1560nm PPLN Waveguide Frequency Conversion Module

Product Description

Optical frequency doubling is widely used in laser technology to convert infrared lasers to visible light or shorten visible wavelengths. It expands laser spectrum coverage and can involve multi-stage frequency doubling for even shorter wavelengths. Ideal Photonics' nonlinear crystals enable sum-frequency, difference-frequency, and frequency doubling. The 1560nm PPLN (Periodically-Poled Lithium Niobate) crystal, for example, uses second-order nonlinear effects to convert 1560nm light to 780nm for optical second-harmonic generation (SHG). This process is achieved through the crystal's waveguide structure, which increases efficiency, with

polarization-maintaining jumpers pre-coupled at both ends for easy integration without manual coupling.

Product features

Laser Microscopes、 Fluorescence Microscopes、 Flow Cytometers、 Various Spectroscopy Applications、 Physical and Chemical Applications

Part Number

MP-PPLN-780-0.1-25

Application area

Quantum Optics Experiment | LiDAR System | Spectral Analysis | Nonlinear Optics Research | Precision Measurement

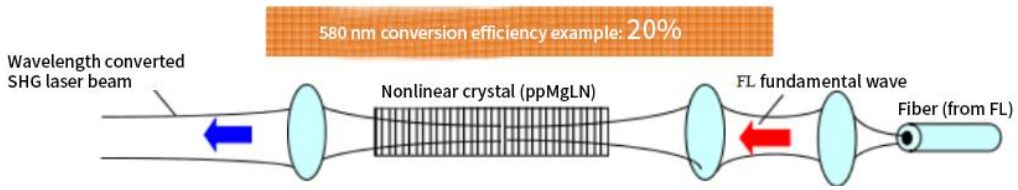
Core parameters

Pump Wavelength	Output Wavelength	Output Fiber
1560nm	780nm	PM850

General Parameters

Built-in Mechanism	Option
Peltier and thermistor for temperature control	Fiber laser source for each wavelength

SWPF filter for fundamental wave cutting	External crystal temperature control driver
PD for light intensity monitoring	External safety shutter
	External acousto-optic modulator (AOM)

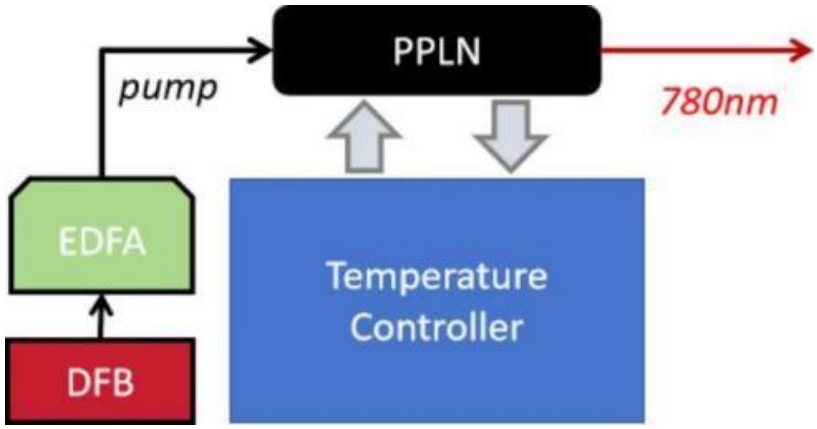


Current Supported Wavelength Conversion	1178nm→589nm，1064nm→532nm，1590nm→795nm,1560→780n m ，1160nm-580nm，1550nm-775nm,1396nm-698nm,1018nm-509nm
Output Power*	Up to 1W (spatial output)
Output form	Collimated light or fiber
Beam quality	Spatial single-mode ， TEM00, $M^2 \leqslant 1.1$

*(Note: Output power may vary depending on the characteristics of the input pump laser, such as power and linewidth.)

Parameter (Space Out)	Parameter (Fiber Coupled Output)
WH-0780-000-A-B-C (space out)	WH-0780-000-F-B-C (fiber out)
1560 nm	1560 nm

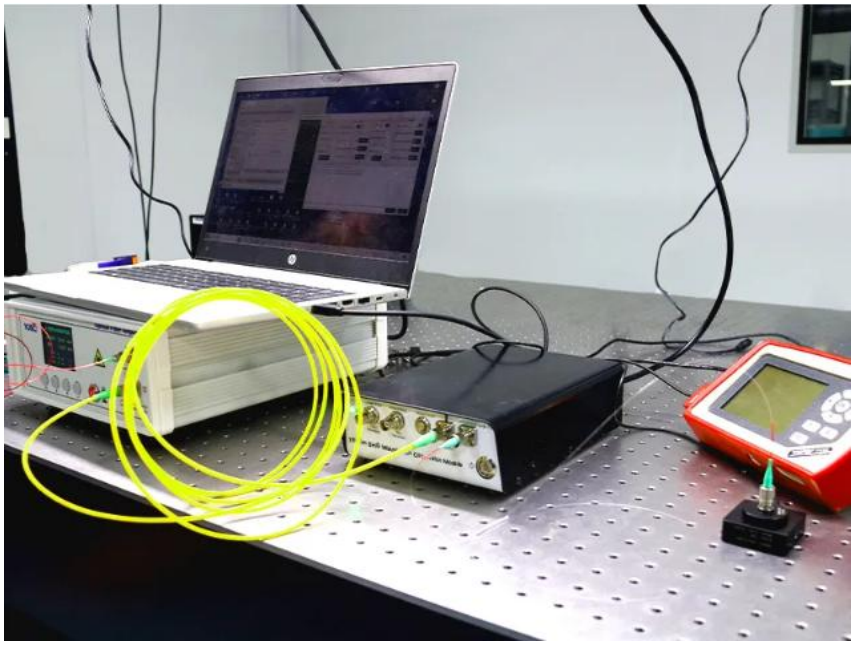
780 nm	780 nm
> 50 %/W	> 25%/W
When pump power is below 100 mW	When pump power is below 100 mW
Typ.: > 30 degree C	Typ.: > 30 degree C
Temperature fine tuning is required.	Temperature fine tuning is required.
B = 3450	B = 3450
2 A max	2 A max
54 mm x 30 mm x 11.2 mm	54 mm x 30 mm x 11.2 mm
IR-cut filter	none
1550 nm PANDA fiber with FC / APC connector	1550 nm PANDA fiber with FC / APC connector
Space out	850 nm PANDA fiber with FC / APC connector



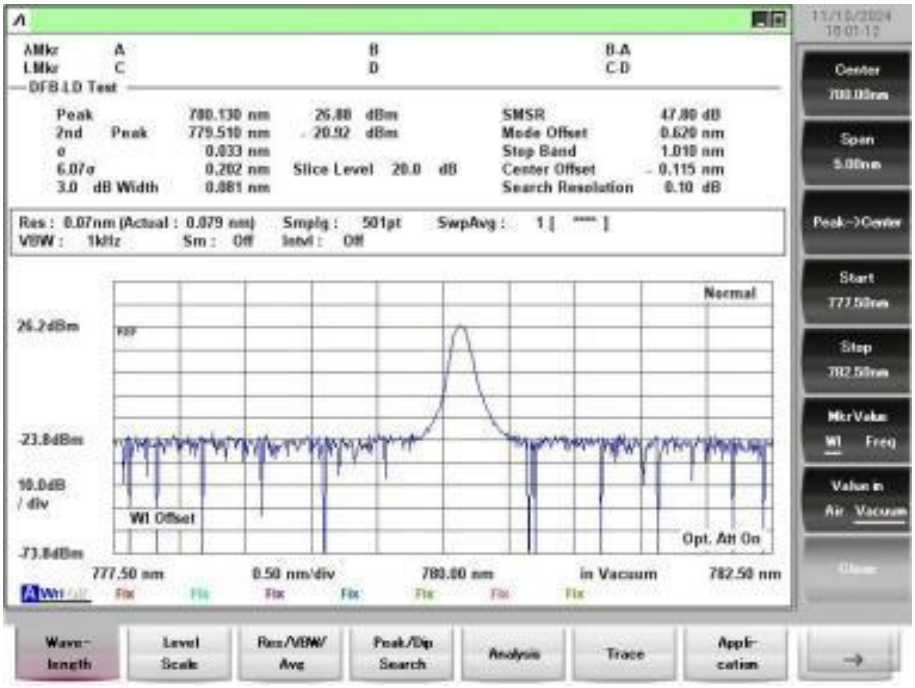
Optical Layout for the Use of PPLN Frequency Doubling Crystal

Test example: 1560 → 780nm

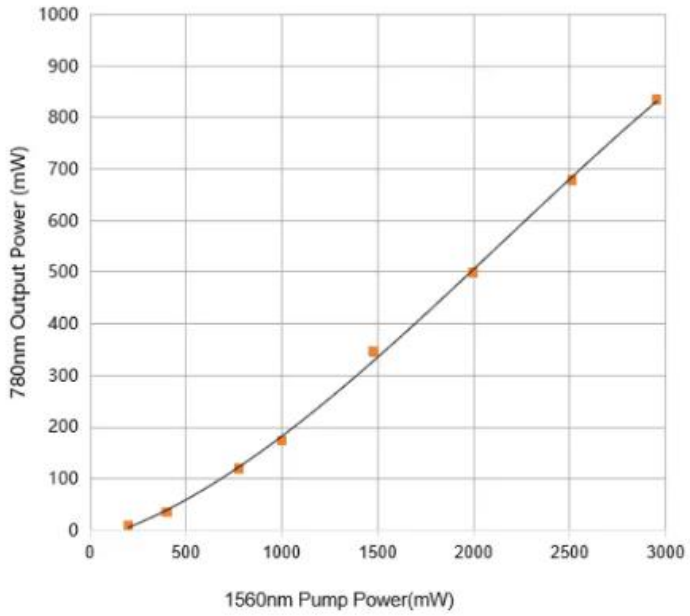
First, select a 1560nm DFB semiconductor laser as the seed source and input it into an EDFA for optical amplification. The amplified fundamental wave light is then used as the pump source for the PPLN crystal. The light is input into the crystal's input port, and after passing through the PPLN, the frequency-doubled 780nm light is generated. Before injecting the pump, it is essential to ensure that the temperature controller of the PPLN is functioning properly and that the crystal is stable at the set temperature.



The 780nm output spectral component was tested using a spectrometer to confirm the frequency doubling process. The spectrum is shown below:

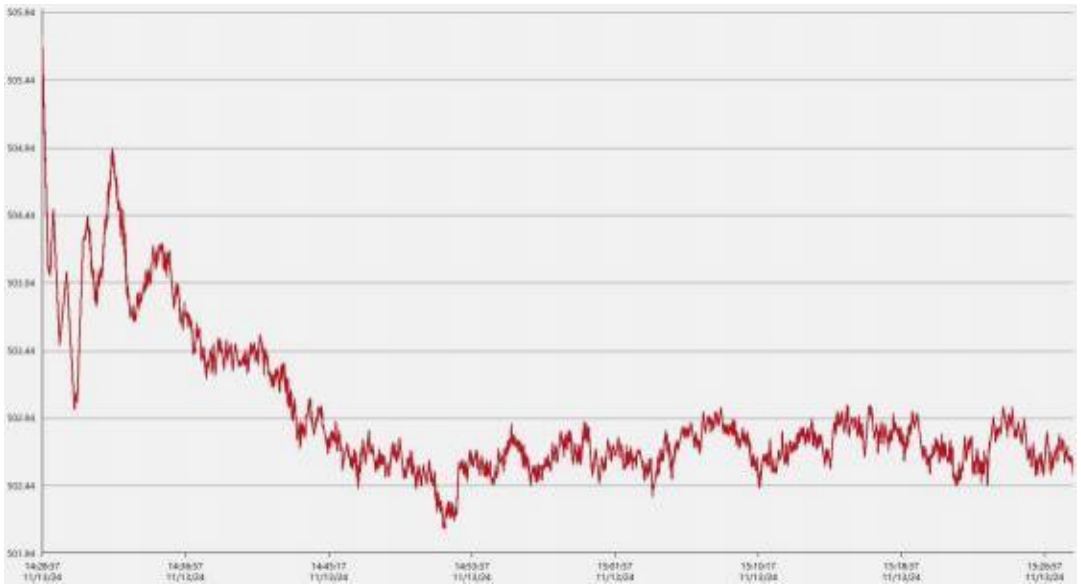


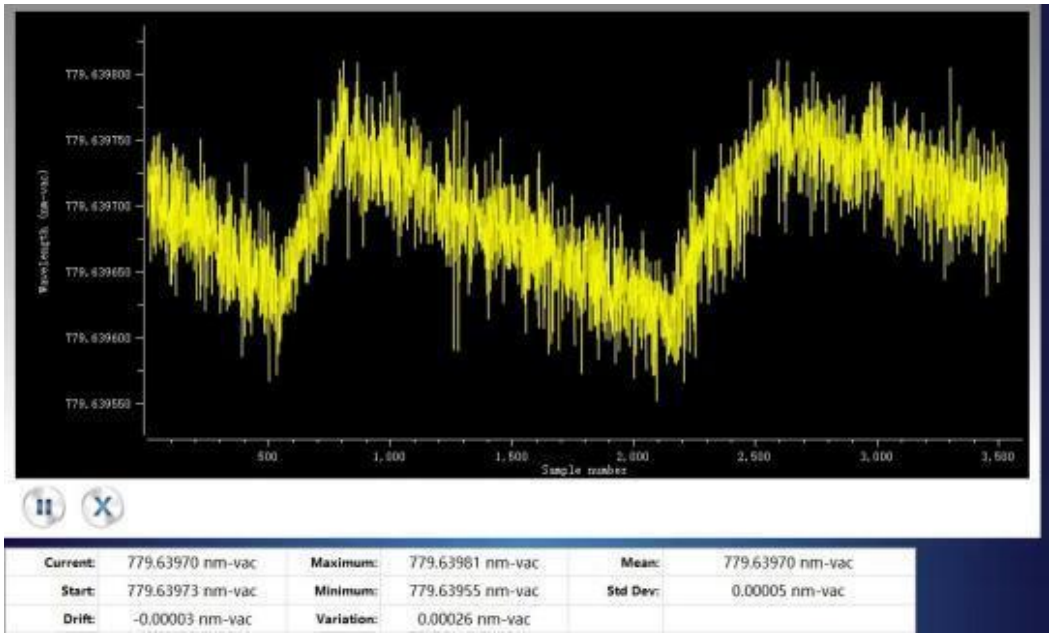
By adjusting the EDFA current, we tested the frequency doubling power variation with different input powers. Higher input power results in higher frequency doubling efficiency.



Finally, we tested the power and frequency stability of the output frequency-doubled light, verifying the operational stability of the PPLN crystal. These two parameters also depend on the noise of the EDFA and DFB, requiring a low-noise light source for testing.

Power stability test:





Precautions:

The waveguide must be properly heat managed. It is recommended to mount the waveguide on a heat sink, with thermal conductive materials like thermal grease applied to the contact surface between the waveguide and the heat sink. The recommended operating environment temperature is 10~30°C. If the temperature is outside this range, secondary temperature control for the heat sink should be applied, setting the heat sink temperature around 20°C. It is strictly prohibited to operate without secondary temperature control in environments exceeding the waveguide's matching temperature.

The matching temperature of the waveguide body must be in the range of 20~60°C.

Start the waveguide's temperature control first, wait for the temperature to stabilize, and then slowly increase the pump power. As the pump power increases, the optimal matching temperature of the waveguide may shift slightly. At this point, fine-tune the waveguide temperature to achieve maximum frequency-doubling output.