



The Broadsweeper-OEM Series of Wavelength-Swept Tunable Semiconductor Lasers

Applications

- Low coherent interferometric applications
- Optical Coherent Tomography (OCT)
- Fiber sensing
- Optical spectroscopy
- Optical components characterization
- Optical metrology



Features

- Compact, robust design suitable for OEM applications
- Akinetic design of the laser cavity
- Three spectral bands of operation with center wavelengths at 790 nm, 840 nm and 930 nm
- Extremely wide tuning range: up to 115 nm for 930-nm model
- *k*-linear wavelength tuning for all models
- High absolute accuracy of the wavelength setting
- Excellent stability and high sweep-to-sweep reproducibility of the operating wavelength
- Power boosting by a standalone, plug-and-play optical power booster
- USB virtual serial port for computer control
- Remote control by TTL-compatible pulses
- The Superlum companion software for computer control
- Product customization capabilities
- +12 VDC operating voltage

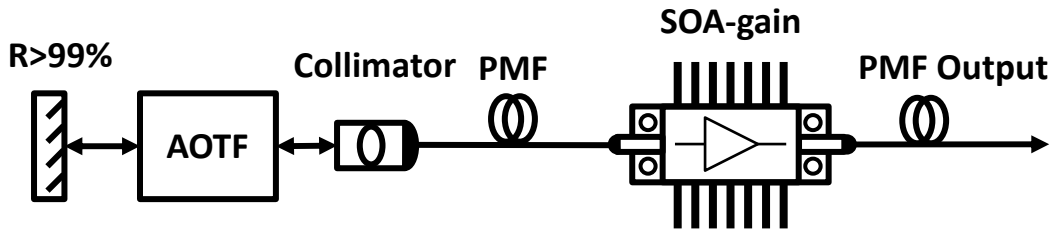
Description

The OEM-Broadsweeper series includes small-size (110 × 31 × 190 mm [W × H × D]) tunable/swept lasers at 790, 840 and 930 nm intended for integration into customer's equipment. In comparison to Superlum's benchtop tunable lasers, these OEM devices provide performance parameters similar to those of their benchtop analogs. The lasers provide the output power of 3 mW and the tuning range from 50 nm (790 nm model) to 115 nm (930 nm model). Optical power may be boosted to 20 mW by a stand-alone boosting unit with the same footprint as the laser one. The devices require +12V DC power supply and may be controlled from a PC via virtual USB ports.

Design and Operation

The optical scheme of the OEM Broadsweeper (see the figure below) is based on an external fiber-optic cavity and a broadband Semiconductor Optical Amplifier (SOA), working as a gain medium.

Specially developed narrowband Acousto-Optical Tunable Filter (AOTF) is used for wavelength tuning. All other components comprising the laser cavity are perfectly fitted for broadband spectral applications. Aberration-free aspherical lenses are used for maximizing the coupling efficiency to optical fiber and minimization of insertion losses of AOTF unit over the entire tuning range. The filter and its optics are all packaged into one monolithic metal housing ensuring reliable day-to-day operation without misalignment. Design of the cavity is akinetic, with no moving parts inside. The AOTF is actively thermally controlled for high wavelength stability and accuracy.



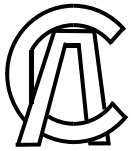
*External Cavity of the OEM-Broadsweeper laser, Simplified schematic
(PMF – Polarization Maintaining Fiber)*

The external cavity of the laser uses a PANDA-type polarization maintaining (PM) fiber. This ensures a well-defined state of polarization and its high stability in time and over the tuning range. Most of fiber-optic components are built on using the fast-axis-blocking technology that also guarantees high values of the PER (> 15 dB) at the laser output.

All OEM Broadswepers provide:

- k -linear wavelength sweeping over the entire tuning range (or in a band of interest)
- high absolute accuracy of the wavelength setting over the entire tuning range in all operating modes including the wavelength sweeping mode
- high stability of the wavelength selected
- high sweep-to-sweep reproducibility of the operating wavelength

The linewidth of the laser emission remains around 0.05 nm over the full tuning range (FTR) and is not affected by the sweep rate, which can be varied between 1 nm/s and 10000 nm/s.



The following operating modes are available with any standard OEM Broadsweeper:

- Static mode: In this mode, the device operates at any fixed wavelength selected within the FTR (a CW laser diode mode).
- Internal triggering mode: In this mode, the sweep cycle at a pre-set tuning speed (within the tuning speeds specified) is internally initiated. The sweeping range (SR) is selectable within the limits: $5\text{ nm} \leq SR \leq FTR$. The internally-generated synch pulses are accessible via the Remote Control port.
- External triggering mode: In this mode, the sweep cycle at a pre-set tuning speed (within the tuning speeds specified) is externally initiated. The externally-generated synch pulses must be applied to the Remote Control port. The sweeping range (SR) is selectable within the limits: $5\text{ nm} \leq SR \leq FTR$. The device is triggered either by the logical level of a trigger signal (default setting) or by the edge of the signal. The mode of triggering can be changed using the Superlum companion software.
- Single sweep mode: In this mode, a single sweep cycle is initiated each time either by a PC command or by using the Superlum companion software which emulates a "pushbutton" on a PC display. Synch pulses generated by the instrument are accessible via the Remote Control port.

The instrument can be locally operated using the top-cover push button. Pushing this button allows enabling or disabling the laser output *only*. The device must be remotely pre-configured to the desired operating parameters before being locally operated.

Remote Control

The Broadsweeper-OEM is equipped with a USB virtual serial port allowing the device to be computer controlled. With the Superlum companion software, which is supplied with the instrument, you can:

- Make any changes in operating parameters of the device (tuning range, sweep rate etc.)
- Analyze the laser performance using the self-test feature

It is highly recommended to periodically test the instrument by using of the self-test procedure provided by the Companion Software to ensure that the device is in good operating conditions. The self-test usually takes a few seconds only. Files with laser parameters which are generated during the test may be sent to Superlum for analysis and evaluation.

Power Requirements

The instrument requires a power supply which will provide +12 VDC at 1.5 A. The instrument is shipped with all optical and electrical accessories necessary for quick start. The power supply unit is offered as an optional accessory and shipped on request *only*. We recommend using linear +12 VDC power supply units to ensure minimum noise at the laser output.



Laser Safety Measures

The offered line of optical products includes the units emitting light at power levels of 3 mW / 20 mW (laser / booster) in the near-infrared spectral range, which is invisible by a human eye. Basing on the values of optical power and the spectral ranges, these light sources can be classified as Class 3R / 3B laser products (as per IEC 60825-1 Ed. 3 2014-05). These sources are intended for integration into the end-user's equipment. These devices do not have the necessary protective features (such as remote interlock, key operated master control, warning signals etc.) required by the Laser Safety standards applicable. Although some of the features are possible under computer control using the Superlum Companion Software. It is the end-user's liability to provide the complete list of the necessary laser safety measures in their systems where the Superlum light sources are going to be used. Superlum cannot be made liable for any injury related with the lack of the required laser safety measures in Superlum's OEM Broadsweepers.

Product Customization

There are capabilities of product customization in terms of optical power, tuning range etc. Contact Superlum with your particular technical requirements.

Wavelengths Covered by Each Model

To make selection of the required spectral range as simple as possible, the models are spectrally arranged in the illustration below.





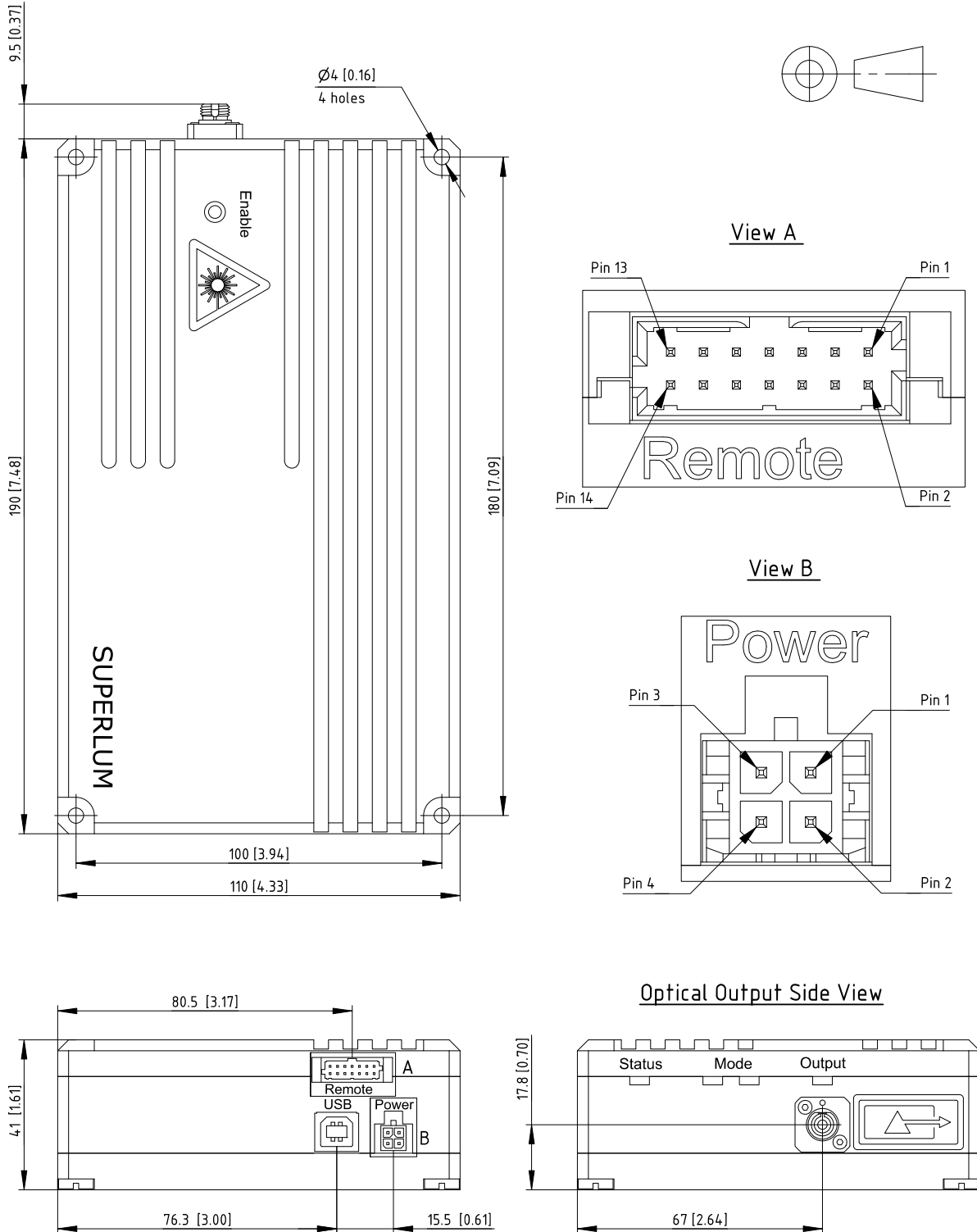
Optical Power Booster as a Supplement to the Broadsweeper-OEM Series

Superlum offers a wide range of optical power boosters ideally suited for use with the Broadsweeper-OEM series. Familiarize yourself with the booster models available by looking through the table below. Refer to Superlum's website for detailed information on technical parameters of the boosters.

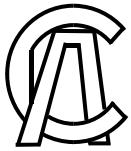
Model	
Wavelength-Swept Tunable Laser	Optical Power Booster
BS-790-1-OEM	BB-790-HP-OEM
BS-840-1-OEM	BB-840-HP-OEM
BS-930-1-OEM	BB-930-HP-OEM*

*AVAILABLE UPON REQUEST

Mechanical Specifications



Dimensional drawing of the OEM Broadsweeper unit. All dimensions are in millimeters [inches].



Technical Specifications of the Broadsweeper-OEM Series

Parameter	Model		
	BS-790-1-OEM	BS-840-1-OEM	BS-930-1-OEM
Center Wavelength	795±5 nm	840±5 nm	935±5 nm
Full Tuning Range (FTR)	55 nm 770±2 nm – 825±2 nm	75 nm 805±2 nm – 880±2 nm	115 nm 880±2 nm – 995±2 nm
Minimum Adjustable Tuning Range (within FTR)	5 nm		
Output Optical Power	3 mW		
Spectral Linewidth (FWHM)	0.05 nm		
Wavelength Setting Resolution	0.01 nm		
Sweep Speed Range	1-10000 nm/s		
Sweep Speed Setting Resolution	0.1 nm/s		
Polarization Extinction Ratio	15 dB (min.)		
Power Level Flatness (over FTR)	< 1.2 dB		
Signal-to-ASE Excess	> 30 dB		
Fiber Type	PANDA PM 850		
Working Fiber Axis	Slow axis, aligned to the connector key		
Optical Output	Through FC/APC matting sleeve with narrow key		
Computer Communication Port	USB virtual port		
Synch Pulses	TTL		
Operating Modes	1) Single Tone mode (CW operation) 2) Continuous Sweeping mode 3) External Triggering mode 4) Single Sweeping mode		

General Specifications

Parameter	Value
Operating Voltage / Current	+12 VDC / 1.5 A
Power Consumption	18 W (max.)
Operating Temperature Range	+15 °C to +35 °C
Storage Temperature Range	0 °C to +40 °C
Physical Dimensions (W × H × D)	110 × 41 × 190 mm
Weight	1.5 kg