

# VisIR

## High Power Picosecond Laser

### Broad Pulse (~ 0.5 ns)

- **NEW** High coherent VisIR HC (with coherent length > 85% of temporal pulse length), at 765, 775, 780, 1030, 1064, 1532, 1550, 1560 nm
- Pulse width ~ 0.5 ns (FWHM)

### Narrow pulse (< 85 ps)

- Available wavelengths 765, 775, 780, 1064, 1532, 1550 nm
- Pulse width typically 70 ps (FWHM)

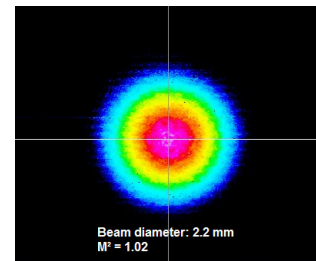
### Specification applies to Narrow and Broad pulse

- Digital interface, can be controlled via USB, Sepia PDL 828 (with dedicated module SEM 828) and RS232
- Average output power > 300 mW and > 1.5 W (depending on wavelength)
- Repetition rate from single shot up to 80 MHz, external or internal triggering
- Collimated output, optional fiber coupling



## Applications

- Time-resolved fluorescence spectroscopy/microscopy (FLIM, FRET, FCS)
- Stimulated Emission Depletion Microscopy (STED)
- Biochemical analytics
- Diffuse Optical Tomography (DOT)
- Quantum optics
- LIDAR, ranging
- 3D polymerization



Beam profile VisIR-765 "STED"

The VisIR laser is a versatile and flexible platform based on a Master Oscillator Fiber Amplifier (MOFA) concept with frequency conversion. The master oscillator generates infrared picosecond pulses at 1064 nm, 1530 to 1560 nm and 1950 nm with variable repetition rates up to 80 MHz using the proven gain-switching techniques from PicoQuant. The output of this seed laser is directly connected to a multi-stage fiber amplifier, which boosts the output from the seed laser by several dB while maintaining the other characteristics of the seed laser beam like the emission wavelength, polarization and the pulse width.

### Compact stand alone device

The VisIR is a stand alone device featuring a special design optimized for maximum heat dissipation.

While the classic VisIR laser modules were manually controlled through a series of switches and dials on the device's front panel, this new generation of modules can now be easily controlled via a variety of interfaces. The VisIR can be connected to a PC via USB interface or (optionally) to a Sepia PDL 828 laser driver through a PicoQuant proprietary interface. In both cases, the VisIR can be fully controlled via an intuitive graphical user interface (GUI) running under Windows. Additionally, the VisIR features an RS232 interface for serial connection.

The VisIR laser module includes all driving functions required for laser operation, such as choice of repetition rate, intensity and trigger source.

### Average output power > 1.5 W

Average output power of typically 1 to 2 W can be reached in the infrared at optimal pulse repetition rate. Moreover, the high pulse energies of the amplified 1550 nm laser (any between 1530 to 1560 nm is available upon request) permit an efficient wavelength conversion using single pass second harmonic generation (SHG). In that way it is possible to generate picosecond pulses at any wavelength between 765 and 780 nm with an average output power of more than 1.5 W (e.g. VisIR-765-HP „STED“). The VisIR can be operated at 12 different internally selectable repetition rates between 31.25 kHz and 80 MHz and can also be triggered externally by TTL or NIM signals at any repetition rate between single shot and 80 MHz. This feature is extremely useful for a perfect synchronization of excitation and depletion laser in a stimulated emission depletion (STED) set-up.

### Flexible pulse duration

The laser can be configured to generate either short pulses of 70 ps or extended pulses of 0.5 ns (FWHM). The extended pulse duration of 0.5 ns is ideal for e.g., STED microscopy as longer pulses or even continuous-wave excitation can expose the sample to an unnecessary amount of radiation, leading to increased photobleaching. By combining the VisIR with our programmable pulse generator PPG 512, the pulse duration can be configured to any length from 0.15 to 0.5 ns. This permits fine control of not only the pulse parameter but also the coherence length of the laser. This is of great help for diffusion measurements in medical application.

### Excellent beam quality

Most VisIR models features a nearly perfectly circular and gaussian shaped beam profile ( $TEM_{00}$ ) which can be specified as a value of  $M^2 < 1.1$ , with a typical figure of about  $M^2 \sim 1.02$ . That is an important parameter for further accurate beam shaping (e.g. „STED-Donut“ for the VisIR-765-HP „STED“).

## Wavelengths

| Type (VisIR-)          | Wavelength [nm]         | Pulse (FWHM)             | Max. avg. Power [W] | Divergence [mrad]  | Beam diameter [mm] | Beam quality                             |
|------------------------|-------------------------|--------------------------|---------------------|--|--------------------|--|
| 765 <sup>1</sup>       | 766 (± 1)               | typ. 70 ps               | > 0.3               | < 0.5  | 2.2 ± 0.2          | $M^2 < 1.1$<br>(Typ. ~ 1.02), $TEM_{00}$ |
| 765-HC <sup>1,7</sup>  | 766 (± 1)               | typ. 0.5 ns <sup>3</sup> | > 1.5               | < 0.5  | 2.2 ± 0.2          | $M^2 < 1.1$<br>(Typ. ~ 1.02), $TEM_0$    |
| 775 <sup>1</sup>       | 774 (± 1) <sup>2</sup>  | typ. 70 ps               | > 0.3               | < 0.5  | 2.2 ± 0.2          | $M^2 < 1.1$<br>(Typ. ~ 1.02), $TEM_{00}$ |
| 775-HC <sup>1,7</sup>  | 774 (± 1) <sup>2</sup>  | typ. 0.5 ns <sup>3</sup> | > 1.5               | < 0.5  | 2.2 ± 0.2          | $M^2 < 1.1$<br>(Typ. ~ 1.02), $TEM_{00}$ |
| 780-HC <sup>1,7</sup>  | 780 (± 1)               | typ. 0.5 ns <sup>3</sup> | > 1.5               | < 0.5  | 2.2 ± 0.2          | $M^2 < 1.1$ $TEM_{00}$                   |
| 1064 <sup>2</sup>      | 1064 (± 2)              | typ. 85 ps               | > 0.75              | < 0.8  | 2.3 ± 0.2          | $M^2 < 1.1$ $TEM_{00}$                   |
| 1064-HC <sup>2,7</sup> | 1064 (± 2)              | typ. 0.6 ns <sup>3</sup> | > 1.0               | < 0.8  | 2.3 ± 0.2          | $M^2 < 1.1$ $TEM_{00}$                   |
| 1530 <sup>2</sup>      | 1531 (± 3)              | typ. 70 ps               | > 0.75              | < 1.5  | 2.2 ± 0.2          | $M^2 < 1.1$ , $TEM_{00}$                 |
| 1530-HC <sup>2,7</sup> | 1531 (± 3)              | typ. 0.5 ns <sup>3</sup> | > 1.3               | < 1.5  | 2.2 ± 0.2          | $M^2 < 1.1$ , $TEM_{00}$                 |
| 1550 <sup>2</sup>      | 1550 (± 3) <sup>3</sup> | typ. 70 ps               | > 0.75              | < 1.5  | 2.2 ± 0.2          | $M^2 < 1.1$ , $TEM_{00}$                 |
| 1550-HC <sup>2,7</sup> | 1550 (± 3)              | typ. 0.5 ns <sup>3</sup> | > 1.3               | < 1.5  | 2.2 ± 0.2          | $M^2 < 1.1$ , $TEM_{00}$                 |
| 1950 <sup>2</sup>      | 1950 (± 3)              | < 100 ps                 | > 0.5               | < 3  | 0.6 ± 0.1          | $M^2 < 1.3$                              |
| 1950-F <sup>2</sup>    | 1950 (± 3)              | < 100 ps                 | > 0.5               | 1.5 m output fiber with stainless steel tubing, divergent output 0.15 NA |                    | $M^2 < 1.1$ , $TEM_{00}$                 |

1 this module is a class 3b laser product

2 this module is a class 4 laser product

3 tunable pulse duration from 0.15 ns to 0.5 ns can be offered along with our Programmable Pulse Generator (PPG 512)

4 any other wavelength between 765 and 780 nm can be provided upon request (may result in longer delivery times)

5 any other wavelength between 1530 and 1560 nm can be provided upon request (may result in longer delivery times)

6 the max average power is not necessarily reached at max pulse repetition rate. Typically for the -HP types, the max avg power is reached between 10 and 40 MHz

7 coherence length >85% of optical pulse width (FWHM) typical: 90-95%, in comparison to VisIR-1550-HP

typically has coherence length of about 30-50% of optical pulse width (FWHM).



INVISIBLE LASER RADIATION  
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION  
CLASS IV LASER PRODUCT  
Complies with IEC 60825-1:2007 / 21 CFR 1040.10 and 1040.11  
except for deviations pursuant to Laser Notice No. 50, dated 24-Jun-07  
MAXIMUM OUTPUT < 10 W / WAVELENGTH = XXX\* nm  
SEE MANUAL

\* Depending on device version, see list of available wavelengths from 765 to 1960 nm

## Specifications

| <b>Optical output</b>                                      |  |
|--|--|
| Available Wavelength                                       | 765 to 1950 nm   |
| Spectral Width   | << 1 nm  |
| Polarization Extinction Ratio (PER)                        | VisIR-765(-HP) > 1:1000 (> 30 dB)<br>VisIR-1064 > 1:60 (> 18 dB)<br>VisIR-1530/1550(-HP) > 1:100 (> 20 dB)<br>VisIR-1950: linear, non polarisation maintaining |
| Power stability (12 hours) ( $\Delta T$ (ambient) < 0.5 K) | < 3 % rms  |
| Other optical specs (power, pulse, beam shape)             | see wavelengths table  |
| <b>Repetition rates</b>                                    |  |
| <i>Internal</i>  |  |
| Range  | user selectable:<br>80, 40, 20, 10, 5 or 2.5 MHz (80 MHz base frequency)<br>1000, 500, 250, 125, 62.5 or 31.25 kHz (1 MHz base frequency)                      |
| <i>External via NIM input</i>                              |  |
| Range  | < 1 Hz to 80 MHz   |
| Trigger level  | fixed trigger level at -400 mV   |
| Connector  | NIM-CAMAC  |
| <i>External via TTL input</i>                              |  |
| Range  | < 1 Hz to 80 MHz   |
| Amplitude  | - 5 V to + 5 V (maximum limits)  |
| Trigger level  | adjustable between -1 V and +1 V   |
| Connector  | BNC  |
| <b>Synchronization output</b>                              |  |
| Amplitude  | < -800 mV into 50 Ohms (NIM)   |
| Connector  | SMA  |
| Timing   | synchronous to the pulse repetition rate   |
| <b>Delays</b>  |  |
| Trigger in (NIM) to sync out                               | typ. $9 \pm 1$ ns  |
| Trigger in (NIM) to optical out                            | typ. 80 ns   |
| Sync out to optical out                                    | typ. 70 ns   |
| <b>USB interface</b>                                       |  |
| Connector  | USB Type-C 3.0   |
| USB version  | 2.0  |
| Compatibility  | PicoQuant Laser Driver Software under Windows™ 10  |
| <b>RS232 interface</b>                                     |  |
| Connector  | Sub-D9 female  |
| Baud rate  | 115200   |
| Data   | 8 bit  |
| Parity   | none   |
| Stop   | 1 bit  |

| <b>Sepia PDL 828 interface</b> |  |
|--------------------------------|--|
| Connector                      | LEMO, PicoQuant proprietary interface to connect to dedicated Sepia Extension Module SEM 828 |
| Compatibility                  | PicoQuant Laser Driver Software under Windows™ 10  |
| <b>Gating</b>                  |  |
| Connector                      | SMA female   |
| <b>Remote interlock</b>        |  |
| Connector                      | 4 pin LEMO EGG.00.304.CLL female   |
| <b>Dimensions</b>              |  |
| Size (l × w × h)               | 352 × 336 × 82.5 mm  |
| Weight                         | 6.5 kg   |
| <b>Operation</b>               |  |
| Temperature range              | 10 - 30 °C   |
| Maximum power consumption      | 100 to 250 VAC, 50/60 Hz, max 130 Watts  |



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