

# ORPHEUS | MIR



## Broad-bandwidth Mid-IR Optical Parametric Amplifier

### FEATURES

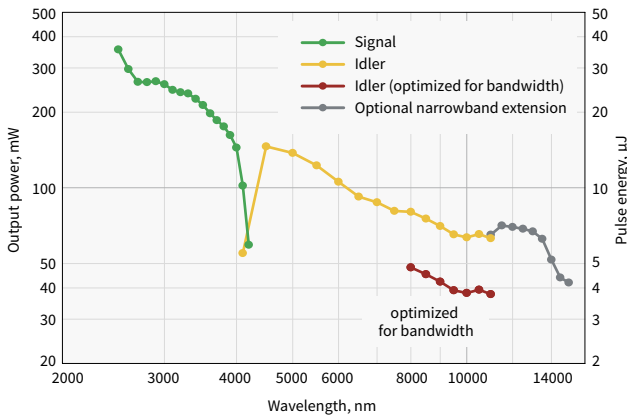
- Broad-bandwidth up to  $500\text{ cm}^{-1}$
- 2500 – 10000 nm tuning range
- < 100 fs pulse duration
- Up to 80 W pump power
- Up to 2 mJ pump pulse energy
- Auxiliary short-pulse output at  $\approx 2000\text{ nm}$
- Optional narrow-bandwidth extension up to 15000 nm
- Optional optimization for bandwidth
- Optional CEP stability



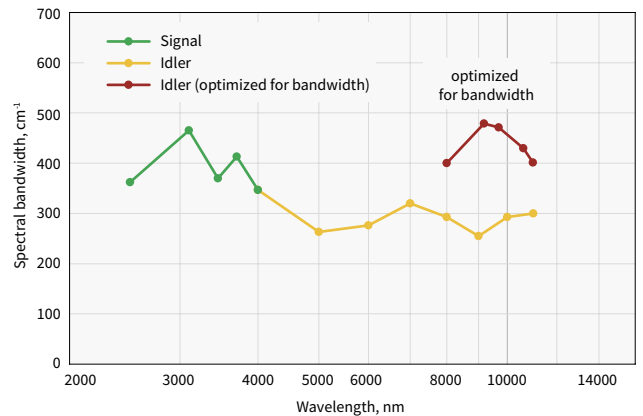
### APPLICATIONS

- Broadband vibrational sum-frequency generation (SFG) spectroscopy
- Time- and angle-resolved photoemission spectroscopy (TR-ARPES)
- Two-dimensional infrared (2D IR) spectroscopy
- High-harmonic generation (HHG) in solids
- Other infrared spectroscopy and strong-field physics applications

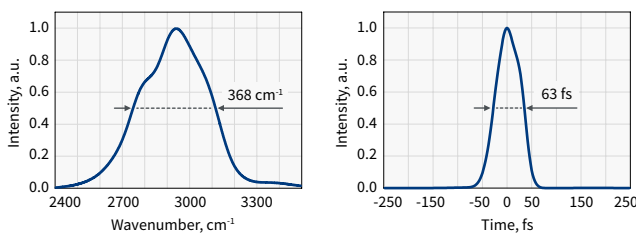
ORPHEUS-MIR is an OPA optimized for the efficient generation of broad-bandwidth mid-IR pulses. The system provides broadband pulses in the tuning range of 2.5 – 10  $\mu\text{m}$  and reaches up to 15  $\mu\text{m}$  with an optional narrow-bandwidth extension. Due to the novel system design, ORPHEUS-MIR 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 lasers.



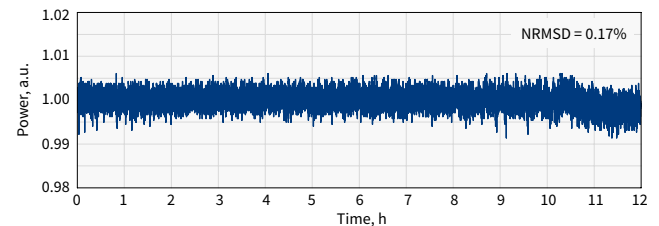
Typical tuning curves of **ORPHEUS-MIR**.  
Pump: 20 W, 2 mJ, 10 kHz



Typical spectral bandwidth of **ORPHEUS-MIR**



Typical output spectrum (left) and pulse duration (right).  
Measured at 3450 nm



Long-term power stability of **ORPHEUS-MIR**.  
Measured over 12 h at 5000 nm

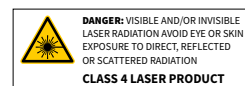
## SPECIFICATIONS

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	> 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>3)</sup>	< 2% @ 5000 nm	
Pulse-to-pulse energy stability, 1 min <sup>3)</sup>	< 2% @ 5000 nm	
<b>AUXILIARY OUTPUT 1 (~2000 nm)</b>		
Output wavelength	≈ 2000 nm (not tunable, optimized for best overall performance)	
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	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>OPTIONAL WAVELENGTH EXTENSION (10000 – 15000 nm)</b>		
Tuning range	10000 – 15000 nm	
Pulse duration	< 300 fs	
Conversion efficiency <sup>2)</sup>	> 0.2% @ 10000 – 15000 nm	
Spectral bandwidth	100 – 150 cm <sup>-1</sup> @ 10000 – 15000 nm	

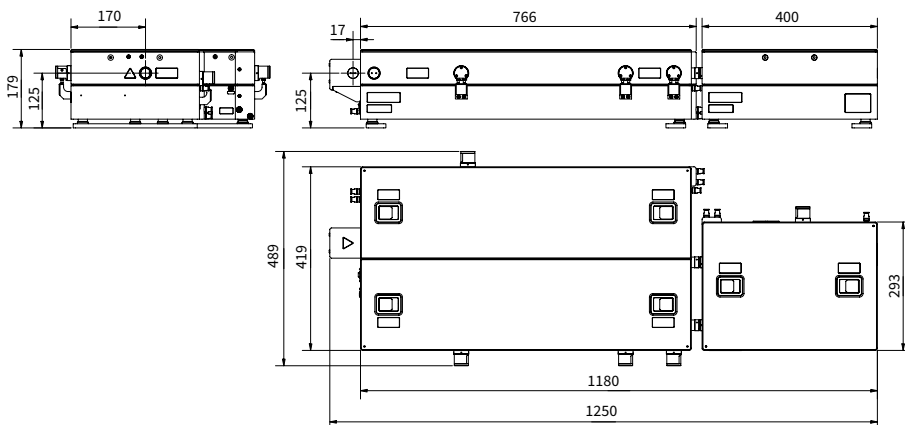
<sup>1)</sup> Optional mode of operation. Optimized for maximum spectral bandwidth at expense of conversion efficiency.

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

<sup>3)</sup> Expressed as NRMSD (normalized root mean squared deviation).



## DRAWINGS



ORPHEUS-MIR drawings