



TSL-770

Flagship model High Performance Tunable Laser



Product Overview

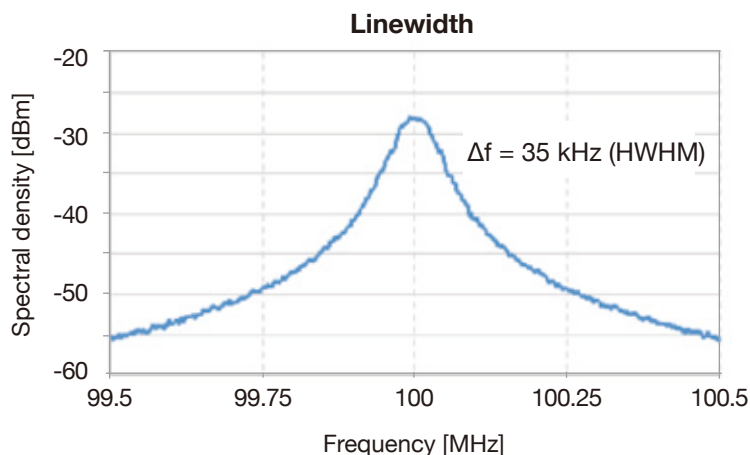
Santec has brought all its experience and knowledge gained over the past 30 years to its all-new 7th generation tunable laser. The TSL-770 is a very high specification tunable laser with flexibility in operation to ensure suitability for a wide range of applications. A ground up redesign of the laser cavity together with ultra-low noise electronics combine to provide market leading scan speed, high optical power, wide tuning range, low noise and narrow linewidth in the same laser. The new proprietary cavity design enhances Q-factor and wavelength stability enabling accurate measurements in even the most cutting-edge research applications.

Features

- Wide tuning range from 1480 to 1640 nm
- Mode-hop-free continuous tuning
- Fast, up to 200 nm/s wavelength sweeps
- High output power +13 dBm
- High signal-to noise ratio 90 dB/0.1 nm
- High wavelength accuracy 0.3 pm (typ.)
- Narrow linewidth < 60 kHz
- Fine tuning scan range 10 GHz



Measurement Data



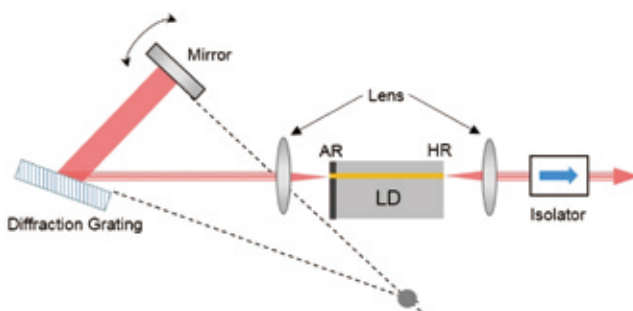
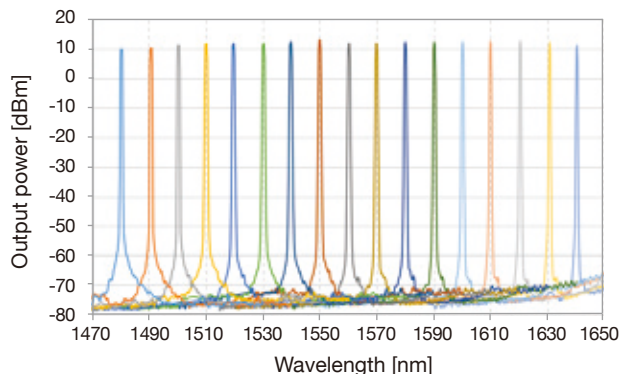
Applications

- Optical component and photonics material characterization
- Fiber optic transmission testing
- Interferometry
- Spectroscopy
- Metrology

Technologies & typical performance

Wide tuning range

The TSL-770 adopts the Littman-Metcalf configuration to achieve a mode-hop-free tuning range of 160 nm. The drive mechanism is robust to ensure long term performance, and is isolated to eliminate acoustic and mechanical noise in the laser.

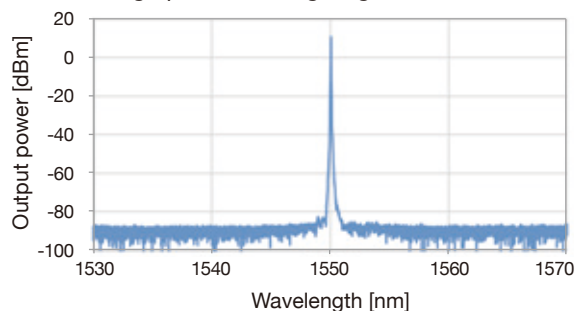


Littman-Metcalf configuration

High S/N and high power

An innovative external cavity design has been implemented to lower the optical SSE noise, leading to a high signal-to-noise ratio of over 90 dB/0.1 nm while still maintaining a high output power of up to +13 dBm. It is ideal for next generation components testing driven by extremely high dynamic range filters and Wavelength Selective Switches (WSS).

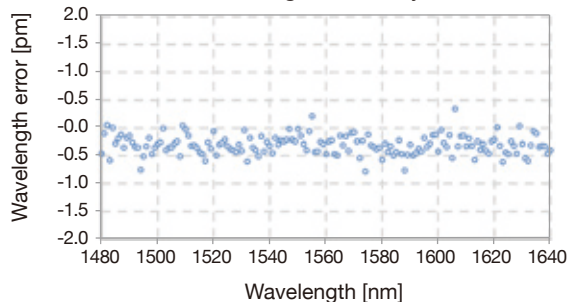
High power and high signal-to-noise ratio



Built-in high performance wavelength meter

The TSL-770 includes a built-in high performance wavelength meter with an absolute wavelength accuracy of ± 2 pm and stores (logs) wavelength data when in continuous sweep mode.

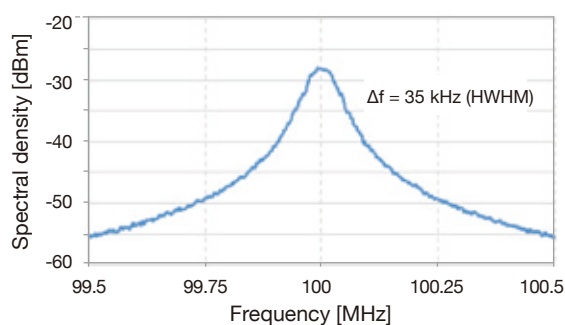
Wavelength accuracy



Narrow linewidth & low jitter

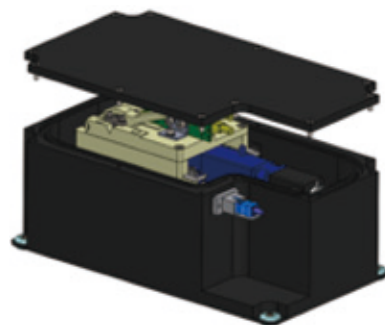
The Q-value of the laser cavity has been maximized by isolating the optical cavity from mechanical vibrations. This results in ultra-narrow laser linewidth and market leading wavelength stability.

Linewidth



Rapid sweep technology

Santec's advanced optomechanical design enables fast sweeps, up to 200 nm/s with high precision and repeatability. Acceleration and deceleration periods are minimized to further reduce the measurement time for repeated scans.



Specifications

Category	Parameter		Unit	Performance	
Wavelength Characteristics	Wavelength Tuning Range		nm	1480 - 1640	1490 - 1630
	Wavelength Setting Resolution		pm	0.1	
	Wavelength Absolute Accuracy *1	Operating Temperature	pm	±1.5	
		25 ±1°C (typ.)	pm	±0.5	
	Wavelength Repeatability *1		pm	±0.5 (±0.2 (typ.))	
	Wavelength Stability (typ.) *2		pm	< ±0.5 (24 hours)	
	Sweep Speed		nm/s	0.5 to 200	
Fine Tuning Scan Range		GHz	≥ 10		
Optical Power Characteristics	Output Power *8	Peak (typ.)	dBm	≥ 13	≥ 13
		> 10 dBm range	dBm	≥ 10 (1500 - 1630 nm)	≥ 10 (1500 - 1630 nm)
		Full Tuning Range	dBm	≥ 7	≥ 8
	Power Repeatability *1, *3		dB	±0.01(±0.002(typ.))	
	Power Stability *2		dB	±0.01(1 hour), (±0.02 (24 hours, typ.))	
	Power Flatness vs. Wavelength *1, *3, *8		dB	±0.2 (±0.05 (typ.))	
	Relative Intensity Noise (RIN) (typ.) *4		dB/Hz	-145 (1 MHz to 3 GHz)	
Spectrum	Linewidth (typ.)	Coherence Ctrl. Off	kHz	60	
		Coherence Ctrl. On	MHz	40	
	SMSR (typ.)		dB	≥ 50	
	Signal to Total Source Spontaneous Emission Ratio*5		dB	≥ 70	
	Signal to Source Spontaneous Emission Ratio *6		dB/nm	≥ 80 (≥ 90 dB/0.1 nm)	
Interface	Optical Output Connector		-	FC or SC, SPC or APC	
	Optical Fiber		-	PMF *7	
	Communication		-	GP-IB (IEEE 488.2), USB, Ethernet	
Modulation	LF Modulation		kHz	DC to 400 (typ.)	
	RF Modulation (option)		MHz	2 to 100 (typ.)	
Environmental Conditions and others	Operating	Temperature	°C	15 to 35	
		Humidity	%	< 80 (non-condensing)	
	Power Supply		-	AC 100 - 240 V (±10 %), 50/60 Hz	
	Power Consumption		VA	100	
	Dimensions (W) x (D) x (H) *9		mm	440 x 416 x 133	
	Weight		kg	16	

* All specifications are quoted after 1 hour warm-up period. Specifications apply for wavelengths not equal to any water absorption line.

*1: At static condition or "Step" sweep mode. *2: Within ± 0.5 °C. *3: At "Auto" power mode. *4: At maximum output power.



*5: Ratio of signal power to total spontaneous emission power within ± 15 nm of the signal wavelength (typical value).

*6: Ratio of signal power to maximum spontaneous emission power in a 1nm band within a ± 3 nm band around the signal wavelength (typical value).

*7: Polarization axis in alignment with connector key. Polarization extinction ratio is 17 dB (typical value).

*8: The specification range is up to 1630 nm. *9: Except for the protrusion.

Model selection

Model Number	Wavelength Range
480640	1480  1640
490630	1490  1630

Other wavelength range model is available on request. Please contact Santec Sales.

Laser safety information



This product is classified class 1M laser product according to IEC 60825-1 (2014).

This product complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 56 dated May 8, 2019.

Ordering code

TSL-770-P - - **P** - - - - **1**

A

B

C

D

E

F

Modulation: **00**: LF / **RF**: LF + RF

Connector Polish: **SP**: SPC / **AP**: APC

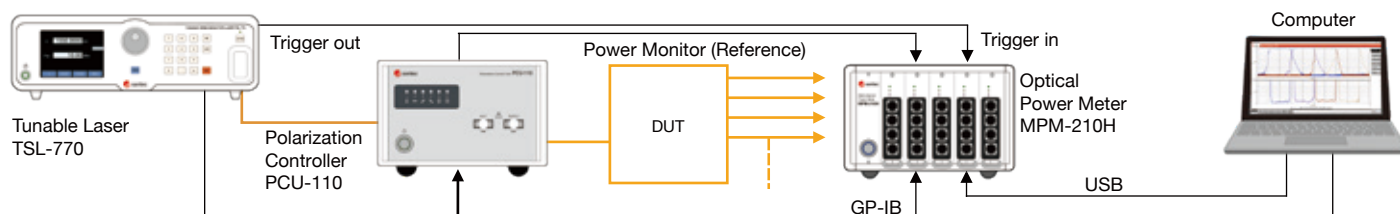
Connector Type: **F**: FC / **S**: SC

Fiber Type: **P**: PMF

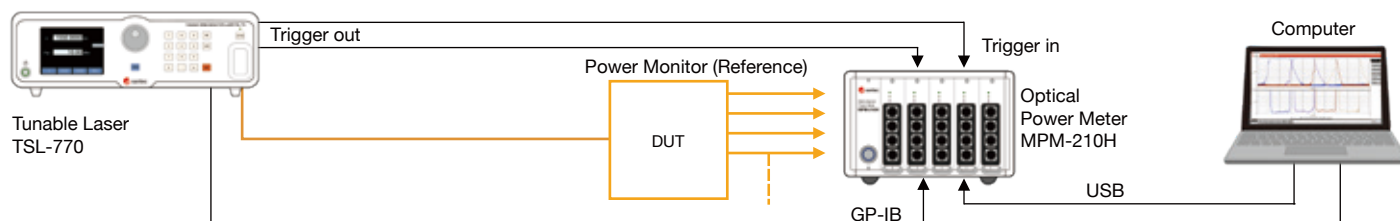
See "Model selection" above. (e.g. 490630: 1490 - 1630 nm)

Typical configuration (Swept Test System with TSL-770)

IL/PDL measurement setup with the polarization controller PCU-110 and the power meter MPM-210H



IL measurement setup with the power meter MPM-210H



The TSL-770 has an internal power monitor that can be used to compensate output power fluctuation in real time. This eliminates the need to take an optical power reference and reduces the number of power meters required in a measurement system. The laser integrates with Santec's power meter, MPM-210H, and polarization controller unit, PCU-110, to create a turn-key WDL or PDL measurement solution. Santec provides software to control the system, as well as dynamic link libraries (DLLs) to enable system integration and control with a variety of programming languages.

Specifications (Swept Test System with TSL-770)

Parameter	Unit	Specifications	Notes
Wavelength Accuracy (typ.) (Absolute) *1	pm	± 1.6	at 10 nm/s
		± 2.3	at 50 nm/s
Wavelength Accuracy (typ.) (Relative)	pm	± 1.3	at 10 nm/s
		± 2.0	at 50 nm/s
Wavelength Repeatability *2	pm	± 0.6	at 10 nm/s
		± 0.9	at 50 nm/s
Scan Speed	nm/s	1 to 200	
Dynamic Range for Insertion Loss (typ.)	dB	80	
Dynamic Range for PDL (typ.)	dB	0 to 5	
Measurement Time for IL (typ.)	sec	4	at 50 nm/s *4,5
Measurement Time for IL / PDL (typ.)	sec	14	at 50 nm/s *4,5
Wavelength Resolution	pm	0.1	
IL Accuracy (typ.)	dB	± 0.02	0 to 30 dB Device IL
		± 0.1	30 to 40 dB Device IL
IL Repeatability *2,3 (typ.)	dB	± 0.02	
IL Resolution	dB	0.001	
PDL Accuracy (typ.)	dB	$\pm (0.02 + 3\% \text{ of PDL})$	0 to 20 dB Device IL
		$\pm (0.15 + 3\% \text{ of PDL}) \text{ (typ.)}$	20 to 40 dB Device IL
PDL Repeatability *2,3 (typ.)	dB	± 0.01	
PDL Resolution	dB	0.01	
Communication	-	USB (USB 2.0 High Speed)	MPM-210H
		GP-IB (IEEE488.2)	TSL-770 / MPM-210H / PCU-110
Operating Temperature	°C	15 to 35	
Operating Humidity	%	< 80	non-condensing

* All specifications are quoted after 1 hour warm-up period and executing a zero calibration. All specifications applies with santec optical power meter MPM-210H.

*1: Temperature within 25 °C \pm 5 °C. *2: Temperature within 25 °C \pm 1 °C. *3: Does not include influence of connector.

*4: The measurement condition is within wavelength resolution 5 pm, wavelength range 50 nm for 1 channel.

*5: Measurement dynamic range per scan is up to 40 dB.



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