



New Modular Broadsweepers and Optical Boosters for OEM Applications

Features of the new design

- Akinetic design of the external cavity without any moving parts
- Excellent tolerance of wavelength settings
- Excellent sweep-to-sweep reproducibility of the output wavelength
- Linear and smooth wavelength tuning at any sweep rate
- Unidirectional sweep in any wavelength direction
- USB communication
- Stand-alone swept laser and booster units
- Compact dimensions
- Low power consumption

Key applications

- Bio-medical OCT
- Bio-chemical spectroscopy
- Fiber-optic sensing
- Interferometric applications

Product description

The new OEM Broadsweeper is a modular 110mm × 41mm × 190mm (W × H × D) version of our the most popular BS-840-1 benchtop widely tunable swept laser at 840 nm. To be accommodated into small volume, the interior of the swept source has been completely re-designed including both the optical bench and electronical PCB. The laser architecture is now relied on a linear external cavity configuration composed of a gain optical module (SOA-371), an acousto-optic tunable filter (AOTF) and a HR broadband mirror. The custom-designed AOTF allows narrow filtering (FWHM < 0.25 nm) and hence high coherence length while maintaining high diffraction efficiency over a wide spectral range. The filter is thermally stabilized with a high performance thermoelectric cooler (Peltier cooler) that ensures high stability of the laser wavelength over time and in temperature. For thermal stability and mechanical rigidity, the most susceptible



Small-size version of the Broadsweeper



components of the external cavity are mounted onto a stainless-steel optical bench. All elements of the laser configuration have been spectrally matched to provide optimum operation.

The output of the laser is provided through the front-vertical-side socket compatible with FC-APC fiber connectors. Special technique of the laser assembling and the use of PANDA PM 850 fiber make it possible to guarantee high polarization extinction ratio (PER) of laser emission (>18 dB) and its stability to temperature variations. Temperature stabilization of the acousto-optic cell, electronical control of the AOTF performance and the total absence of any moving parts in the laser resonator make possible to ensure:

- high absolute accuracy of the output wavelength
- high sweep-to-sweep reproducibility of the output wavelength
- high linearity of the instantaneous wavelength-vs-time dependence in sweep operation
- the absence of the need to use special techniques for instantaneous wavelength monitoring in time during sweep operation

The laser is capable of tuning the wavelength between 805 and 875 nm with output power of 3 mW at any sweep speed between 1 nm/s and 10 000 nm/s. The width of the laser line does not exceed 0.05 nm throughout the full tuning range.

The laser supports USB connection to a PC for remote control. The most essential parameters of the device are accessible for monitoring and modification from a computer by using Superlum companion software supplied with the instrument. The laser has a TTL remote port on the back vertical side of the device which is used for synchronization needs.

OEM optical power booster is a great option for those wishing to increase the swept-laser power. It elevates the power from 3 mW up to 20 mW. The device is offered as an additional stand-alone unit. It features simple installation and reliable operation. The device has been constructed as plug-and-play unit that is completely pre-set at the factory and does not require any adjustments during operation. Physical dimensions of the booster housing are 110 mm × 31 mm × 190 mm (W × H × D). Since the footprints of both devices are the same, stackable installation of the devices is allowed provided that sufficient ventilation for heat dissipation is implemented.



Optical power booster for the Broadsweeper

As our standard BS-840-1, the new one is capable of operating in three modes:

- Single-wavelength (stationary) operation within the full tuning range.
- Continuous sweeping (free-running) at any sweep speed in a range of 1 – 10 000 nm/s.
- External triggering of sweep operation.

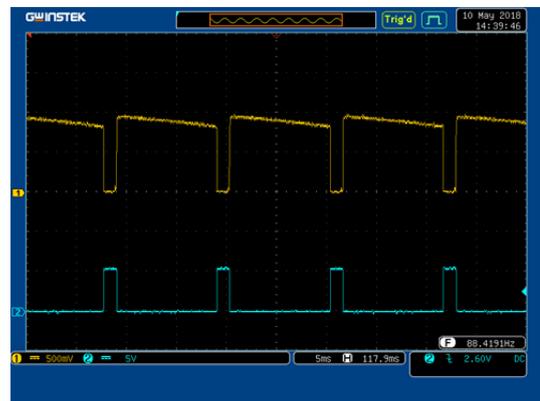


There are several unique features realized in the new model of the swept laser:

- The laser performs single sweeping initiated either by a command from a computer or by an external TTL signal applied to the TTL port.
- In the external sweeping mode, the laser is operated by a logical level of a TTL signal via the TTL port. So long as the level is high, the device continues free-running spectral tuning. When the level goes low, the laser terminates tuning and waits the next high-level event to re-start free-running operation.

TTL-compatible synchronization pulses generated by the laser in sweep operation are accessible via the TTL port at the back of the device. External pulses necessary for external triggering of the device are applied to this port as well.

Driving electronics ensures laser operation in constant power mode. A unique design of Superlum's electronics allows achieving a flat-top shape of the tuning at any sweep speed (see the picture to the right). Any variations of the laser power at the top of the shape as well as drive current overshooting during power activation are eliminated. The pause time between two consecutive sweeps in continuous sweeping mode is adjustable in a range of 200 μ s to 167 s. User-set parameters are saved in a nonvolatile memory of the device.



The laser continuously sweeps the wavelength between 805nm and 875nm. (The yellow trace is a repetitive tuning between two wavelengths. The blue trace shows synchronization pulses generated by the device.)

Both devices (the swept laser and the booster) allow rigid fixing to metallic surfaces with four M4 screws.

Improvements and modifications in the new design

Several extensive modifications in the driving electronics and the laser cavity configuration were made with respect to the benchtop version in order to improve laser performance. They include:

- To simplify assembling and to reduce manufacturing time, the linear scheme of the external cavity of the laser has been implemented in the current design.
- Wavelength resolution performance has been improved to 0.01 nm.
- Minimal sweep speed has been reduced to 1 nm/s that yields a sweep time of 70 s for a 70 nm-tuning range.
- Slow-speed sweep operation has been considerably improved. Now, wavelength extremes of the tuning range are precisely reached at any sweep speed below 10 nm/s.



- The laser is capable of tuning the wavelength in any direction (downwards or upwards). The direction of sweeping is easily changed with Superlum companion software.
- To prolong lifetime of the laser, output emission is turned off during each pause between sweeps. In the free-running mode, the pause duration can be changed in a range of ~200 μ s – 167 s.
- In single-wavelength mode of operation, applying external TTL pulses to the TTL remote port allows the laser power to be pulse modulated (switched on/off). The minimum pulse duration is 100 μ s.

Thanks to obvious benefits of the new design, the combination of the swept laser and the power booster offers a powerful and cost-effective solution to wavelength tuning that fits easily into a measuring system or sub-assembly. Our modular approach allows you to try our new BROADSWEEPER first and then to order our optical power booster to combine two units into a high power swept wavelength system.

Specifications in brief

- Full tuning range: 805 – 875 nm
- Minimum tuning range: 5 nm
- Optical power: 3 mW (from laser output) / 20 mW (after boosting)
- Linewidth (FWHM): 0.05 nm
- Wavelength setting resolution: 0.01 nm
- Scan speed range: 1 – 10 000 nm/s
- PER: 18 dB (min.)
- Power vs. wavelength flatness: < 1 dB
- Signal-to-ASE excess: 30 dB (min.)
- Fiber type: PANDA PM 850
- Optical output: compatible with FC-APC fiber connectors
- Operating voltage/current: +12 V DC / 1 A
- Communication between the laser and a PC: via USB interface
- Operating temperature range: from +15 °C to +35 °C
- Outline dimensions (W × H × D):
 - 110 mm × 41 mm × 190 mm (laser unit)
 - 110 mm × 31 mm × 190 mm (booster unit)
- Weight:
 - 1.5 kg (laser unit)
 - 1 kg (booster unit)

The modular 840-nm sweepers and boosters will be commercially available starting October 2018. Orders for prototypes may be placed starting July 2018.

Superlum also plans offering of an OEM version of 780-nm wavelength swept laser soon.

Contact us today for more information about the new products.