CRONUS | 3P

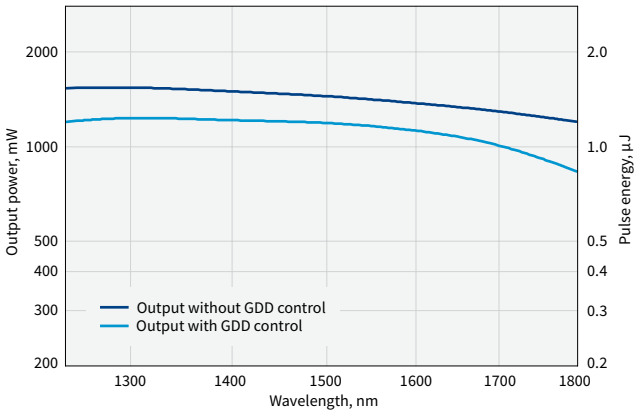
Laser Source for Advanced Nonlinear Microscopy

FEATURES

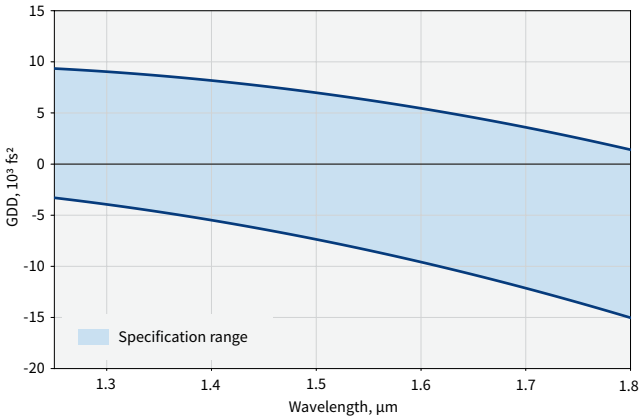
- High pulse energy for deep imaging
- 1250 – 1800 nm tuning range for 3P imaging
- Down to 50 fs pulse duration for high peak power
- Automated wavelength and GDD control for optimal signal
- Market-leading pulse-to-pulse energy stability

CRONUS-3P is a laser source developed for advanced nonlinear microscopy. It provides µJ-level pulses down to 50 fs at repetition rates of up to 2 MHz and tunable in the short-wavelength infrared (SWIR) range from 1250 to 1800 nm, thus covering the biological transparency windows at 1300 and 1700 nm for three-photon (3P) microscopy. In addition, CRONUS-3P offers simultaneous 1030 nm amplifier and oscillator outputs.

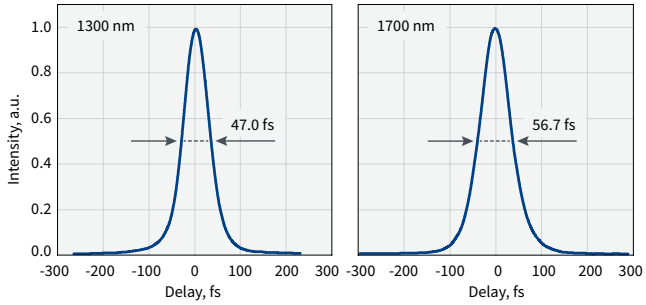
Typically, multiphoton imaging in the SWIR range requires a complex multi-device laser system, a large optical table, and skilled staff. This reality encumbers neuroscience and other biomedical applications. The CRONUS-3P system is a next-generation, industrial-grade, single-supplier solution that is more compact, more reliable, and more versatile. It achieves tunable femtosecond excitation with integrated group delay dispersion (GDD) control, ensuring optimal pulse duration at the sample, while industrial-grade design guarantees high pulse-to-pulse energy and long-term power stability.



Output power and pulse energy vs wavelength.
Pump: 40 W, 1 MHz.



GDD control range



Typical pulse duration at 1300 nm and 1700 nm

SPECIFICATIONS

Model	CRONUS-3P	
Tuning range [1]	1250 – 1800 nm	
Repetition rate [2]	Single-shot to 2 MHz	
	1300 nm	**1700 nm**
Pulse duration	< 50 fs	< 65 fs
Output power	> 1100 mW @ 1 MHz > 800 mW @ 2 MHz	> 800 mW @ 1 MHz > 500 mW @ 2 MHz
GDD control range [3]	−4000 to +9000 fs²	−12000 to +3500 fs²
Beam diameter [4]	3 – 5 mm	
Beam quality (M^2)	< 1.2	
Beam ellipticity	> 0.8	
Beam divergence	< 1 mrad	
Long-term power stability, 24 h [5]	< 1%	
Pulse-to-pulse energy stability, 1 min [5]	< 1%	

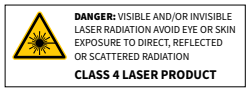
MAIN OUTPUT WITHOUT GDD CONTROL

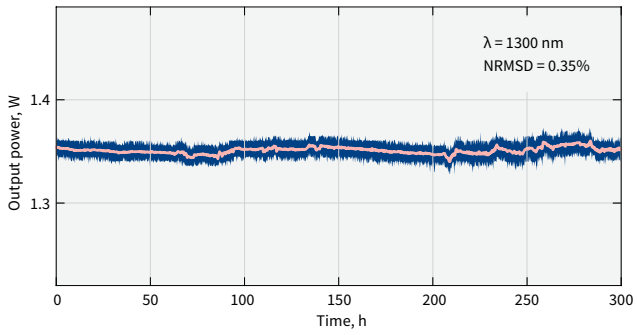
Output power	> 1500 mW @ 1 MHz > 1000 mW @ 2 MHz	> 1050 mW @ 1 MHz > 700 mW @ 2 MHz

ADDITIONAL OUTPUTS

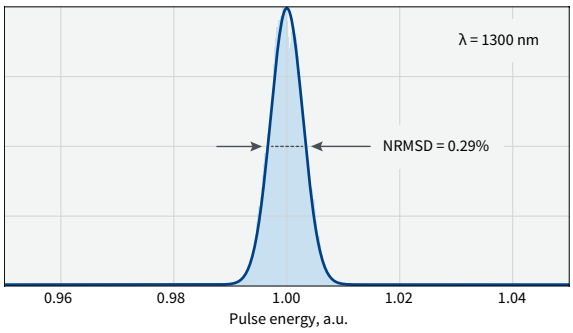
Auxiliary 1030 nm amplifier output	1030 ± 10 nm, up to 40 W, up to 2 MHz, < 250 fs
Optional 1030 nm oscillator output	1030 ± 10 nm, up to 500 mW, ≈ 65 MHz, ≈ 200 fs

[1] *Alternative 2P+3P configuration with extended tuning range to 650 – 920 nm is available, contact sales@lightcon.com.*
[2] *Lower repetition rate with higher pulse energy option available.*
[3] *Continuous dispersion control; −3000 fs² compensates a microscope with +3000 fs².*
[4] *1/e², measured at compressor output.*
[5] *Expressed as NRMSD (normalized root mean squared deviation).*

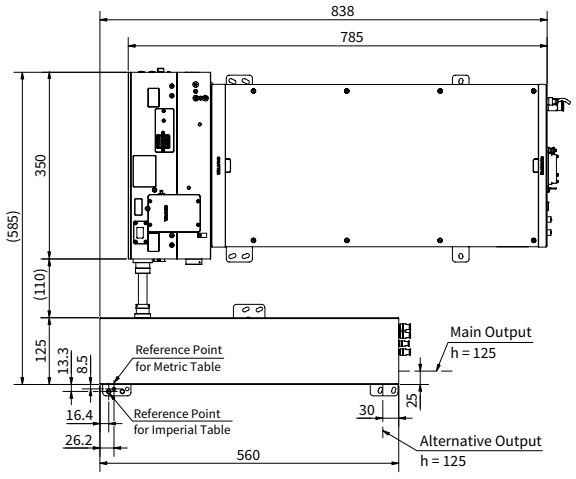




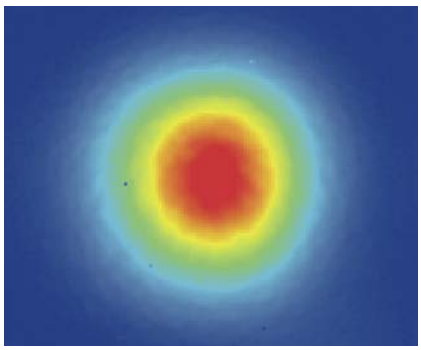
Typical long-term power stability at 1300 nm



Typical pulse-to-pulse energy distribution at 1300 nm



CRONUS-3P drawing



Beam profile at 1300 nm,
4.2 mm diameter (1/e²)

CRONUS | 2P

NEW

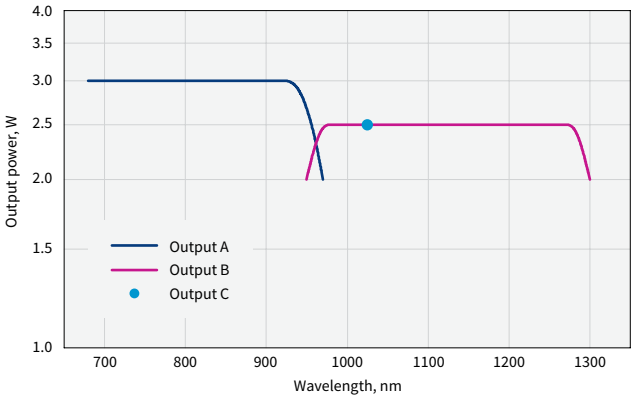
Three-Channel Wavelength-Tunable Femtosecond Laser

FEATURES

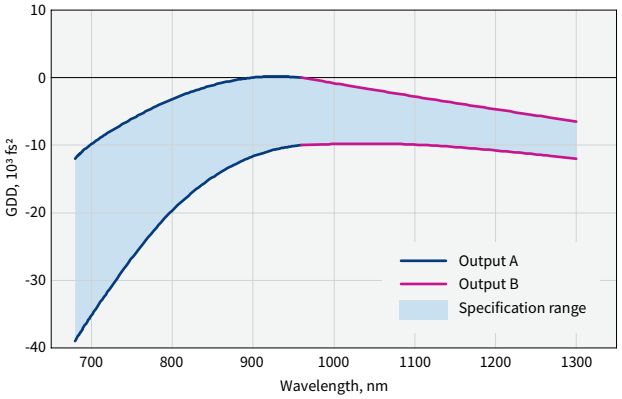
- Watt-level output at high repetition rate for fast imaging
- Two tunable and one fixed output for simultaneous multibeam excitation
- Automated GDD control for shortest pulses at the sample
- Industrial-grade design for high power and beam stability

CRONUS-2P is a femtosecond laser providing watt-level three synchronized outputs with high repetition rate, short pulse duration, and GDD control, making it the ultimate source for nonlinear microscopy. In standard configuration, the two independently tunable outputs, operating separately or simultaneously, cover 680 – 960 nm and 960 – 1300 nm, respectively, while the third is fixed at 1025 nm and is accessible in parallel. Thus, the CRONUS-2P can be used for simultaneous excitation of multiple fluorescent probes, calcium indicators, or opsins at their absorption maxima, whereas second- and third-harmonic emission (SHG and THG) can be spectrally shifted for ease of detection or resonant enhancement.

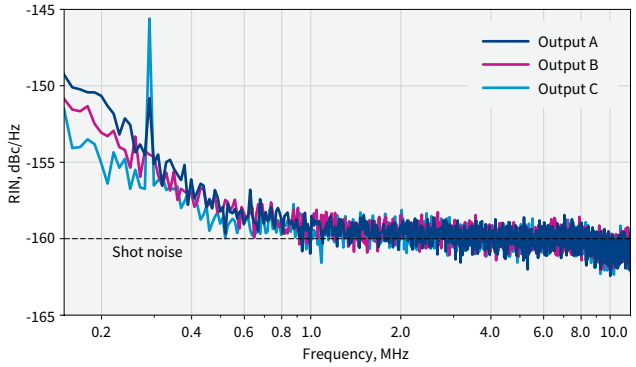
The two tunable and simultaneous channels also enable advanced coherent anti-Stokes and stimulated Raman scattering (CARS and SRS) applications with dual-band imaging, a broader selection of vibrational resonance frequencies, constant-difference dual-beam tuning, resonant enhancement, and more.



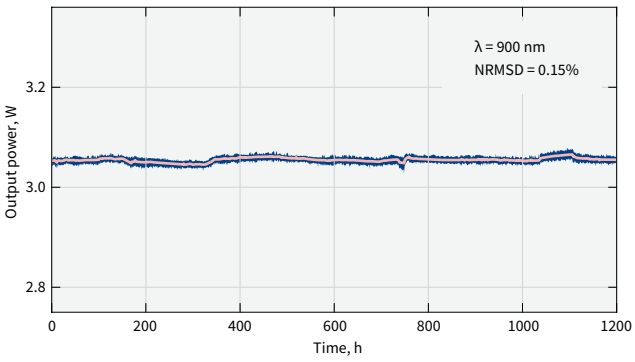
CRONUS-2P tuning curve



GDD control range



CRONUS-2P relative intensity noise (RIN)



Typical output power stability of CRONUS-2P at 900 nm

SPECIFICATIONS

Model	CRONUS-2P		
	Output A	**Output B**	**Output C**
Tuning range [1]	680 – 960 nm	960 – 1300 nm	1025 nm (fixed)
Output power [2]	> 3 W @ 920 nm	> 2.5 W @ 1100 nm	> 2.5 W
Pulse duration [3] [4]	< 160 fs		
Repetition rate	77 ± 1 MHz		
Beam quality, M^2 [3]	< 1.2		
Polarization	Linear, horizontal		
Beam divergence, full angle	< 1 mrad		< 1.5 mrad
Beam diameter [3] **($1/e^2$)**	3.0 ± 0.4 mm	3.2 ± 0.4 mm	2.8 ± 0.4 mm
Beam ellipticity [3]	> 0.8		
Beam astigmatism [3]	< 20%		
Beam pointing stability [5]	< 200 µrad		n/a
Long-term power stability, 24 h [3] [6]	< 1%		
GDD control range	−10000 to −35000 fs^2 @ 700 nm −3000 to −20 000 fs^2 @ 800 nm 0 to −10 000 fs^2 @ 960 nm	0 to −10 000 fs^2 @ 960 nm −3000 to −10 000 fs^2 @ 1100 nm −6 000 to −12 000 fs^2 @ 1300 nm	n/a

OPTIONAL WAVELENGTH EXTENSIONS (UV – VIS)

Second harmonic tuning range	340 – 480 nm	480 – 650 nm	n/a
Conversion efficiency at peak	> 30%		

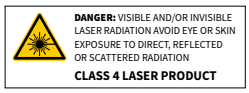
ENVIRONMENTAL REQUIREMENTS

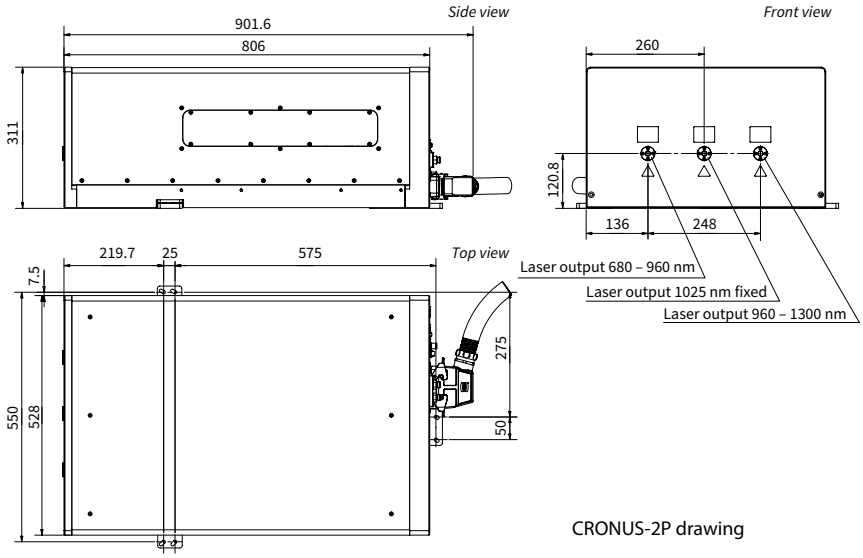
Altitude	< 2000 m
Temperature, operating	18 – 30 °C
Temperature, storage	10 – 35 °C
Relative humidity, operating	< 80% (non-condensing)

DIMENSIONS

Laser head (L × W × H)	806 × 528 × 311 mm
Rack for power supply and chiller (L × W × H)	642 × 553 × 673 mm

[1] *Configuration with dual-output A or dual-output B is also available.*
[2] *Simultaneous mode: > 1 W @ 920 nm, > 1 W @ 1100 nm, and > 2.5 W @ 1025 nm.*
[3] *Speficied at 920 nm, 1100 nm, and 1025 nm, respectively.*
[4] *IR pulse duration determined assuming sech2 shape.*
[5] *Beam pointing deviation over the entire tuning and GDD control range.*
[6] *Expressed as NRMSD (normalized root mean squared deviation); with less than ±1 °C temperature change after 1 h warm up.*





CRONUS-2P drawing