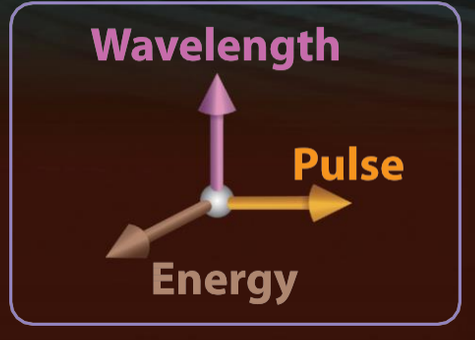
HC PHOTONICS CORP.

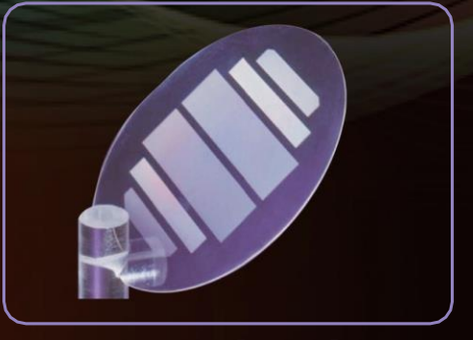
E = hc/λ = HC Photonics / full spectrum λ

Enable Generation & Sensing of Full Spectrum Laser Sources as well as their applications



Laser Sources

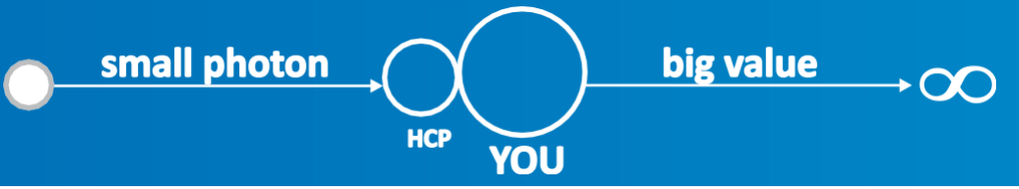
+ with



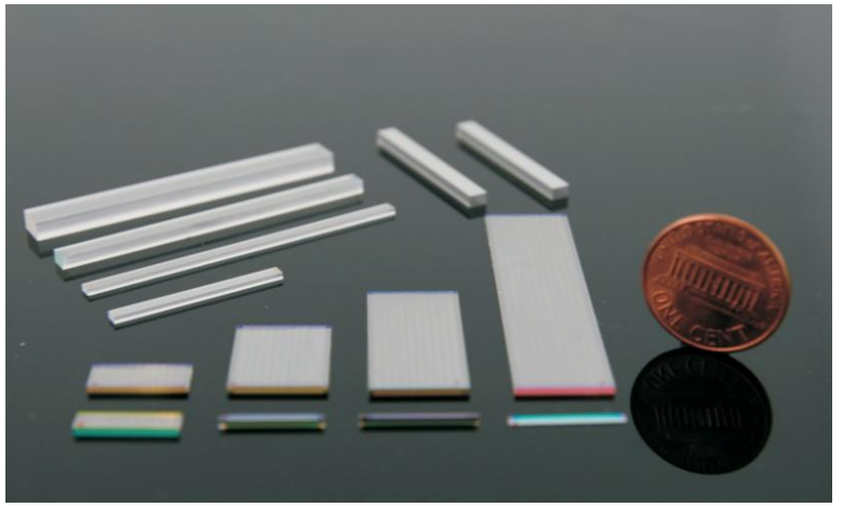
PPXX Technology

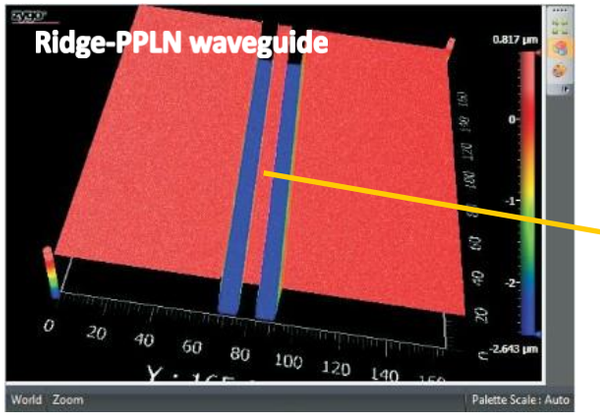
= enable

Full Spectrum Opportunities



Periodically poled Lithium Niobate/Lithium Tantalate (PPXX chips)

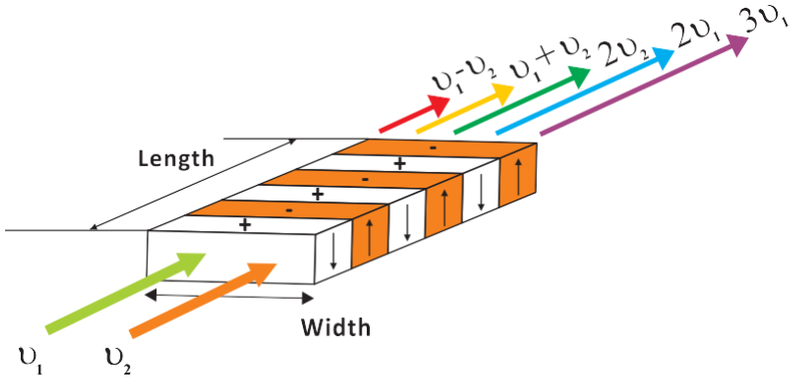


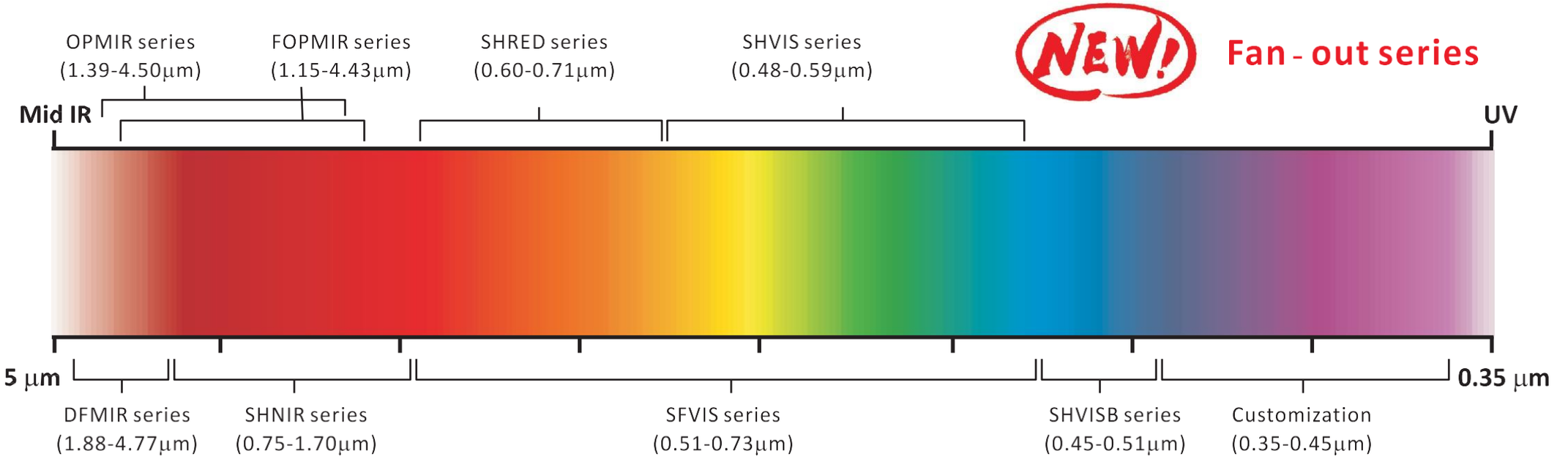


PPXX (periodically poling lithium niobate/tantalate) technology is an efficient laser wavelength conversion technology, which enables the generation and conversion of new laser wavelengths via $\chi(2)$ nonlinearity of the material. With the engineered micro-structure on ferroelectric nonlinear materials and the special waveguide technology, HCP's PPXX chips can provide you efficient frequency conversion processes for full-spectrum applications.

Configuration of nonlinear frequency conversion:

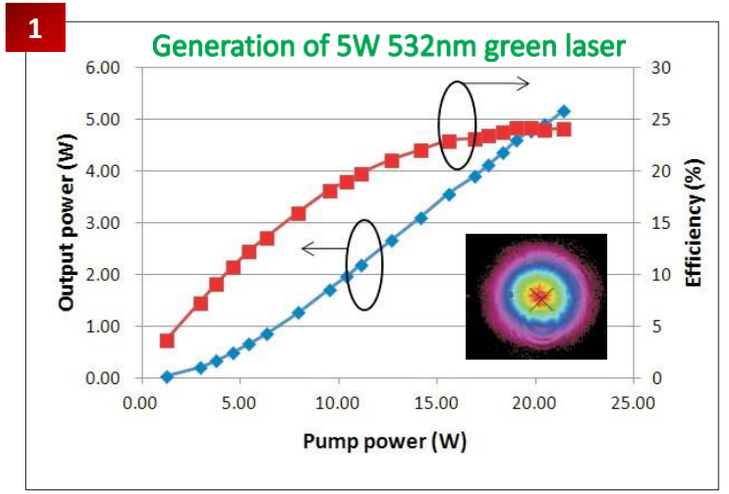
SHG
SFG
DFG/OPA
SPDC
OPO
...



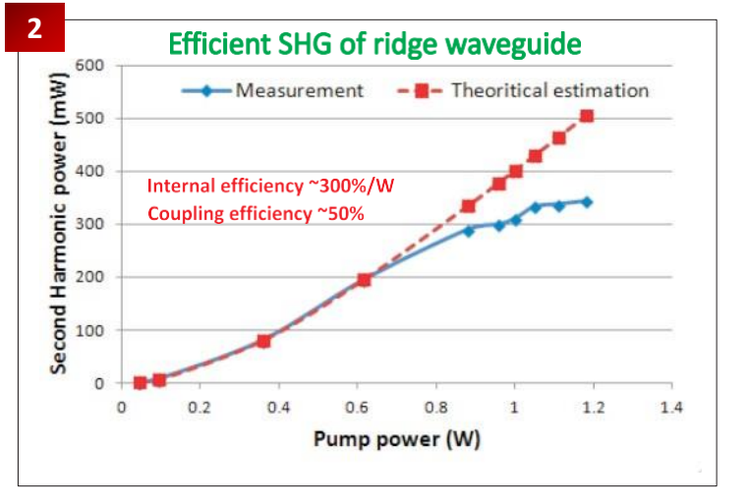


SHIPPING TODAY >365 stock PPLNs with single/multiple/fan-out design in different lengths

1

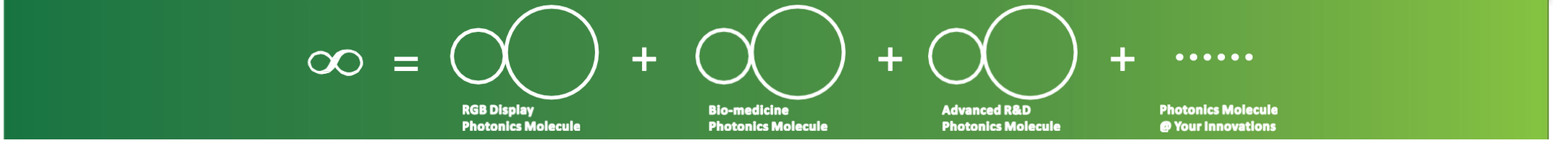


2



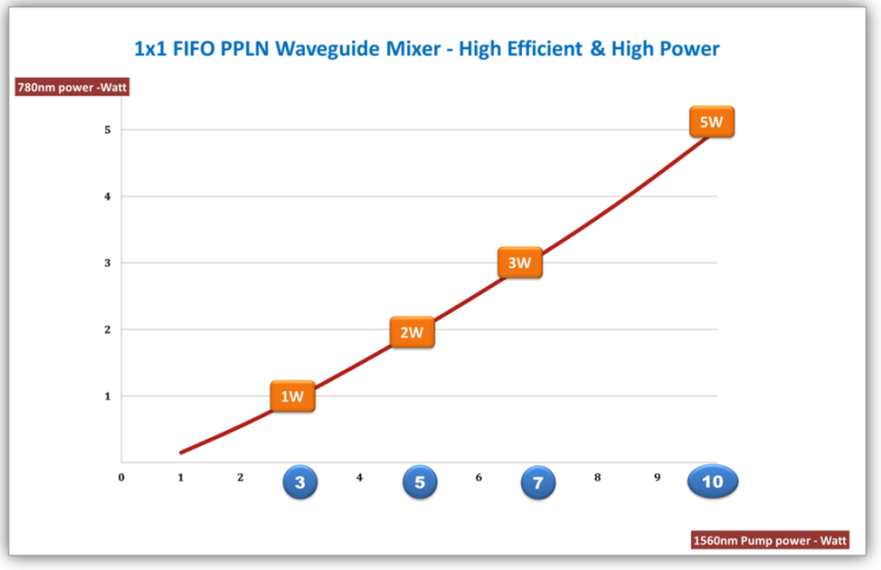
(1) Generation of high power visible light by single pass frequency doubling in PPLT. The beam quality remains nearly Gaussian beam.

(2) The efficient SHG for 1um pump in 1cm-long ridge waveguide. The propagation loss and fiber-waveguide mode mismatching have been taken into account in the coupling efficiency.

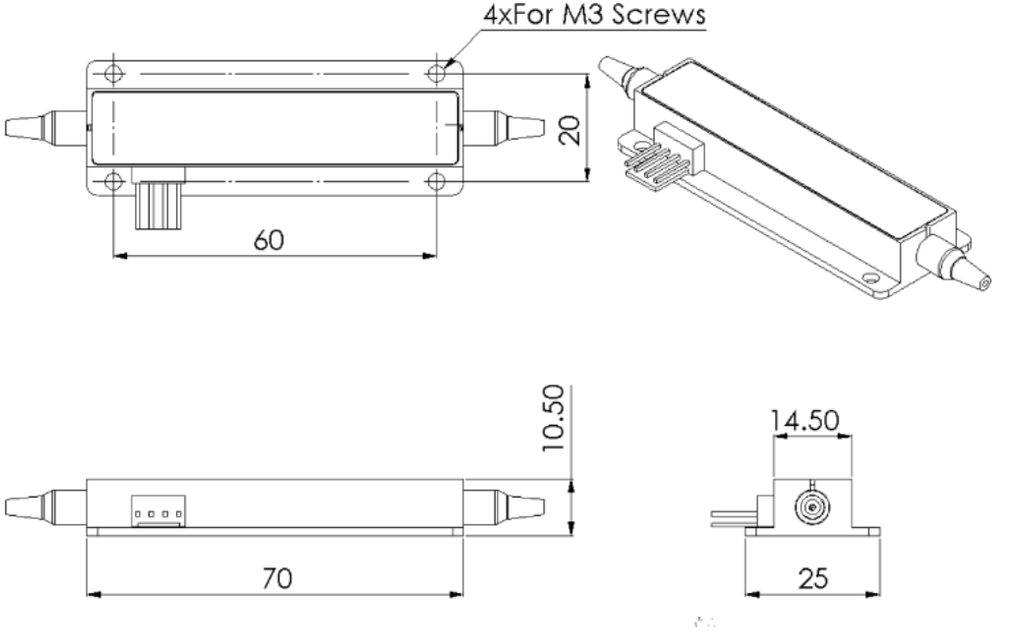


PPXX Mixers NEW Telecom band SHG

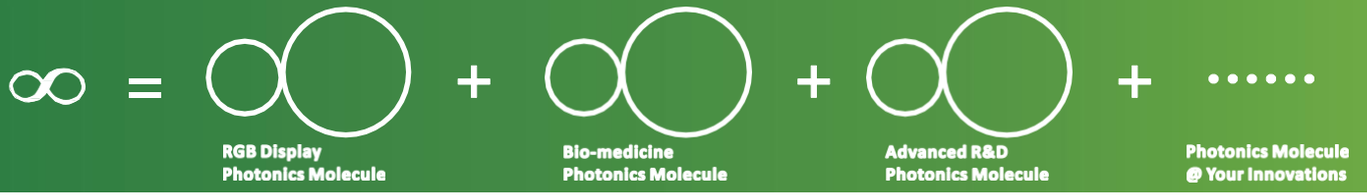
- High efficiency (up to 50%)
- High power (up to **5W** out of PM fiber)
- Compact/Robust package (~18 cc only)
- Custom Wavelengths upon request
- Fiber delivery (FIFO, Fiber-In & Fiber-Out)
- **Commercial volume**



Package dimension:



Unit: mm



PPXX Mixers

- Waveguide mixer

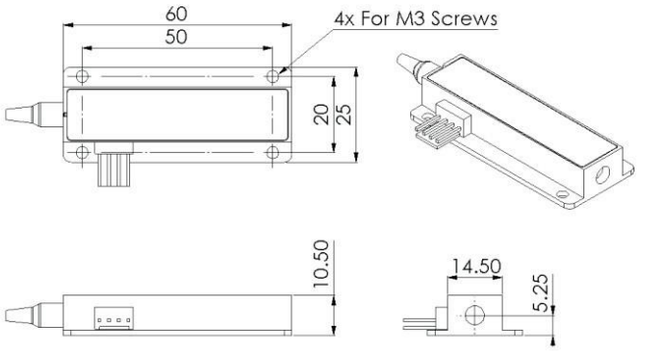
Features:

- High efficiency (up to 50%)
- High power (up to **5W** out of PM fiber)
- Compact/Robust package
- Custom Wavelengths upon request
- Fiber delivery (FIFO, Fiber-In & Fiber-Out)
- **Commercial volume**

Applications:

- Industrial Quality Control
- Quantum
- Bio & Medicine
- Spectroscopy & Environment
- Space & Defense
- Science & Research

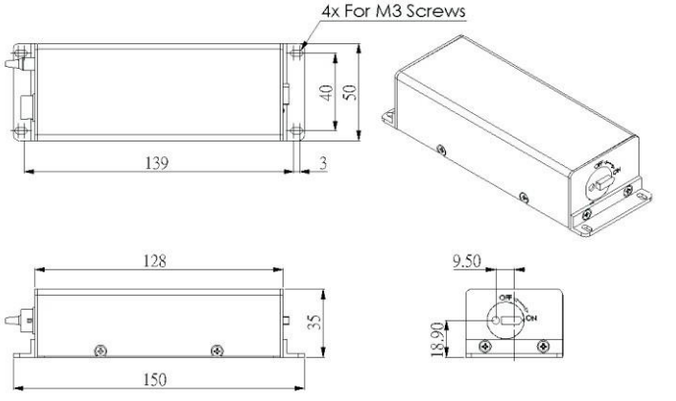
Package dimension:



unit: mm

- Bulk mixer

HCP's precision alignment and photonics packaging facilities can provide you fast customization and commercialization. A compact, plug & play, and integrated module provided by HCP for the wavelength conversion applications is called "Mixers". With the integrated optics and electronics inside, our mixers free your hands from the delicate optical alignment and provide maintain free solution. Our basic capabilities include simulation, integration processed to qualification test. Please just contact us for your special applications. We will realize your innovation with "Photonics Packaging & Application Integration Service" based on the concept of open innovation.



unit: mm

General specifications of standard PPXX mixers

Parameters	Bulk type	Waveguide type
Series	B(450-495nm) G(495-560nm) Y(560-580nm) O(580-620nm) R(620-800nm)	
Options	Power monitoring, Control unit, Filter module	Power monitoring, Control unit, Filter module, Fiber adaptor package
Functionality	Second Harmonic Generation (SHG)	
Output power	Up to 10W	Up to 5.0W
Required pump power	Up to 40W	Up to 10W
Beam Charateristics	TEM00, Collimated	TEM00, oval shape
Beam quality, M^2	<1.2	
Polarization	Linear, >20dB	
Return loss	-45dB	-40dB
Environmental condition	10~35 deg. C (Operating), -20~70 deg. C (Storage & Transportation)	

Custom options:

1. Wavelength range: UV (355nm)~MIR (4200nm)
2. Integrated photodetector for output power monitoring
3. Configurations of nonlinear frequency conversion: SHG, SFG, DFG/OPA, SPDC, etc.
4. Specified fiber coupled output e.g. PM480, SMF1550 and fiber length with or without connectors
5. 1x0 (fiber in/free space out), 1x1 (fiber in/out), 2x0 (2 fibers in/free space out), 2x1(2 fibers in/1 fiber out)

Please refer to "PPLN Optical Mixers" catalog for further information

PPXX Cavity Mixers

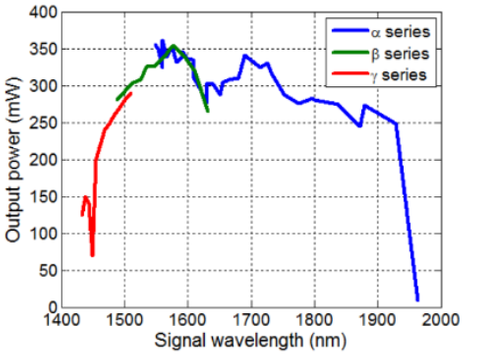
Cavity configuration is an alternative way to enhance nonlinear frequency conversion. To fit with all kinds of applications, we have developed a cavity mixer platform which provides users-friendly interface. With this platform structure, it can be easily transformed to external pump OPO (EP-OPO), Intra-cavity OPO (IC-OPO), Intra-cavity SFG (IC-SFG), Intra-cavity DFG (IC-DFG) etc. They are widely applied for generating NIR signal wavelengths between 1.4-2 um and MIR idler wavelengths between 2.3-4.5 um.

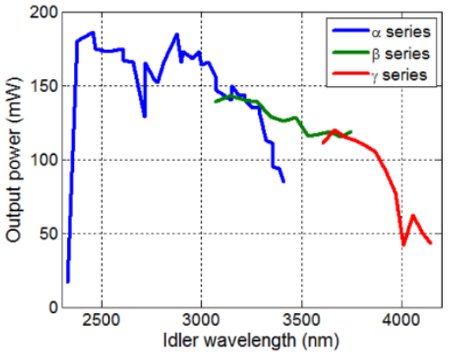
Features:

- Cavity enhanced for higher efficiency
- Wavelength from UV/Visible to NIR/MIR
- Fiber delivery optional
- Wavelength tunable up to few-hundred nm
- Convenient, compact and robust

Parameter	unit	ICOPO-B[1] & ICOPO-TB[2]
Signal/Idler Wavelength	nm	α series: 1560-1880/2500-3300 β series: 1495-1640/3000-3700 γ series: 1440-1510/3600-4080
Signal/Idler Output Power	mW	α series: 250/100 β series: 250/90 γ series: 200/70
Linewidth	GHz	300
Beam Quality		TEM00, Signal M2<1.2, Idler M2<1.5
Polarization		Linear, >20dB

1. ICOPO-B: broad bandwidth (few nm), specific wavelength within α,β,γ range could be designed
2. ICOPO-TB: tunable (few hundred nm)

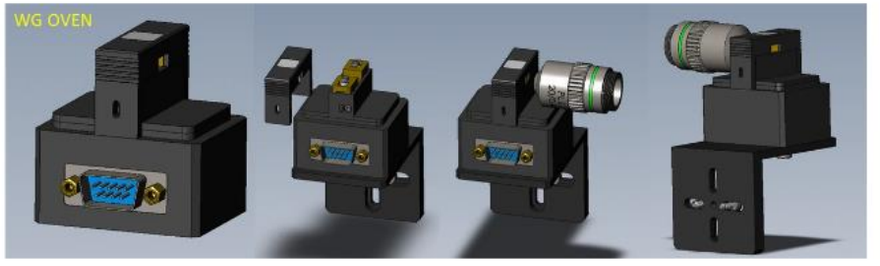




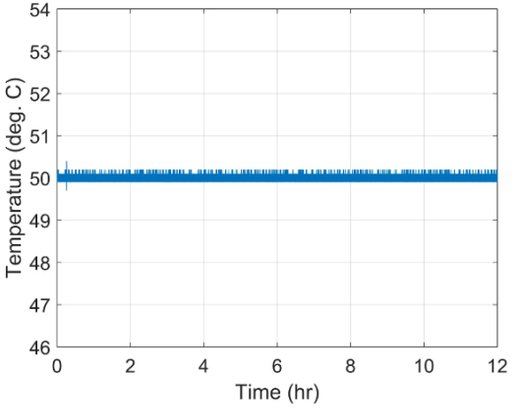
Accessories

- Temperature controller & Ovens

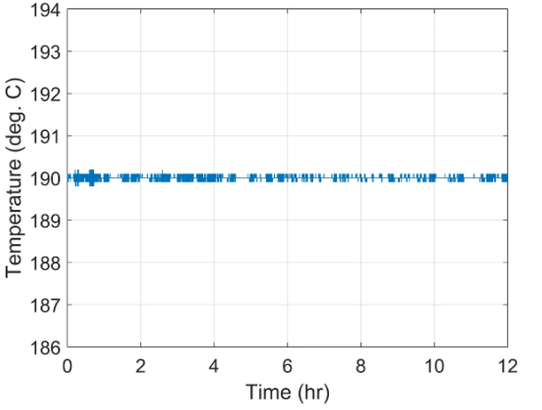
TC-038D



- PID control
- Auto-tuning & programmable
- Tuning step: 0.1°C
- Temperature tuning range: ambient temp. to 200°C
- Storage temperature: -20°C to 70°C
- Maximum power consumption: 24V/60W
- Communication Interface: USB & GUI program included
- Dimension: 150(L) x 90(W) x 65(H) mm^3
- CE, RoHS/REACH compliance
- Excellent temperature stability

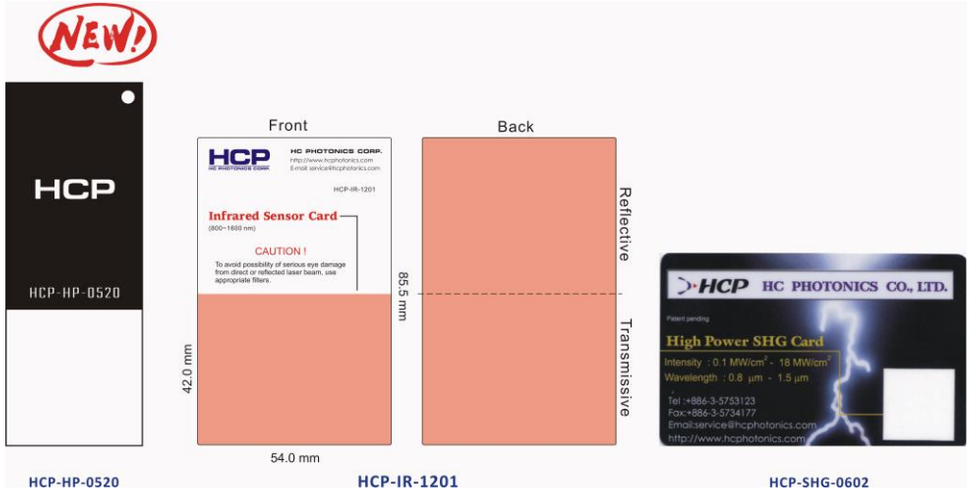


Temperature stability at 50 degrees Celsius

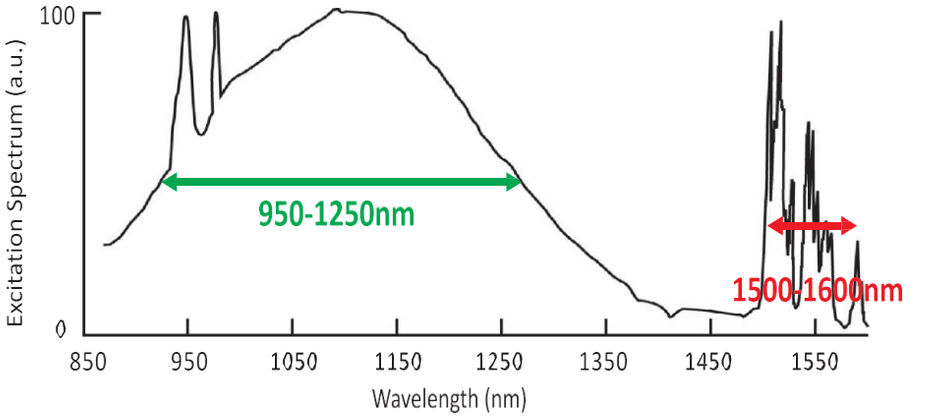


Temperature stability at 190 degrees Celsius

- IR sensing card



Technical information:



Welcome OEM orders with your logo and designs

Features:

- Ideally designed for CW or pulsed lasers (800~1600nm)
- Edge-to-edge design for easy alignment
- No optical recharging is required (HCP-HP-0520 & HCP-SHG-0602)
- ISO standard PVC card or Metal Aluminum base
- 2-in-1 card - Reflective & Transmissive (see laser spot from back side)
- Could be cut into small pieces for use (HCP-IR-1201)

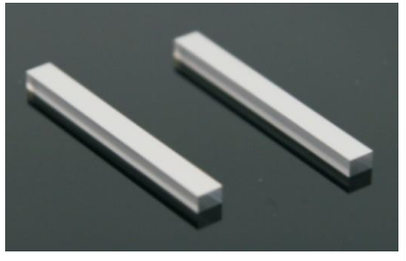
Specification	HCP-IR-1201	HCP-HP-0520	HCP-SHG-0602
Sensing Wavelength Range	800~1600 nm	800~1600 nm	800~1600 nm
Emission Wavelength Range	520~670 nm	400~800 nm	400~800 nm
Physical Dimension	86 mm x 54 mm	101 mm x 38 mm	86 mm x 54 mm
Active Region	86 mm x 54 mm (overall) 42 mm x 54 mm (transmissive) 43.5 mm x 54 mm (reflective)	38 mm x 38 mm (reflective)	20 mm x 20 mm (reflective)
Substrate Material	ISO standard PVC card	Aluminum	ISO standard PVC card

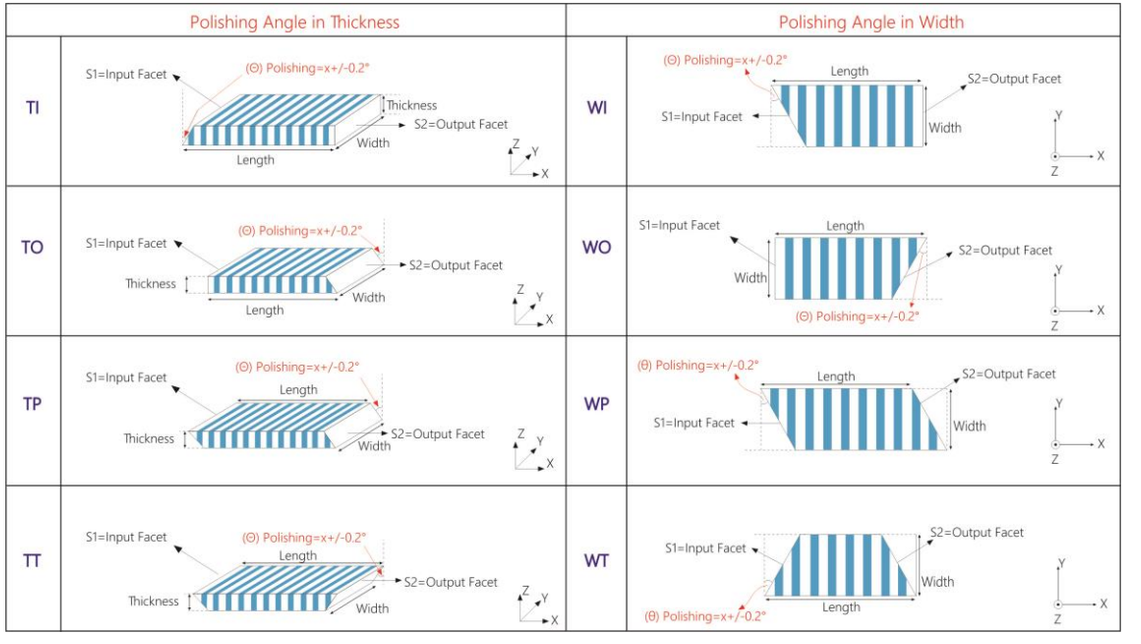
Applications:

- View, locate and analyze CW Lasers, Pulsed Lasers, and IR Laser Diodes)

Photonics services

- Precision polishing





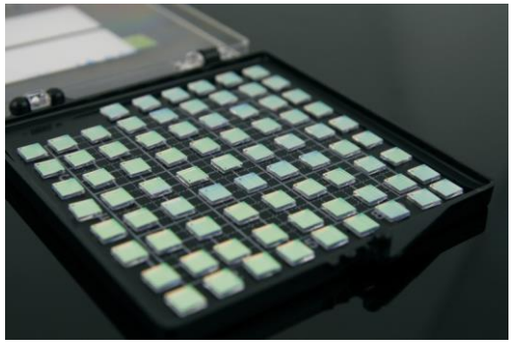
HC Photonics has excellent polishing capacities in house to meet specified requirements, such as wedge polishing, flatness, scratch/dig parallelism,...etc.

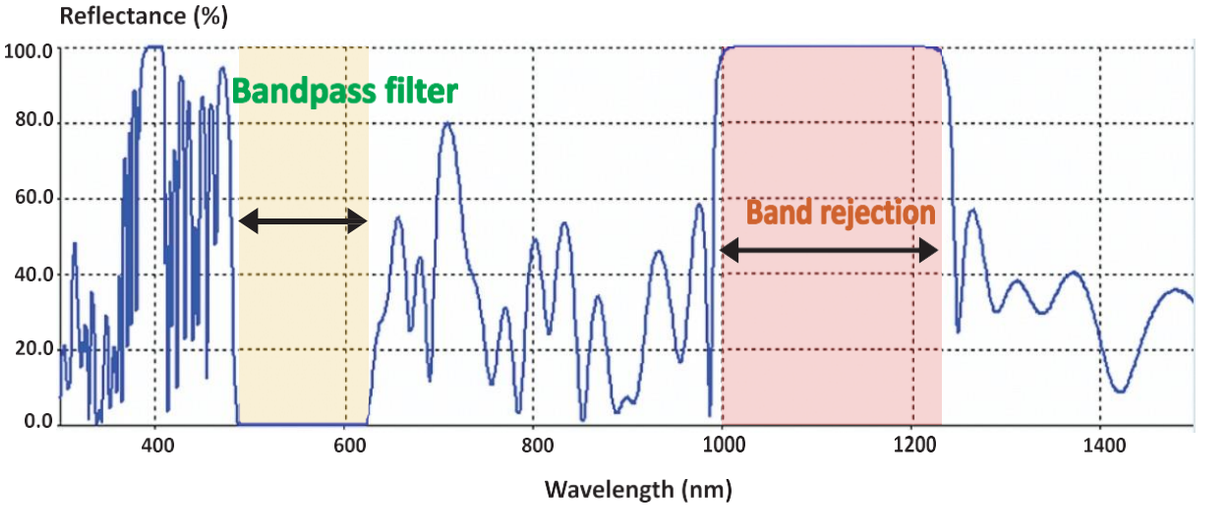
Technical information

Dimension Specification	P	G	Q
Parallelism S1//S2(0°±)	3'	5'	5'
Perpendicularity(90°±)	15'	21'	35'
ΔX (mm)	± 0.2 , X ≥ 5 mm ± 0.1 , X < 5 mm		
ΔY (mm)	± 0.1		
ΔZ (mm)	± 0.05		

Surface Specification	A1	A2	A3
Scratch/Dig (S/D) based on MIL-O-13830	10/5	20/10	20/20
Clear Aperture (C.A.) in Z	80%		
Clear Aperture (C.A.) in Y	90%		
Chipping on S1 & S2	No chipping within C.A.		
Flatness (λ@633nm)	λ/10	λ/6	λ/6

- Optical coating





We have extensive experiences at optical coating on serval substrates like Lithium Niobate or BK series glassed. No only anti-reflection coating but also beam splitter (50/50) or dichroic mirrors are provided. Please specify your substrate, polarization and incident angle when making an enquiry. HCP would be willing to offer our coating service for you.

- Sputter thin film deposition coater with radical assisted sputtering (RAS) technology
- Spectrometer for coating measurement

Technical information

Specifications	
Substrate	MgO:LN/LT/Quartz/Fused Silica/Optical Glass/Others
Incident Angle (Polarization)	0°/45° (P/S)
Coating Specification	Anti-Reflection (AR), Beam Splitter, High-Refection (HR), custom spec
Damage threshold	>3GW/cm^2 @1064nm, 30ns pulse, 25um radius, 1-3kHz Repetition rate
Surface Specification	A1/A2/A3 (see polishing spec on Page 10)

Your trusted value co-creation partner

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