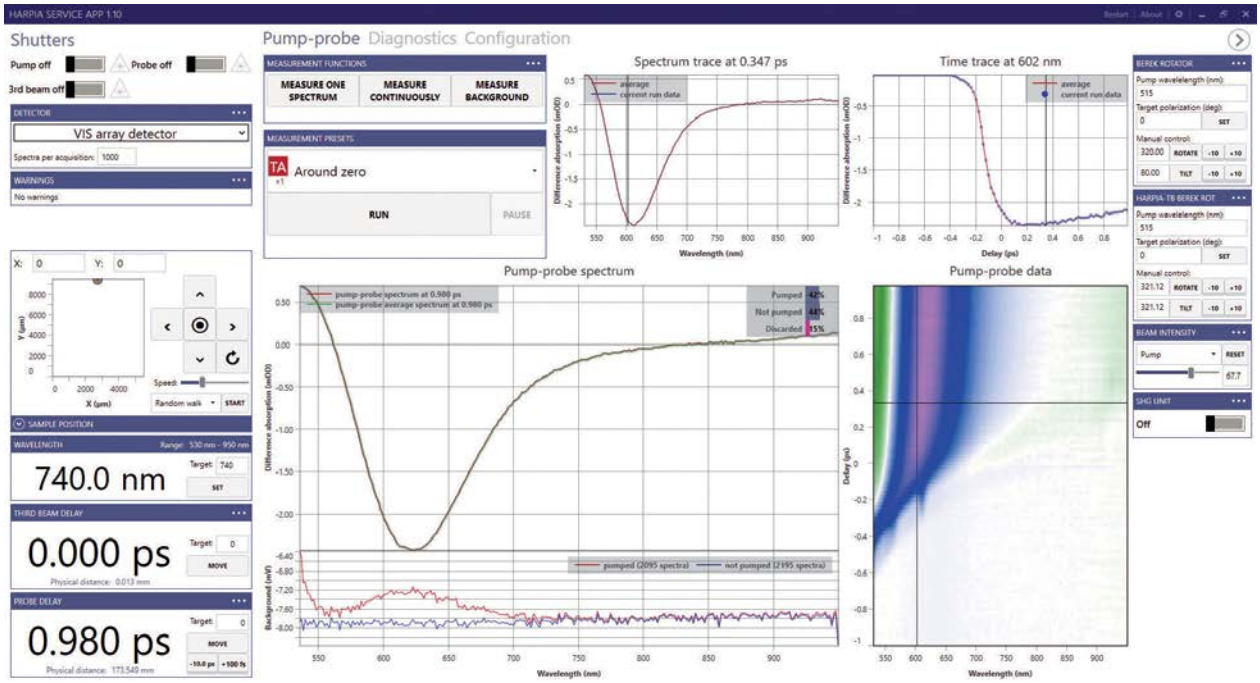
- A user-friendly interface
- Measurement presets
- Measurement noise suppression
- Diagnostics and data export
- Continuous support and updates
- An API for remote experiment control using third-party software (LabVIEW, Python, MATLAB)

## Data analysis software

**An ultrafast spectroscopy data analysis software, featuring:**

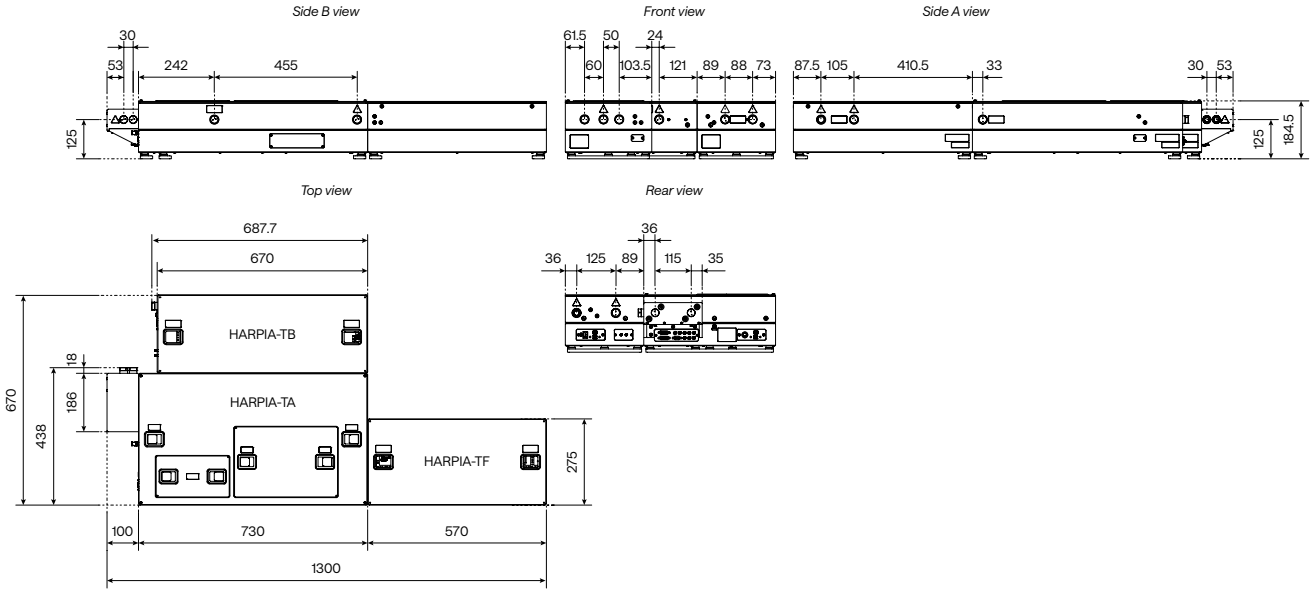
- Advanced data wrangling: slicing, merging, cropping, smoothing, fitting, etc.
- Advanced global and target analysis
- Probe spectral chirp correction, calibration and deconvolution
- Support for 3D data sets (2D electronic spectroscopy, fluorescence lifetime imaging)
- Publication-ready figure preparation and data export

**HARPIA** Service App main window




## Drawings

**HARPIA** system with **HARPIA-TB** and **HARPIA-TF** modules



# HARPIA | LIGHT

NEW

## Tabletop Transient Absorption Spectroscopy Systems

- Class 1 laser product
- Maintenance-free single-box solution
- Plug-and-play installation
- Intuitive measurement and data analysis
- Femto-to-nanosecond temporal resolution




### Specifications

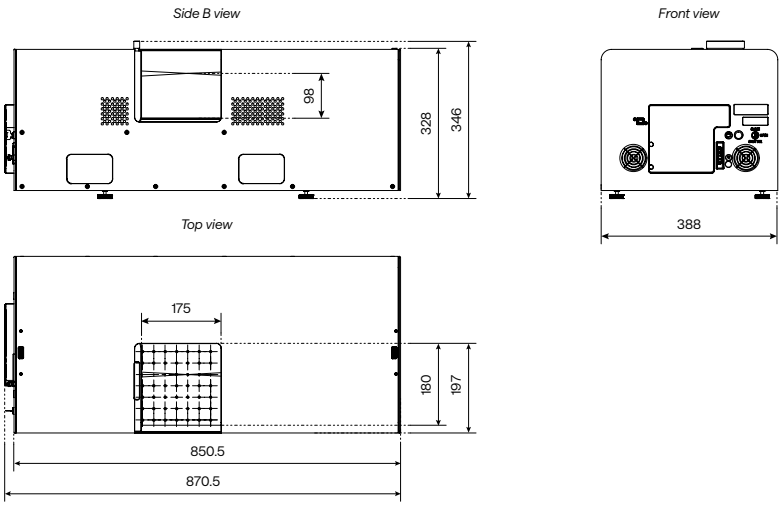
| Modes | Transmission and reflection |
|---|---|
| Probe spectral range | 435 – 935 nm |
| Probe polarization control | Linear (0 – 180°) |
| Pump wavelengths | 515 nm, 343 nm |
| Delay range (resolution) | 7.5 ns (10 fs) |
| Temporal resolution | ≤ 290 fs |
| Laser repetition rate | 60 kHz [1] |

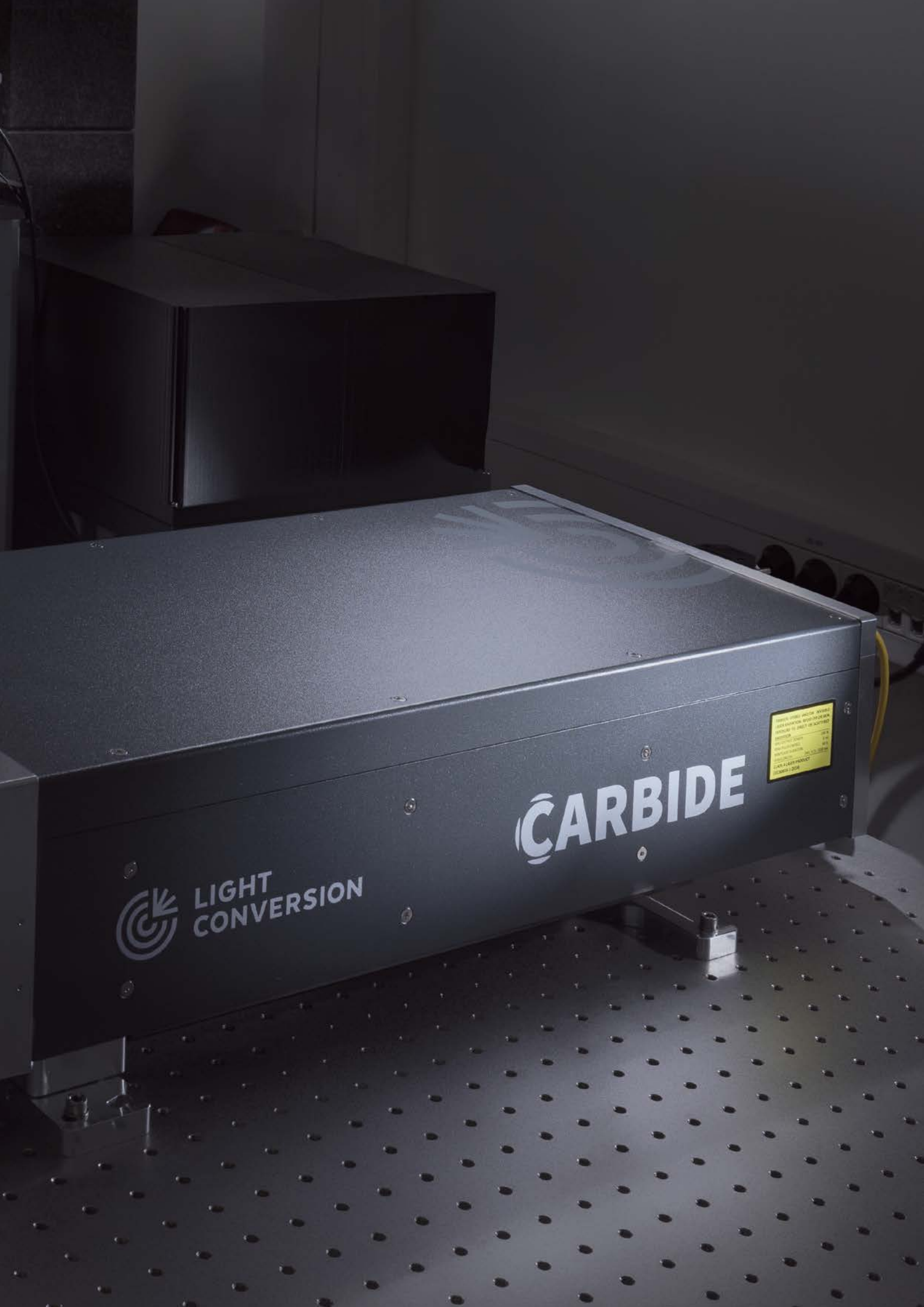
[1] *Pulse selection can be set to any integer division of the 60 kHz fundamental repetition rate.*

CLASS 1
LASER PRODUCT

### Drawings

HARPIA-LIGHT




CARBIDE
LIGHT
CONVERSION

# Femtosecond Lasers

LIGHT CONVERSION is world-renowned for its industrial-grade Yb-based femtosecond lasers, covering a wide range of industrial, scientific, and medical applications.

High average power and pulse energy at high repetition rates

Market-proven industrial-grade stability and reliability

Automated harmonics and wavelength-tunable extensions

## CARBIDE

Compact industrial design in air- or water-cooled models, providing up to 120 W, 1 mJ or 80 W, 2 mJ with excellent output stability.

## PHAROS

Scientific flexibility with process-tailored output parameters, offering up to 1 mJ pulse energy at < 100 fs or up to 5 mJ at < 250 fs.

# CARBIDE

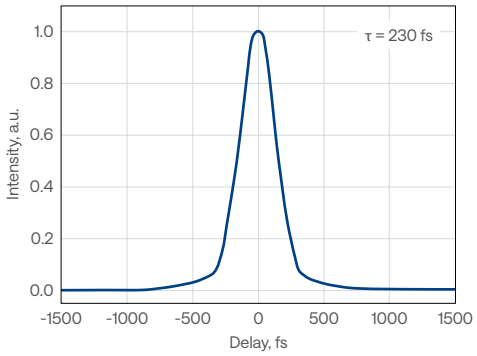
## Industrial Femtosecond Lasers

- Maximum output of 120 W (IR) or 50 W (UV)
- NEW — Single-shot – 10 MHz repetition rate
- Pulse-on-demand and BiBurst for pulse control
- Automated harmonics up to the 5th and wavelength-tunable extensions
- Air-cooled or water-cooled models

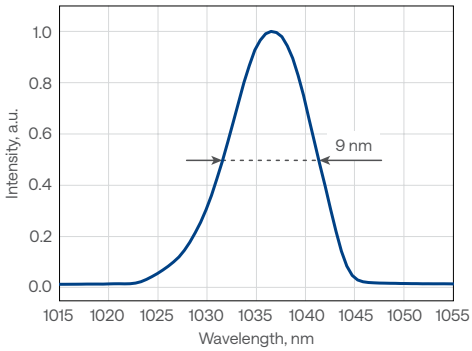



CARBIDE-CB3

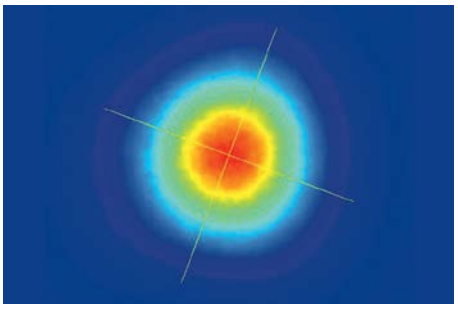
**CARBIDE-CB3**
Typical pulse duration



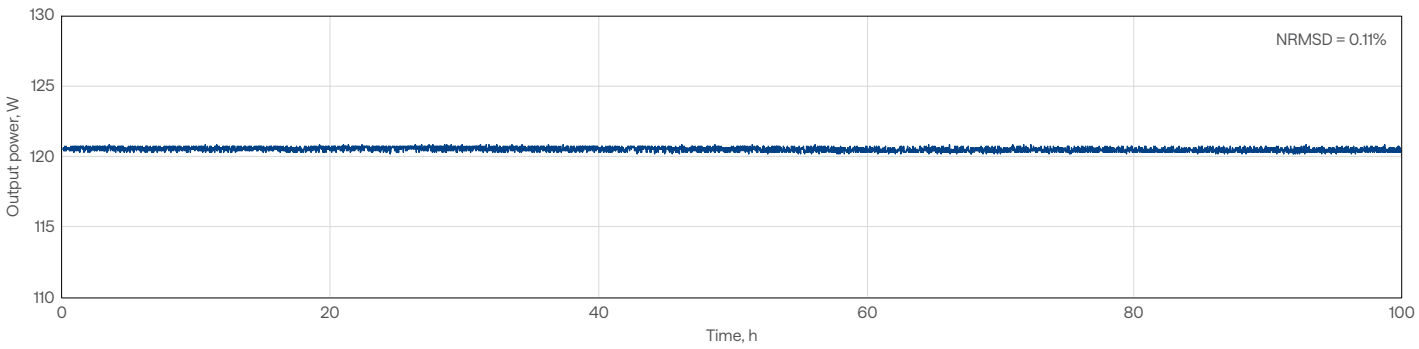

**CARBIDE-CB3**
Typical spectrum




**CARBIDE-CB3**
Typical beam profile



**CARBIDE-CB3-120W**
Long-term power stability



# CARBIDE-CB3 specifications

NEW

| Model | CB3-20W | CB3-40W | CB3-40W-10MHz | CB3-80W | CB3-120W |
|---|---|---|---|---|---|
| **OUTPUT CHARACTERISTICS** | | | | | |
| Cooling method | Water-cooled | | | | |
| Center wavelength | 1030 ± 10 nm | | | | |
| Maximum output power | 20 W | 40 W | | 80 W | 120 W |
| Pulse duration [1] | < 250 fs | | | < 350 fs [2] | < 250 fs |
| Pulse duration tuning range | 250 fs – 10 ps | | | 350 fs – 10 ps | 250 fs – 10 ps |
| Maximum pulse energy | 0.4 mJ | | | 0.8 mJ | 2 mJ | 1 mJ |
| Repetition rate | Single-shot – 1 MHz | Single-shot – 1 MHz (2 MHz on request) | Single-shot – 10 MHz | Single-shot – 2 MHz | |
| Pulse selection | Single-shot, pulse-on-demand, SPPT [3], any fundamental repetition rate division | | | | |
| Polarization | Linear, vertical; 1 : 1000 | | | | |
| Beam quality, $M^2$ | < 1.2 | | | | |
| Beam diameter [4] | 3.9 ± 0.4 mm | | | 4.2 ± 0.4 mm | 5.1 ± 0.7 mm | 5 ± 0.5 mm |
| Beam pointing stability | < 20 µrad/°C | | | | |
| Pulse energy control | FEC [5] | | Attenuator [6] | FEC [5] | |
| Pulse picker leakage | < 0.25% | | < 0.5% | < 0.25% | |
| Pulse-to-pulse energy stability, 8 h [7] | < 0.5% | | | | |
| Long-term power stability, 100 h [7] | < 0.3% | | | | |
| **MAIN OPTIONS** | | | | | |
| Oscillator output [8] | < 0.5 W, 120 – 250 fs, 1030 ± 10 nm, ≈ 65 MHz | | | | |
| Harmonic generator [9] | 515 nm, 343 nm, 257 nm, or 206 nm; refer to CARBIDE HG | | | | |
| Optical parametric amplifier [10] | UV – MIR; refer to I-OPA or ORPHEUS | | | | |
| BiBurst option | Tunable GHz and MHz burst with burst-in-burst capability; refer to BiBurst | | | | |
| **DIMENSIONS** | | | | | |
| Laser head (L × W × H) | 633 × 350 × 174 mm | | | | |
| Chiller (L × W × H) | 585 × 484 × 221 mm | | 680 × 484 × 307 mm | | |
| 24 V DC power supply (L × W × H) | 352 × 195 × 75 mm | | | | 376 x 449 x 88 mm |
| **ENVIRONMENTAL & UTILITY REQUIREMENTS** | | | | | |
| Operating temperature | 15 – 30 °C | | | | |
| Relative humidity | < 80% (non-condensing) | | | | |
| Electrical requirements | Laser | 100 V AC, 7 A – 240 V AC, 3 A; 50 – 60 Hz | | 100 V AC, 12 A – 240 V AC, 5 A; 50 – 60 Hz | 100 V AC, 15 A – 240 V AC, 7 A; 50 – 60 Hz |
| | Chiller | 100 – 230 V AC; 50 – 60 Hz | | 200 – 230 V AC; 50 – 60 Hz | |
| Rated power | Laser | 1000 W | | 1000 W | 2000 W |
| | Chiller | 1400 W | | 2000 W | |
| Power consumption | Laser | 500 W | | 900 W | 1500 W |
| | Chiller | 1000 W | | 1300 W | 1800 W |

[1] *Assuming a Gaussian pulse shape.*

[2] *Pulse duration can be reduced to < 250 fs if a pulse peak intensity of > 50 GW/cm² is tolerated by the customer setup.*

[3] *Synchronous pulse picker trigger (SPPT) mode provides pulse gating with a jitter time of 16 ns.*

[4] *FW 1/e², using maximum pulse energy.*

[5] *Fast energy control (FEC) provides fast, full-scale individual pulse energy control; an external analog control input is available. An optional integrated waveplate-based variable optical attenuator is available.*

[6] *Waveplate-based variable optical attenuator (VOA); an external analog control input is available. FEC is available for repetition rates up to 2 MHz.*

[7] *Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).*

[8] *Available simultaneously, requires a scientific interface. Contact sales@lightcon.com for more details or customized solutions.*

[9] *Integrated. For an external harmonic generator, refer to HIRO.*

[10] *Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.*

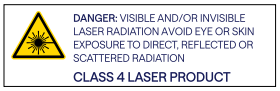


# CARBIDE-CB5 specifications

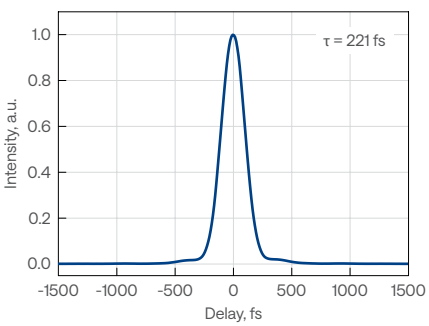


| Model | CB5-6W | CB5-5W | CB5-SP |
|---|---|---|---|
| **OUTPUT CHARACTERISTICS** | | | |
| Cooling method | Air-cooled [1] | | |
| Center wavelength | 1030 ± 10 nm | | |
| Maximum output power | 6 W | 5 W | |
| Pulse duration [2] | < 290 fs | | < 190 fs |
| Pulse duration tuning range | 290 fs – 20 ps | | 190 fs – 20 ps |
| Maximum pulse energy | 100 µJ | 83 µJ | 100 µJ |
| Repetition rate | Single-shot – 1 MHz | | |
| Pulse selection | Single-shot, pulse-on-demand, any fundamental repetition rate division | | |
| Polarization | Linear, vertical; 1 : 1000 | | |
| Beam quality, $M^2$ | < 1.2 | | |
| Beam diameter [3] | 2.1 ± 0.4 mm | | |
| Beam pointing stability | < 20 µrad | | |
| Pulse energy control | Attenuator [4] | AOM [5] | Attenuator [4] |
| Pulse picker leakage | < 2% | < 0.1% | < 2% |
| Pulse-to-pulse energy stability, 12 h [6] | < 0.5% | | |
| Long-term power stability, 100 h [6] | < 0.3% | | |
| **MAIN OPTIONS** | | | |
| Oscillator output | n/a | | |
| Harmonic generator [7] | 515 nm, 343 nm, 257 nm, or 206 nm; refer to CARBIDE HG | | |
| Optical parametric amplifier [8] | UV – MIR; refer to I-OPA or ORPHEUS | | |
| BiBurst option | n/a | | |
| **DIMENSIONS** | | | |
| Laser head (L × W × H) | 633 × 324 × 162 mm | | |
| Chiller | Not required | | |
| 24 V DC power supply (L × W × H) | 220 × 95 × 46 mm | | |
| **ENVIRONMENTAL & UTILITY REQUIREMENTS** | | | |
| Operating temperature | 17 – 27 °C | | |
| Relative humidity | < 80% (non-condensing) | | |
| Electrical requirements | 100 V AC, 3 A – 240 V AC, 1.3 A; 50 – 60 Hz | | |
| Rated power | 280 W | | |
| Power consumption | 250 W | | |

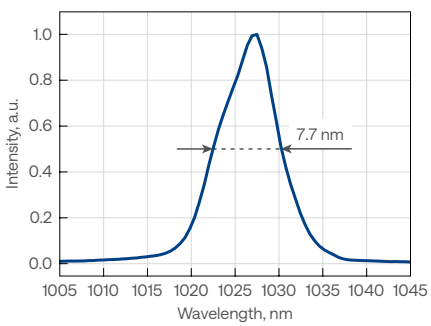
[1] *Water-cooled version available on request.*
[2] *Assuming a Gaussian pulse shape.*
[3] *FW 1/$e^2$, using maximum pulse energy.*
[4] *Waveplate-based variable optical attenuator (VOA); an external analog control input is available.*
[5] *Enhanced contrast AOM. Provides fast, full-scale individual pulse energy control; an external analog control input is available.*
[6] *Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).*
[7] *Integrated. For an external harmonic generator, refer to HIRO.*
[8] *Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.*



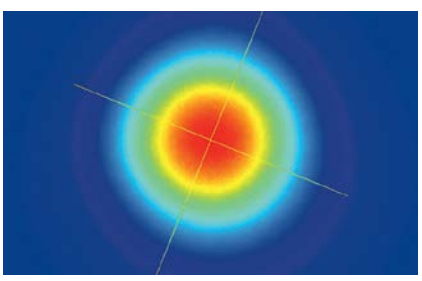

CARBIDE-CB5
Typical pulse duration



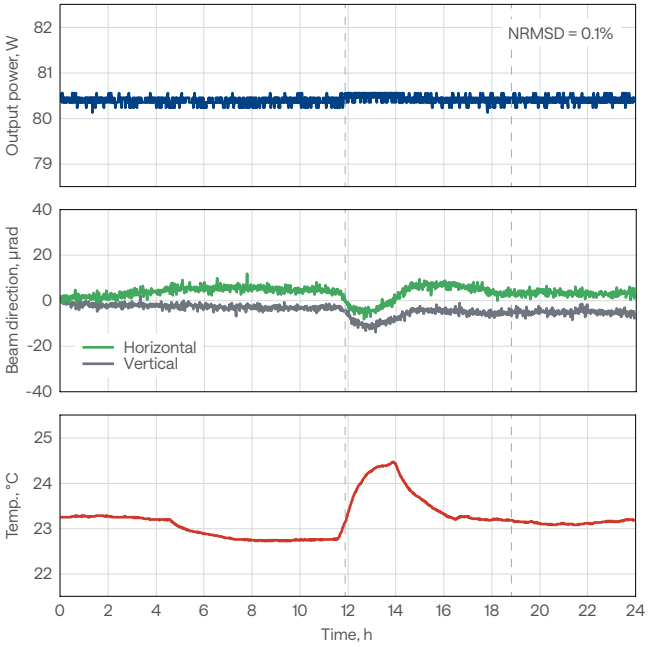

CARBIDE-CB5
Typical spectrum



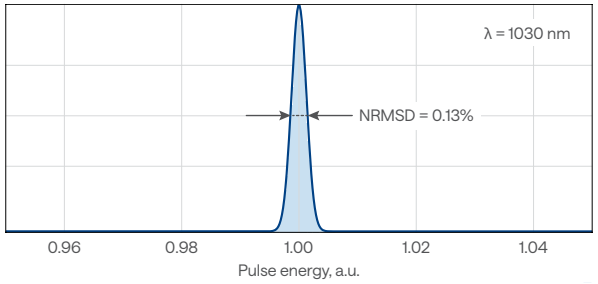

CARBIDE-CB5
Typical beam profile



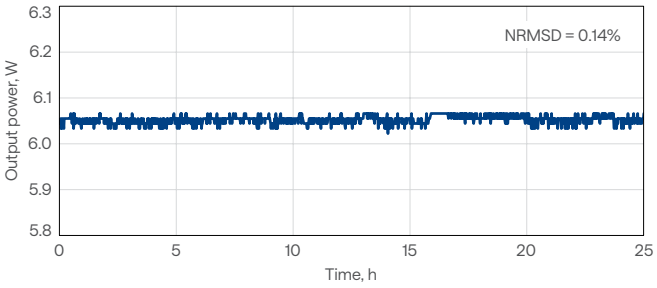
**CARBIDE-CB3** output power and beam direction stability with power lock enabled, across varying environmental conditions




**CARBIDE-CB3**
Typical pulse-to-pulse energy stability

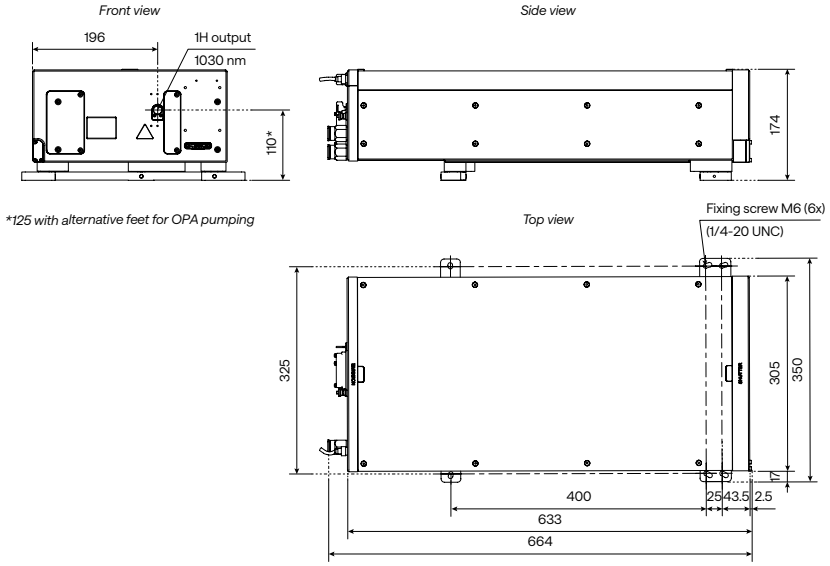



**CARBIDE-CB5-6W**
Long-term power stability

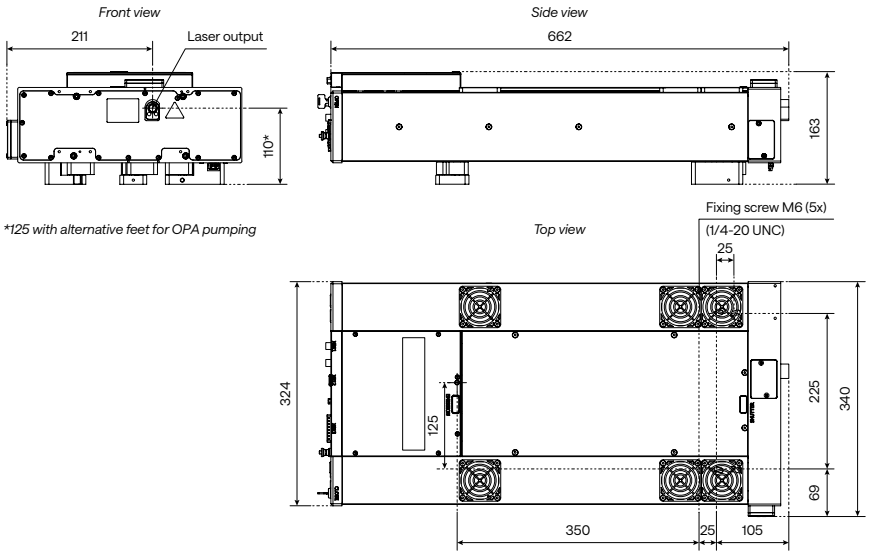



## Drawings

### CARBIDE-CB3




Air-cooled **CARBIDE-CB5** with an attenuator




*The drawings depend on the exact configuration. If crucial for integration, please contact sales@lightcon.com.*

# PHAROS

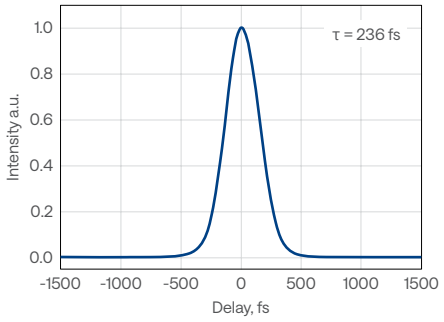
## High-Energy Femtosecond Lasers

NEW

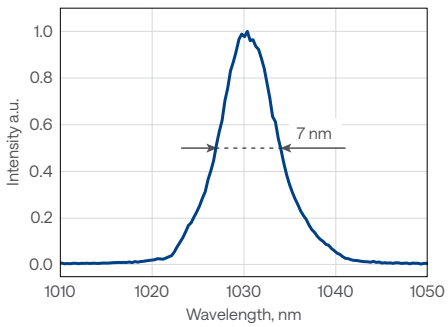
- Maximum pulse energy of up to 5 mJ
- Down to < 100 fs right at the output
- Tunable pulse duration, 100 fs – 20 ps
- Pulse-on-demand and BiBurst for pulse control
- Automated harmonics up to the 5th and wavelength-tunable extensions



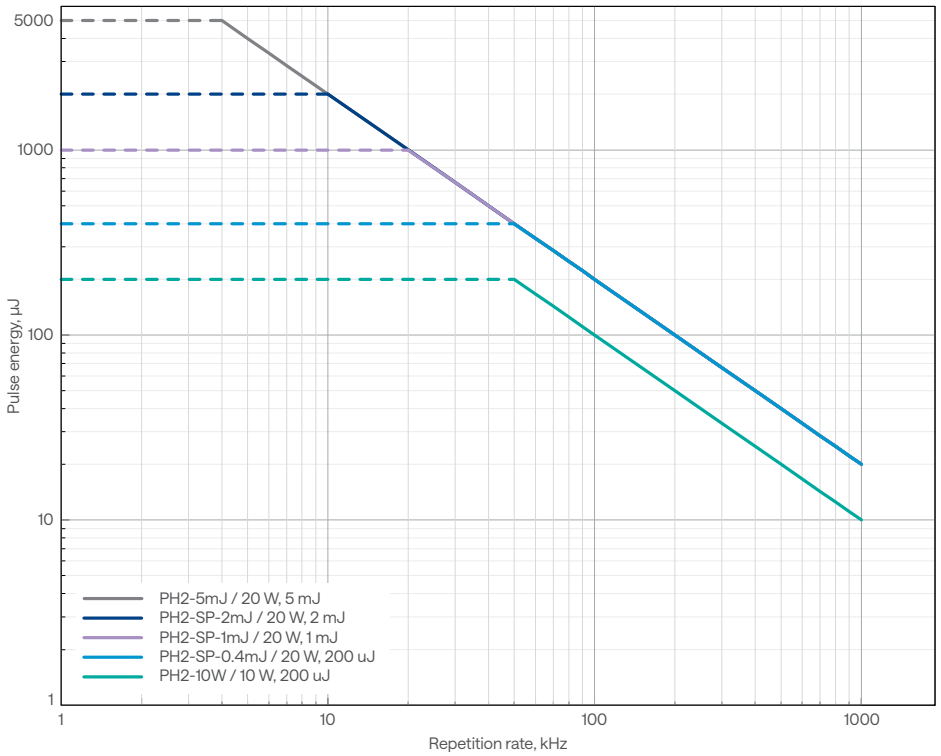

**PHAROS-PH2-5mJ**
Typical pulse duration




**PHAROS-PH2-5mJ**
Typical spectrum




**PHAROS**
Pulse energy vs fundamental repetition rate



# Specifications

NEW

| Model | PH2-10W | PH2-SP | | | PH2-5mJ | PH2-UP | |
|---|---|---|---|---|---|---|---|
| **OUTPUT CHARACTERISTICS** | | | | | | | |
| Center wavelength [1] | 1030 ± 10 nm | | | | | | |
| Maximum output power | 10 W | 20 W | | | | | |
| Pulse duration [2] | < 290 fs | < 190 fs | | | < 250 fs | < 100 fs | |
| Pulse duration tuning range | 290 fs – 10 ps (20 ps on request) | 190 fs – 10 ps (20 ps on request) | | | n/a | 100 fs – 10 ps | |
| Maximum pulse energy | 0.2 mJ | 0.4 mJ | 1 mJ | 2 mJ | 5 mJ | 0.4 mJ | 1 mJ |
| Repetition rate | Single-shot – 1 MHz | | | | | | |
| Pulse selection | Single-shot, pulse-on-demand, any fundamental repetition rate division | | | | | | |
| Polarization | Linear, horizontal | | | | | | |
| Beam quality, $M^2$ | < 1.2 | | < 1.3 | | | < 1.2 | |
| Beam diameter [3] | 3.3 ± 0.5 mm | 4.0 ± 0.5 mm | 4.5 ± 0.5 mm | 6.8 ± 0.7 mm | 11 ± 0.5 mm | 4.5 ± 0.5 mm | 6 ± 0.5 mm |
| Beam pointing stability | < 20 µrad/°C | | | | | | |
| Pre-pulse contrast | < 1 : 1000 | | | | | | |
| Post-pulse contrast | < 1 : 200 | | | | | | |
| Pulse-to-pulse energy stability, 8 h [4] | < 0.5% | | | | | | |
| Long-term power stability, 100 h [4] | < 0.3% | | | | | | |
| **MAIN OPTIONS** | | | | | | | |
| Oscillator output [5] | 1 – 7 W, 50 – 250 fs, ≈ 1035 nm, ≈ 76 MHz | | | | | | |
| Harmonic generator [6] | 515 nm, 343 nm, 257 nm, or 206 nm; refer to PHAROS HG or HIRO | | | | | | |
| Optical parametric amplifier [7] | UV – MIR; refer to I-OPA or ORPHEUS | | | | | | |
| BiBurst option | Tunable GHz and MHz burst with burst-in-burst capability; refer to BiBurst | | | | | | |
| CEP stabilization | Refer to CEP & RRL Option | | | | | | |
| Repetition rate locking | | | | | | | |
| **DIMENSIONS** | | | | | | | |
| Laser head (L × W × H) [8] | 730 × 419 × 230 mm | | | | 827 × 492 × 250 mm | 770 × 419 × 230 mm | |
| Chiller (L × W × H) | 590 × 484 × 267 mm | | | | | | |
| 24 V DC power supply (L × W × H) [8] | 280 × 144 × 49 mm | | | | | | |
| **ENVIRONMENTAL & UTILITY REQUIREMENTS** | | | | | | | |
| Operating temperature | 15 – 30 °C (air conditioning recommended) | | | | | | |
| Relative humidity | < 80% (non-condensing) | | | | | | |
| Electrical requirements – Laser | 100 V AC, 12 A – 240 V AC; 5 A, 50 – 60 Hz | | | | | | |
| Electrical requirements – Chiller | 100 – 230 V AC; 50 – 60 Hz | | | | | | |
| Rated power – Laser | 1000 W | | | | | | |
| Rated power – Chiller | 1400 W | | | | | | |
| Power consumption – Laser | 600 W | | | | | | |
| Power consumption – Chiller | 1000 W | | | | | | |

[1] *Precise wavelengths for specific models are available upon request.*

[2] *Assuming a Gaussian pulse shape.*

[3] *FW 1/e², measured at laser output, using maximum pulse energy.*

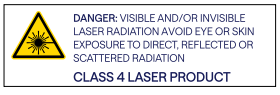
[4] *Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).*

[5] *Available simultaneously. Contact sales@lightcon.com for more details or customized solutions.*

[6] *Integrated except for PH2-5mJ. For an external harmonic generator, refer to HIRO.*

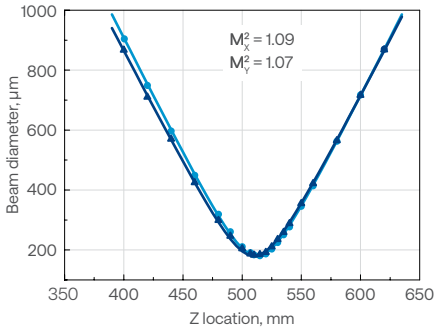
[7] *Integrated except for PH2-20W-SP-2mJ and PH2-5mJ. For more options and OPAs, refer to the ORPHEUS series of OPAs.*

[8] *Dimensions depend on the laser configuration and integrated options.*

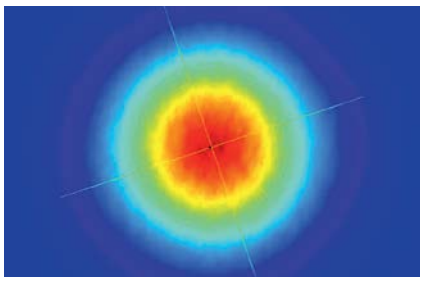


# Beam properties

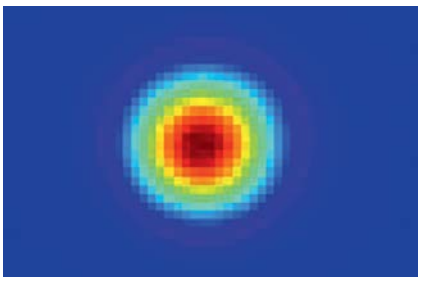
**PHAROS**
Typical $M^2$ measurement data




**PHAROS**
Typical near-field beam profile

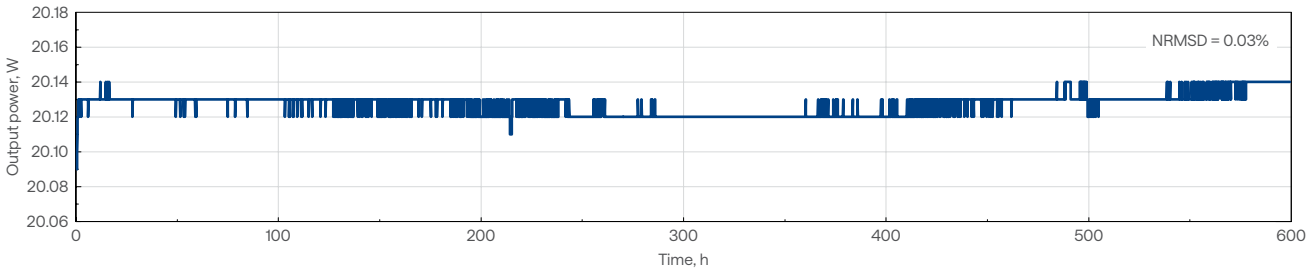


**PHAROS**
Typical far-field beam profile

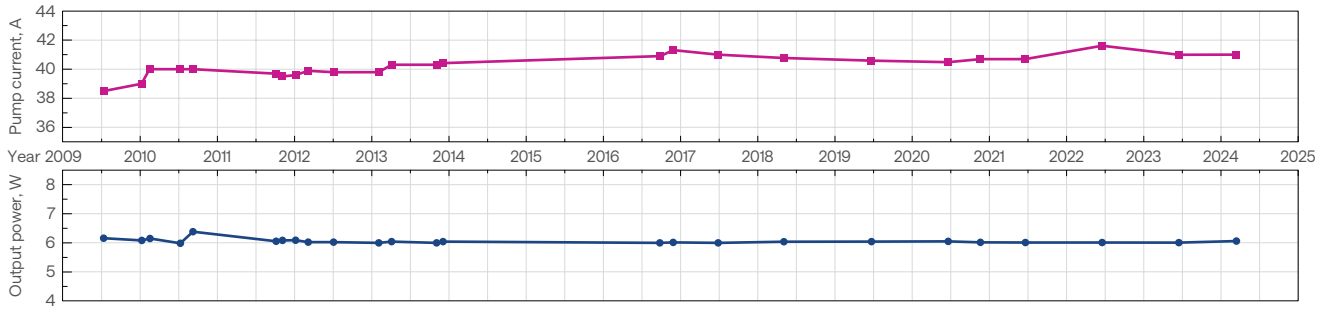


# Stability measurements

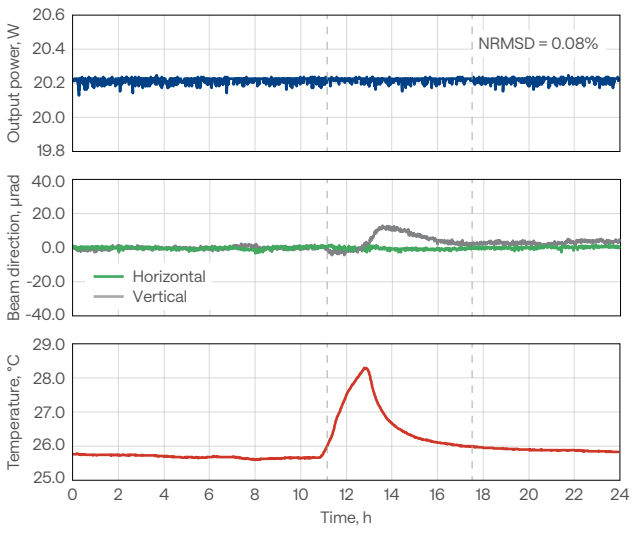
**PHAROS**
Long-term power stability



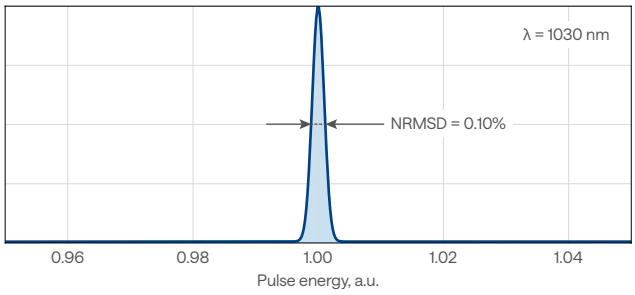

Output power of industrial-grade **PHAROS** lasers operating 24/7 and the current of the pump diodes over the years




**PHAROS** output power and beam pointing stability with power lock enabled, across varying environmental conditions



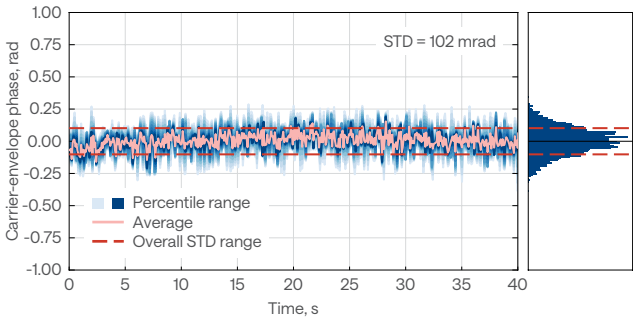

**PHAROS**
Typical pulse-to-pulse energy stability



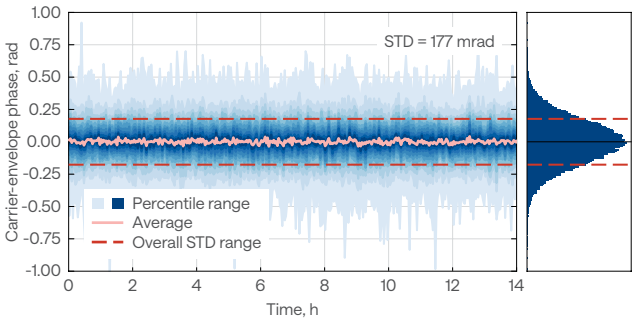
## CEP stabilization

**PHAROS** lasers can be equipped with feedback electronics for carrier-envelope phase (CEP) stabilization of the output pulses. The carrier-envelope offset (CEO) of the **PHAROS** oscillator is actively locked to 1/4$^{th}$ of the repetition rate with a < 100 mrad standard deviation. The CEP stable pulses from the synchronized amplifier have a < 350 mrad standard deviation. The CEP drift occurring inside the amplifier and the user's setup can be compensated with an out of loop f-2f interferometer, which is a part of the complete **PHAROS** active CEP stabilization package.

**PHAROS**
Short-term CEP stability operating at 200 kHz repetition rate




**PHAROS**
Long-term CEP stability operating at 200 kHz repetition rate

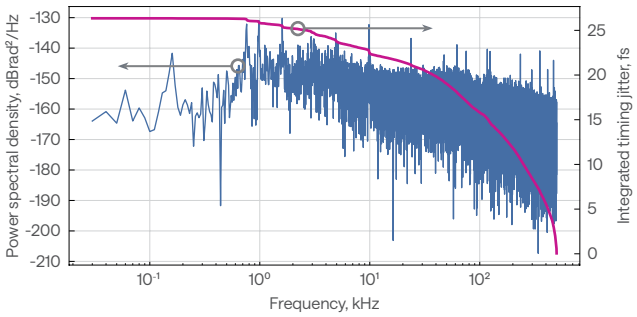



## Repetition rate locking

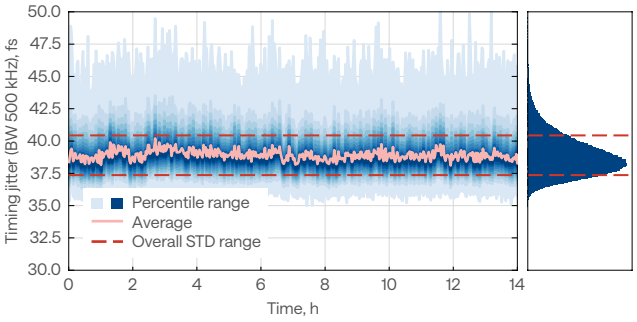
The oscillators in **PHAROS** lasers can be customized for repetition rate locking applications. Coupled with the necessary feedback electronics, the oscillator's repetition rate can be synchronized to an external RF source using the two piezo stages installed within the cavity.

The repetition rate locking system ensures an integrated timing jitter of less than 200 fs for RF reference frequencies above 500 MHz. Additionally, continuous phase shifting is available upon request.

Phase noise data of **PHAROS** oscillator
locked to a 2.8 GHz RF source

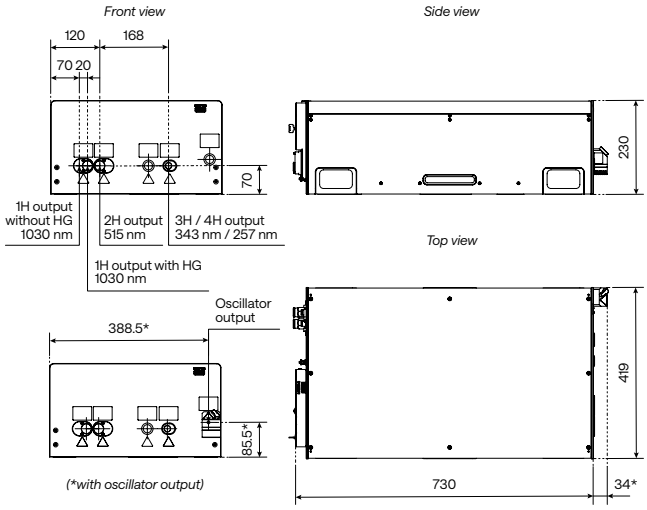



Timing jitter stability over 14 h
**PHAROS** oscillator locked to a 2.8 GHz RF source

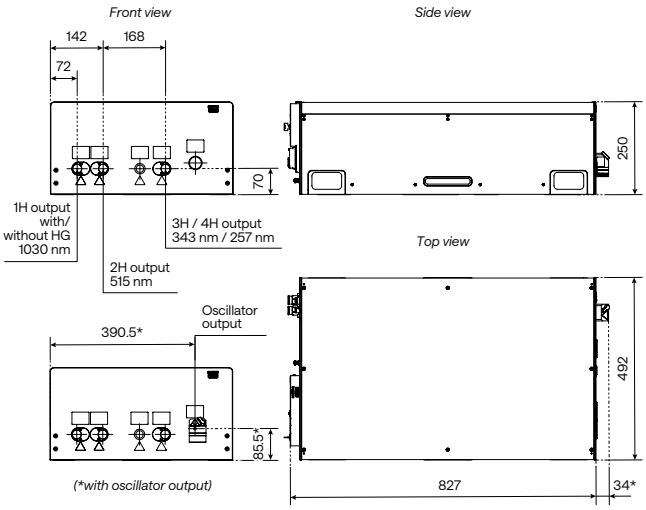



## Drawings

**PHAROS-PH2-730**
-10W or -20W-SP with a FEC or BiBurst option, or a harmonic generator




**PHAROS-PH2-827**
-10W with an -HE harmonic generator option, or -5mJ




*The drawings depend on the exact configuration. If crucial for integration, please contact sales@lightcon.com.*

# HIRO

## External Harmonic Generators

- 515 nm, 343 nm, 257 nm, and 206 nm outputs
- Simple selection of the active harmonic
- Simultaneous or switchable outputs
- Standalone harmonics module for CARBIDE, PHAROS



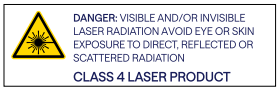

### HIRO for CARBIDE or PHAROS

| Model | HIRO | HIRO-HP | HIRO-HE |
|---|---|---|---|
| Maximum pump power | 20 W | 80 W | |
| Pump pulse energy | 8 – 400 µJ | 200 – 1000 µJ | 1000 – 4000 µJ |
| Available outputs [1) 2)] | Up to 4H [3)] | Up to 5H | |
| Conversion efficiency [1) 4)] | > 50% (2H)<br>> 25% (3H)<br>> 10% (4H) [5)]<br>> 5% (5H) [6) 7)] | | |
| Polarization [8)] | Linear, horizontal (2H, 5H)<br>Linear, vertical (3H, 4H) | | |

**DIMENSIONS**

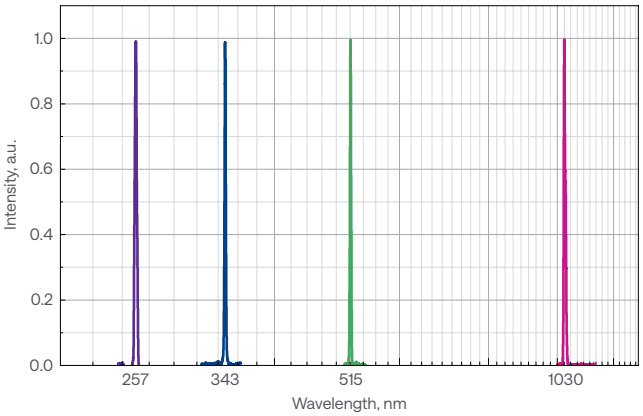
| | | |
|---|---|---|
| Dimensions (L × W × H) | 487 × 176 × 180 mm | 552 × 320 × 170 mm |

1) *For harmonic combinations and simultaneous outputs, contact sales@lightcon.com.*
2) *Residual fundamental output available upon request.*
3) *White light continuum output available upon request.*
4) *Percentage of pump power, for repetition rate of up to 1 MHz.*
5) *Maximum output power of 1 W.*
6) *Maximum ouput power of 150 mW. Only for HIRO-HP/HE.*
7) *> 1 % when pumped with PHAROS-UP.*
8) *Different polarization is available upon request.*

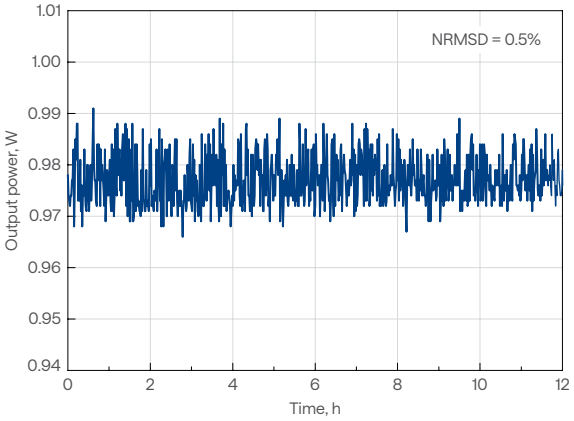


# Performance

**HIRO** outputs

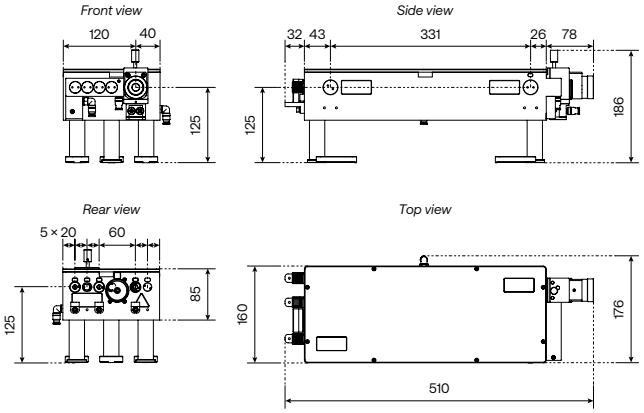



4H output power stability

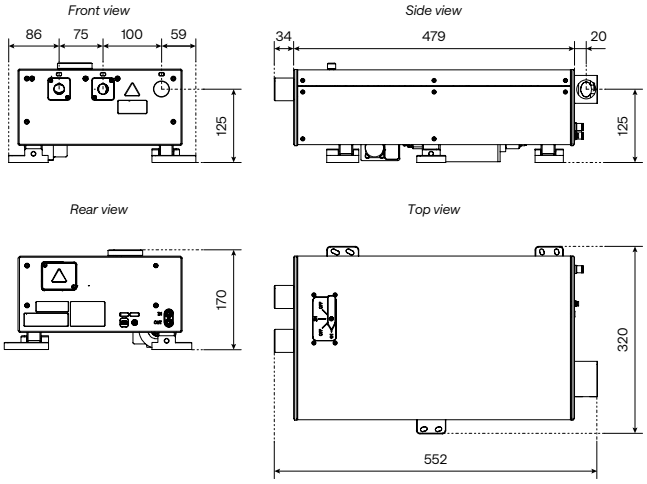


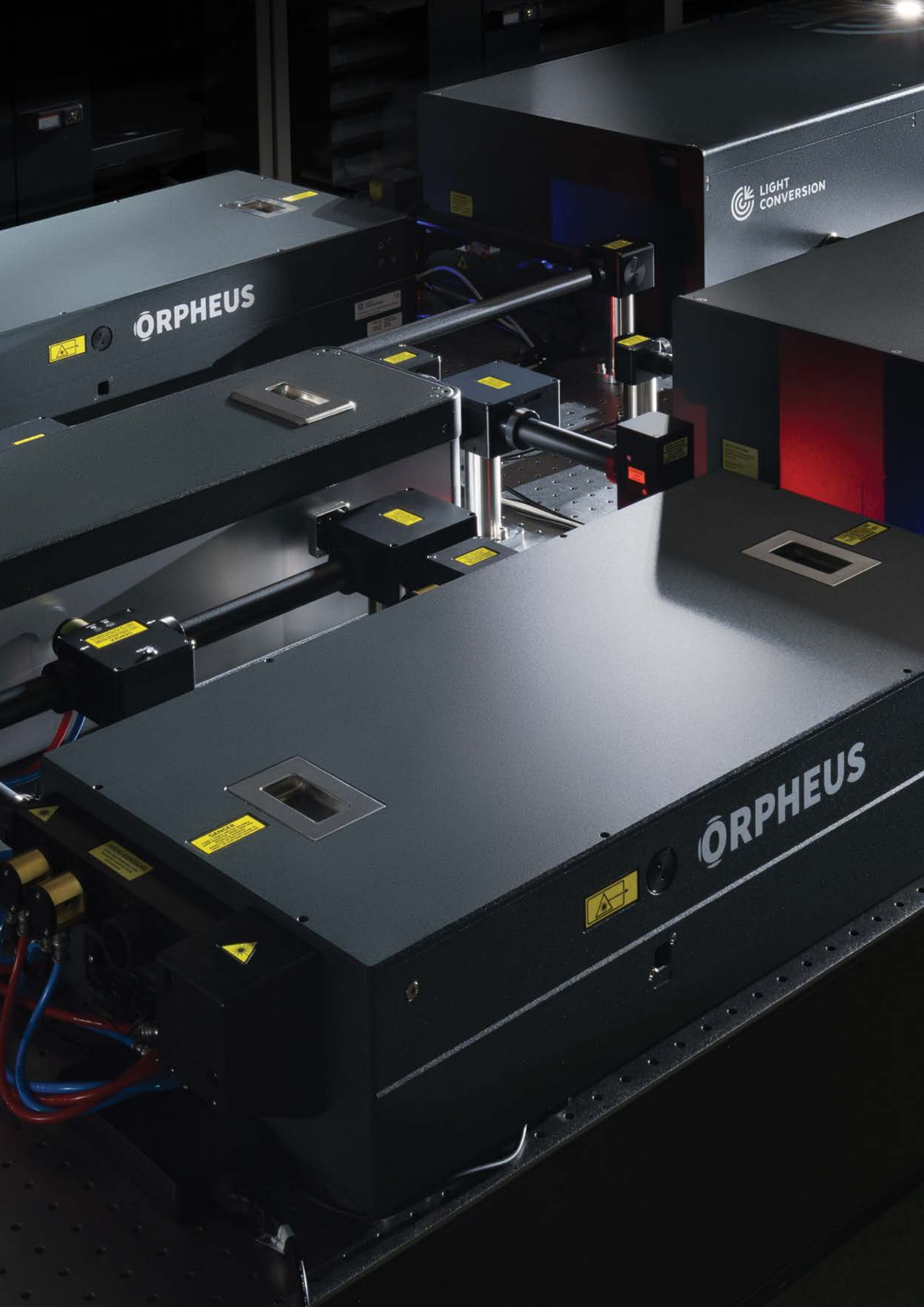

# Drawings

HIRO




HIRO-HP/HE




ORPHEUS
LIGHT
CONVERSION
ORPHEUS

# Wavelength-Tunable Sources

Coupled with femtosecond lasers, these OPAs provide an invaluable source for ultrafast spectroscopy, nonlinear microscopy, and a variety of other scientific applications.

Continuous wavelength tunability from UV to MIR

Pulse durations from tens of femtoseconds to a few picoseconds

Leading OPA manufacturer for more than 30 years

## I-OPA

The only industrial-grade commercial OPA, combining wavelength tunability with compact and robust design.

## ORPHEUS

A classic OPA platform that many are familiar with – simple to use yet offers an extensive range of parameters.

## ORPHEUS | NEO

Next-generation OPA featuring exceptional stability and multiple detectors for continuous power monitoring and diagnostics.

# I-OPA

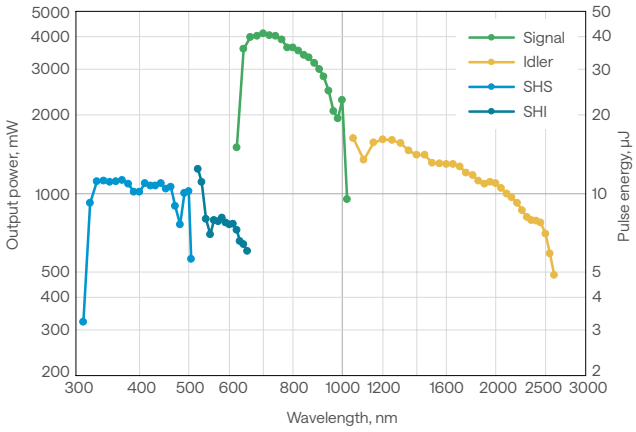
## Industrial-Grade Optical Parametric Amplifiers

- Wavelength tunability in an industrial design
- Single-box solution
- Tunable or fixed-wavelength models
- Plug-and-play installation and robust performance
- The most compact OPA in the market

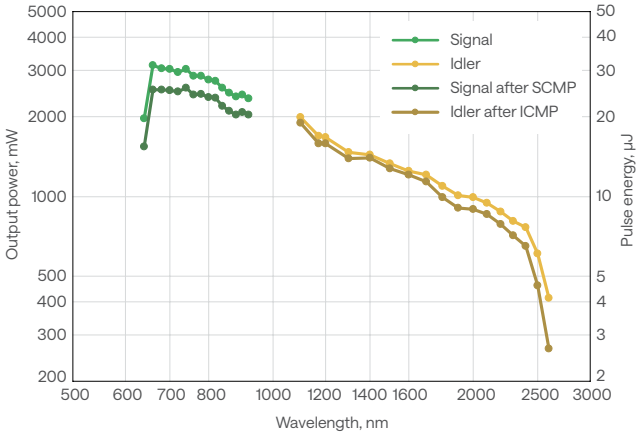



CARBIDE-CB3 with I-OPA-HP

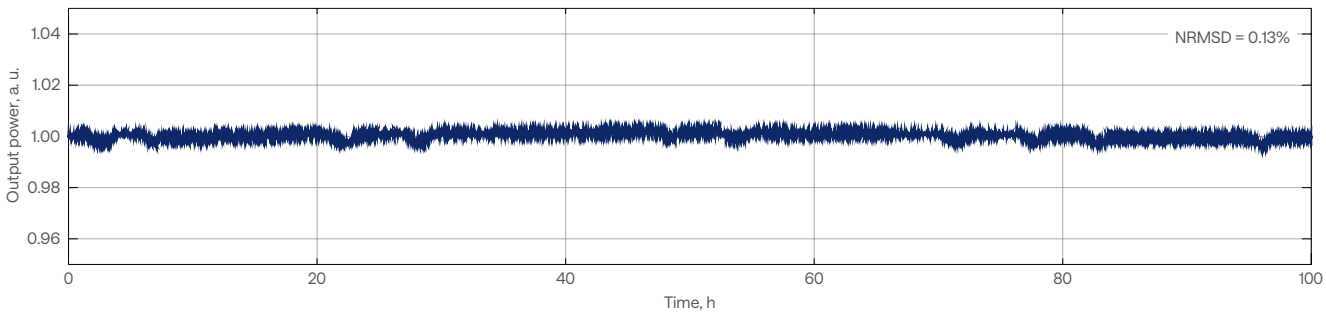
**I-OPA-HP** typical tuning curves
Pump: 40 W, 400 µJ, 100 kHz




**I-OPA-F** typical tuning curves
Pump: 40 W, 400 µJ, 100 kHz




**I-OPA-HP**
Typical power stability at 1300 nm



# Specifications

| Model | I-OPA-HP | I-OPA-F | I-OPA-ONE |
|---|---|---|---|
| Pump power | Up to 40 W | | |
| Pump pulse energy | 20 – 400 µJ | | |
| Repetition rate | Up to 2 MHz | | |
| Tuning range [1] | 640 – 1010 nm (signal)<br>1050 – 2600 nm (idler) | 650 – 920 nm (signal)<br>1200 – 2500 nm (idler) | 1350 – 2000 nm (signal)<br>2100 – 4500 nm (idler) |
| Conversion efficiency | > 7% @ 700 nm<br>(40 – 400 µJ pump; up to 1 MHz) | | > 9% @ 1550 nm<br>(40 – 400 µJ pump; up to 1 MHz) |
| | > 3.5% @ 700 nm<br>(20 – 40 µJ pump; up to 2 MHz) | | > 6% @ 1550 nm<br>(20 – 40 µJ pump; up to 2 MHz) |
| Spectral bandwidth [2] | 80 – 220 $cm^{-1}$ @ 700 – 960 nm | 200 – 1000 $cm^{-1}$ @ 650 – 920 nm<br>150 – 1000 $cm^{-1}$ @ 1200 – 2000 nm | 60 – 150 $cm^{-1}$ @ 1450 – 2000 nm |
| Pulse duration [2] [3] | 120 – 250 fs | < 55 fs @ 800 – 920 nm<br>< 70 fs @ 650 – 800 nm<br>< 100 fs @ 1200 – 2000 nm | 100 – 300 fs |
| Long-term power stability, 8 h [4] | < 1% @ 800 nm | | < 1% @ 1550 nm |
| Pulse-to-pulse energy stability, 1 min [4] | < 1% @ 800 nm | | < 1% @ 1550 nm |
| Wavelength extension options | 320 – 505 nm (SHS) [5]<br>525 – 640 nm (SHI) [5] | Contact<br>sales@lightcon.com | 4500 – 10 000 nm (DFG) |
| Pulse compression options [2] | n/a | SCMP (signal pulse compressor)<br>ICMP (idler pulse compressor)<br>GDD-CMP (compressor with GDD control) | n/a |

## PUMP LASER REQUIREMENTS

| | |
|---|---|
| Pump laser | CARBIDE or PHAROS |
| Center wavelength | 1030 ± 10 nm |
| Maximum pump power | 40 W |
| Maximum repetition rate | Up to 2 MHz |
| Pump pulse energy | 20 – 400 µJ |
| Pulse duration | 180 – 300 fs |

## ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

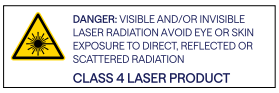
[1] *In the case of a fixed wavelength (FW), a single wavelength can be selected from the signal or idler range. The signal may have an accessible idler pair, and vice versa.*

[2] *I-OPA-F broad-bandwidth pulses are compressed externally. Typical pulse duration before compression: 120 – 250 fs, after compression: 25 – 70 fs @ 650 – 920 nm, 40 – 100 fs @ 1200 – 2000 nm.*

[3] *Output pulse duration depends on the selected wavelength and the pump laser pulse duration.*

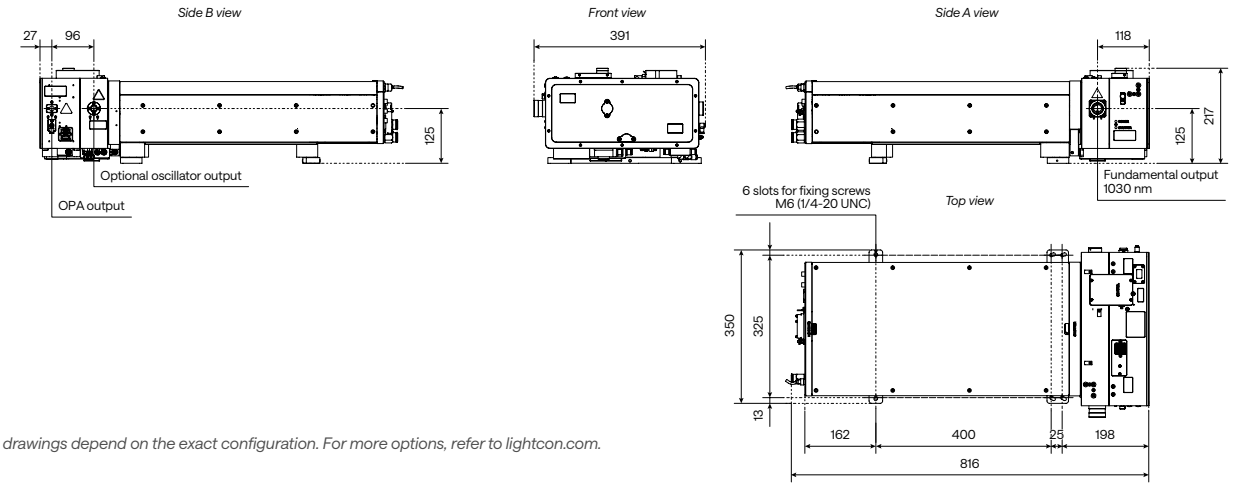
[4] *Expressed as normalized root mean squared deviation (NRMSD).*

[5] *Conversion efficiency is 1.2% at peak; specified as a percentage of pump power.*




# Drawings

CARBIDE-CB3 with I-OPA-HP




*The drawings depend on the exact configuration. For more options, refer to lightcon.com.*

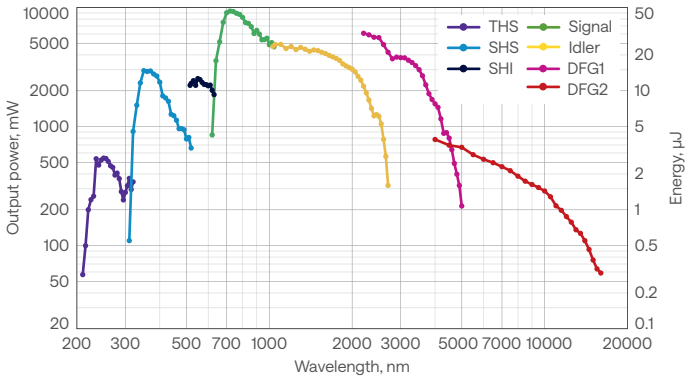
# ORPHEUS

## Optical Parametric Amplifiers

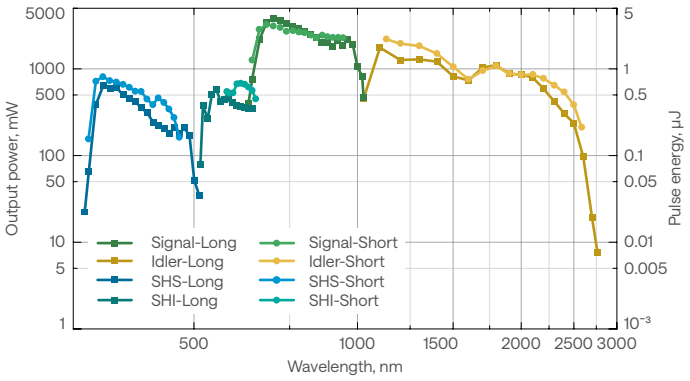
- Continuous tunability from UV to MIR, 190 – 16 000 nm
- Single-shot – 2 MHz repetition rate
- Up to 80 W pump power
- Up to 0.4 mJ pump pulse energy



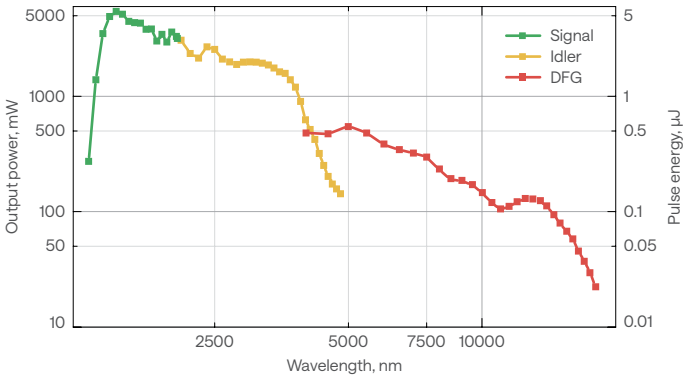

**ORPHEUS** typical tuning curves
Pump: 80 W, 400 µJ, 200 kHz




**ORPHEUS-F** typical tuning curves
Pump: 40 W, 40 µJ, 1000 kHz




**ORPHEUS-ONE** typical tuning curves
Pump: 40 W, 40 µJ, 1000 kHz




Optics Toolbox

# Specifications

| Model | ORPHEUS | | ORPHEUS-F | ORPHEUS-ONE |
|---|---|---|---|---|
| Tuning range [1] | 630 – 1030 nm (signal)<br>1030 – 2600 nm (idler) | | 650 – 900 nm (signal)<br>1200 – 2500 nm (idler) [2] | 1400 – 2000 nm (signal)<br>2100 – 4200 nm (idler) |
| Pump power | Up to 80 W | | | |
| Repetition rate | Up to 2 MHz | | | |
| Pump pulse energy [3] | 8 – 20 µJ | 20 – 400 µJ | 10 – 400 µJ | 12 – 400 µJ |
| Conversion efficiency | > 4.5% @ peak (signal)<br>> 2% @ peak (idler) | > 9% @ peak (signal)<br>> 4% @ peak (idler) | > 7% @ 700 nm [4] | > 9%, 30 – 400 µJ pump @ 1550 nm<br>> 6%, 12 – 30 µJ pump @ 1550 nm |
| Pulse duration | 120 – 400 fs | | < 55 fs<br>@ 800 – 900 nm [5]<br>< 70 fs<br>@ 650 – 800 nm [5]<br>< 100 fs<br>@ 1200 – 2000 nm [5] | 100 – 300 fs |
| Spectral bandwidth | 60 – 220 $cm^{-1}$ | | 200 – 750 $cm^{-1}$<br>@ 650 – 900 nm | 50 – 150 $cm^{-1}$ @ 1450 – 2000 nm |
| Long-term power stability, 8 h [6] | < 2% @ 800 nm | | | < 2% @ 1550 nm |
| Pulse-to-pulse energy stability, 1 min [6] | < 2% @ 800 nm | | | < 2% @ 1550 nm |
| Compressor transmission | n/a | | 65% @ 650 – 900 nm<br>80% @ 1200 – 2000 nm | n/a |

## WAVELENGTH EXTENSIONS

| | | | | |
|---|---|---|---|---|
| DUV | n/a | 190 – 215 nm:<br>> 0.3% @ 200 nm [7] | n/a | n/a |
| THS | 210 – 315 nm:<br>> 0.4% @ 250 nm [8] | 210 – 315 nm:<br>> 0.8% @ 250 nm [8] | n/a | n/a |
| SHS, SHI | 315 – 630 nm:<br>> 1.2% @ 350 nm | 315 – 630 nm:<br>> 2.4% @ 350 nm | 325 – 450 nm:<br>> 1% @ peak<br>600 – 650 nm:<br>0.5% @ peak | n/a |
| DFG | 2200 – 4200 nm:<br>> 1.5% @ 3000 nm | 2200 – 4200 nm:<br>> 3% @ 3000 nm | n/a | 4000 – 16 000 nm:<br>> 0.3% @ 10 000 nm, 30 – 2000 µJ pump<br>> 0.2% @ 10 000 nm, 12 – 30 µJ pump |
| | 4000 – 16 000 nm:<br>> 0.1% @ 10 000 nm | 4000 – 16 000 nm:<br>> 0.2% @ 10 000 nm | | |

## PUPM LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

[1] *Dual output model (-TWINS) available, providing two optically synchronized and simultaneous outputs.*

[2] *Long pulse mode is optional, providing 650 – 1010 nm (signal) and 1050 – 2500 nm (idler) range at < 290 fs.*

[3] *Pump pulse energy up to 5 mJ applicable, refer to ORPHEUS-HE.*

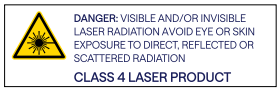
[4] *Specified before pulse compressor. Conversion efficiency at peak is 10% for signal and idler combined.*

[5] *After pulse compression. Typical pulse duration before compression: 120 – 250 fs, after compression: 25 – 70 fs @ 650 – 920 nm, 40 – 100 fs @ 1200 – 2000 nm.*

[6] *Expressed as normalized root mean squared deviation (NRMSD).*

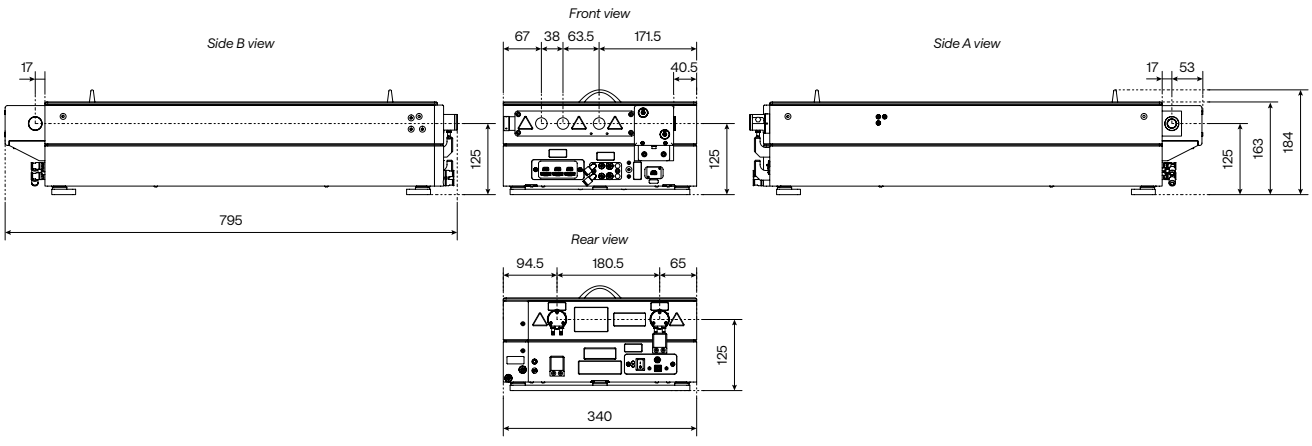
[7] *DUV conversion efficiency is specified for pump power up to 10 W and frequencies up to 200 kHz. In the case of higher pump power, conversion efficiency decreases. The maximum output power is 40 mW at 200 nm.*

[8] *For > 15 µJ pump pulse energy.*




# Drawings

ORPHEUS



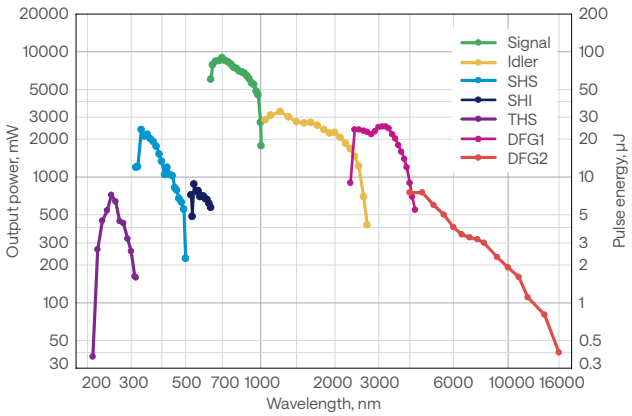
# ORPHEUS | NEO

## Next-Generation Optical Parametric Amplifiers

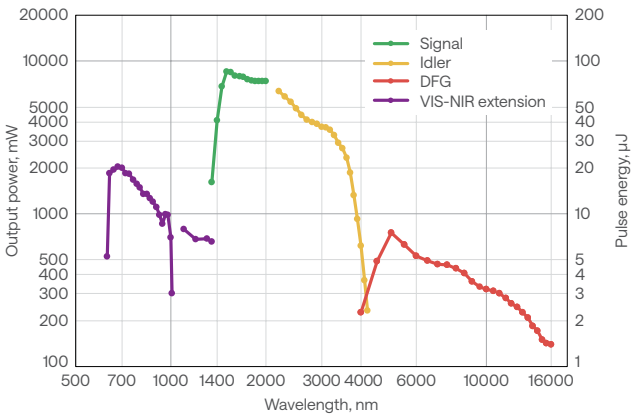
- Wavelength range from UV to MIR, 210 – 16 000 nm
- Continuous power monitoring and diagnostics
- Pumped by PHAROS-UP for 100 fs pulses
- Supports up to 80 W, 800 µJ pump at 2 MHz
- Fully integrated wavelength extensions



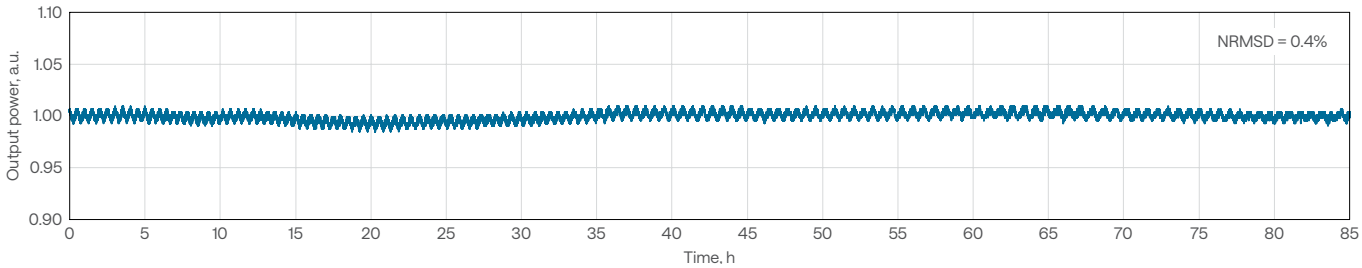

**ORPHEUS-NEO** typical tuning curves
Pump: 80 W, 800 µJ, 100 kHz




**ORPHEUS-NEO-ONE** typical tuning curves
Pump: 80 W, 800 µJ, 100 kHz




**ORPHEUS-NEO** typical long-term power stability at 800 nm



# ORPHEUS-NEO specifications

| Model | ORPHEUS-NEO | ORPHEUS-NEO-ONE | ORPHEUS-NEO-UP | ORPHEUS-NEO-ONE-UP |
|---|---|---|---|---|
| Pump laser | CARBIDE or PHAROS | | PHAROS-UP | |
| Pump power | Up to 80 W | | Up to 20 W | |
| Pump pulse energy | 20 – 800 µJ | | 20 – 400 µJ | |
| Repetition rate | Up to 2 MHz | | Up to 1 MHz | |
| Tuning range | 640 – 1000 nm (signal)<br>1050 – 2600 nm (idler) | 1400 – 2000 nm (signal)<br>2100 – 4200 nm (idler) | 640 – 1000 nm (signal)<br>1050 – 2600 nm (idler) | 1450 – 2000 nm (signal)<br>2100 – 4500 nm (idler) |
| Conversion efficiency | > 7% @ 700 nm<br>(40 – 800 µJ pump; up to 1 MHz) | > 9% @ 1550 nm<br>(40 – 800 µJ pump; up to 1 MHz) | > 7% @ 700 nm | > 9% @ 1550 nm |
| | > 3.5% @ 700 nm<br>(20 – 40 µJ pump; up to 2 MHz) | > 6% @ 1550 nm<br>(20 – 40 µJ pump; up to 2 MHz) | | |
| Spectral bandwidth | 60 – 220 $cm^{-1}$<br>@ 700 – 960 nm | 50 – 150 $cm^{-1}$<br>@ 1450 – 2000 nm | 120 – 300 $cm^{-1}$<br>@ 700 – 2600 nm | 150 – 300 $cm^{-1}$<br>@ 1500 – 1900 nm;<br>2200 – 3500 nm [1] |
| Pulse duration [2] | 120 – 400 fs | 100 – 400 fs | < 110 fs @ 700 – 1000 nm<br>< 120 fs @ 1060 – 2000 nm | < 120 fs @ 1500 – 1900 nm |
| Beam quality, $M^2$ | < 1.3 @ 800 nm | < 1.3 @ 1550 nm | < 1.3 @ 800 nm | < 1.3 @ 1550 nm |
| Beam diameter [3] | 2.1 ± 0.9 mm @ 800 nm | 2.1 ± 0.9 mm @ 1550 nm | 2.1 ± 0.9 mm @ 800 nm | 2.1 ± 0.9 mm @ 1550 nm |
| Beam divergence (full-angle) | < 2 mrad @ 800 nm | < 4 mrad @ 1550 nm | < 2 mrad @ 800 nm | < 4 mrad @ 1550 nm |
| Long-term power stability, 8 h [4] | < 1% @ 800 nm | < 1% @ 1550 nm | < 1% @ 800 nm | < 1% @ 1550 nm |
| Pulse-to-pulse energy stability, 1 min [4] | < 1% @ 800 nm | < 1% @ 1550 nm | < 1% @ 800 nm | < 1% @ 1550 nm |

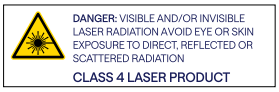
## WAVELENGTH EXTENSIONS

| | | | | |
|---|---|---|---|---|
| Conversion efficiency | 210 – 320 nm (THS)<br>> 0.4% @ 250 nm | n/a | 210 – 320 nm (THS)<br>0.2% @ 250 nm | n/a |
| | 320 – 500 nm (SHS) and<br>525 – 640 nm (SHI)<br>> 1.2% @ 350 nm | | 320 – 500 nm (SHS) and<br>525 – 640 nm (SHI)<br>1.2% @ 350 nm | |
| | n/a | 640 – 1000 nm and<br>1050 – 1350 nm<br>> 1% @ 700 nm | n/a | 640 – 1000 nm and<br>1050 – 1450 nm<br>> 1% @ 700 nm |
| | 2500 – 4200 nm (DFG1)<br>> 3% @ 3000 nm | 4000 – 16 000 nm (DFG) [5]<br>> 0.3% @ 10 000 nm<br>(for > 40 µJ pump) | 2500 – 4500 nm (DFG1)<br>3% @ 3000 nm | 4500 – 14 000 nm (DFG) [5]<br>0.2% @ 10 000 nm |
| | 4000 – 16 000 nm (DFG2) [5]<br>> 0.2% @ 10 000 nm | | 4500 – 14 000 nm (DFG2) [5]<br>0.1% @ 10 000 nm | |

## PUMP LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS

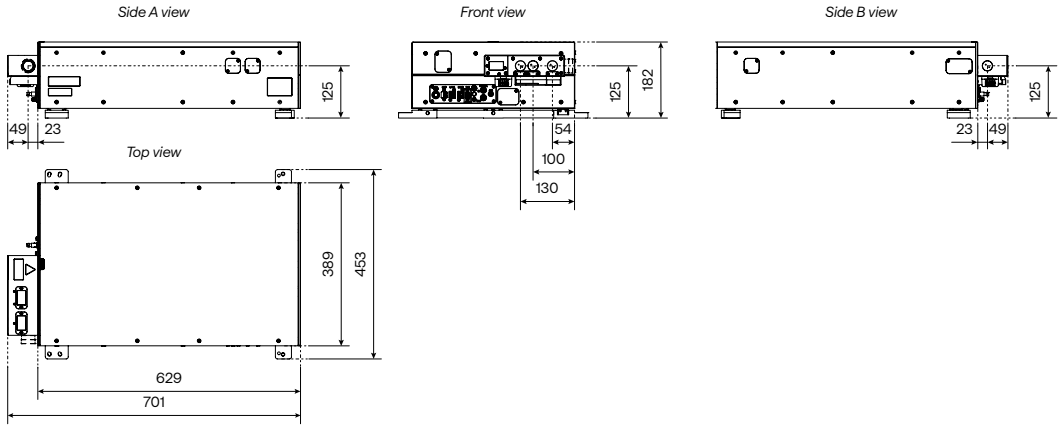
Refer to lightcon.com

[1] *Spectral bandwidth is equal to 150 – 250 $cm^{-1}$ @ 5000 – 12 000 nm.*
[2] *Output pulse duration depends on the selected wavelength and the pump laser pulse duration.*
[3] *FW 1/$e^2$, measured at laser output, using maximum pulse energy.*
[4] *Expressed as normalized root mean squared deviation (NRMSD).*
[5] *Pre-installed output window limits the tuning range to 12 µm. The window is used for dust protection and output power diagnostics, but it can be removed to access the full wavelength range.*




# Drawings

ORPHEUS-NEO / ORPHEUS-NEO-UP





# Ultrafast Spectroscopy Applications

LIGHT CONVERSION delivers best-in-class lasers and laser systems for today's most demanding applications.

Femtosecond pump-probe

Time-resolved fluorescence spectroscopy

Flash photolysis

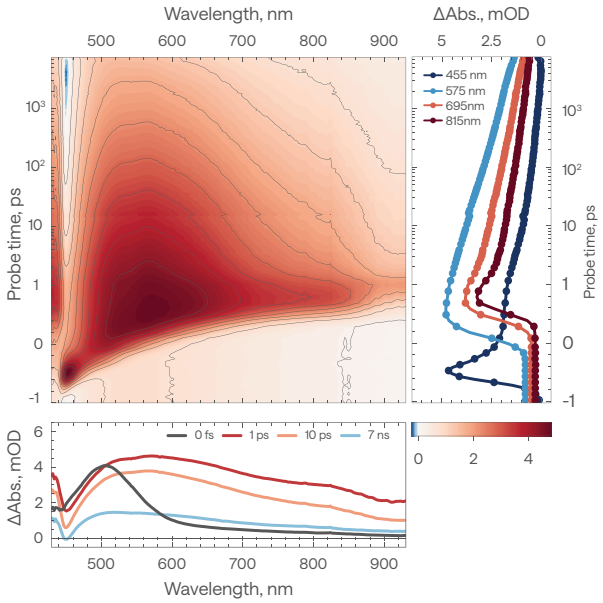
# Ultrafast Spectroscopy Applications

**HARPIA | LIGHT**

## Femtosecond pump-probe

Ultrafast dynamics of long-pass filter measurement utilizing the **HARPIA-LIGHT** transient absorption spectroscopy system.

MEASUREMENT CONDITIONS
Pulse repetition rate: 60 kHz
Pump wavelength: 343 nm
Pump pulse energy: 70 nJ
Acquisition time: 1 s per spectrum (per delay point)
Total measurement time: 60 min

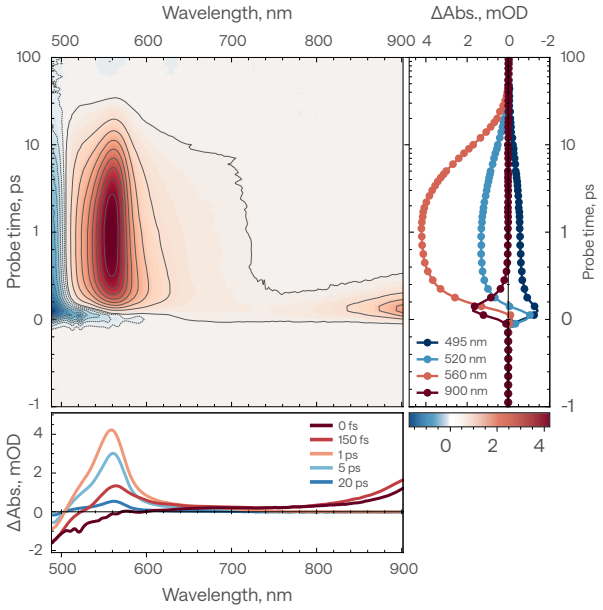



**HARPIA | TA**

## Femtosecond pump-probe

Spectral dynamics of β-carotene in solution, acquired using **HARPIA-TA**.

MEASUREMENT CONDITIONS
Pulse repetition rate: 100 kHz
Pump wavelength: 490 nm
Pump pulse energy: < 10 nJ
Acquisition time: 13 s per spectrum (per delay point)

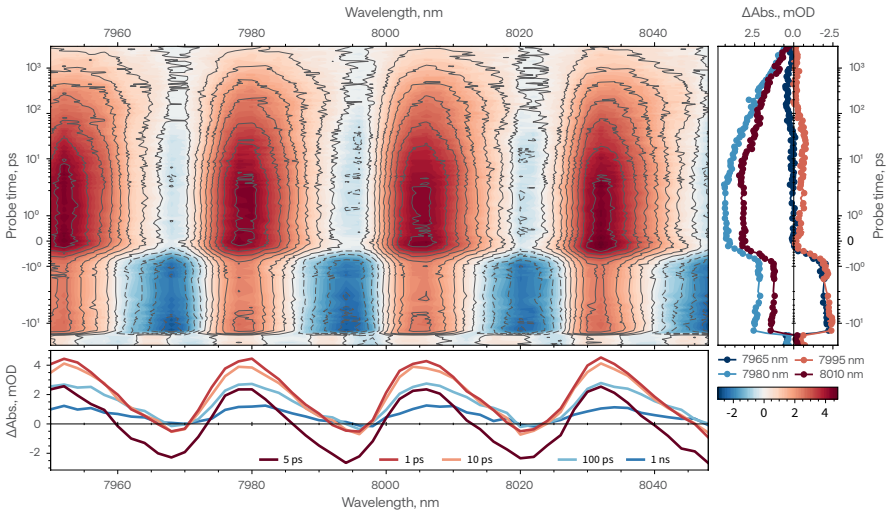



**HARPIA | TA**

## IR femtosecond pump-probe

Pump-probe dynamics of a GaAs wafer in the IR, acquired using signal and reference single-channel detectors of **HARPIA-TA**.

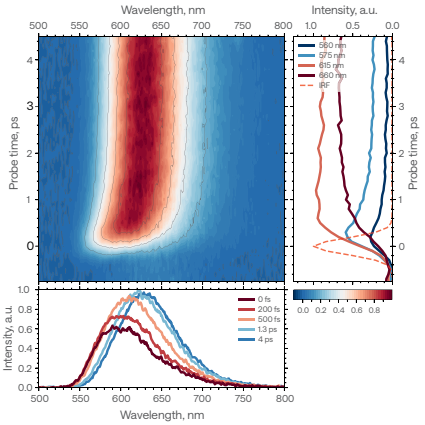
MEASUREMENT CONDITIONS
Pulse repetition rate: 75 kHz
Pump wavelength: 700 nm
Acquisition time: 1 s per point



# Time-resolved fluorescence spectroscopy

## Kerr gate measurements

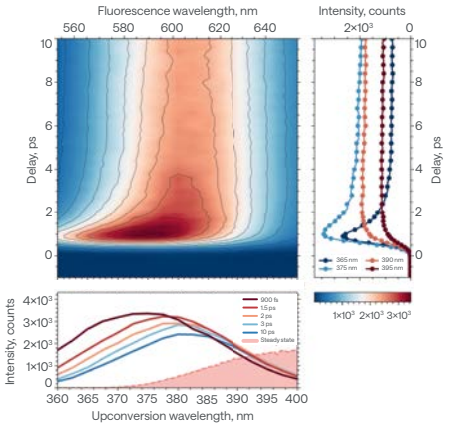
Kerr gate measurements in DCM illustrate the method's ability to probe fluorescence evolution with a sub-picosecond temporal resolution.




## Fluorescence upconversion

Fluorescence dynamics of DCM laser dye in solution, acquired using **HARPIA-TF** in fluorescence upconversion mode.

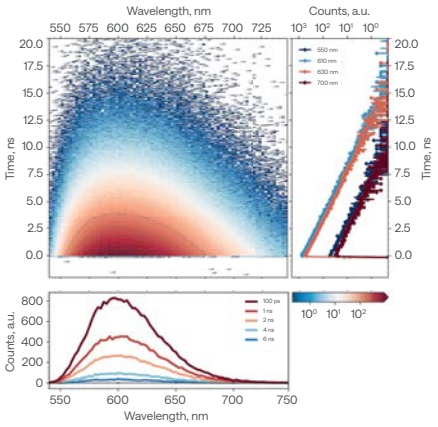
**MEASUREMENT CONDITIONS**
Repetition rate: 100 kHz
Pump wavelength: 430 nm




## TCSPC

Fluorescence dynamics of DCM laser dye in solution, acquired using **HARPIA-TF** in TCPSC mode.

**MEASUREMENT CONDITIONS**
Repetition rate: 100 kHz
Pump wavelength: 430 nm

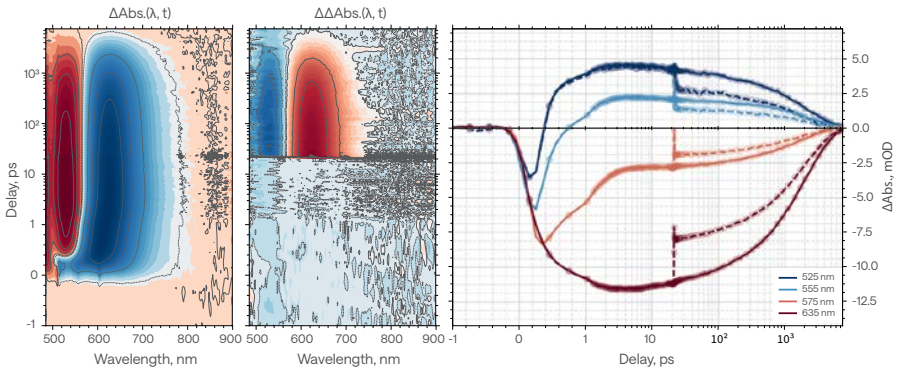



# HARPIA | TB

## Femtosecond pump-dump-probe

Pump-dump-probe dynamics of DCM laser dye, measured using **HARPIA-TB** with the dump pulse resonant to the emission band of DCM.

**MEASUREMENT CONDITIONS**
Pulse repetition rate: 50 kHz
Pump wavelength: 515 nm
Dump wavelength: 700 nm
Dump delay: 21 ps
Pump pulse energy: 90 nJ
Dump pulse energy: 190 nJ

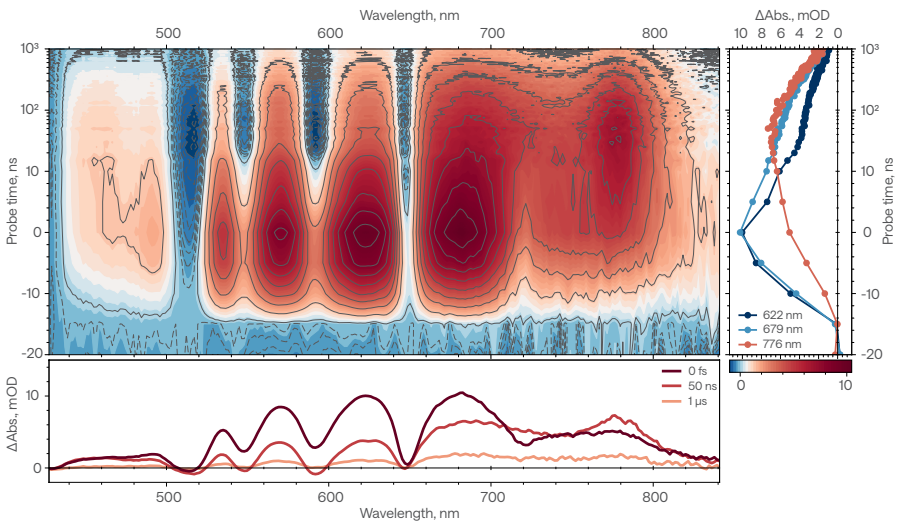



# HARPIA | TA-FP

## Flash photolysis

Nanosecond spectral dynamics of meso-Tetraphenylporphine in solution, acquired using **HARPIA-TA-FP.**

**MEASUREMENT CONDITIONS**
Pulse repetition rate: 1.8 kHz
Pump wavelength: 343 nm
Pump pulse energy: 5.4 µJ



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