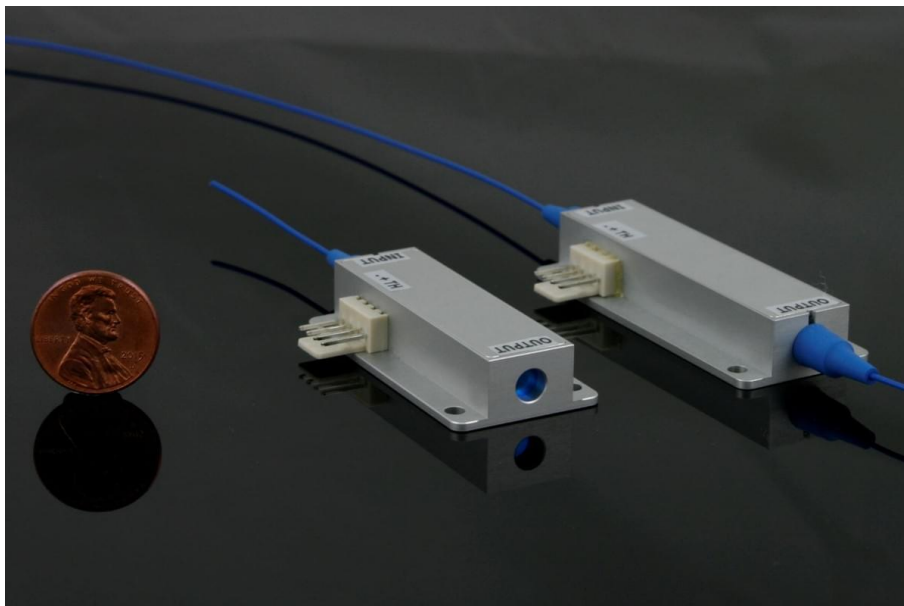


PPLN Waveguide Mixers: super efficient frequency converter

PPLN waveguide mixers are frequency conversion modules which integrate PPLN waveguide chips into a convenient, compact, robust, cost-effective packaged format for your application convenience. With waveguide structure, PPLN waveguide mixers have higher efficiency in single-pass configuration as compared to bulk mixers. Optimized for your desired input pump lasers, PPLN waveguide mixers provide the polarization-maintained output either in free space or optical fiber, with available output wavelength ranging from UV/Visible to NIR/MIR and output power up to sub-Watt or even up to Watt level.



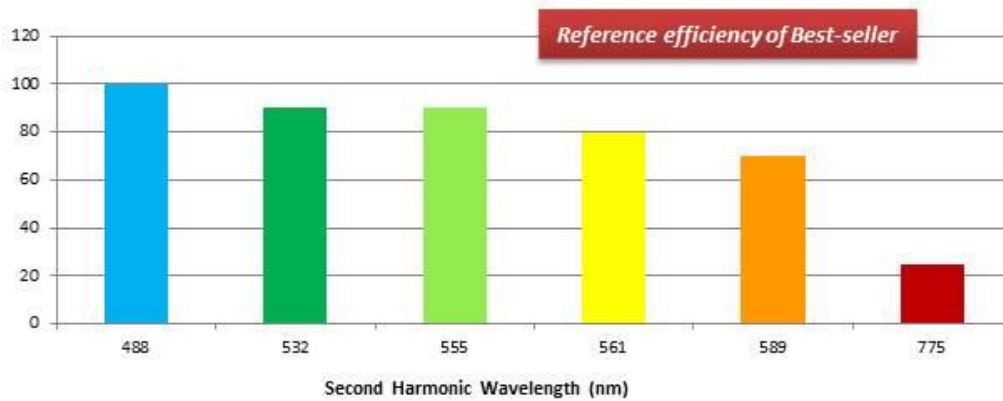
Key features

- Single-pass & high-efficiency, optimized for your specified input pumps
- Available output wavelength from UV/Visible to NIR/MIR
- Available mixing configuration from fundamental type to advanced type (such as SHG, SFG, and DFG etc.)
- Available for fiber or free space as input/output coupling interfaces (such as 1x0, 1x1, 2x0, 2x1, 0x0, 0=free space, 1=one fiber, 2=dual fibers)
- Optional alignment beam for free space input
- Available with integrated thermistor/TEC for QPM temperature optimization & optional photodiode (PD) for power monitoring/automatic power control
- Convenient, compact and robust and available for a variety of application customizations

Bestseller

	Waveguide Mixer – SHG				
Color	B	G	Y	O	R
Range (nm)	450-495	495-560	560-580	580-620	620-800
Best seller, λ ^{*1}	<u>488nm</u>	<u>532nm</u> <u>555nm</u>	<u>561nm</u>	<u>589nm</u>	<u>775nm</u>
Applications	CyPet, GFP, PA-GFP, Dronpa, FITC	YFP, Rhodamine, mOrange, DsRed	mApple, DsRed, TRITC, Cy3	Texas Red, mCherry, mRFP, mKate	NIR Raman spectroscopy, Rb/K cooling,
Efficiency ^{*2}	100%/W	90%/W	80%/W	70%/W	25%/W
Pump	Diode	Diode/Yb&Yb+/Raman lasers			Diode/Er laser
Fiber output ^{*3}	Yes, <0.5W with single mode PM fiber				

1. The wavelengths of the best sellers are within +/- 0.5 nm typically. Custom wavelengths are available upon request.
2. The SHG conversion efficiency is *conservatively listed* by pump condition with single-longitudinal mode lasers. Normally the efficiency could be doubled with multi-longitudinal mode lasers e.g. **180%/W @532 nm**.
3. Typical coupling efficiency is >75%~ 80% with single mode PM fiber. Higher efficiency is available.



General Specifications

Optics	unit	Spec.		
		Minimum	Typical	Maximum
Beam quality, M ²				≤1.2
Output beam (TEM00) ellipticity	%	1.2-2.0, wavelength dependent		
Numerical aperture		Wavelength dependent		
Output polarization state		Horizontal, PER>20dB		
Back reflection for IR wavelength	dB		-40	
Fiber coupled output	%		75	
Mechanics	unit	Spec.		
		Minimum	Typical	Maximum
Housing dimension (LxWxH)	mm	60x25x10.5, 70x25x10.5(fiber-out)		
Beam height	mm	5.25+/-0.5		
Statistic beam angle	mrad	-7.5	0	7.5
Electrics	unit	Spec.		
		Minimum	Typical	Maximum
Electrical connector		Molex (4P)		
Thermoelectric cooler		3.9V, 1.7A maximum, Qc = 4.9W		
Environment	unit	Spec.		
		Minimum	Typical	Maximum
Storage temperature (no humidity)	°C	-20	-	70
Operating temperature range	°C	10	25	35
Operating rel. humidity (non condensing)	%RH	10	-	85
Restriction of hazardous substances directive (RoHs)		Declaration of Conformity to 2011/65/EG		

1. The wavelengths of the best sellers are within +/- 0.5 nm typically. Custom wavelengths are available upon request.
2. The SHG conversion efficiency is **conservatively listed** by pump condition with single-longitudinal mode lasers. Normally the efficiency could be doubled with multi-longitudinal mode lasers e.g. **180%/W @532 nm**.
3. Typical coupling efficiency is >75%~ 80% with single mode PM fiber. Higher efficiency is available.

To avoid possible damage on fiber connectors, direct fiber splicing is recommended. However, if FC/APC or FC/PC connectors are needed, one can use commercially available components to handle fiber connection such as Fiber-to-Fiber U-Benchs. (Thorlabs Inc.)

PANDA PM Fiber spec (Corning)	PM 1550	PM14XX	PM 1300	PM 980	PM 850	PM 630	PM 480	PM 400
Wavelength (nm)	1550	1400-1490	1300	980	850	630	480	410
Mode-field Diameter (µm)	10.5 ± 0.5	9.8 ± 0.5	9.0 ± 0.5	6.6 ± 0.5	5.5 ± 0.5	4.5 ± 0.5	4.5 ± 0.5	3.5 ± 0.5
Beat Length Range (mm)	3.0-5.0	2.8-4.7	2.5-4.0	1.5-2.7	1.0-2.0	≤ 2.0	≤ 2.0	≤ 1.7
Maximum Cross Talk at 100 m (dB)	-30	-30	-30	-30	-30	-30	-30	-30*
Typical Cross Talk at 4 m (dB)	-40							
Cutoff Wavelength (nm)	1300-1440	1260-1380	1130-1270	870-950	650-800	520-620	400-470	330-400
Maximum Attenuation (dB/km)	0.5	1.0	1.0	2.5	3.0	12	30	≤ 50

* PM 400 Cross Talk is ≤ -30dB/100 m at 410 nm and 480 nm measurement wavelengths

Example available configurations:

