

# ORPHEUS | MIR



## Broad-Bandwidth Mid-Infrared Optical Parametric Amplifier

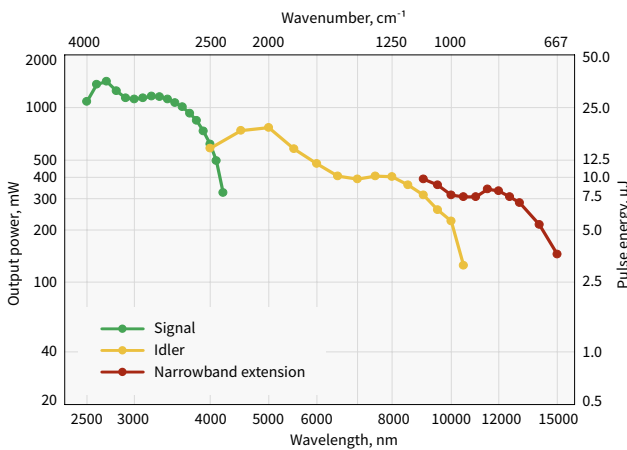
### FEATURES

- Up to 800  $\text{cm}^{-1}$  spectral bandwidth
- 2500 – 15 000 nm tuning range
- < 100 fs pulse duration
- Up to 400 kHz repetition rate
- Up to 80 W, 2 mJ pump
- Short-pulse high-energy output at 2000 nm
- Optimization for bandwidth
- CEP-stable option

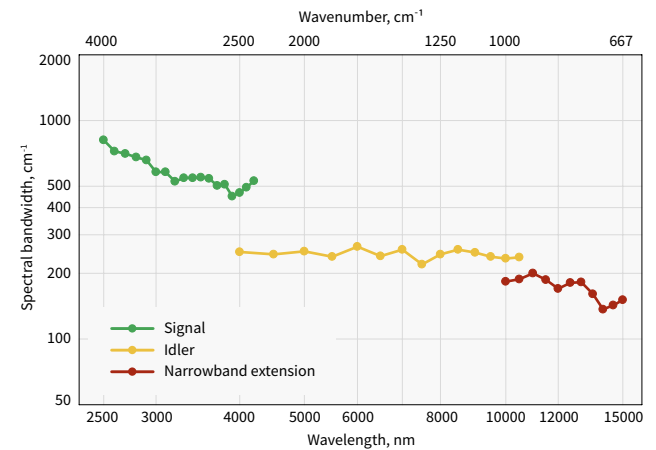


ORPHEUS-MIR is an optical parametric amplifier (OPA) optimized for the efficient generation of broad-bandwidth MIR pulses. The laser system provides broadband pulses in the tuning range of 2.5 – 10  $\mu\text{m}$  and reaches up to 15  $\mu\text{m}$  with a narrow-bandwidth extension. Due to the novel system design, ORPHEUS-MIR provides < 100 fs pulses directly at the output. Signal and Idler outputs are available simultaneously. The system architecture is well-suited for high-energy and high-power PHAROS and CARBIDE femtosecond pump lasers.

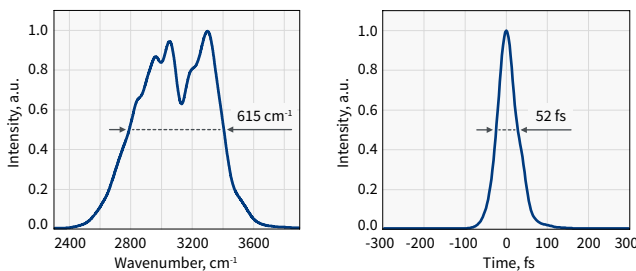
ORPHEUS-MIR serves as an excellent high-repetition-rate source for infrared spectroscopy such as broadband vibrational sum-frequency generation (SFG) spectroscopy. Combined with a narrow-bandwidth output of SHBC, it forms a compact laser system for SFG measurements, covering most of the MIR spectrum while also providing high spectral resolution. Furthermore, its high output stability is the key to fast and high-quality SFG imaging.



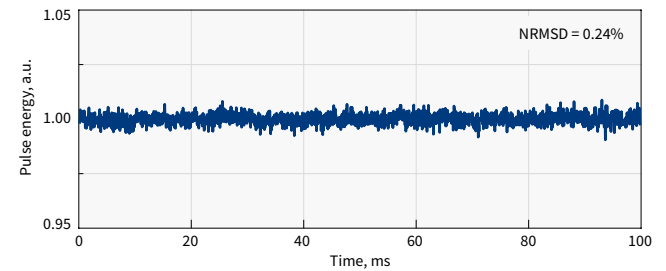
Typical tuning curves of **ORPHEUS-MIR**.  
Pump: 80 W, 2 mJ, 40 kHz



Typical spectral bandwidth of **ORPHEUS-MIR**



Typical output spectrum (left) and pulse duration (right).  
Measured at  $\approx 3000 \text{ nm}$



Pulse-to-pulse energy stability of **ORPHEUS-MIR**.  
Measured at  $\approx 3000 \text{ nm}$

## SPECIFICATIONS

Model	<b>ORPHEUS-MIR</b>	
<b>MAIN OUTPUT (2500 – 10000 nm)</b>		
Mode of operation	Standard	Optimized for bandwidth <sup>1)</sup>
Tuning range	2500 – 4000 nm (Signal) 4000 – 10000 nm (Idler)	
Maximum pump power	80 W	
Pump pulse energy	200 μJ – 2 mJ	
Pulse duration	< 100 fs	
Conversion efficiency <sup>2)</sup>	> 1.2% @ 3000 nm > 1.0% @ 3500 nm > 0.6% @ 5000 nm	
	> 0.3% @ 9000 nm	> 0.2% @ 9000 nm
Spectral bandwidth <sup>3)</sup>	> 300 cm <sup>-1</sup> @ 2500 – 4000 nm > 200 cm <sup>-1</sup> @ 4000 – 8000 nm	
	> 200 cm <sup>-1</sup> @ 8000 – 10000 nm	> 350 cm <sup>-1</sup> @ 8000 – 10000 nm
Long-term power stability, 8 h <sup>4)</sup>	< 2% @ 5000 nm	
Pulse-to-pulse energy stability, 1 min <sup>4)</sup>	< 2% @ 5000 nm	
<b>AUXILIARY OUTPUT 1 (2000 nm)</b>		
Output wavelength <sup>5)</sup>	2000 ± 100 nm	
Pulse duration	< 50 fs	
Conversion efficiency <sup>2)</sup>	> 8%	
Spectral bandwidth	> 350 cm <sup>-1</sup>	
<b>AUXILIARY OUTPUT 2 (1350 – 2000 nm)</b>		
Tuning range <sup>6)</sup>	1350 – 2000 nm	
Pulse duration	< 300 fs	
Conversion efficiency <sup>2)</sup>	Contact sales@lightcon.com	
Spectral bandwidth	60 – 150 cm <sup>-1</sup>	
<b>WAVELENGTH EXTENSION (10000 – 15000 nm)</b>		
Tuning range	10000 – 15000 nm	
Pulse duration	< 300 fs	
Conversion efficiency <sup>2)</sup>	> 0.2% @ 12000 nm	
Spectral bandwidth	100 – 150 cm <sup>-1</sup>	

<sup>1)</sup> Optional mode of operation. Optimized for maximum spectral bandwidth at expense of conversion efficiency.

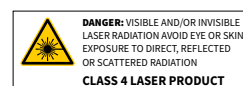
<sup>2)</sup> Specified as a percentage of pump power.

<sup>3)</sup> FWHM (full width at half maximum).

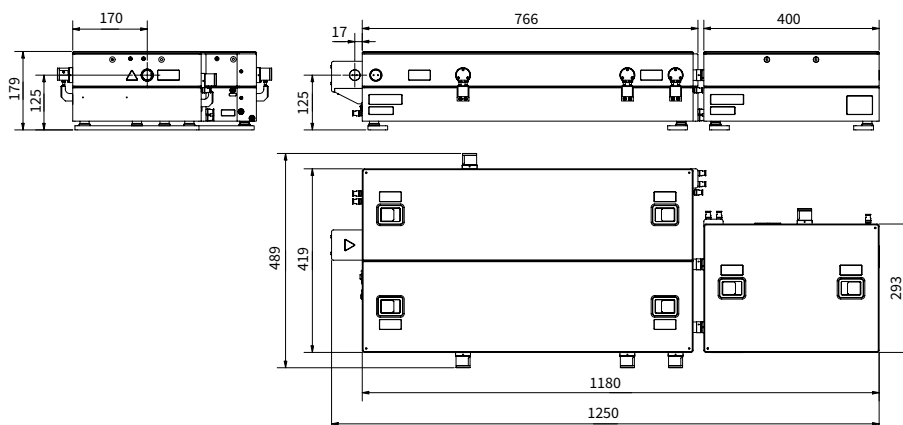
<sup>4)</sup> Expressed as NRMSD (normalized root mean squared deviation).

<sup>5)</sup> Not tunable, optimized for best overall performance. Not simultaneous to OPA output.

<sup>6)</sup> Simultaneous to OPA output. Available on request.



## DRAWINGS



ORPHEUS-MIR drawings