

Applications

- Distributed Sensing based on Rayleigh Scattering (DAS / ϕ -OTDR)
- Frequency Modulated Continuous Wave (FMCW) LiDAR
- Doppler LiDAR
- Vibrometry
- Brillouin Sensing (BOTDR)
- Quantum Key Distribution (QKD)
- Radio Frequency over Fiber
- Precision Metrology

Features

- Ultra-Narrow Linewidth
- Monolithic Design
- Rugged
- Ultra Compact
- Flat Frequency Modulation Response

Narrow-Linewidth DFB Laser Module

LXM



The Narrow-Linewidth DFB Laser Module (LXM) is based on indie proprietary laser diode technology. Ultra-low phase noise and fast frequency modulation properties make this laser module unique and sets new standards in single frequency lasers.

indie Narrow-Linewidth DFB Laser Module is available in both standard (typical 15 kHz instantaneous linewidth) and frequency-locked ultra-narrow (typical 0.08 kHz instantaneous linewidth) models. It can provide up to 70 mW fiber coupled optical power with central wavelength options around 1545 nm, 1550 nm and 1560 nm.

The LXM laser module is based on a proprietary DFB laser diode design that exhibits an intrinsically narrow-linewidth and a high frequency modulation bandwidth.

It is perfectly suited for frequency modulated continuous wave (FMCW) LiDAR, Doppler LiDAR, distributed acoustic sensing based on Rayleigh scattering (DAS), Brillouin sensing, quantum key distribution (QKD), and precision metrology applications.

Top Features

- **Narrow Linewidth Monolithic Design:** Typical 15 kHz instantaneous linewidth under direct drive and 0.08 kHz for the ultra-narrow linewidth model.
- **Best-in-class Packaging and Low-noise Control Electronics:** Rugged, stable and reliable laser modules delivered on spec.
- **Frequency Modulation Interface:** 5 V peak to peak input allowing total freedom in terms of frequency modulation control for up to 4.5 GHz frequency chirp.
- **High Modulation Bandwidth:** Flat modulation response up to 10 MHz, which can be leveraged in use cases such as frequency chirp linearity optimization or optical frequency and phase locking.

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Optical Specifications

Parameters	Standard Module LXM-S	Ultra-Narrow Linewidth Module LXM-U	Units
Center wavelength ⁽¹⁾	1545 1550 1560		nm
Center wavelength tuning ⁽²⁾	±25		GHz
Wavelength tuning resolution	20	5	MHz
Instantaneous linewidth	< 25 (typical 15) ⁽³⁾	< 0.2 (typical 0.08) ⁽⁴⁾	kHz
Output power options	> 40, > 70	> 40, > 60	mW
Output type	CW		-
Relative intensity noise at > 1 MHz	< -155		dBc/Hz
Side mode suppression ratio	> 40		dB
Polarization extinction ratio	> 17		dB

- (1) Contact indie for specific/other wavelengths.
(2) LXM-U can be tuned to ±25 GHz prior to locking. Once locked, wavelength tuning is limited to ±2 GHz.
(3) Lorentzian instantaneous linewidth obtained by multiplying the one-sided PSD of frequency noise measured at 10 MHz by π.
(4) Instantaneous linewidth obtained by multiplying the one-sided PSD of frequency noise measured at 1 MHz by π.

Fast Frequency Modulation

Parameters	Standard Module LXM-S	Ultra-Narrow Linewidth Module LXM-U	Units
Frequency modulation amplitude ⁽¹⁾	@1 kHz > 4.0 (typ. 4.5) @10 kHz > 3.0 (typ. 4.0) @100 KHz > 2.0 (typ. 3.0)	0.2	GHz _{p-p}
Frequency modulation response	Up to 1 ⁽²⁾	Up to 10 ⁽³⁾	MHz
Frequency modulation method	Analog voltage input		-
Modulation voltage magnitude	5	Typ. 2.5 ⁽⁴⁾	V _{p-p}

- (1) LXM-S: The amplitude is characterized using triangular voltage waveform at 10 kHz modulation frequency. Contact indie for an extended modulation amplitude.
(2) LXM-S: Typical 6 dB amplitude drop between 10 kHz and 1 MHz modulation frequency. Contact indie for an extended modulation response.
(3) LXM-U: Flat amplitude and phase response up to 10 MHz modulation frequency.
(4) LXM-U: The exact voltage amplitude associated to 0.2 GHz frequency modulation is provided in the test report.

Contact us at info@teraxion.com or visit our website www.indie.inc/photronics.

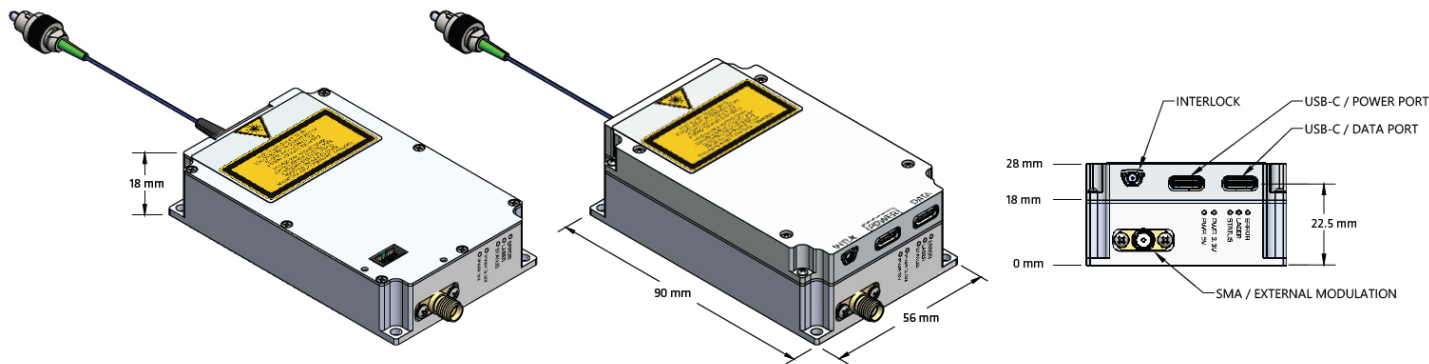
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Mechanical, Electrical, and Environmental Specifications

Parameters	Laser Only	With Interface Board	Units
Dimensions (L x W x H)	90 x 56 x 18	90 x 56 x 28	mm
Power and communication connectors	14-pin FTMH	USB-C PD3.0 (power), USB-C (comm), MMCX (interlock)	-
Communication interface	uArt, LVTTTL	USB-C Software included (Windows®)	-
Power supply voltage	5	USB-C PD3.0 power block included	VDC
Power consumption	< 15 at start up, Typ. 5 steady-state		W
Interlock shut down time		< 10	ms
Frequency modulation connector		SMA	-
Optical fiber	Panda polarization maintaining		-
Optical connector	FC / APC (narrow key), slow axis aligned to key		-
Operating temperature		-20 to 65	°C
Storage temperature		-40 to 85	°C
Humidity (non-condensing)		< 95	%

Mechanical Diagram



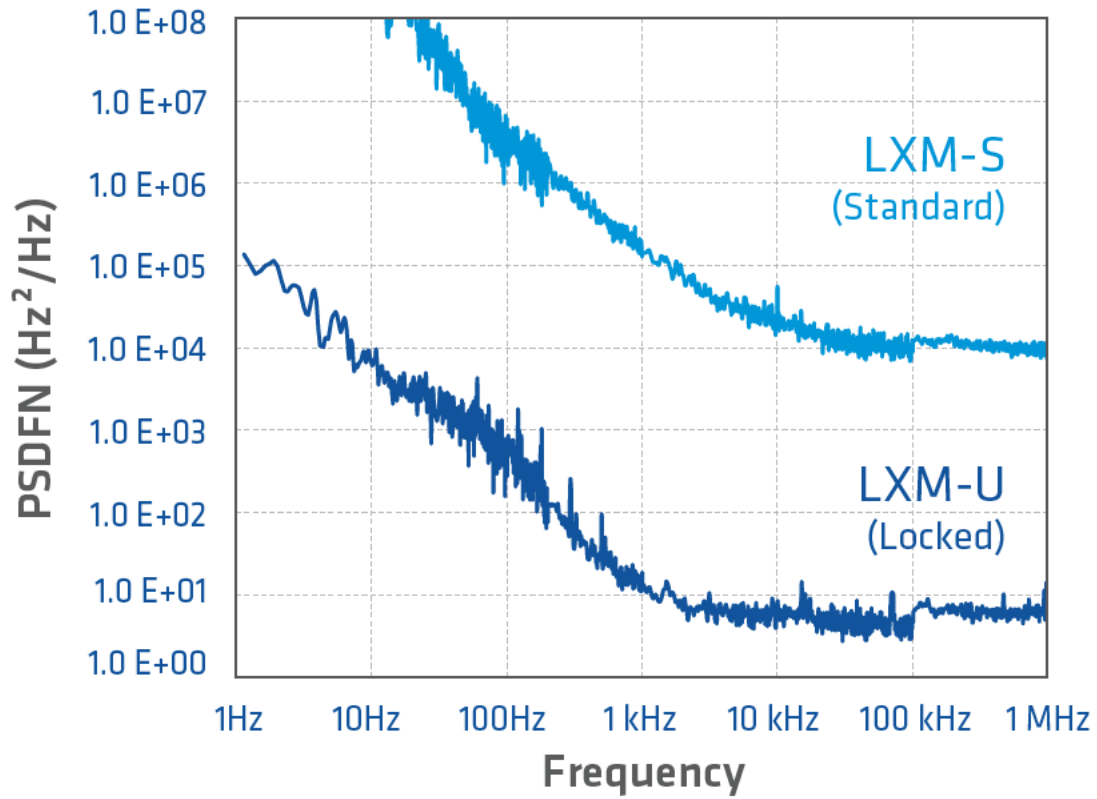
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Narrow-Linewidth DFB Laser Module

LXM

Power Spectral Density of Frequency Noise



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