

Spectrolight Laser System

- Tunable Laser System(TLS)

Light Done Right!



01. Overview



TLS-RED (Tunable bandwidth)

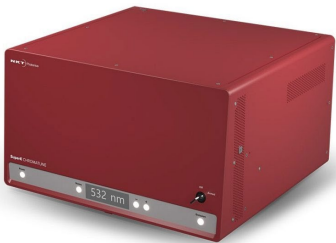


TLS-BLUE (Fixed bandwidth)

* M = Mode lock, V = Variable

<i>Model name</i>	TSL10	TSLM10	TSLM20	TSLM40	TSLM35V	TSL80V	TSLM70
<i>Model grade</i>	Entry-Level			Mid-Range		High-End	
<i>Suggestion Applications</i>	Light source for TCSPC Sensor calibration			Fluorescence imaging Defect Inspection for product			

VS.



Chromatune (NKT Photonics)

Limits :

- 1) Wavelength tuning range : 400 – 1000 nm



LDTLS (ENERGETIQ(Hamamatsu))

Limits :

- 1) Wavelength tuning range :380 – 1100 nm / 800 – 1700 nm
→ There are no products that cover up to UV-SWIR.
- 2) Bandwidth Fixed
- 3) CW LDLS Source

02. Line up & Specifications – TLS RED

Tunable Laser System (TLS RED) : *Each TLS has VIS, IR, SWIR, and Custom wavelength selection*

Model	Supercontinuum Output Power		Repetition Rate	Output pulse Width(ps)	Tuning Range (nm)	Bandwidth (FWHM) (nm)
	Visible	Total				
TSL10-RED	100 mW	1 W	5 MHz	< 300 ps	450 – 1700 nm	2 - 15 nm (nominal)
TSLM10-RED	250 mW	1 W	10 MHz	< 50 ps	410 – 1700 nm	
TSLM20-RED	500 mW	2 W	20 MHz	< 50 ps	410 – 1700 nm	
TSLM40-RED	1 W	4 W	40 MHz	< 50 ps	410 – 1700 nm	
TSLM35V-RED	1 W	3.5 W	0.01 to 40 MHz	< 50 ps	410 – 1700 nm	
TSL80V-RED	1 W	8 W	0.01 to 200 MHz	< 300 ps	430 – 1700 nm	
TSLM70-RED	2 W	7 W	80 MHz	< 50 ps	410 – 1700 nm	

Users can select a supercontinuum laser model and variable wavelength ranges according to the user’s applications for custom model.

The supercontinuum laser model table *(SL-Pico: Supercontinuum laser)*

Model	Supercontinuum Output Power		Repetition Rate	Output pulse Width	Spectral Range
	Visible	Total			
SL10	100 mW	1 W	5 MHz	< 300 ps	450 – 2400 nm
SLM10	250 mW	1 W	10 MHz	< 50 ps	410 – 2400 nm
SLM20	500 mW	2 W	20 MHz	< 50 ps	410 – 2400 nm
SLM40	1 W	4 W	40 MHz	< 50 ps	410 – 2400 nm
SLM35V	1 W	3.5 W	0.01 to 40 MHz	< 50 ps	410 – 2400 nm
SL80V	1 W	8 W	0.01 to 200 MHz	< 300 ps	430 – 2400 nm
SLM70	2 W	7 W	80 MHz	< 50 ps	410 – 2400 nm

Wavelength range table *(Flexible Wavelength Selector: Poly-RED)*

FWHM (nm)	2-15					3-15		5-15				7-13
CWL (nm)	410 - 435	430 - 490	485 - 550	545 - 650	615 - 700	639 - 790	775 - 890	880 - 1015	1000 - 1150	1140 - 1310	1300 - 1500	1475 - 1700

User specified custom wavelength range selectable from 410~1700(nominal)

02. Line up & Specifications – TLS BLUE

Tunable Laser System (TLS BLUE) : Each TLS has VIS, IR, SWIR, and Custom wavelength selection

Model	Supercontinuum Output Power		Repetition Rate	Output pulse Width(ps)	Tuning Range (nm)	Bandwidth (FWHM) (nm)
	Visible	Total				
TSL10-BLUE	100 mW	1 W	5 MHz	< 300 ps	450 – 1700 nm	Fixed 10 or 20 nm (nominal)
TSLM10-BLUE	250 mW	1 W	10 MHz	< 50 ps	410 – 1700 nm	
TSLM20-BLUE	500 mW	2 W	20 MHz	< 50 ps	410 – 1700 nm	
TSLM40-BLUE	1 W	4 W	40 MHz	< 50 ps	410 – 1700 nm	
TSLM35V-BLUE	1 W	3.5 W	0.01 to 40 MHz	< 50 ps	410 – 1700 nm	
TSL80V-BLUE	1 W	8 W	0.01 to 200 MHz	< 300 ps	430 – 1700 nm	
TSLM70-BLUE	2 W	7 W	80 MHz	< 50 ps	410 – 1700 nm	

Users can select a supercontinuum laser model and variable wavelength ranges according to the user’s applications for custom model.

The supercontinuum laser model table (SL-Pico: Supercontinuum laser)

Model	Supercontinuum Output Power		Repetition Rate	Output pulse Width	Spectral Range
	Visible	Total			
SL10	100 mW	1 W	5 MHz	< 300 ps	450 – 2400 nm
SLM10	250 mW	1 W	10 MHz	< 50 ps	410 – 2400 nm
SLM20	500 mW	2 W	20 MHz	< 50 ps	410 – 2400 nm
SLM40	1 W	4 W	40 MHz	< 50 ps	410 – 2400 nm
SLM35V	1 W	3.5 W	0.01 to 40 MHz	< 50 ps	410 – 2400 nm
SL80V	1 W	8 W	0.01 to 200 MHz	< 300 ps	430 – 2400 nm
SLM70	2 W	7 W	80 MHz	< 50 ps	410 – 2400 nm

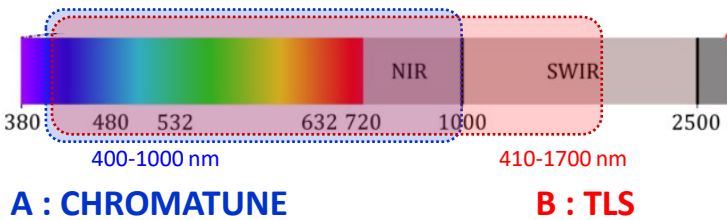
Wavelength range table (Flexible Wavelength Selector: Poly-BLUE)

FWHM (nm)	10 or 20 (nominal)											
CWL (nm)	410 - 435	430 - 490	485 - 550	545 - 650	615 - 700	639 - 790	775 - 890	880 - 1015	1000 - 1150	1140 - 1310	1300 - 1500	1475 - 1700

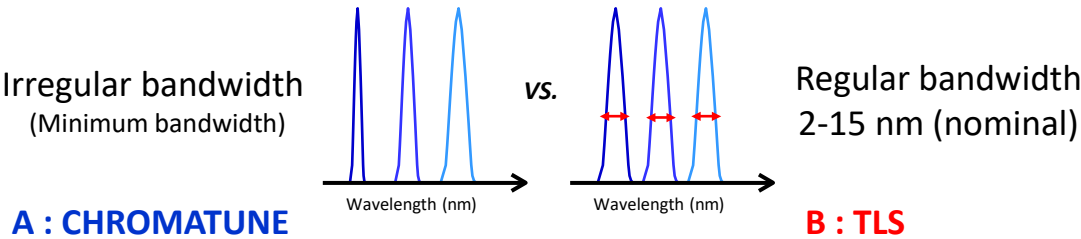
User specified custom wavelength range selectable from 410~1700(nominal)

03. Comparison

Spectral Coverage



Bandwidth



Out-of-band suppression

> 40 dB vs. > 80 dB
OD 10 up to 1700 nm

A : CHROMATUNE B : TLS

*Output power (Bandwidth 10 nm)

> 1 mW vs. (TSLF70)
Max. > 40 mW
Min. > 13 mW

A : CHROMATUNE B : TLS

	NKT	TLS			
	SuperK CHROMATUNE	TSLM10-RED	TSLM20-RED	TSLM40-RED	TSLM70-RED
*Output power (Bandwidth 10 nm)	Min. > 1 mW	Max. > 5 mW	Max. > 10 mW	Max. > 20 mW	Max. > 40 mW
		Min. > 1.5 mW	Min. > 3 mW	Min. > 6.5 mW	Min. > 13 mW
Repetition rate	78 MHz	10 MHz	20 MHz	40 MHz	80 MHz
Price	\$ \$ \$ \$	\$	\$ \$	\$ \$ \$	\$ \$ \$ \$

03. Comparison details

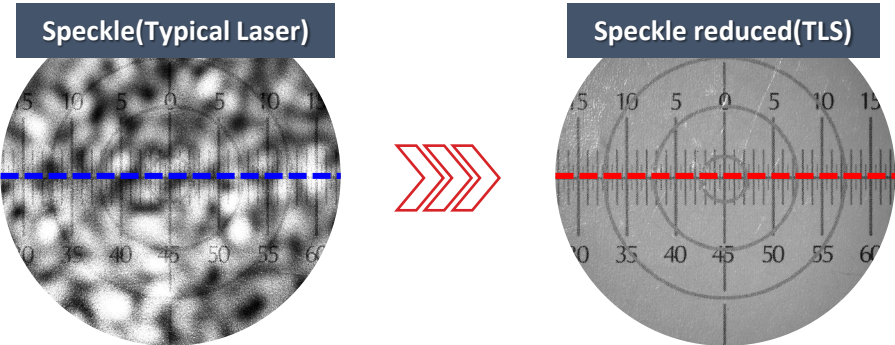
	Laser-Driven Tunable Light Sources (LDTLS®)	SuperK CHROMATUNE	Tunable Laser System (TLS)
Light source type	CW lamp	PS pulsed Fixed: 78 MHz Variable: 0.15-78 MHz	PS pulsed Fixed: 5,10,20,40,80 MHz Variable: 0.01-200 MHz
Wide tuning range at once	350-1100 nm / 800-1700 nm	400-1000 nm	410- 1700 nm
FWHM range	Fixed (4.7, 6.5, 9 nm)	Adjustable Min: 5-10 nm, Max: 50 nm	Fixed (10, or 20 nm) Adjustable (2-15 nm)
Adjustable bandwidth in real-time	N/A	Min: 5-10 nm, Max: 50 nm	2-15 nm (nominal)
Out of band suppression	No information found	> 40 dB	> 80 dB: OD 10 up to 1700 nm
Scan speed	< 20 ms for a 2 nm step	~ 1 second Full spectral scan speed	20 to 200 ms depending on spectral scan range
Beam divergence	NA 0.39	< 1.5 mrad	< 1 mrad
Output power	A few hundred μ W/nm	> 1 mW	Max. > 40 mW (TSLF70) Min. > 13 mW
Types of product	4 types Depending on wavelength range	2 types Depending on Repetition rate	Various types Depending on Output power, adjustable FWHM, and Customizable wavelength tuning range
Sync(trigger) output	N/A	NIM, logic, analogue	NIM, TTL
Output type	Fiber Coupled	Fiber Coupled	Free space or fiber coupled
Weight	16.6 kg	26-27.5 kg	Over 30 kg
Dimension	266 x 432 x 222	440 x 251 x 400	584.3 x 583.6 x 246

PROS

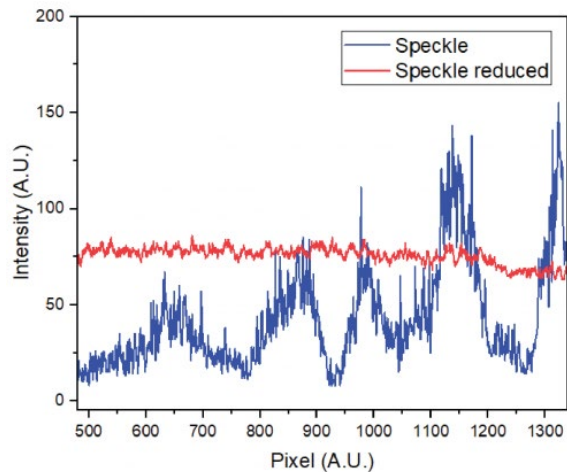
- ⊕ Stable output power fluctuation
→ *RSD < 1 %*
- ⊕ Broadband tunability up to SWIR (**410-1700 nm**)
→ *The world's first wide continuous tunable CWL & FWHM*
- ⊕ High output power : **> 40 mW** (Maximum power at 10 nm FWHM)
→ *Suitable for spectral imaging with wide applications*
- ⊕ Bandwidth fixed and adjustable
→ *Fixed (**10, or 20 nm**), Adjustable (**2-15 nm**, nominal)*
- ⊕ Various models depend on Power
→ *Total Power : **1, 2, 3.5, 4, 7, 8 W** or more*
- ⊕ Reduced Laser speckle noise
→ *Ideal for imaging applications*
- ⊕ Wavelength uniformity inside the beam
→ *Uniform wavelength distribution beam*
- ⊕ High out of band blocking (**> 80 dB: OD 10**)
→ *Blocking unwanted wavelength up to 1700 nm*
- ⊕ High pointing stability
→ *No beam position drifts for long distance*
- ⊕ Various types of repetition rates
→ *Fixed: **5,10,20,40,80 MHz** / Variable: **0.01-200 MHz***

05. PROS : Low Speckle noise & stable power fluctuation

Low Speckle noise



Low S/N ration imaging with speckle using conventional laser(left), clear imaging with reduced speckle noise using TLS(right)



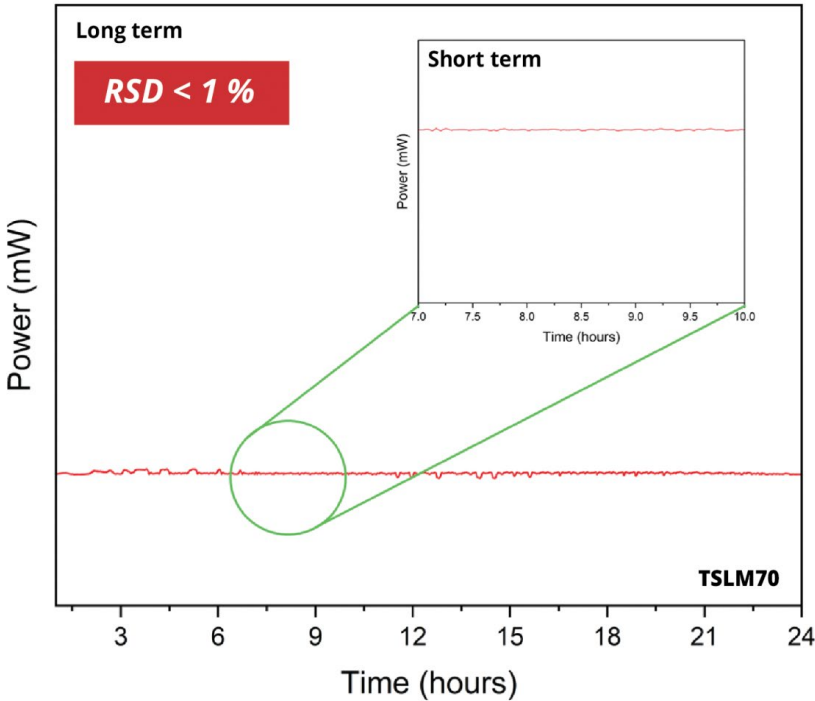
Speckle noise can be reduced by TLS and fiber technique combination

Low power fluctuation

Stable Long-term Power Fluctuation

RSD is < 1 % at 650/15 nm

*RSD = Relative Standard Deviation



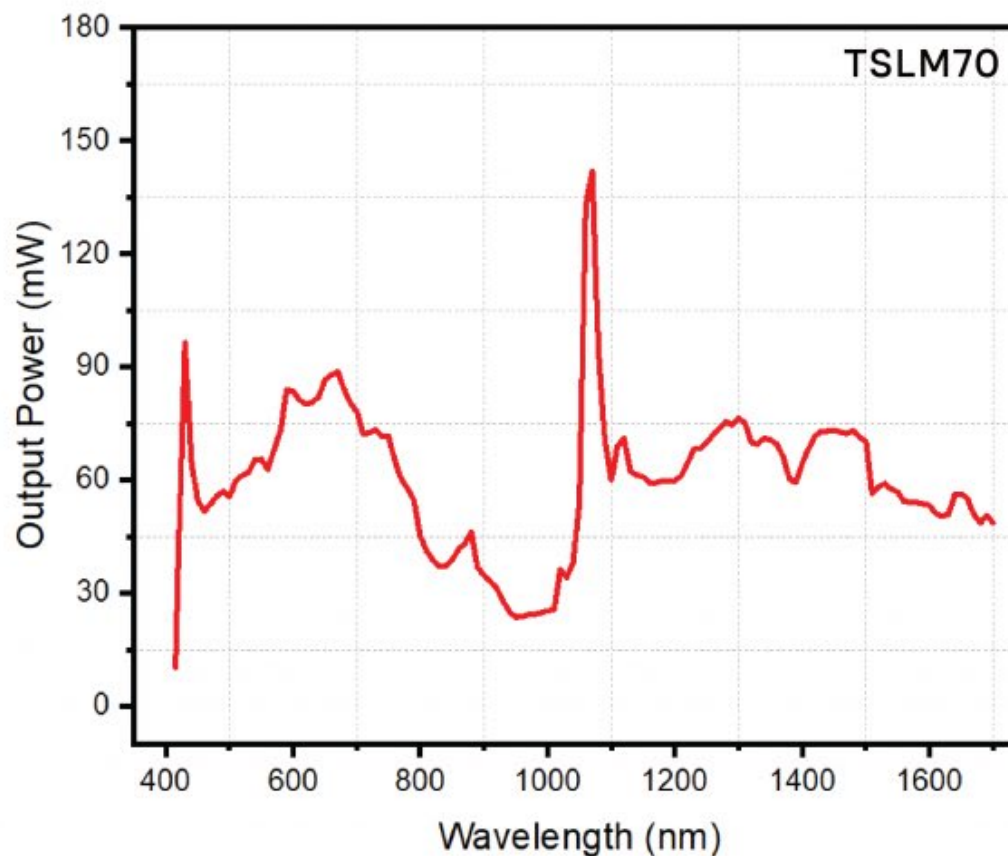
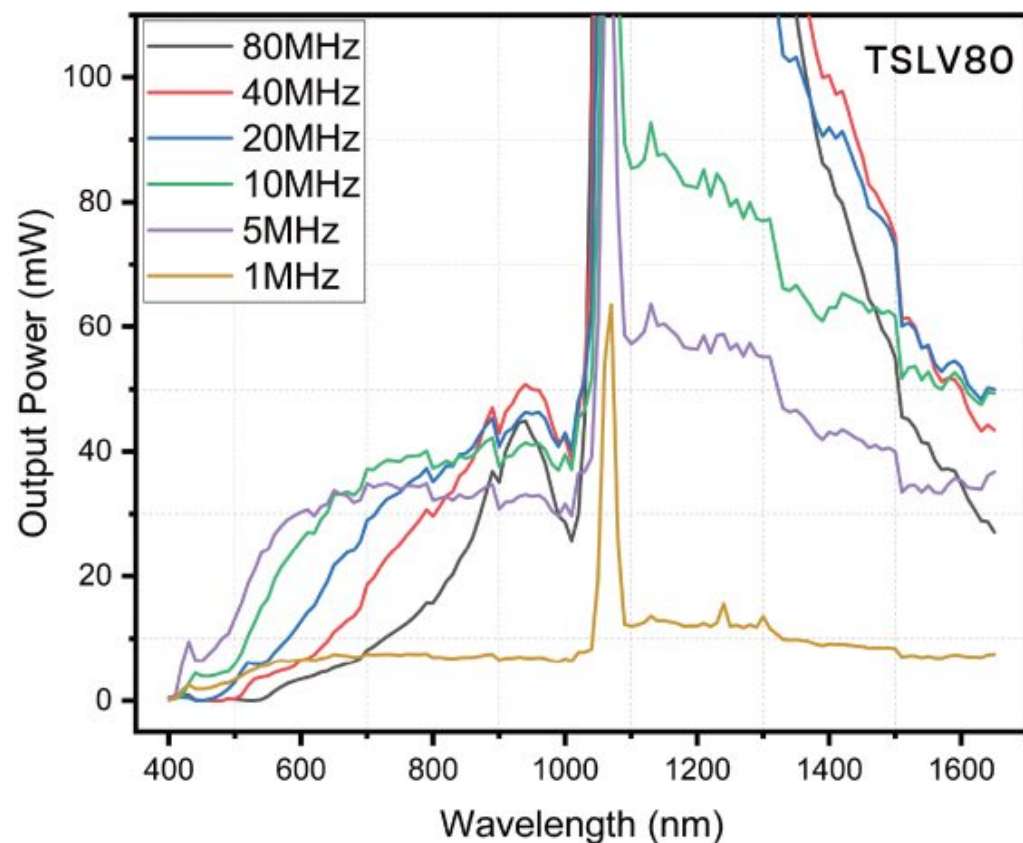
Stable output power fluctuation : RSD < 1 %

06. PROS : High Output Power

High Output Power of TLS

> 40 mW (Maximum power at 10 nm FWHM)

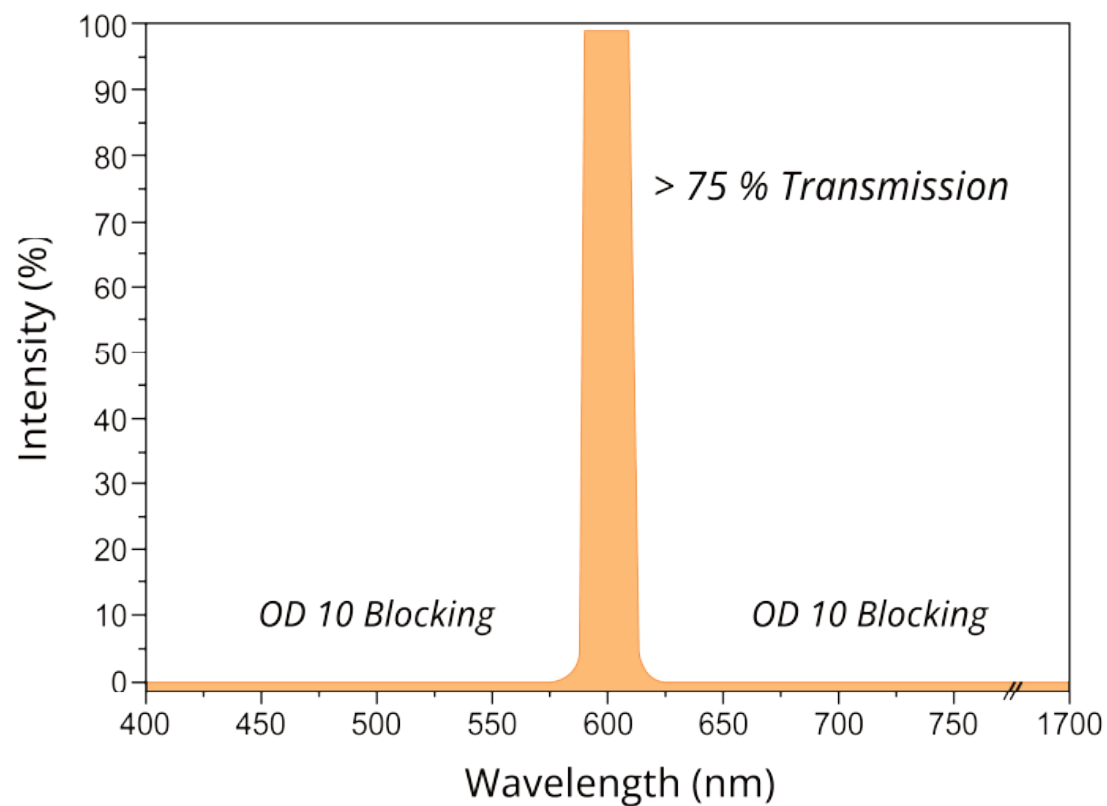
**Graphs measured at 15 nm bandwidth (FWHM)*



07. PROS : High Out-of-band Blocking

High Out-of-band Blocking

High out-of-band blocking (OD 10) avoids unwanted spectral leakage and associated background noise typical of liquid crystal-based filtering systems





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