PT277 SERIES

Single Housing Mid-Infrared Tunable Picosecond Laser System



The PT277 series are turn-key, single-housing mid-infrared lasers integrating a pump laser and OPO. PT277 delivers narrowband (2 – 4 cm^{-1}) pulses in the wide spectral range of 703 – 18 500 nm, with an optional optically synchronised second output at 1064 nm. Hands-free spectral scanning is superior for vibrational spectroscopy, nanoscopy, nonlinear spectroscopy. The Fast Scan accelerates spectral measurements through rapid wavelength switching and full-range scanning.

The laser has an internal air cleaning system to clean from water vapor and organics.

Nearly diffraction-limited divergence and beam-direction stability throughout the entire spectral tuning range are essential in tunable radiation applications requiring high-precision laser beam focusing.

Fast and fully automatic wavelength tuning is achieved by advanced microprocessor control. The wavelength tuning elements are mounted on precise closed-loop micro-stepping motors. The temperatures of the nonlinear crystals are controlled by thermo-controllers. No additional manual adjustment of the laser system is needed.

PT277 series features two models

Model	Features
PT277-SI	Tuning range: 1403 – 2020 nm (7127 – 4951 cm^{-1}) 2250 – 4400 nm (4444 – 2273 cm^{-1})
PT277-XIR	Tuning range: 1403 – 2020 nm (7127 – 4951 cm^{-1}) 2250 – 4400 nm (4444 – 2273 cm^{-1}) 4800 – 18500 nm (2083 – 540 cm^{-1})
-SH option	Tuning range 703 – 1024 nm (14 225 – 9 766 cm^{-1})
-H option	Synchronised second output at 1064 nm

FEATURES

- ***Tuning range 703 – 18 500 nm (14 225 – 540 cm^{-1})***
- *Optically synchronised second output at 1064 nm*
- ***Hands-free tuning**: motorized for the entire tuning range*
- ***Linewidth <4 cm^{-1}** in the entire tuning range*
- *Nearly diffraction limited divergence*
- *Beam direction stability in the entire tuning range*
- ***Single housing**: integrates a pump laser and OPO in a single housing*
- *Internal air cleaning system*
- *PC control via USB (virtual COM port), RS232, LAN using REST API commands*
- *Fast wavelength scan (sweep)*
- *System with two independently tunable wavelengths (available on request)*

APPLICATIONS

- *Infrared spectroscopy*
- *SNOM (scanning near field microscopy)*
- *PiFM (Photoinduced Force Microscopy)*
- *Nonlinear spectroscopy:*
  - *SFG (Sum frequency generation spectroscopy)*
  - *CARS (Coherent Anti-Stokes Raman Spectroscopy)*

SPECIFICATIONS [1]

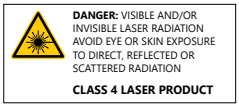
Parameter	PT277-SI	PT277-XIR
OUTPUT SPECIFICATIONS		
Tuning range		
Signal	1403 – 2020 nm (7127 – 4951 cm^{-1})	
Idler	2250 – 4400 nm (4444 – 2273 cm^{-1})	
DFG	–	4800 – 18 500 nm (2083 – 540 cm^{-1})
Output power [2]		
@ 1403 – 2020 nm (Signal)	> 400 mW	
@ 2250 – 4000 nm (Idler)	> 100 mW	
@ 12 500 nm (DFG)	–	> 10 mW
@ 18 000 nm	–	> 1 mW
Linewidth	< 4 cm^{-1}	
Pulse repetition rate	~ 87 MHz (same as pump laser)	
Pulse duration	7.5±1 ps	
Typical beam diameter [3] (at $1/e^2$ level)	~ 3 mm @ 3000 nm	
Typical beam divergence [4]	< 5 mrad @ 1600 nm	
Beam pointing stability	< 50 µrad rms @ 1600 nm	
Polarization		
Signal and idler	linear, vertical	
DFG	–	linear, vertical
Sweep speed for spectral range		
From 1403 to 2020 nm (Signal)	< 4 s	
From 2250 to 4400 nm (Idler)	< 4 s	
From 4800 to 18 000 nm (DFG)	–	< 2 s
Output power modulation frequency (AOM)	0 Hz – 2 MHz	
PHYSICAL CHARACTERISTICS		
Laser unit size (W×L×H)	320 × 766 × 241 mm	
Power supply size (W×L×H)	483 × 140 × 390 mm , stand-alone	
Chiller (third-party, approx.) (W×L×H)	290 × 420 × 290 mm , stand-alone	
Umbilical length	3 m	
SERVICE AND OPERATION REQUIREMENTS		
Cooling	water-air	
Room temperature	22 ± 2 °C	
Room temperature stability	± 1 °C	
Relative humidity	< 80 % (non-condensing)	
Power requirements	100 – 240 VAC (-10% / +5%), single phase, 50/60 Hz	
Power consumption	< 1 kW	
Cleanness of the room	not worse than ISO Class 9	

[1] All specifications are subject to change without notice. The parameters given in the table are indicators of the typical performance of the laser system. They may vary with each manufactured laser system.

[2] Output powers are specified at selected wavelengths. See typical tuning curves for power at other wavelengths. Power drops are possible.

[3] May vary depending on pump pulse energy.

[4] Full angle at FWHM level.



Note: The laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer than 1 hour then the laser system needs to warm up for a few hours before switching radiation on. The laser and auxiliary units must be installed in a place free from dust and aerosols. It is advisable to operate the laser in an air-conditioned room and to place the laser at a distance from air conditioning outlets. The laser should be positioned on a solid optical table. Access from both sides should be ensured. Intense sources of vibrations like freight elevators, railway stations, etc. should be avoided nearby.

OPTIONS

Option -H

Synchronised second output at 1064 nm. Output power >0.5 W.
Available with PT277-SI or PT277-XIR.

Option -SH

Tuning range 703 – 1024 nm (14 225 – 9766 cm^{-1}).
Available with PT277-SI or PT277-XIR.

TUNING CURVES

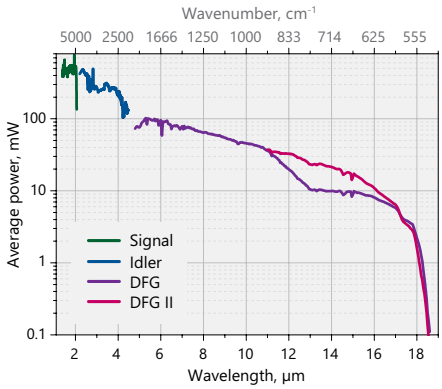


Fig 1. Typical PT277-XIR laser system output tuning curve.
The actual tuning curve might differ from presented here.

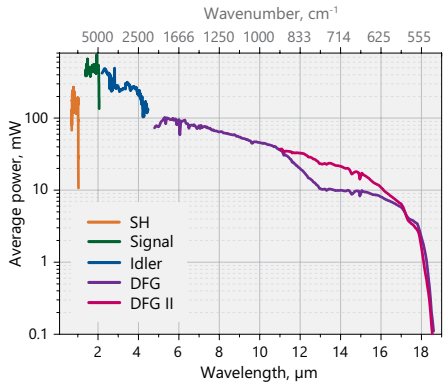


Fig 2. Typical PT277-XIR-SH laser system output tuning curve.
The actual tuning curve might differ from presented here.

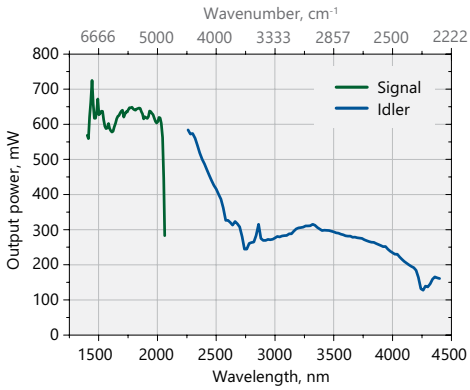


Fig 3. Typical PT277-SI laser system output tuning curve.
The actual tuning curve might differ from presented here.

ACOUSTO-OPTIC MODULATOR AOM

An acousto-optic modulator AOM is used for the output pulse train modulation.
Modulation frequency range is 0 – 2 MHz.

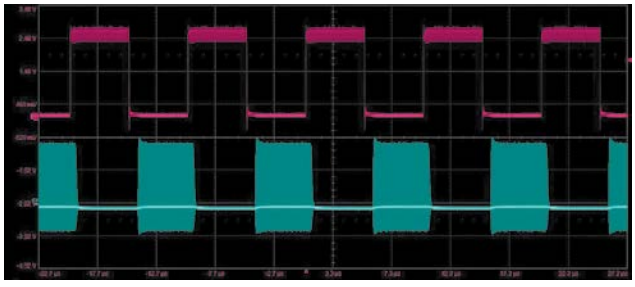


Fig 4. AOM control example:
magenta – 100 kHz control TTL signal to AOM CONTROL;
cyan – optical signal

COMMUNICATION INTERFACES

For customer convenience, the laser can be operated from a master device or a personal computer using various interfaces. Depending on the system configuration, control is available via the USB interface (REST API over RNDIS or VCP with ASCII commands), the RS-232 interface (ASCII commands), the LAN interface (REST API), or from the remote control pad with a backlit display that remains easy to read even while wearing laser safety glasses.

Communication module interfaces

Interface	Description
USB*	REST API over RNDIS
RS232	ASCII commands
LAN	REST API

* Default, other option: ASCII commands over virtual serial port

OUTLINE DRAWINGS



Fig 5. PT277-SI laser features the same external housing as PT277-XIR. PT277-XIR and PT277-SI lasers feature attachable handles that enable easy transportation and installation

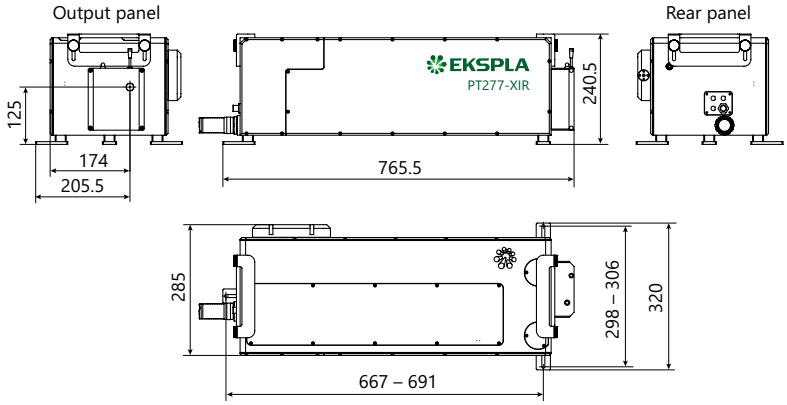


Fig 6. External dimensions of PT277-XIR and PT277-SI laser units (the same external housing)