

Solea

Supercontinuum Laser

- Extended Spectral range: 525 nm - 900 nm (ECO mode), 480 nm - 900 nm (BOOST mode)
- Extended 2-year worldwide warranty*
- Supercontinuum output or wavelength selected output through built-in tunable bandpass filter
- Emission from a polarization maintaining singlemode fiber with FC/PC connector
- Externally triggerable 1 MHz - 40 MHz
- Internal oscillator: 2.5 MHz to 40 MHz (user selectable)
- Optimized timing / synchronization output for TCSPC or FLIM
- Supercontinuum average output power up to 250 mW (ECO mode) or 750 mW (BOOST mode) at 40 MHz repetition rate
- Average spectral output power after wavelength selector up to 1 mW / 5 nm (ECO mode) or up to 2.5 mW / 5 nm (BOOST mode) at 40 MHz repetition rate.
- Pulse width down to 90 ps (wavelength and power dependent)

* restricted to 2000 hours of operation in BOOST mode for the fiber components

Applications

- Time-resolved fluorescence spectroscopy / microscopy (FLIM, FRET)
- Stimulated Emission Depletion Microscopy (STED)
- Multicolor excitation (PIE / ALEX)
- Single molecule spectroscopy (FCS / FLCS, Antibunching)



The Solea lasers are stand alone, computer controlled, supercontinuum laser sources with an unmatched flexibility in repetition rates. The lasers are available in four versions covering two possible spectral domains and either including a tunable bandpass filter for wavelength selection (Solea, SoleaR) or directly emitting the unfiltered supercontinuum spectrum (Solea White, SoleaR White).

All lasers emit from a polarization maintaining single-mode fiber with FC/PC connector. The Solea lasers are based on a unique combination of gain-switched, fiber-amplified laser diodes with exclusive patented fiber pumping control and a well established state-of-the-art photonic-crystal fiber for supercontinuum generation.

Variable repetition rates up to 40 MHz

A special feature of the Solea lasers is the capability to be operated at various freely adjustable repetition rates between 1 MHz and 40 MHz. The repetition rates can be either selected using an internal oscillator, which provides six fixed user-selectable repetition rates between 2.5 MHz and 40 MHz. Alternatively, the Solea lasers can even be externally triggered at any repetition rate between 1 MHz and 40 MHz. This unique feature permits synchronization with other lasers for, e.g., multicolor excitation schemes. The extinction between each pulse is complete, classical contrast limited pulse pickers are not needed.

Easy wavelength selection

The emission wavelength selector for the Solea lasers is based on a tunable bandpass filter. The filter features a high side mode suppression ratio of greater than OD 5 (50 dB), which makes it even suitable for single molecule detection. The wavelength selector permits to set the central emission wavelength as well as the width of the spectral emission to any value between 3 nm and 15 nm. It can also be bypassed in order to have access to the available supercontinuum spectrum.

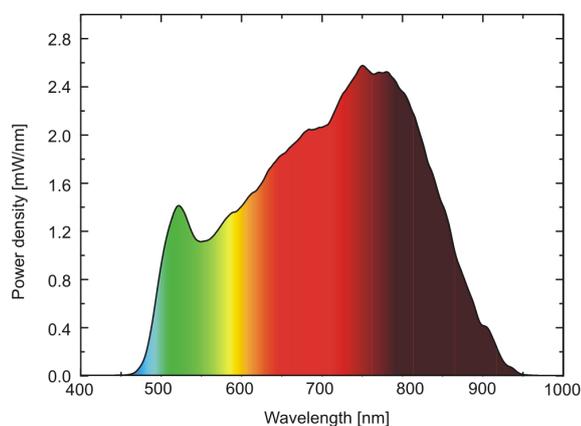
Polarized emission in the VIS down to 480 nm

The Solea lasers emit from a polarization maintaining single-mode fiber and can be operated in two modes: ECO and BOOST. In ECO mode, the stress induced in the photonic-crystal fiber is lower than in the BOOST mode. In ECO mode, the SoleaR for example features a usable spectral range between 525 nm and 900 nm. The average spectral output of the supercontinuum reaches more than 250 mW after the emission fiber at 40 MHz repetition rate, which corresponds to an average spectral density of 0.4 mW/nm. After the emission wavelength selector an average output power of 1.0 mW at 40 MHz repetition rate is available for a 5 nm wide spectral bandwidth.

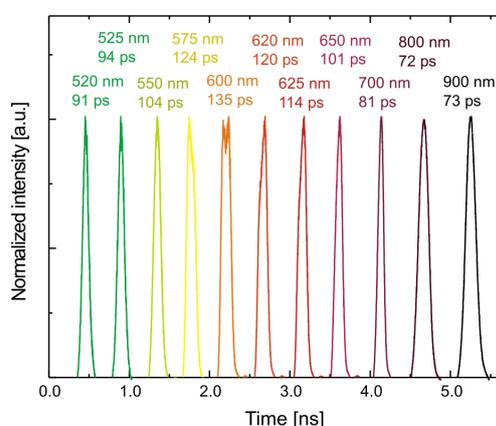
The Solea can also be operated in BOOST mode, which extends the available spectral range down to 480 nm. The average spectral output of the supercontinuum then reaches more than 750 mW after the emission fiber at 40 MHz repetition rate, which corresponds to an average spectral density of 1.0 mW/nm. After the emission wavelength selector an average output power of 2.5 mW at 40 MHz repetition rate is available for a 5 nm wide spectral bandwidth.

Pulse width down to 90 ps

The output pulse width after the emission wavelength selector depends on the output power and selected emission wavelength. It is typically around 150 ps (FWHM) and can reach 90 ps (FWHM) for certain wavelengths. Each pulse is accompanied by a corresponding timing optimized synchronization signal, which can be used to trigger other components such as TCSPC electronics.



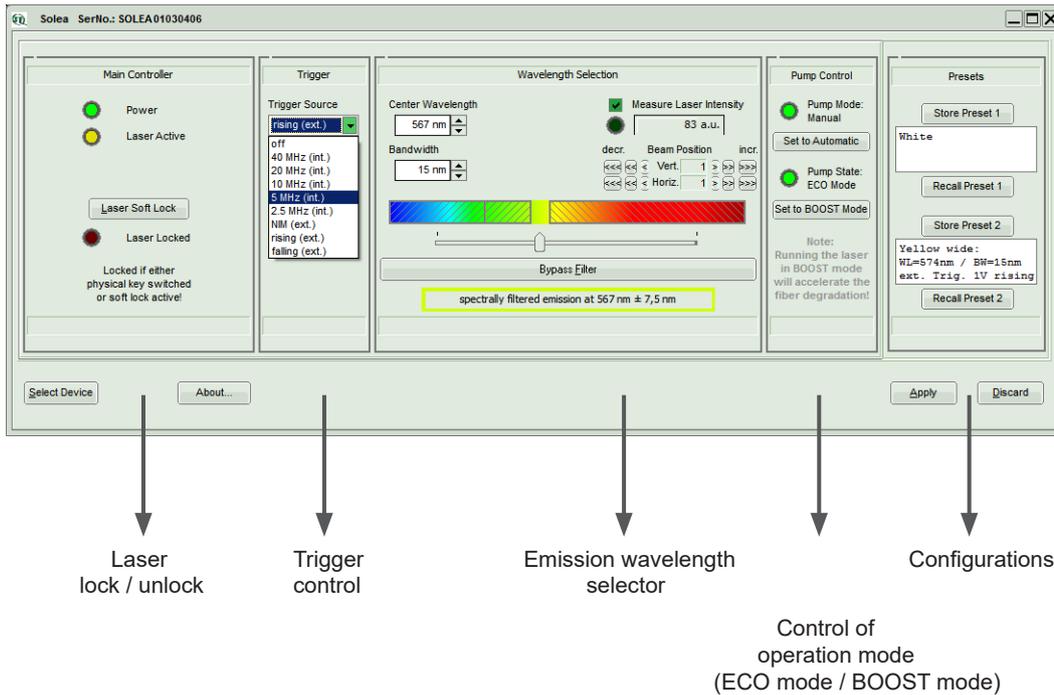
Spectral range of the SoleaR.



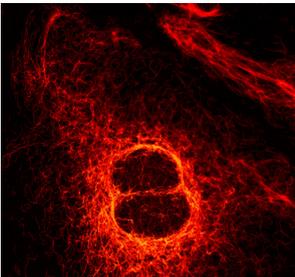
Pulse profiles and pulse widths (FWHM) at different central wavelengths after the emission wavelength selector. The spectral band-pass was set to 5 nm. The Solea was operated in ECO mode.

Full computer control via easy to use software

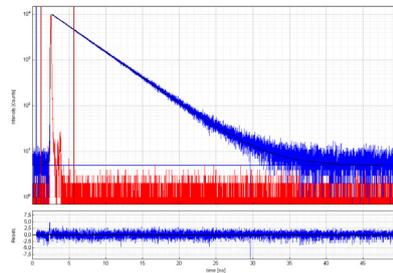
The Solea lasers are completely computer controlled by an easy to use graphical user interface (GUI) for Windows. The software allows to control pulse repetition rate, operation mode, as well as central wavelength and spectral width of the output. Different settings can be pre-defined and saved for an easy change of configurations. A library for custom programming is also provided and allows access to all functions of the Solea from, e.g., LabView or other programming languages.



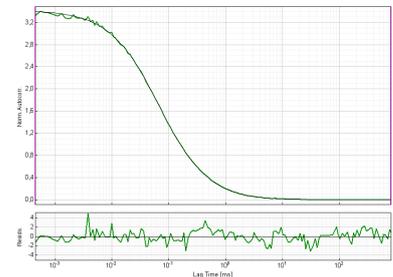
Application Examples



STED microscopy using the Solea laser for excitation. The image shows vimentin fibers stained with ATTO 565 via primary and secondary antibodies. A lateral resolution of approx. 50 nm is obtained, which can be expected for a fiber with a diameter of 10 nm, covered by antibodies with a diameter of approx. 8 nm each. (Data courtesy of J. Engelhardt and S.W. Hell, DKFZ Heidelberg, Germany)



Fluorescence lifetime measurements of ATTO 555 in ethanol. The sample was excited at 550 nm using a spectral bandwidth of 5 nm and a repetition rate of 20 MHz. Data was collected using the TCSPC based spectrometer FluoTime 300. Data analysis using numerical reconvolution resulted in a single lifetime of 3.87 ns ($c_2=1.07$).



Fluorescence correlation spectroscopy (FCS) of ATTO 655 in water. The sample was excited at 630 nm using a spectral bandwidth of 5 nm and a repetition rate of 10 MHz. Data was collected using the confocal microscope MicroTime 200. The correlation curve can be nicely fitted and the amplitude of zero at long lag times proves the high stability of the laser output.



INVISIBLE OR VISIBLE
LASER RADIATION
AVOID DIRECT EXPOSURE TO BEAM
CLASS 3B LASER PRODUCT
IEC / EN 60825-1

Specifications

	Solea, Solea White	SoleaR, SoleaR White
Optical output after emission fiber		
Spectral range (- 3 dB bandwidth)	525 nm - 700 nm (ECO mode) 480 nm - 700 nm (BOOST mode)	525 nm - 900 nm (ECO mode) 480 nm - 900 nm (BOOST mode)
Output fiber	polarization maintaining fiber with FC/PC, connector and endcap, length: 3 m	polarization maintaining fiber with FC/PC, connector and endcap, length: 3 m
<i>Supercontinuum output</i>		
Average output power @ 40 MHz repetition rate	> 100 mW (ECO mode) > 250 mW (BOOST mode)	> 250 mW (ECO mode) > 750 mW (BOOST mode)
Average spectral power density @ 40 MHz repetition rate	0.4 mW / nm (ECO mode) 1 mW / nm (BOOST mode)	0.4 mW / nm (ECO mode) 1 mW / nm (BOOST mode)
<i>Output after emission wavelength selector (not included in Solea White, SoleaR White)</i>		
Bandwidth tunability (FWHM)	3 nm to 15 nm	3 nm to 15 nm
Average output power @ 40 MHz repetition rate, @ 5 nm bandwidth (FWHM)	1 mW (ECO mode) 2.5 mW (BOOST mode)	1 mW (ECO mode) 2.5 mW (BOOST mode)
Pulse width (wavelength and output power dependent)	min. 90 ps; typ. 150 ps; max. 230 ps	min. 90 ps; typ. 150 ps; max. 230 ps
Repetition rates		
<i>Internal</i>		
Range (user selectable)	2.5, 5, 10, 20, 40 MHz	2.5, 5, 10, 20, 40 MHz
<i>External via NIM input</i>		
Range	1 MHz to 40 MHz	1 MHz to 40 MHz
Trigger level	fixed trigger level at - 400 mV	fixed trigger level at - 400 mV
Connector	NIM-CAMAC	NIM-CAMAC
<i>External via TTL input</i>		
Range	1 MHz to 40 MHz	1 MHz to 40 MHz
Amplitude	- 5 to + 5 V (maximum limits)	- 5 to + 5 V (maximum limits)
Trigger level	adjustable between - 1 V and + 1 V	adjustable between - 1 V and + 1 V
Connector	BNC	BNC
Synchronization output		
Amplitude	< - 800 mV into 50 Ohms (NIM)	< - 800 mV into 50 Ohms (NIM)
Connector	SMA	SMA
Dimensions		
Base unit (w × d × h)	465 × 425 × 285 mm	465 × 425 × 285 mm
Weight	32.6 kg	32.6 kg
Operation		
Operating system	Windows™ 7/8/8.1/10	Windows™ 7/8/8.1/10
PC interface	USB 2.0	USB 2.0
Temperature range	10 °C - 35 °C	10 °C - 35 °C
Maximum power consumption	375 W	375 W

Solea Versions

	Solea	Solea White	SoleaR	SoleaR White
Supercontinuum output	✓	✓	✓	✓
Integrated emission wavelength selector	✓		✓	



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