COHERENT®

Mira OPO

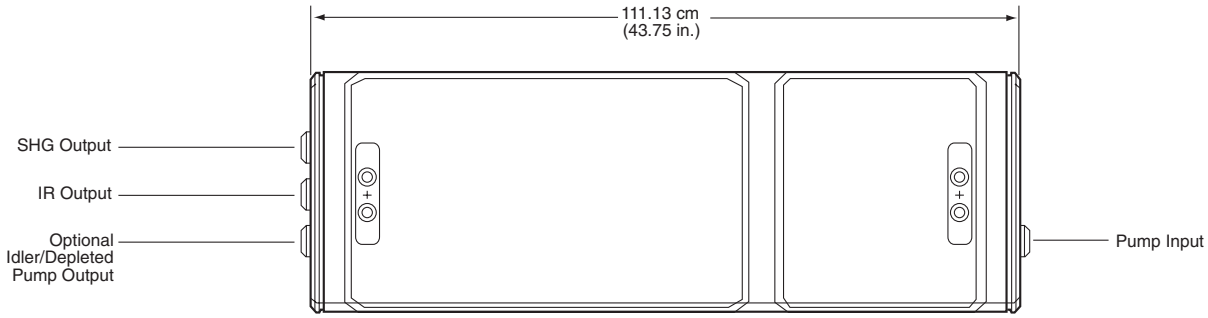
Synchronously-Pumped Optical Parametric Oscillator

Features

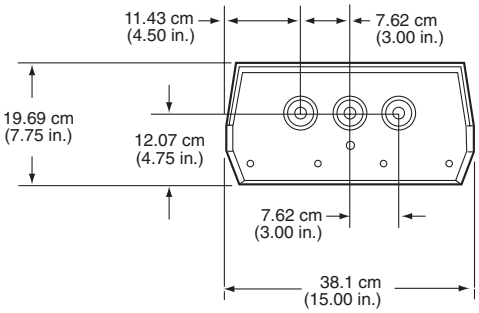
- Ultimate tunable flexibility – IR and visible/IR versions
- Femtosecond and picosecond operation using a common platform[1]
- Low pump threshold (as low as 0.5W)
- Simple, fast wavelength tuning
- Access to idler wavelengths to ~3 µm with optional optics sets
- High power visible output using highly efficient intracavity doubling
- Active cavity length stabilization (all models)
- Active pulse width or bandwidth stabilization[2]

Mechanical Specifications

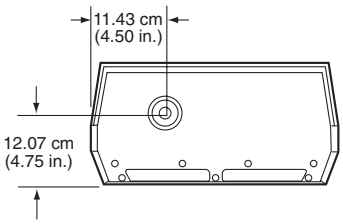
Laser Head - Top View



Laser Head - Front View



Laser Head - Rear View



[1] Assumes appropriate femtosecond or picosecond pump source.
[2] Included with optional Advanced Diagnostics package (for bulk OPOs only).

Superior Reliability & Performance

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PP-Automatic

This unique version of OPO allows the output wavelength to be remotely adjusted without adjustment of the pump wavelength. The key component in the PP-Automatic is the periodically-poled (PP), quasi-phase-matched OPO crystal. This allows the Mira OPO output wavelength to be tuned by simply adjusting the cavity length of the OPO electronically. The PP crystals are designed to be pumped at a wavelength close to the peak of the Ti:S gain spectrum where the Mira power is highest. Like the Bulk Crystal versions, the PP version is available in femtosecond, picosecond and long-picosecond configurations, as well as Linear (for IR output) and SHG-Ring (for visible or IR output).Wavelength tuning and stabilization are achieved with a feedback loop based on a miniature spectrometer integrated inside the Mira OPO head enclosure. Relative power and humidity sensors are included. Full electronic control of the output wavelength is supplied via either the supplied electronics unit or via computer with RS-232 (LabVIEW program and RS-232 commands supplied). The S1 version uses one PP crystal with a pump wavelength of approximately 830 nm. The S2 version uses two interchangable PP crystals with pump wavelengths of approximately 830 nm and 775 nm. A Mini Autocorrelator is available as an option.

System Specifications

Periodically Poled (PP-Automatic) Mira OPO

Model	VIS S1[1,2]	VIS S2[1,3]	IR S1[2]	IR-S2[3]
Cavity Configuration	Ring cavity with intracavity SHG	Ring cavity with intracavity SHG	Linear cavity	Linear cavity
Tuning Range (nm)				
Signal SHG[4,5]	550 to 750	505 to 750	-	-
Signal[4,5]	1100 to 1600	1000 to 1600	1100 to 1600	1000 to 1600
Idler (option)	1750 to 3300	1750 to 3300	1750 to 3300	1750 to 3300
Nominal Pump Wavelength (nm)	830	775 or 830	830	775 or 830
Average Power				
Verdi V18 pumped Mira HP-F	>500mW at 600 nm	>500mW at 600 nm	>550mW at 1300 nm	>550 mW at 1300 nm
Verdi V10 pumped Mira 900F	>150 mW at 600 nm	>150 mW at 600 nm	>180 mW at 1300 nm	>180 mW at 1300 nm
Verdi V5 pumped Mira 900F	>40 mW at 600 nm	>40 mW at 600 nm	>60 mW at 1300 nm	>60 mW at 1300 nm
Pulse Width[6]				
fs version (typical)	200 fs for 130 fs pump pulse			
ps version (typical)	1.6 ps for 1.4 ps pump pulse			
Time-Bandwidth Product all versions (typical)	0.6			
Repetition Rate (nominal)(MHz)	76 (Other rep. rates up to 90MHz available on request)			
Pump Threshold (mW)				
High-power version[7]	<700			
Low-power version[8]	<500			
Noise[9,10] (%)	<0.5			
Spatial Mode	TEM_{00}			
Typical Beam Diameter ($1/e^2$)(mm)	2.2			
Typical Beam Divergence (full angle)(mrad)	1.0			
Polarization	Horizontal for IR signal and idler (>100:1) Vertical for VIS (>100:1)			

1 VIS version can be simply modified to produce IR performance. The necessary optics are included as standard with VIS versions.
2 S1 version uses one PP crystal with a pump wavelength of approximately 830 nm.
3 S2 version uses two interchangable PP crystals with pump wavelengths of approximately 830 nm and 775 nm.
4 Second output coupler (optional) allows access up to 800 nm.
5 In picosecond configuration the pump wavelength must be adjusted slightly in order to access the entire quoted tuning range.
6 Assumes Gaussian pulse shape (deconvolution factor 0.71).
7 Mira OPO pumped by Verdi V10 pumped Mira 900 or Verdi V18 pumped Mira HP.
8 Mira OPO pumped by Verdi V5 pumped Mira 900.
9 RMS noise measured in 10 Hz to 1 MHz bandwidth.
10 With Verdi, noise is <0.5% RMS. With argon-ion pump, noise is <2% RMS.

Bulk Crystal

The Bulk Crystal version of the Mira OPO is based on a non-critically phase-matched interaction in KTP or one of its isomorphs, offering high conversion efficiency and wide tuning ranges.

Linear and ring cavity versions are available. The linear cavity is a single signal resonant system that offers highly efficient infrared (IR) output in the 1050 to 1600 nm wavelength range, and up to 3000 nm with the optional non-resonant idler. The ring cavity is also a single signal resonant system with intracavity second harmonic generator (SHG) that is temperature phase-matched. This ring-SHG configuration is the most efficient method to generate high power visible (VIS) output. It covers the 525 to 680 nm wavelength range that fills the gap between the fundamental and SHG outputs from modelocked Ti:Sapphire.

There are two schemes offered for controlling the bulk OPO. The simpler is the basic control scheme (supplied as standard) that ensures that the OPO cavity length is always optimized to maintain stability at the chosen operating point. An advanced optional control scheme includes an autocorrelator, spectrometer and more sophisticated electronics to allow the user to stabilize the OPO with respect to pulse width, bandwidth or power.

System Specifications

Bulk Crystal Mira OPO	**KTP**		**CTA**
Model	VIS-1[1]	IR-1	IR-3
Cavity Configuration	Ring cavity with intracavity SHG	Linear cavity	Linear cavity
Tuning Range[2] (High Power)(nm)			
Signal SHG	525 to 660	-	-
Signal	1050 to 1320	1050 to 1320	1350 to 1600 (1400 to 1700 option available)
Idler (option)	2200 to 3000	2200 to 3000	1600 to 1900 (1700 to 2100 option available)
Tuning Range[3] (Low Power)(nm)			
Signal SHG	530 to 605	-	-
Signal	1060 to 1210	1060 to 1210	1350 to 1600 (1400 to 1700 option available)
Idler (option)	2300 to 2850	2300 to 2850	1600 to 1830 (1700 to 1830 option available)
Average Power			
Verdi V18 pumped Mira HP-F	>750 mW at 580 nm	>750 mW at 1160 nm	>750 mW at 1550 nm
Verdi V10 pumped Mira 900F	>200 mW at 580 nm	>240 mW at 1160 nm	>200 mW at 1550 nm
Verdi V5 pumped Mira 900F	>60 mW at 580 nm	>80 mW at 1160 nm	>60 mW at 1550 nm
Pulse Width[4]			
fs version (typical)	250 fs for 130 fs pump pulse		200 fs for 130 fs pump pulse
ps version (typical)	1.6 ps for 1.4 ps pump pulse		1.6 ps for 1.4 ps pump pulse
Time-Bandwidth Product all versions (typical)	0.6		
Repetition Rate (nominal)(MHz)	76 (other rep. rates up to 90MHz available on request)		
Pump Threshold (mW)	<500		
Noise[5,6] (%)	<0.5		
Spatial Mode	TEM_{00}		
Typical Beam Diameter ($1/e^2$)(mm)	1.25		
Typical Beam Divergence (full angle)(mrad)	1.3		
Polarization	Horizontal for IR signal (>100:1) Vertical for Idler (>100:1) Vertical for VIS (>100:1)		

1 VIS version can be simply modified to produce IR performance. The necessary optics are included as standard with VIS versions.
2 Mira OPO pumped by Verdi V10 pumped Mira 900 or Verdi V18 pumped Mira HP.
3 Mira OPO pumped by Verdi V5 pumped Mira 900.
4 Assumes Gaussian pulse shape (deconvolution factor 0.71).
5 RMS noise measured in 10 Hz to 1 MHz bandwidth.
6 With Verdi, noise is <0.5% RMS. With argon-ion pump, noise is <2% RMS.

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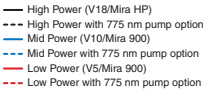
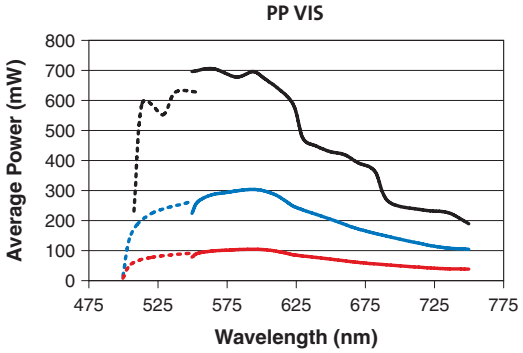
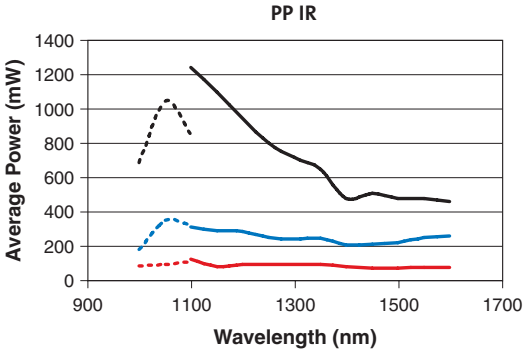
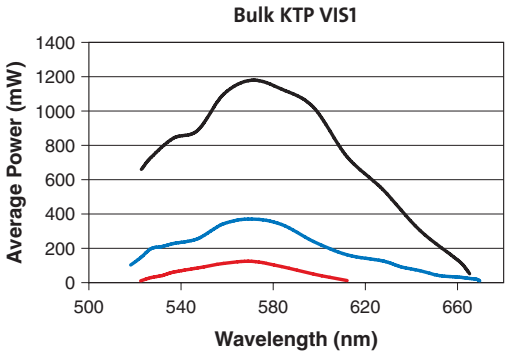
Typical Tuning Curves for femtosecond Mira OPO PP-Automatic

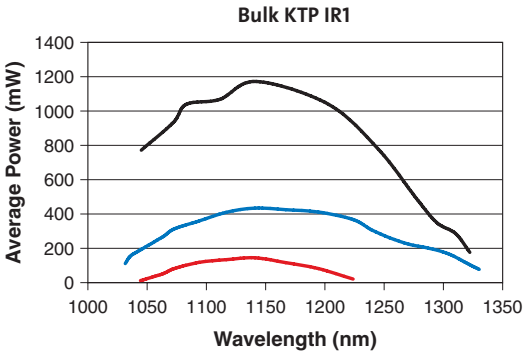


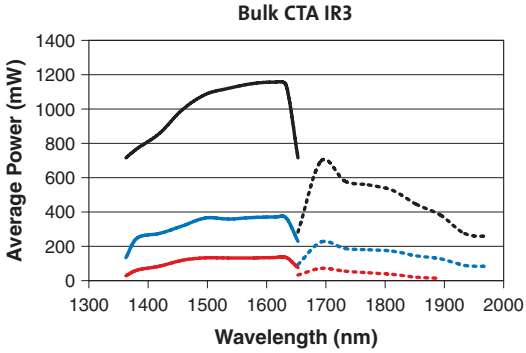




Typical Tuning Curves for femtosecond Mira OPO Bulk Crystal







Coherent follows a policy of continuous product improvement. Specifications are subject to change without notice.

Coherent's scientific and industrial lasers are certified to comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health on all systems ordered for shipment after August 2, 1976.

Coherent offers a limited warranty for all Mira OPO systems. For full details of this warranty coverage, please refer to the Service section at www.Coherent.com or contact your local Sales or Service Representative.

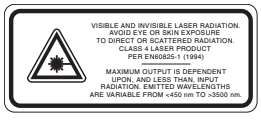
The Mira OPO is manufactured jointly by Coherent, Inc. and APE GmbH.

COHERENT®

www.Coherent.com

Coherent, Inc.
5100 Patrick Henry Drive
Santa Clara, CA 95054
phone (800) 527-3786
(408) 764-4983
fax (800) 362-1170
(408) 988-6838
e-mail tech.sales@Coherent.com

Benelux +31 (30) 280 6060
China +86 (10) 6280 0209
France +33 (0)1 6985 5145
Germany +49 (6071) 9680
Italy +39 (02) 34 530 214
Japan +81 (3) 5635 8700
Korea +82 (2) 460 7900
UK +44 (1353) 658 833



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