EKSPLA

Tunable Wavelength Lasers

Picosecond or nanosecond pulse duration

From 193 to 18000 nm

Hz, kHz or MHz repetition rate

Low jitter synchronization

2021

Tunable Wavelength Lasers

2021

Revision 20210722

About Company

Background

EKSPLA focuses on the design and manufacturing of advanced lasers & systems and employs more than 27 years' experience as well as a close partnership with the scientific community. 76 out of the 100 top universities use EKSPLA lasers. The company is leading in the global market for scientific picosecond lasers.

Clients like CERN, NASA, ELI, Max Planck Institutes, Cambridge University and Massachusetts Institute of Technology have chosen Ekspla as their partner.

For scientist who needs unique instrument for research, we provide parameter tailored laser systems that enable customer to perform complex experiments. In-house design and manufacturing ensures operative design, manufacturing and customization of new products.

Highly stable and reliable EKSPLA lasers combined with our own subsidiaries in the US, UK and China as well as more than 20 approved representative offices with properly trained laser engineers worldwide, ensure short response time and fast laser service as well as maintenance.

History

EKSPLA was founded about 27 years ago by a small team of engineers united around the idea of making the most advanced lasers in the world. EKSPLA was independent company with little money, but lots of creativity, and a deep technical understanding of lasers and how useful they could be for research and industry. From the start, the whole team had a deep mutual respect and believed in and supported each other. The first laser was sold at its first launch event, at an international exhibition in Germany. Soon after, the innovation was noticed by partners in Japan, and supply of the systems to leading universities there has been started. The concept of continuous improvement was admired and embraced, so it has become one of the key principles that apply to everything is done.

Contents

Photo: PT series tunable wavelength laser features pump laser and OPG integrated into single/rugged housing for better performance and easy integration in other systems

Picosecond Tunable Systems

For researchers demanding wide tuning range, high conversion efficiency and narrow line-width, EKSPLA PG series optical parametric generators is an excellent choice. All models feature hands-free wavelength tuning, valuable optical components protection system as well as wide range of accessories and extension units.

Long-term experience and close cooperation with scientific institutions made it possible to create range of models, offering probably the widest tuning range: from 193 nm to 16000 nm. Versions, offering near transform limited line-width as well as operating at kHz repetition rates are available.

For customer convenience the wavelength can be set from personal computer through USB (RS-232 is optional) interface using supplied LabVIEW™ drivers or from remote control pad with backlit display that is easy to read even while wearing laser safety glasses.

EKSPLA PL series picosecond mode-locked lasers are recommended for pumping of PG series Optical Parametric Generators. Combining together, researchers get complete tunable wavelength system, capable to assist researchers in wide range of spectroscopy applications: time-resolved pump-probe, nonlinear, infrared spectroscopy, laser-induced fluorescence.

SHORT SELECTION GUIDE

For Your convenience, table contains all available options and highest parameter values. Not all output specifications are available at the same time simultaneously. Please refer to the catalog page for exact specifications and available options.

Model	Output wavelength range	Max pulse repetition rate	Linewidth	Special feature	Page
PGx01	193–16000 nm	50 Hz	< 6 cm^{-1}	High peak power (>50 MW), ideal for non-linear spectroscopy	6
PGx03	210–2300 nm	1000 Hz	< 12 cm^{-1}	Operating at kHz repetition rate	10
PGx11	193–16000 nm	50 Hz or 1000 Hz	< 2 cm^{-1}	Narrow linewidth (<0.8 cm^{-1} on some versions)	13
PT277	1400 – 2050, 2200–4450 nm	87 MHz	< 2.5 cm^{-1}	Optional intensity modulation up to 2 MHz	18
PT403	210 – 2300 nm	1000 Hz	< 9 cm^{-1}	Pump laser and OPG integrated in 2-in-1 combo housing	20

PGx01 SERIES

High Energy Broadly Tunable OPA

FEATURES

- *Ultra-wide spectral range from **193** to **16 000 nm***
- *High peak power (**>50 MW**) ideal for non-linear spectroscopy applications*
- *Narrow linewidth **<6 cm^{-1}** (for UV < 9 cm^{-1})*
- *Motorized hands-free tuning in 193–2300 nm or 2300–16 000 nm range*
- *PC control via USB port (RS232 is optional) and LabVIEW™ drivers*
- *Remote control via keypad*

APPLICATIONS

- *Nonlinear spectroscopy: vibrational-SFG, surface-SH, Z-scan*
- *Pump-probe experiments*
- *Laser-induced fluorescence (LIF)*
- *Other laser spectroscopy applications*

Travelling Wave Optical Parametric Generators (TWOPG) are an excellent choice for researchers who need an ultra-fast tunable coherent light source from UV to mid IR.

Design

The units can be divided into several functional modules:

- optical parametric generator (OPG);
- diffraction grating based linewidth narrowing system (LNS);
- optical parametric amplifier (OPA);
- electronic control unit.

The purpose of the OPG module is to generate parametric superfluorescence (PS). Spectral properties of the PS are determined by the properties of a nonlinear crystal and usually vary with the generated wavelength.
In order to produce narrowband radiation, the output from OPG is narrowed by LNS down to 6 cm^{-1} and then used to seed OPA.

Output wavelength tuning is achieved by changing the angle of the nonlinear crystal(s) and grating. To ensure exceptional wavelength reproducibility, computerized control unit driven precise stepper motors rotate the nonlinear crystals and diffraction grating. Nonlinear crystal temperature stabilization ensures long-term stability of the output radiation wavelength.
In order to protect nonlinear crystals from damage, the pump pulse energy is monitored by built-in photodetectors, and the control unit produces an alert signal when pump pulse energy exceeds the preset value.

For customer convenience the laser can be operated from master device or personal computer through USB (VCP, ASCII commands), RS232 (ASCII commands) or LAN (REST API) interfaces or from remote control pad with backlit display that is easy to read even while wearing laser safety glasses.

Available models

Model	Features
PG401	Model has a tuning range from 420 to 2300 nm and is optimized for providing highest pulse energy in the visible part of the spectrum. The wide tuning range makes PG401 units suitable for many spectroscopy application.
PG501-DFG	Model has a tuning range from 2300 to 16000 nm. The PG501-DFG1 model is the optimal choice for vibrational-SFG spectroscopy setups.

SPECIFICATIONS [1]

Model	PG401	PG401-SH	PG401-DUV	PG501-DFG1	PG501-DFG2
Tuning range					
DUV	–		193–209.95 nm	–	
SH	–	210–340, 370–419 nm		–	
Signal	420 – 680 nm	–			
Idler	740 – 2300 nm	–			
DFG				2300–10000 nm	2300–16000 nm
Output pulse energy [2]	> 1000 µJ at 450 nm	> 100 µJ at 300 nm	> 50 µJ at 200 nm	> 250 µJ at 3700 nm, > 40 µJ at 10000 nm	> 250 µJ at 3700 nm, > 80 µJ at 10000 nm
Linewidth	< 6 cm^{-1}	< 9 cm^{-1}		< 6 cm^{-1}	
Max pulse repetition rate	50 Hz				
Scanning step					
Signal	0.1 nm	–			
Idler	1 nm	–			
Typical beam size [3]	~4 mm	~3 mm		~9 mm	
Beam divergence [4]	< 2 mrad			–	
Beam polarization	–	vertical		horizontal	
Signal	horizontal	–			
Idler	horizontal	–			
Typical pulse duration	~15 ps	~12 ps		~20 ps	
PUMP LASER REQUIREMENTS					
Pump energy					
at 355 nm	–	10 mJ		–	
at 532 nm	–			10 mJ	
at 1064 nm	–		2 mJ	6 mJ	15 mJ
Recommended pump source [5]	PL2231-50-TH, PL2251A-TH			PL2231-50-TH, PL2251A-TH	PL2231A-50-SH, PL2251B-SH
Beam divergence	< 0.5 mrad				
Beam profile	homogeneous, without hot spots, Gaussian fit >90 %				
Pulse duration [6]	30 ± 5 ps				
PHYSICAL CHARACTERISTICS					
Size (W x L x H)	456 × 633 × 244 mm	456 × 1031 × 249 ± 3 mm			
OPERATING REQUIREMENTS					
Room temperature	15 – 30 °C				
Power requirements	100 – 240 V AC single phase, 47 – 63 Hz				
Power consumption	< 100 W				

[1] Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PG401 units, 3000 nm for PG501 units and 300 nm for PG401SH units and for basic system without options.

[2] See tuning curves for typical pulse energies at other wavelengths. Higher energies are available, please contact Ekspla for more details.

[3] Beam diameter is measured at the $1/e^2$ level.

[4] Full angle measured at the FWHM point.

[5] If a pump laser other than PL2250 or PL2230 is used, measured beam profile data should be presented when ordering.

[6] Should be specified if non-EKSPLA pump laser is used.

CUSTOMIZED FOR SPECIFIC REQUIREMENTS

Please note that these products are custom solutions tailored for specific applications or specific requirements.

Interested? Tell us more about your needs and we will be happy to provide you with tailored solution.

PG401-DFG1 provides:

- The broadest hands-free tuning range – from 420 to 10000 nm
- It can be further extended up to 16000 nm with -DFG2 option. It should be noted, that for the 8000 – 16000 nm range a different nonlinear crystal is used, and exchange of the crystals needs to be done manually

PG402 features:

- Gap-free tuning range 410 – 709, 710 – 2300 nm
- Linewidth < 18 cm^{-1}

TUNING CURVES

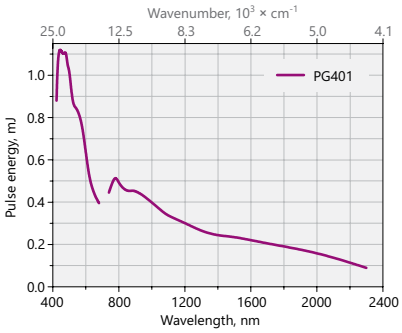

Fig 1. Typical PG401 model tuning curve
Pump energy: 10 mJ at 355 nm

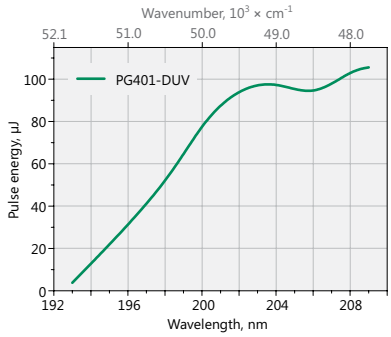

Fig 2. Typical PG401-DUV model tuning curve

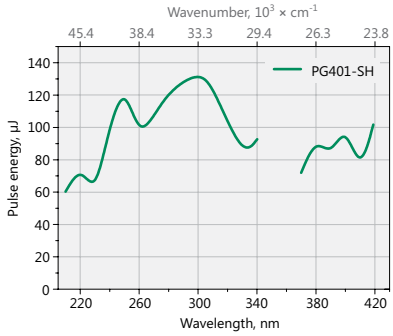

Fig 3. Typical PG401-SH model tuning curve. *Pump energy: 10 mJ at 355 nm*

Note: The energy tuning curves are affected by air absorption due narrow linewidth. These pictures present pulse energies where air absorption is negligible.

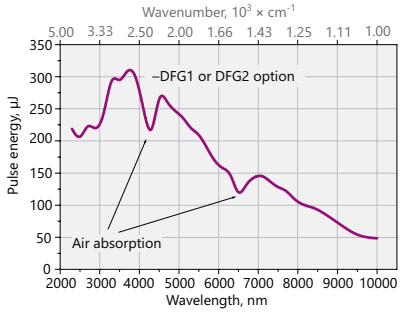

Fig 4. Typical PG501-DFG1 tuning curve in 2300–10000 nm range
Pump energy: 7 mJ at 1064 nm

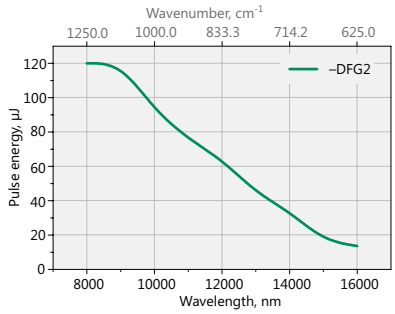

Fig 5. Typical PG501-DFG2 tuning curve in 8000–16000 nm range
Pump energy: 15 mJ at 1064 nm

RECOMMENDED UNITS ARRANGEMENT ON OPTICAL TABLE

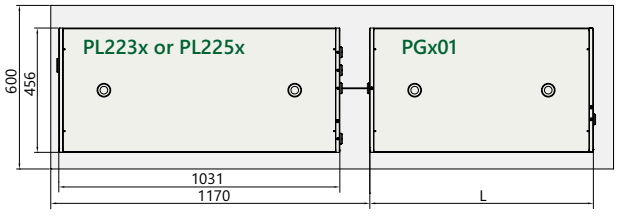

Fig 6. Arrangement of pump laser and PGx01 unit on optical table

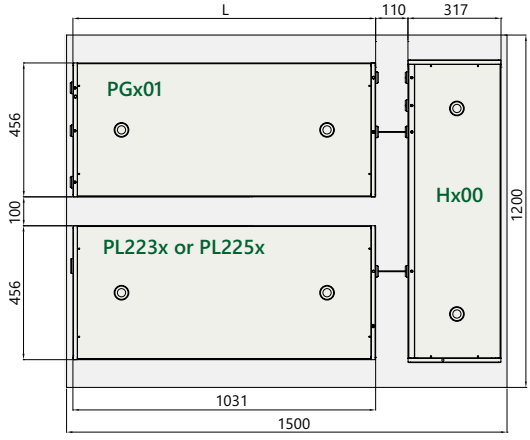

Fig 7. Recommended arrangement of pump laser and PGx01-DFGx unit on optical table

OUTLINE DRAWINGS

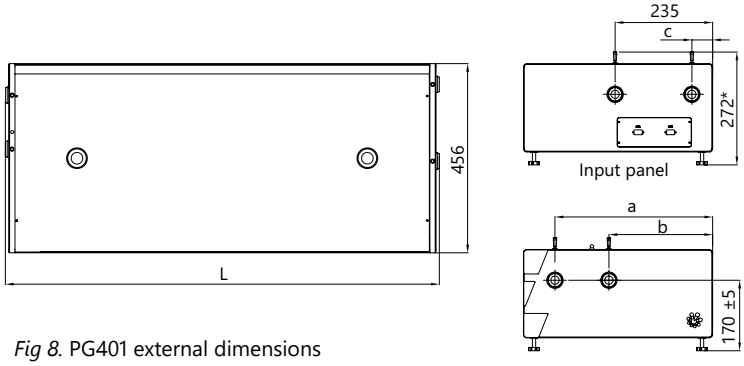

Fig 8. PG401 external dimensions

OUTPUTS PORTS

Model	L, mm	a, mm	b, mm	c, mm	Port 1	Port 2
PG401	633	380	×	×	420–680 nm, 740–2300 nm	–
PG401-SH	838	380	×	×	210–340 nm, 370–419.9 nm, 420–680 nm, 740–2300 nm	–
PG401-SH/DUV	1026	380	250	50	210–340 nm, 370–419 nm, 420–680 nm, 740–2300 nm	192–209.95 nm

For SFG optional 532 nm output port 2.

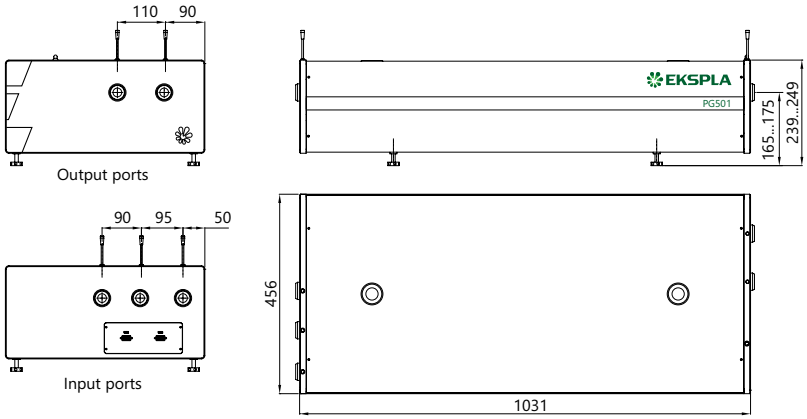

Fig 9. PG501 external dimensions

ORDERING INFORMATION

PG401-DUV

Model
PG4xx → 355 nm pump

01 → travelling wave, narrowed linewidth
02 → travelling wave, not narrowed
11 → synchronous pumping, narrowed

Optional tuning range extension
DUV → 193–209.95 nm
SH → 210-340 nm & 370-420 nm

Custom products, tailored for specific applications. Inquire for other specifications.

DFG1 → 2300–10000 nm; >250 μJ at 3700 nm
DFG2 → 2300–16000 nm

PG501-DFG1

Model
PG5xx → 532 nm pump

01 → travelling wave, narrowed linewidth

Tuning range
DFG1 → 2300–10000 nm; >250 μJ at 3700 nm
DFG2 → 2300–16000 nm

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

PGx03 SERIES

kHz Repetition Rate Broadly Tunable OPA

FEATURES

- *Picosecond pulses at **1 kHz** pulse repetition rate*
- *Hands-free wavelength tuning*
- *Tuning range from **210 nm** to **2300 nm***
- *Narrow linewidth **<6 cm^{-1}***
- *Low divergence <2 mrad*
- *PC control using USB (RS232 is optional) and LabVIEW™ drivers*
- *Remote control via keypad*

PGx03 series Optical Parametric Generators (OPG) are designed to be pumped by 1 kHz mode-locked lasers with 1 W average power. An excellent choice is the PL2210A series mode-locked picosecond laser from EKSPLA.

The optical design is optimized to produce low divergence beams with moderate linewidth (typically 12 cm^{-1}) at approximately 15 – 20 ps pulse duration. Due to the unique broad tunability range from 210 to 2300 nm these devices are an excellent choice for many spectroscopic applications.

Upon request the optical layout can be easily modified for pumping by other mode-locked lasers with high pulse energy or longer pulse duration.

Three models designed for pumping by up to the 3rd harmonic of Nd:YAG laser are available.

Microprocessor based control system provides automatic positioning of relevant components for hands free operation. Nonlinear crystals, diffraction grating and filters are rotated by ultra-precise stepper motors in the microstepping mode, with excellent reproducibility. Precise nonlinear crystal temperature stabilization ensures long-term stability of generated wavelength and output power.

For customer convenience the system can be controlled through its USB type PC interface (RS232 is optional) with LabView™ drivers or a remote control pad. Both options allow easy control of system settings.

Available standard models are summarized in a table below. Please inquire for custom-built versions.

APPLICATIONS

- *Time resolved pump-probe spectroscopy*
- *Laser-induced fluorescence*
- *Infrared spectroscopy*
- *Nonlinear spectroscopy: vibrational-SFG, surface-SH, Z-scan*
- *Other laser spectroscopy applications*

Available models

Model	Features
PG403	Model has a tuning range from 410 to 2300 nm and is optimized for providing the highest pulse energy in the visible part of the spectrum. When combined with an optional Second Harmonic Generator (SHG), it offers the widest possible tuning range – from 210 to 2300 nm.
PG503	Model has a tuning range from 700 to 2200 nm and the highest pulse energy in the near-IR spectral range. PG503 is a cost-effective alternative to the narrow-band mode-locked Ti:S lasers.

New Laser and PG in one housing – see page 20

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SPECIFICATIONS [1]

Model	PG403	PG403-SH	PG503
OPA SPECIFICATIONS			
Output wavelength tuning range			
SH	–	210 – 410 nm	–
Signal	410 – 709 nm		700 – 1000 nm
Idler	710 – 2300 nm		1150 – 2200 nm
Output pulse energy [2]			
SH [3]	–	10 µJ	–
Signal	50 µJ		70 µJ
Idler [4]	15 µJ		25 µJ
Pulse repetition rate	1000 Hz		
Linewidth	< 12 cm^{-1}		
Typical pulse duration [5]	15 ps		20 ps
Scanning step			
SH	–	0.05 nm	–
Signal	0.1 nm		
Idler	1 nm		
Typical beam size [6]	~ 3 mm		
Beam divergence [7]	< 2 mrad		
Beam polarization [8]			
SH	–	horizontal	–
Signal	horizontal		
Idler	vertical		
PUMP LASER REQUIREMENTS			
Min pump energy [9]			
at 532 nm	–		0.45 mJ
at 355 nm	0.3 mJ		–
Pulse duration [10]	30 ps		
Beam size [10]	2 – 3 mm		
Beam divergence	< 1 mrad		
Beam profile	homogeneous, without hot spots, Gaussian fit > 90 %		
Recommended pump source	PL2210A-TH	PL2210A-TH	PL2210A-SH
PHYSICAL CHARACTERISTICS			
Size (W × L × H)	456 × 820 × 273 mm		456 × 632 × 273 mm
OPERATING REQUIREMENTS			
Room temperature	15 – 30 °C		
Power requirements	100 – 240 V single phase, 47 – 63 Hz		
Power consumption	< 120 W		

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PG403 units, at 800 nm for PG503 units and for basic system without options.

2) Pulse energies are specified at selected wavelengths. See typical tuning curves for pulse energies at other wavelengths.

3) Measured at 250 nm.

4) Measured at 1000 nm.

5) Estimated assuming 30 ps at 1064 nm pump pulse. Pulse duration varies depending on wavelength and pump energy.

6) Beam diameter at the $1/e^2$ level. Can vary depending on the pump pulse energy.

7) Beam divergence measured at 450 nm.

8) Separate output ports for SH, signal and idler ranges.

9) Max pump energy is limited by available non-linear crystal sizes.

10) Should be specified while ordering if non-Ekspla pump laser is used.

TUNING CURVES

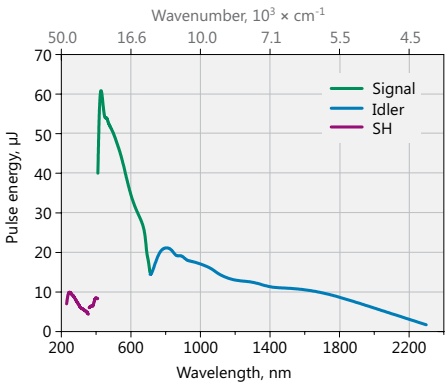


Fig 1. Typical PG403-SH model tuning curve.
Pump energy – 0.3 mJ at 355 nm

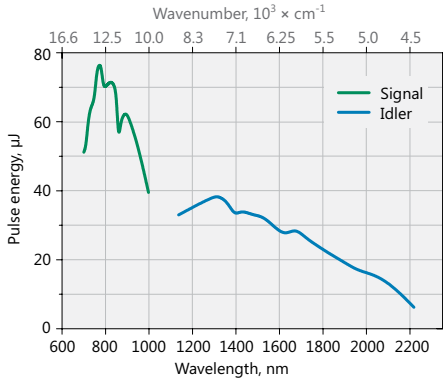


Fig 2. Typical PG503 model tuning curve.
Pump energy – 0.45 mJ at 532 nm

RECOMMENDED UNITS ARRANGEMENT ON OPTICAL TABLE

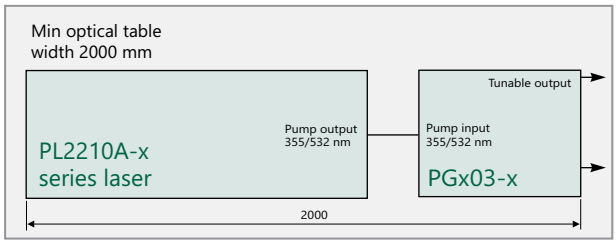


Fig 3. Arrangement of pump laser and PGx03 unit on optical table

OUTLINE DRAWINGS

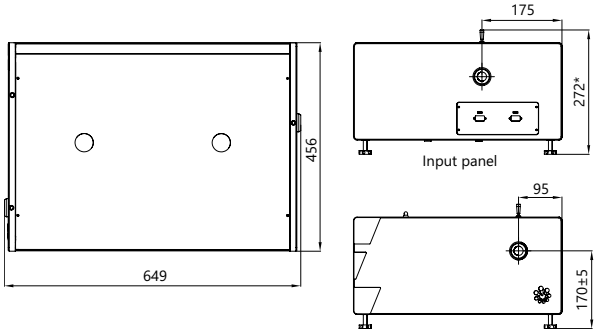


Fig 4. PGx03 model external dimensions

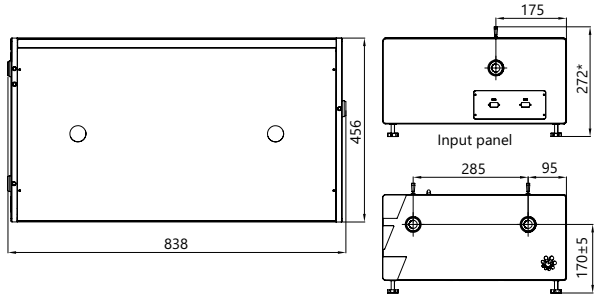


Fig 5. PGx03-SH model external dimensions

ORDERING INFORMATION

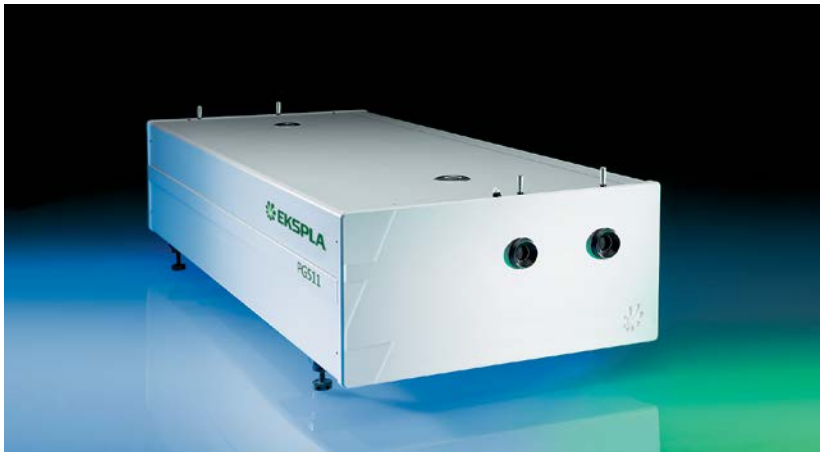
Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

PG403-SH

Model	Optional tuning range extension
PG403 → 355 nm pump	SH → 210–410 nm
PG503 → 532 nm pump	

PGx11 SERIES

Transform Limited Broadly Tunable Picosecond OPA



PGx11 series optical parametric devices employ advanced design concepts in order to produce broadly tunable picosecond pulses with nearly Fourier-transform limited linewidth and low divergence. High brightness output beam makes the PGx11 series units an excellent choice for advanced spectroscopy applications.

Optical layout of PGx11 units consists of Synchronously pumped Optical Parametric Oscillator (SOPO) and Optical Parametric Amplifier (OPA). SOPO is pumped by a train of pulses at approx. 87 MHz pulse repetition rate. The output from SOPO consists of a train of pulses with excellent spatial and spectral characteristics, determined by the SOPO cavity parameters.

OPA is pumped by a single pulse temporally overlapped with SOPO output. After amplification at SOPO resonating wavelength, the PGx11 output represents a high intensity single pulse on top of a low-intensity train, while in all other spectral ranges (idler for PG411 and PG711, signal for PG511, also DFG stages) only a single high intensity pulse is present.

Three models designed for pumping by up to the 3rd harmonic of Nd:YAG laser are available.

FEATURES

- *2 cm^{-1} or **0.8 cm^{-1}** linewidth*
- *High brightness picosecond pulses at 50 Hz or at up to **1 kHz** pulse repetition rate*
- *Nearly Fourier-transform limited linewidth*
- *Low divergence <2 mrad*
- *Hands-free wavelength tuning*
- *Tuning range from **193 nm** to **16000 nm***
- *PC control using USB (RS232 is optional) and LabVIEW™ drivers*
- *Remote control via keypad*

APPLICATIONS

- *Time resolved pump-probe spectroscopy*
- *Laser-induced fluorescence*
- *Infrared spectroscopy*
- *Nonlinear spectroscopy: vibrational-SFG, surface-SH, Z-scan, pump probe*
- *Other laser spectroscopy applications*

Available models

Model	Features
PG411	Model has a tuning range from 410 to 2300 nm and is optimized for providing highest pulse energy in the visible part of the spectrum. When combined with an optional Second Harmonic Generator (SHG) and Sum Frequency Generator (-DUV), it offers the widest possible tuning range – from 193 to 2300 nm.
PG511	Model has a tuning range 2300–10000 nm. PG411 and PG511 models are designed to be pumped by PL2230 series lasers with a 50 Hz pulse repetition rate.
PG711	Model has 1 kHz pulse repetition rate and uses DPSS mode-locked laser of the PL2210 series for pumping. When pumped with pulses of 90 ps duration, linewidths of less than 1 cm^{-1} were measured in the spectral range up to 16 µm, which makes this device an excellent choice for time-resolved or nonlinear infrared spectroscopy.

Microprocessor based control system provides automatic positioning of relevant components, allowing hands free operation. Nonlinear crystals, diffraction grating and filters are rotated by ultra-precise stepper motors in microstepping mode, with excellent reproducibility.

Precise nonlinear crystal temperature stabilization ensures long-term stability of generated wavelength and output power.

For customer convenience the system can be controlled through its USB type PC interface (RS232 is optional) with LabView™ drivers or a remote control pad. Both options allow easy control of system settings.

Available standard models are summarized in a table below. Please inquire for custom-built versions.

SPECIFICATIONS [1]

Model	PG411	PG411-SH	PG411-SH-DUV	PG511-DFG	PG711	PG711-DFG
Output wavelength tuning range						
SH, DUV	–	210–410 nm	193–410 nm	–		
Signal	410–709 nm			–	1550–2020 nm	
Idler	710–2300 nm			–	2250–3350 nm	
DFG	–			2300–10000 nm	–	3350–16000 nm
DFG2 (up to 16000 nm)	–			inquire	–	
Output pulse energy [2]						
SH, DUV	–	100 µJ [3]	50 µJ [3]	–		
Signal	700 µJ			–	500 µJ	
Idler [4]	250 µJ			–	100 µJ	
DFG	–			> 200 µJ at 3700 nm, >40 µJ at 10000 nm	–	20 µJ [5]
Max pulse repetition rate	50 Hz			50 Hz	1000 Hz	
Linewidth	< 3 cm^{-1} [6]			< 2 cm^{-1}	< 0.8 cm^{-1}	< 1 cm^{-1}
Linewidth Idler	< 5 cm^{-1} [6]			–		
Typical pulse duration [7]	~15 ps			~20 ps	~70 ps	
Scanning step						
SH, DUV	–	0.01 nm		–		
Signal	0.1 nm					
Idler	1 nm					
DFG	–					1 nm
Typical beam diameter [8]	~ 4 mm			~ 9 mm	~ 3 mm	
Beam divergence [9]	< 2 mrad					
Beam polarization [9]						
SH, DUV	–	vertical		–		
Signal	horizontal			vertical	horizontal	
Idler	vertical			horizontal	vertical	
DFG	–			horizontal	–	horizontal

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PG411 units, 800 nm for PG511 units, and 1620 nm for PG711 units and for basic system without options.

2) Pulse energies are specified at selected wavelengths. See typical tuning curves for pulse energies at other wavelengths.

3) Measured at 280 nm for SH and 200 nm for DUV.

4) Measured at 1000 nm for PG411 units, 1620 nm for PG511, and 3000 nm for PG711 units.

5) Measured at 10000 nm.

6) Linewidth for signal (409 – 710 nm) < 3 cm^{-1}, linewidth for idler and SH-DUV (710 – 2300 nm and 193 – 409 nm) < 5 cm^{-1}.

7) Estimated FWHM assuming pump pulse duration 30 ps at 1064 nm for PG411 and PG511 units, and 90 ps at 1064 nm for PG711 units.

8) Beam diameter is measured at $1/e^2$ level and can vary depending on the pump pulse energy.

9) Full angle measured at FWHM level.

SPECIFICATIONS [1)]

Model	PG411	PG411-SH	PG411-SH-DUV	PG511-DFG	PG711	PG711-DFG
PUMP LASER REQUIREMENTS						
Recommended pump source	PL2231 + APL2100-TRAIN-H411			PL2231 + H500-APL2100-TRAIN	PL2211A TR	
Min. pump energy or power [10)]						
at 1064 nm	–		2 mJ	(10 mJ)	5 mJ at 1 kHz	
at 532 nm	–			5 mJ (8 mJ)		
at 355 nm	5 mJ (10 mJ)			–		
Pulse duration [11)]	30 ps				90 ps	
Beam polarization at pump wavelength	vertical			horizontal		
Beam size [12)]	7 mm				2.5 mm	
Beam divergence	< 0.5 mrad					
Beam profile	homogeneous, without hot spots					
PHYSICAL CHARACTERISTICS						
Size (W × L × H)	456 × 1026 × 244 mm	456 × 1226 × 244 mm		PL2231: 456 × 1026 × 244 mm H500-APL2100-TRAIN: 456 × 1026 × 244 mm		456 × 1026 × 244 mm
OPERATING REQUIREMENTS						
Room temperature	15–30 °C					
Room temperature stability	± 2 °C					
Power requirements	100–240 V single phase, 47–63 Hz					
Power consumption	< 300 W					

[10)] The first number represents pulse train energy or power, while the value in brackets represents single pulse energy.

[11)] At FWHM level. Inquire for other available pulse duration options.

[12)] Beam diameter measured at $1/e^2$ level.

RECOMMENDED UNITS ARRANGEMENT ON OPTICAL TABLE

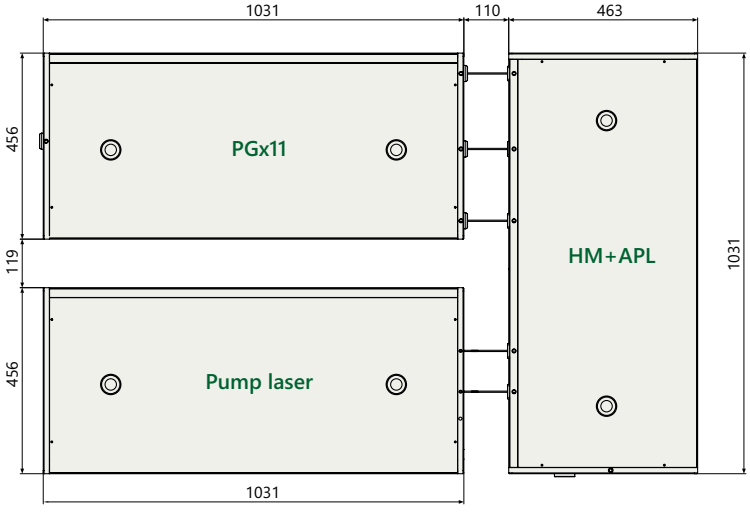


Fig 1. Arrangement of pump laser and PGx11 unit on optical table

TUNING CURVES

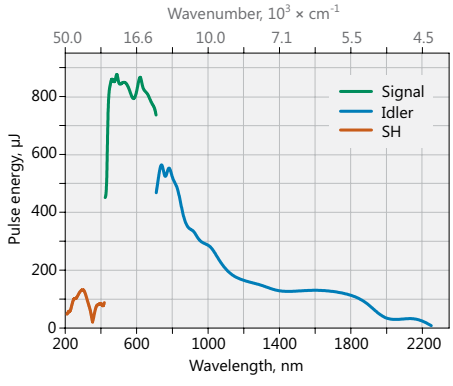


Fig 2. Typical PG411-SH model tuning curve

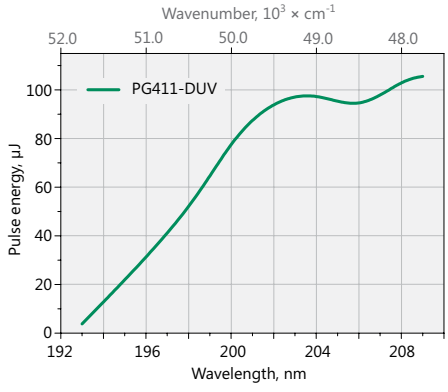


Fig 3. Typical PG411-DUV model tuning curve

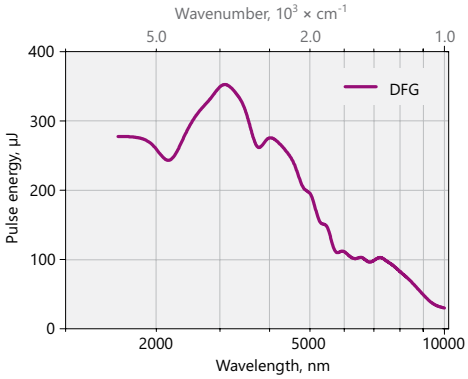


Fig 4 Typical PG511-DFG model tuning curve

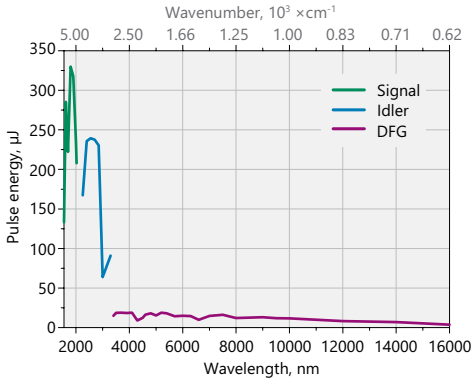


Fig 5. Typical PG711-DFG model tuning curve.
Pump energy: 2.5 mJ at 1064 nm, 1 kHz repetition rate

Note: The energy tuning curves are affected by air absorption due narrow linewidth. These pictures present pulse energies where air absorption is negligible.

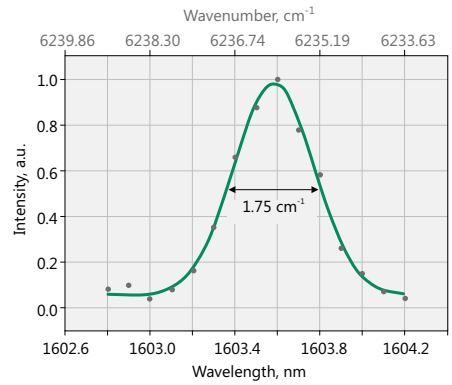


Fig 6. PG511-DFG model typical output linewidth

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OUTLINE DRAWINGS

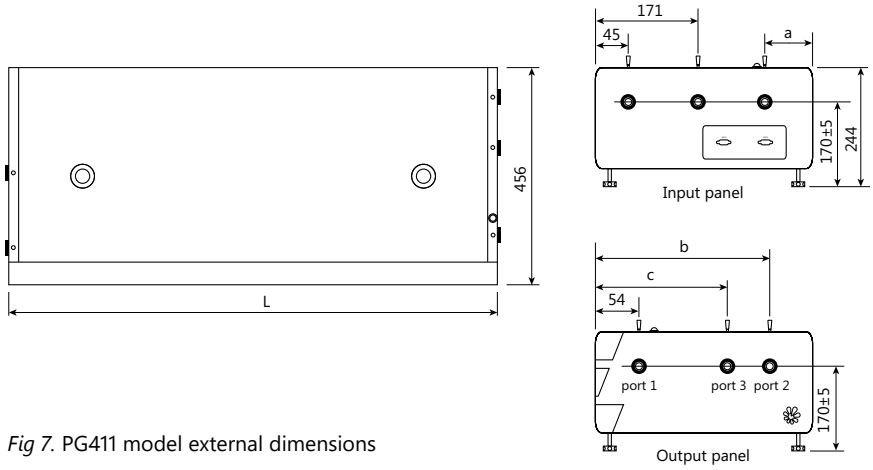

Fig 7. PG411 model external dimensions

OUTPUTS PORTS

Model	L, mm	a, mm	b, mm	c, mm	Port 1	Port 2	Port 3
PG411	1026	×	411	×	420–709 nm, 710–2300 nm	420–709 nm, 710–2300 nm	–
PG411-SH	1226	×	411	×	420–709 nm, 710–2300 nm	210–419 nm, 420–709 nm, 710–2300 nm	–
PG411-SH/DUV	1226	235	411	331	420–709 nm, 710–2300 nm	210–419 nm, 420–709 nm, 710–2300 nm	192–209.95 nm

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

PGx11-SH

Model
PG411 → ps 355 nm pump
PG511 → ps 532 nm pump
PG711 → ps 1064 nm pump

Optional tuning range extension
SH (PG411) → 210–420 nm
SH/DUV (PG411) → 193–420 nm
DFG (PG511) → 2300–10000 nm
DFG (PG711) → 3350–16000 nm

PT277 SERIES

Single Housing NIR-IR Range Tunable Picosecond Laser

FEATURES

- ***1400–4450 nm** tuning range*
- *Nearly Fourier transform-limited linewidth*
- *Nearly diffraction limited divergence*
- *Output wavelength monitoring (optional)*
- *PC control via USB (RS232 is optional) and LabView™ drivers*

APPLICATIONS

- *Infrared microscopy*
- *Infrared spectroscopy*

PT277 series laser systems integrate a picosecond optical parametric oscillator and DPSS pump laser into a single compact housing. Mounting the components into one frame provides a cost-effective and robust solution with improved long-term stability and reduced maintenance costs.

The tuning range is for the model PT277 1400 – 2050 and 2200 to 4450 nm with nearly Fourier transform limited linewidth.

The microprocessor-controlled wavelength tuning is fully automatic. The wavelength controlling elements are mounted on precise micro-stepping motors. The temperature of the non-linear crystal is controlled by a precise thermocontroller with a bidirectional Peltier element, resulting in the fast tuning of crystal temperature. For customer convenience the system can be controlled through its USB type PC interface (RS232 is optional) with LabView™ drivers or a remote control pad. Both options allow easy control of system settings.

TUNING CURVES

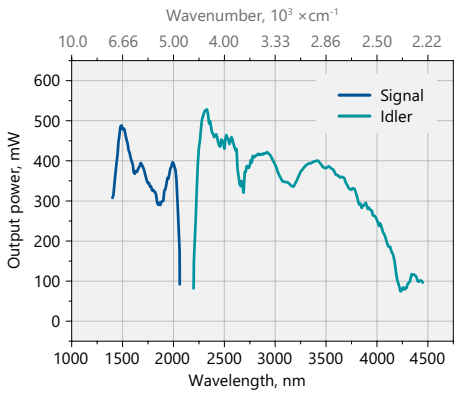

Fig 1. Typical output power of PT277 tunable laser.
The power is shown only at the wavelengths where ambient air absorption is negligible

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SPECIFICATIONS [1]

Model	PT277
Pulse repetition rate [2]	87 MHz
Tuning range	
Signal	1400 – 2050 nm
Idler	2200 – 4450 nm
Output power [3]	
OPO [4]	> 500 mW
Linewidth [4]	< 2.5 cm^{-1}
Typical pulse duration [4] [5]	70 ps
Scanning step	
Signal	0.1 nm
Idler	0.1 nm
Polarization	
Signal beam	horizontal
Idler beam	horizontal
Typical beam diameter [4] [6]	~2 mm
Typical beam diameter, Idler [4] [6]	~5 mm
Typical beam divergence [4] [7]	< 2 mrad
PHYSICAL CHARACTERISTICS	
Unit size (W × L × H)	370 × 800 × 260 mm
Power supply size (W × L × H)	520 × 500 × 290 mm
Umbilical length	2 m
OPERATING REQUIREMENTS	
Cooling	water-air
Room temperature	22 ± 2 °C
Relative humidity	20 – 80 % (noncondensing)
Power requirements	100 – 240 V AC, single phase 50/60 Hz
Power consumption	< 1 kVA

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked 'typical' are indications of typical performance (not specifications) and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 1064 nm and for basic system without options.

2) Inquire for custom pulse repetition rates.

3) Output powers are specified at selected wavelengths. See typical tuning curves for power at other wavelengths.

4) Measured at 1600 nm for PT277 model at signal range.

5) Pulse duration can vary depending on wavelength and pump energy.

6) Beam diameter at the $1/e^2$ level and can vary depending on the pump pulse energy.

7) Full angle measured at the FWHM level.

OUTLINE DRAWINGS

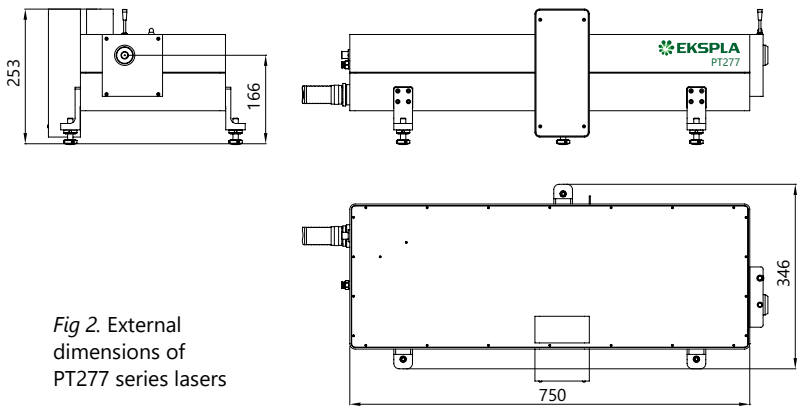

Fig 2. External dimensions of PT277 series lasers

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

PT403 SERIES

Tunable Wavelength Picosecond Laser

PT403 series laser systems integrate a picosecond 1 KHz repetition rate DPSS pump laser and optical parametric generator into a single housing. New picosecond tunable wavelength laser system provide from 210 to 2300 nm from the one box.

Unlike other solutions in the market, offering laser and OPO in different units, new approach features pump laser and OPO integrated into one unit. That delivers almost twice smaller footprint, shorter installation, better stability and other substantial benefits for user.

All-in one-box solution features all components placed into one compact housing. It means better overall stability because all potential causes for misalignment between separate units of pump laser and optical parametric generator are eliminated.

To ensure reliability industry and market tested solutions were employed during the build-up of PT403.

Pump laser is based on industry "gold standard" diode pumped Ekspla PL2210 series picosecond mode-locked laser. Improved output parameters and reduced maintenance costs are achieved by employing diode-pumped-only technology.

Optical parametric generator is based on PGx03 picosecond optical parametric amplifier systems. Fully automatized and microprocessor based control system ensures hands free precise wavelength tuning.

PT403 was built without sacrificing any parameters or reliability. The optical design is optimized to produce low divergence beams with moderate linewidth (typically < 9 cm^{-1}) at approximately 15 – 20 ps pulse duration. Featuring 1 KHz repetition rate PT403 tuneable laser is versatile cost-efficient tool for scientists researching various kind of disciplines like time resolved fluorescence, pump-probe spectroscopy, laser-induced fluorescence, Infrared spectroscopy and other aplications.

For customer convenience the system have PC interface module with USB interface, remote control through Windows DLL function calls. This options allow easy control of system settings.

FEATURES

- *Tuning range: 210 – 2300 nm*
- *Motorized hands-free tuning*
- *High pulse energy at 1 kHz rates*
- *Diode pumped solid state design*
- *Narrow linewidth < 9 cm^{-1}*
- *Remote control via keypad*
- *PC control*
- *Optional streak camera triggering pulse with < 10 ps rms jitter*
- *Turn-key operation*
- *Air cooled – external water supply is not required*
- *Low maintenance costs*

APPLICATIONS

- *Time resolved fluorescence, pump-probe spectroscopy*
- *Laser-induced fluorescence*
- *Infrared spectroscopy*
- *Nonlinear spectroscopy: surface-SH, Z-scan*
- *Other spectroscopic and nonlinear optics applications*

BENEFITS

- *Better long term stability (compared with layout where laser and OPO are in different units)*
- *Higher safety – all beams are in the box*
- *Shorter installation time*
- *Almost twice smaller footprint*

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SPECIFICATIONS [1]

Model	PT403	PT403-SH
OPA SPECIFICATIONS		
Output wavelength tuning range		
SH	–	210 – 409 nm
Signal	410 – 709 nm	
Idler	710 – 2300 nm	
Output pulse energy [2]		
SH [3]	–	15 µJ
Signal [4]	80 µJ	
Idler [5]	25 µJ	
Pulse repetition rate	1000 Hz	
Linewidth	< 9 cm^{-1}	< 12 cm^{-1}
Typical pulse duration [6]	~ 15 ps	
Scanning step		
SH	–	0.05 nm
Signal	0.1 nm	
Idler	1 nm	
Typical beam size [7]	~ 2 mm	
Beam divergence [8]	< 2 mrad	
Beam pointing stability	≤ 100 µrad rms	
Beam polarization		
SH	–	horizontal
Signal	horizontal	
Idler	vertical	
Optical pulse jitter		
Internal triggering regime [9]	< 50 ps (StDev) in respect to TRIG1 OUT pulse	
External triggering regime	~ 3 ns (StDev) in respect to SYNC IN pulse	
TRIG1 OUT pulse delay [10]	-400 ... 150 ns	
OPERATING REQUIREMENTS		
Room temperature	22 ± 2 °C	
Relative humidity	20 – 80% (non-condensing)	
Power requirements	100 – 240 V single phase, 47 – 63 Hz	
Power consumption	< 0.6 kW	
Water service	air cooled	
Cleanness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm for PT403 units for basic system without options.

2) Pulse energies are specified at selected wavelengths. See typical tuning curves for pulse energies at other wavelengths.

3) Measured at 260 nm.

4) Measured at 450 nm.

5) Measured at 1000 nm.

6) Estimated assuming 30 ps at 1064 nm pump pulse. Pulse duration varies depending on wavelength and pump energy.

7) Beam diameter at the $1/e^2$ level. Can vary depending on the wavelength.

8) Beam divergence measured at FWHM.

9) < 10 ps jitter is provided with PRETRIG option.

Communication module interfaces

Interface	Description
USB	virtual serial port, ASCII commands
RS232	ASCII commands
LAN	REST API
WLAN	REST API

DESIGN

The units can be divided into several functional parts:

1. 1 kHz repetition rate DPSS pump laser,
2. Optical parametric generator (OPG),
3. Electronic control unit.

Fig 1. PT403 unit

PT403 series laser systems integrate a picosecond 1 kHz repetition rate DPSS pump laser and optical parametric generator into a single housing. As pump laser is used PL2210 series diode-pumped, air-cooled, mode-locked Nd:YAG laser. Picosecond tunable wavelength laser system provide from 210 to 2300 nm from the single optical unit.

OPTIONS

▶ Option SF

Energy increasing in 300 – 409 nm range by sum-frequency generation. > 20 µJ @ 340 nm. Pulse energies are ~ 10 % lower in comparison to the system without SF option. See table below for pulse energy specifications:

Model [1]	PT403	PT403-SH
SH [2]	–	> 13 µJ
Signal [3]	> 70 µJ	
Idler [4]	> 22 µJ	

[1] Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.

[2] Measured at 260 nm.
[3] Measured at 450 nm.
[4] Measured at 1000 nm.

▶ Options -H, -2H, -3H

1064 nm or 532 nm, or 355 nm outputs. All energy is directed to this output port.

– H output energy 0.7 mJ;

– 2H output energy 0.3 mJ;

– 3H output energy 0.3 mJ.

TUNING CURVES

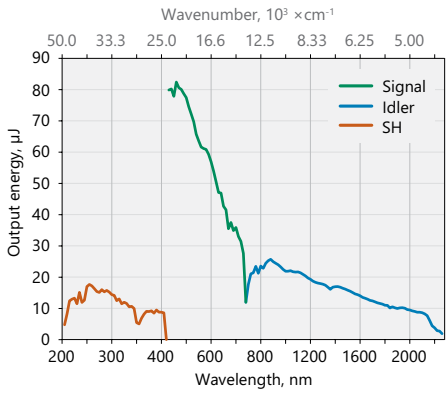

Fig 2. Typical PT403 tuning curves in signal (420 – 709 nm) and idler (710 – 2300 nm) ranges.

Note: The energy tuning curves are affected by air absorption due narrow linewidth. These pictures present pulse energies where air absorption is negligible.

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OUTLINE DRAWINGS

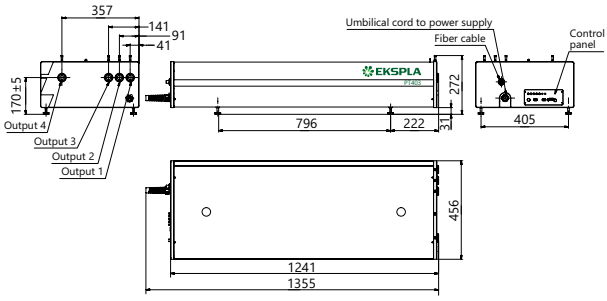


Fig 3. PT403 series laser head typical outline drawing

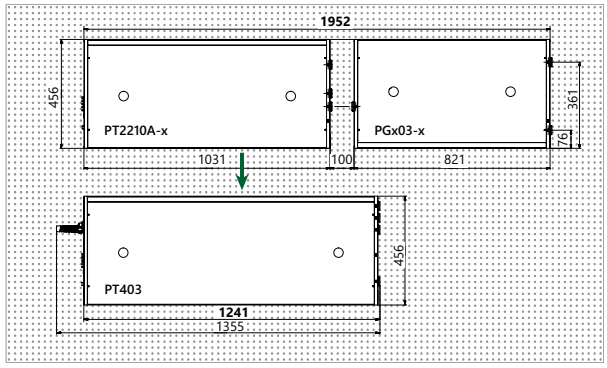
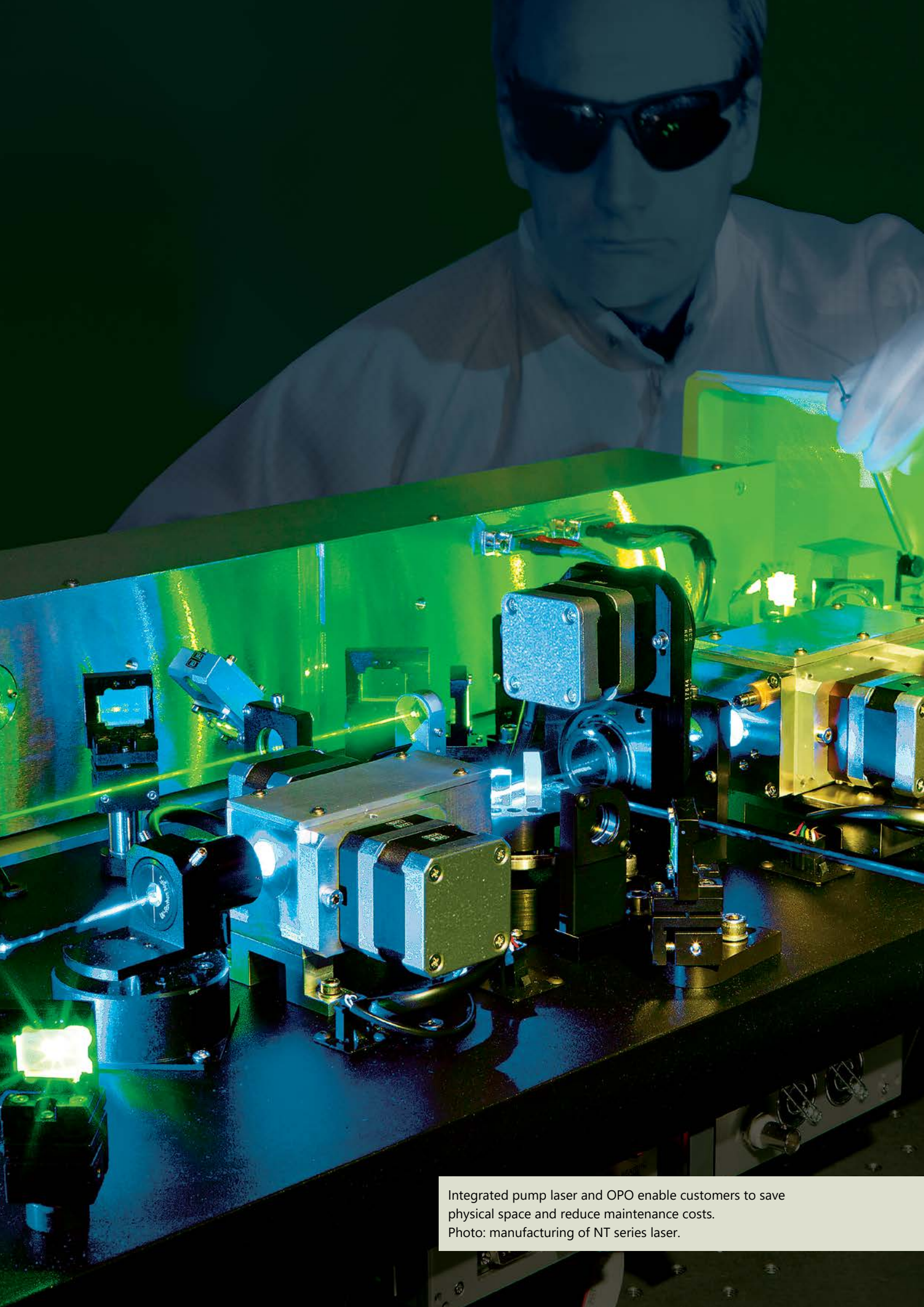


Fig 4. Compared with layout where laser and OPO are in different units, PT403 features almost twice smaller footprint

OUTPUTS PORTS

Model	L, mm	Port 1	Port 2	Port 3	Port 4
PT403	1241	1064 / 532 nm	–	355 nm	410 – 2300 nm
PT403-SH/SF	1441	1064 / 532 nm	210 – 2300 nm	355 nm	410 – 2300 nm

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.



Integrated pump laser and OPO enable customers to save physical space and reduce maintenance costs.
Photo: manufacturing of NT series laser.

Nanosecond Tunable Lasers

NT series tunable lasers offer tunable, automated wavelength output from UV to IR out of the one small-footprint box. Integrated into a single compact housing, the diode or flash-lamp pumped Q-switched Nd:YAG laser and OPO offer hands-free, no-gap tuning across the specified range.

The output wavelength can be set from control pad with backlit display that is easy to read even while wearing laser safety glasses. Alternatively, the laser can be controlled also from personal computer using supplied LabVIEW™ drivers.

Most of the pump lasers do not require water for cooling, thus further reducing running and maintenance costs. A built-in OPO pump energy monitor allows monitoring of pump laser performance without the use of external power meters.

Wide range of available options, accessories and modifications enable to tailor laser to better fit for your requirement. High conversion efficiency, stable output, easy maintenance, robust design and compact size make NT series systems an excellent choice for many applications including laser induced fluorescence, flash photolysis, photobiology, metrology, remote sensing and many others.

In the year 2011 the NT series systems has received the Photonics Oscar – Prism Award for Photonics Innovation in Scientific lasers category.

SHORT SELECTION GUIDE

For Your convenience, table contains all available options and highest parameter values. Not all output specifications are available at the same time simultaneously. Please refer to the catalog page for exact specifications and available options.

Model	Output wavelength range	Repetition rate, up to	Pump laser	Special feature	Page
NT230	192–2600 nm	100 Hz	Diode pumped solid state	High, up to 15 mJ pulse energy from OPO	26
NT240	210–2600 nm	1000 Hz	Diode pumped solid state	Broadly tunable kHz pulsed DPSS lasers	30
NT250	335–2600 nm	1000 Hz	Diode pumped solid state	UV-NIR range DPSS lasers	34
NT270	2500–12000 nm	1000 Hz	Diode pumped solid state	Wide IR tuning range at kHz repetition rate	37
NT340	192–2600 nm	20 Hz	Flash-lamp pump laser	Wide range of modifications to tailor for specific applications	40
NT350	330–2600 nm	20 Hz	Flash-lamp pump laser	High output pulse energy	44
NT370	2500–18000 nm	20 Hz	Flash-lamp pump laser	Wide IR tuning range	47
PhotoSonus M	330–600 nm 660–2300 nm	20 Hz	Diode pumped solid state	Mobile tunable wavelength DPSS laser source	50
PhotoSonus X	660–2600 nm	100 Hz	Diode pumped solid state	Tunable wavelength NIR range DPSS laser	52

NT230 SERIES

High Energy Broadly Tunable DPSS Lasers

BENEFITS

- *The system is widely tunable; 192 – 2600 nm and delivers high pulse energy (up to 15 mJ) which allows investigation of an extensive range of materials*
- *High repetition rate (up to 100 Hz) and output power enable fast data collection and intensive excitation of materials*
- *Narrow linewidth (down to 3 cm^{-1}) and superior tuning resolution (1 – 2 cm^{-1}) allow recording of high quality spectra*
- *High integration level saves valuable space in the laboratory*
- *Diode pumping reduces maintenance frequency*
- *Auto-calibration makes easy operation and maintenance*
- *Integrated energy meter verifies energy data readings*
- *Automatic electromechanical output shutters ensure high level of safety*
- *User friendly extendable handles ease transportation and repositioning of laser*
- *In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply*
- *Variety of control interfaces: USB, RS232, LAN and WLAN ensures easy control and integration with other equipment*
- *Attenuator and fiber coupling options facilitate incorporation of NT230 systems into various experimental environments*

FEATURES

- *Integrates DPSS pump laser and OPO into a single housing*
- *Hands-free no-gap wavelength tuning from **192** to **2600 nm***
- *High, up to **15 mJ** pulse energy from OPO*
- ***100 Hz** pulse repetition rate*
- *More than **1.8 mJ** output pulse energy in UV*
- *Less than 5 cm^{-1} linewidth*
- ***2–5 ns** pulse duration*
- *Auto-callibration*
- *Electromechanical output shutters*
- *Integrated energy meter*
- *Transportation handles*
- *355 nm laser output*
- *Remote control via key pad or PC*
- *Optional separate output port for 532/1064 nm beam*

APPLICATIONS

- *Laser-induced fluorescence*
- *Flash photolysis*
- *Photobiology*
- *Remote sensing*
- *Metrology*
- *Non-linear spectroscopy*

NT230 series lasers deliver high up to 10 mJ energy pulses at 100 Hz pulse repetition rate, tunable over a broad spectral range. Integrated into a single compact housing, the diode pumped Q-switched Nd:YAG laser and Optical Paramteric Oscillator (OPO) offers hands-free, no-gap tuning from 192 to 2600 nm. With its 100 Hz repetition rate, the NT230 series laser establishes itself as a versatile tool for many laboratory applications, as laser induced fluorescence, flash photolysis, photobiology, metrology, remote sensing, etc.

Due to the innovative diode-pumped design, NT230 series lasers feature maintenance-free laser operation for an extended period of time and improved stability (compared with flash-lamp pumped counterparts).

NT230 series systems can be controlled from a remote control pad or/and a computer using supplied LabVIEW™ drivers. The control pad allows easy control of all parameters and features on a backlit system display that is easy to read even with laser safety eyewear.

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SPECIFICATIONS [1]

Model	NT230-50	NT230-100
OPO		
Wavelength range		
Signal	405–710 nm	
Idler	710–2600 nm	
SH and SF	210–405 nm [2]	
DUV	192–210 nm	
Pulse energy [3]		
OPO	15 mJ	10 mJ
SH and SF [4]	1.8 mJ	1.3 mJ
DUV	0.25 mJ	0.15 mJ
Pulse repetition rate	50 Hz	100 Hz
Pulse duration [5]	2–5 ns	
Linewidth [6]	<5 cm^{-1}	
Tuning resolution [7]		
Signal	1 cm^{-1}	
Idler	1 cm^{-1}	
SH/SF/DUV	2 cm^{-1}	
Polarization		
Signal	horizontal	
Idler	vertical	
SH/SF	horizontal	
DUV	vertical	
OPO beam divergence [8]	<2 mrad	
Typical beam diameter [9]	5 mm	
PUMP LASER		
Pump wavelength [10]	355 nm	
Typical pump pulse energy [11]	50 mJ	35 mJ
Pulse duration [6]	2–5 ns	
PHYSICAL CHARACTERISTICS		
Unit size (W × L × H)	451 × 696 × 172 mm	
Power supply size (W × L × H)	471 × 391 × 147 mm	
External chiller	inquire	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Cooling	external chiller	
Room temperature	18–27 °C	
Relative humidity	20–80 % (non-condensing)	
Power requirements	100–240 V AC, single phase, 50/60 Hz	
Power consumption	<1.8 kW	
Cleanliness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change. Parameters marked typical are illustrative. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm and for basic system without options.

2) Separate –SH and –SF options are available.

3) See tuning curves for typical outputs at other wavelengths.

4) Measured at 260 nm wavelength.

5) FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

6) Linewidth is <8 cm^{-1} for 210 – 405 nm range.

7) When wavelength is controlled from PC. When wavelength is controlled from keypad, tuning resolution is 0.1 nm for signal, 1 nm for idler and 0.05 nm for SH, SF and DUV.

8) Full angle measured at the FWHM level at 450 nm.

9) Beam diameter is measured at 450 nm at the $1/e^2$ level and can vary depending on the pump pulse energy.

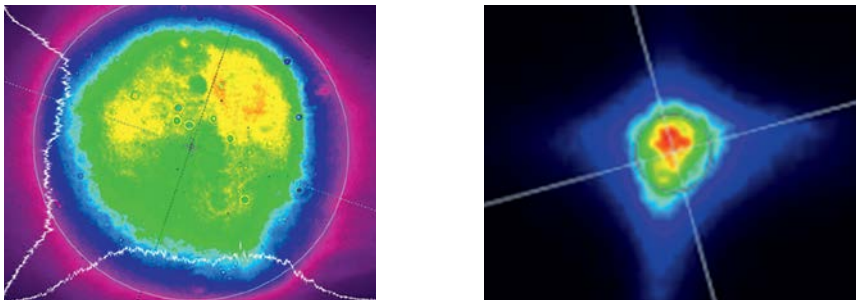
10) Separate output port for the 3rd harmonic beam is standard. Output ports for other harmonic are optional.

11) The pump laser pulse energy will be optimized for best OPO performance and can vary with each unit we manufacture.

Accessories and optional items

Option	Features
-SH	Tuning range extension in UV range (210–405 nm) by second harmonic generation
-SF	Tuning range extension in 300–405 nm range by sum-frequency generation
-SH/SF	Tuning range extension in 210–405 nm range by combining second harmonic and sum-frequency generator outputs for maximum possible pulse energy
-DUV	Deep UV option for 192 – 210 nm range output
-H, -2H	1064 nm or 532 nm output via separate port
-FC	Fiber coupled output in 300–2000 nm range
-ATTN	Attenuator
-SCU	Spectral filtering accessory for improved spectral purity of pulses

PERFORMANCE



Near field Far field

Fig 1. Typical beam profiles of NT230 series lasers at 450 nm

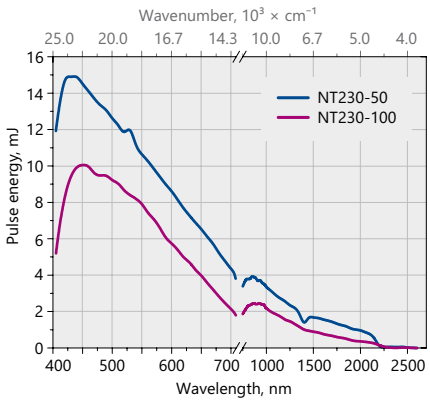


Fig 2. Typical output pulse energy of NT230 laser

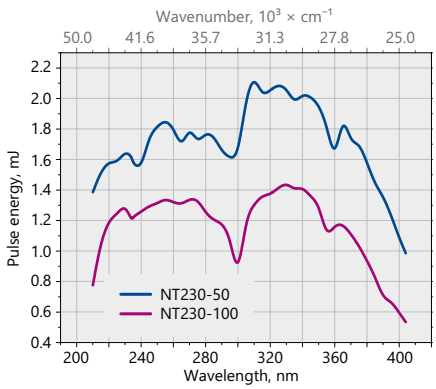


Fig 3. Typical output pulse energy of NT230 laser with SH/SF extension

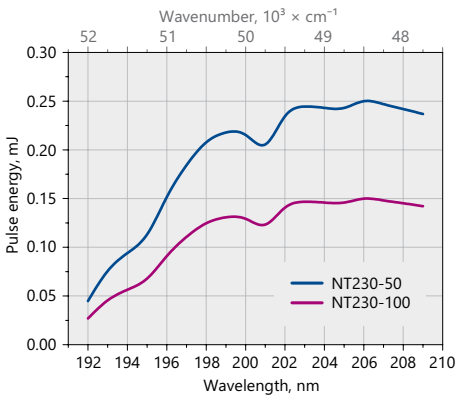


Fig 4. Typical output pulse energy of NT230 laser with DUV extension

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OUTLINE DRAWINGS

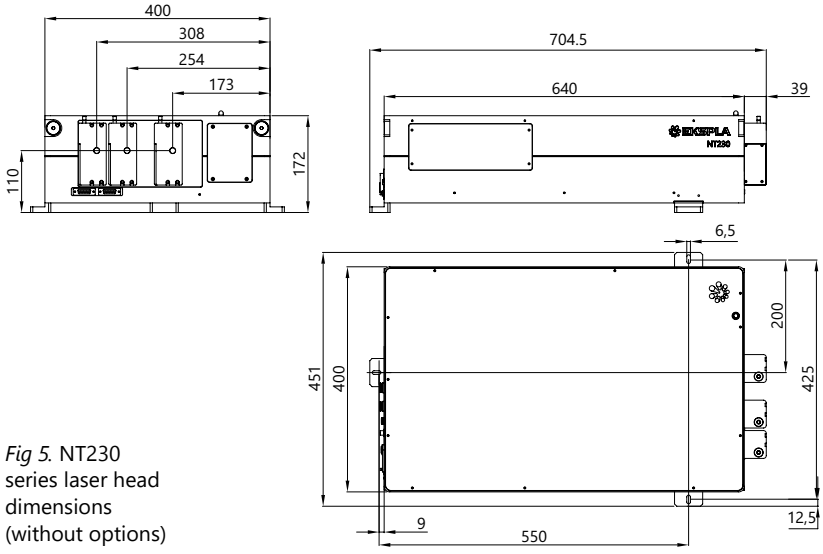


Fig 5. NT230 series laser head dimensions (without options)

Fig 6. For easier transportation laser features integrated carrying handles, which can be hidden inside, when not in need

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

NT230-50-SH-H-2H-SCU

Model

Pulse repetition rate in Hz

Optional tuning range extension:
SH → 210–405 nm
SF → 300–405 nm
SH/SF → 210–405 nm
DUV → 192–210 nm

Options:
H → extra 1064 nm output
2H → extra 532 nm output
SCU → spectral filtering accessory

NT240 SERIES

Broadly Tunable kHz Pulsed DPSS Lasers

BENEFITS

- *High repetition rate 1000 Hz enables fast data collection*
- *End pumping with diode technology ensures high reliability and low maintenance costs*
- *Narrow linewidth (down to 3 cm^{-1}) and superior tuning resolution (1 – 2 cm^{-1}) allow recording of high quality spectra*
- *High integration level saves valuable space in the laboratory*
- *In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply*
- *Variety of control interfaces: USB, RS232, LAN and WLAN ensures easy control and integration with other equipment*
- *Attenuator and fiber coupling options facilitate incorporation of NT240 systems into various experimental environments*

FEATURES

- *Integrates DPSS pump laser and OPO into a single housing*
- *Hands-free no-gap wavelength tuning from **210** to **2600 nm***
- ***1000 Hz** pulse repetition rate*
- *More than **60 µJ** output pulse energy in UV*
- *Less than 5 cm^{-1} linewidth*
- ***3–6 ns** pulse duration*
- *Remote control via key pad or PC*
- *Optional separate output for the OPO pump beam 355 nm, 532 nm or 1064 nm*

APPLICATIONS

- *Laser-induced fluorescence spectroscopy*
- *Pump-probe spectroscopy*
- *Non-linear spectroscopy*
- *Time-resolved spectroscopy*
- *Photobiology*
- *Remote sensing*
- *Determination of the telescope throughput*

NT240 series lasers produce pulses at an unprecedented 1 kHz pulse repetition rate, tunable over a broad spectral range. Integrated into a single compact housing, the diode pumped Q-switched Nd:YAG laser and OPO offers hands-free, no-gap tuning from 210 to 2600 nm. With its 1000 Hz repetition rate, the NT240 series laser establishes itself as a versatile tool for many laboratory applications, including laser induced fluorescence, flash photolysis, photobiology, metrology, remote sensing, etc.

NT240 series systems can be controlled from a remote control pad or/and a computer using supplied LabVIEW™ drivers. The control pad allows easy control of all parameters and features on a backlit display that is easy to read even with laser safety eyewear.

Thanks to a DPSS pump source, the laser requires little maintenance. It is equipped with air-cooled built-in chiller, which further reduces running costs. A built-in OPO pump energy monitor allows monitoring of pump laser performance without the use of external power meters. The optional feature provides a separate output port for the 1064, 532 or 355 nm beam.

SPECIFICATIONS [1]

Model	NT242	NT242-SH	NT242-SF	NT242-SH/SF
OPO				
Wavelength range				
Signal	405–710 nm			
Idler	710–2600 nm			
SH and SF	—	210–300 nm	300–405 nm	210–405 nm
Pulse energy [2]				
OPO	450 µJ			
SH and SF	—	40 µJ at 230 nm	60 µJ at 320 nm	
Pulse repetition rate	1000 Hz			
Pulse duration [3]	3–6 ns			
Linewidth [4]	< 5 cm^{-1}			
Tuning resolution [5]				
Signal	1 cm^{-1}			
Idler	1 cm^{-1}			
SH and SF	—	2 cm^{-1}		
Polarization				
Signal	horizontal			
Idler	vertical			
SH and SF	—	vertical		
Typical beam diameter [6]	3 × 6 mm			
PUMP LASER				
Pump wavelength [7]	355 nm		355 / 1064 nm	
Typical pump pulse energy [8]	3 mJ		3 / 1 mJ	
Pulse duration [3]	4–6 ns at 1064 nm			
PHYSICAL CHARACTERISTICS				
Unit size (W × L × H)	456 × 1040 × 297 mm			
Power supply size (W × L × H)	520 × 400 × 286 mm			
Umbilical length	2.5 m			
OPERATING REQUIREMENTS				
Cooling	built-in chiller			
Room temperature	18–27 °C			
Relative humidity	20–80 % (non-condensing)			
Power requirements	100–240 V AC, single phase 50/60 Hz			
Power consumption	< 1.5 kW			
Cleanliness of the room	not worse than ISO Class 9			

[1] Due to continuous improvement, all specifications are subject to change. Parameters marked typical are illustrative; they are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm and for basic system without options.

[2] See tuning curves for typical outputs at other wavelengths.

[3] Measured at FWHM level with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

[4] Linewidth is <8 cm^{-1} for 210–405 nm range.

[5] For manual input from PC. When wavelength is controlled from keypad, tuning resolution is 0.1 nm for signal, 1 nm for idler and 0.05 nm for SH and SF.

[6] Beam diameter is measured at 450 nm at the $1/e^2$ level and can vary depending on the pump pulse energy.

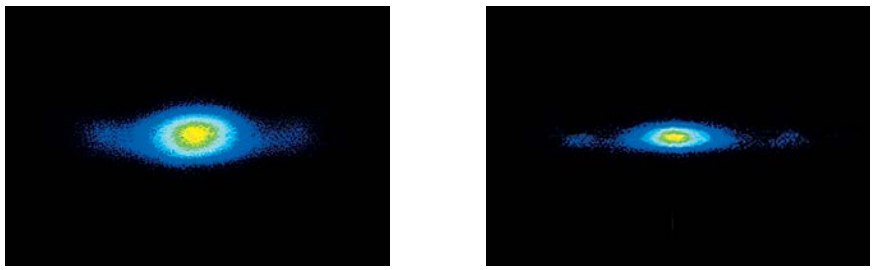
[7] Separate output port for the 3rd and other harmonic is optional.

[8] The pump laser pulse energy will be optimized for best OPO performance. The actual pump laser output can vary with each unit we manufacture.

Accessories and optional items

Option	Features
-SH	Tuning range extension in UV range (210–300 nm) by second harmonic generation
-SF	Tuning range extension in 300–405 nm range by sum-frequency generation
-SH/SF	Tuning range extension in 210 – 405 nm range by combining second harmonics and sum-frequency generator outputs for maximum possible pulse energy
-SCU	Spectral filtering accessory for improved spectral purity of pulses
-H, -2H, -3H	1064, 532 and 355 nm output via separate port
-FC	Fiber coupler
-Attn	Attenuator option

PERFORMANCE



Near field Far field

Fig 1. Typical beam profiles of NT242 series lasers at 500 nm

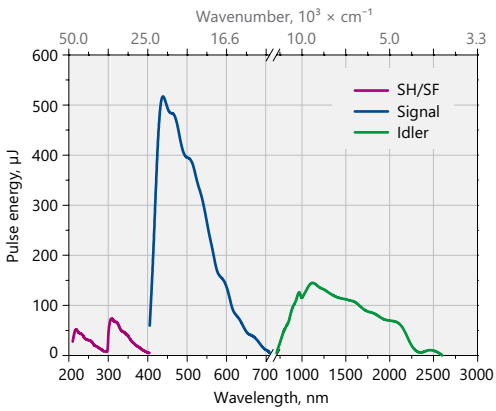


Fig 2. Typical output pulse energy of NT242 series tunable laser

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OUTLINE DRAWINGS

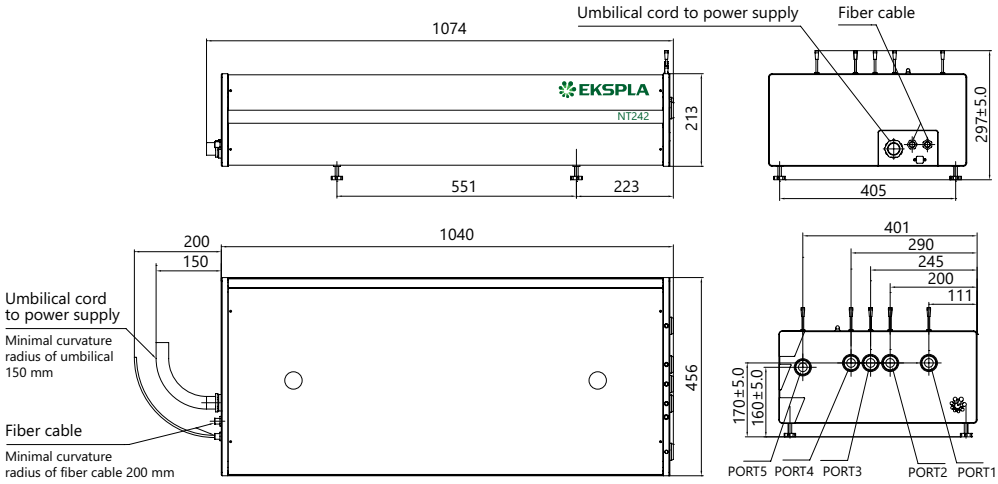


Fig 3. NT242 series laser head dimensions

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

NT242-SH-H-2H-SCU

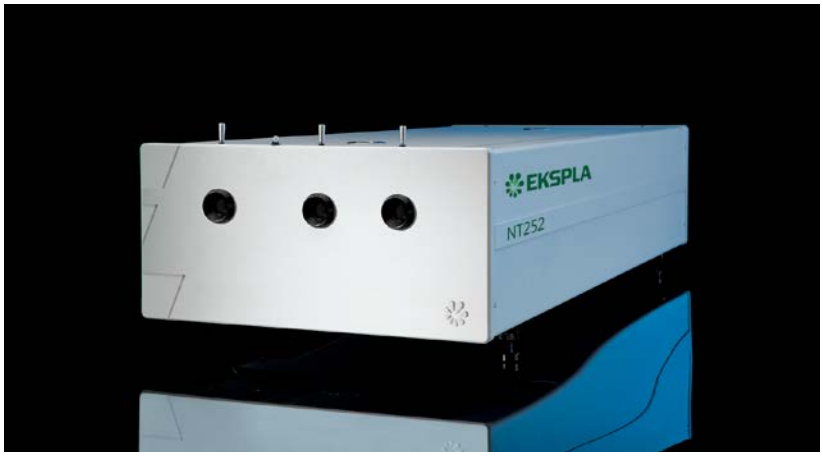
Model

Optional tuning range extension:
SH → 210–300 nm
SF → 300–405 nm
SH/SF → 210–405 nm

Options:
H → extra 1064 nm output
2H → extra 532 nm output
SCU → spectral filtering accessory

NT250 SERIES

Tunable Wavelength UV-NIR Range DPSS Lasers



FEATURES

- *Integrates DPSS pump laser and OPO into a single housing*
- *Dry, no water inside!*
- *Hands-free no-gap wavelength tuning from **335** to **2600 nm***
- ***1000 Hz** pulse repetition rate*
- *More than 1.1 mJ output pulse energy in NIR*
- ***1–4 ns** pulse duration*
- *Remote control via key pad or PC*

BENEFITS

- *High repetition rate (1000 Hz) enables fast data collection*
- *End diode pumping and water-free technology ensure high reliability and low maintenance costs*
- *Superior tuning resolution (1 – 2 cm^{-1}) allows recording of high quality spectra*
- *High integration level saves valuable space in the laboratory*
- *In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply*
- *Variety of control interfaces: USB, RS232, LAN and WLAN ensures easy control and integration with other equipment*
- *Attenuator and fiber coupling options facilitate incorporation of NT250 systems into various experimental environments*

APPLICATIONS

- *Photoacoustic imaging*
- *Laser-induced fluorescence spectroscopy*
- *Pump-probe spectroscopy*
- *Photobiology*
- *Remote sensing*
- *Metrology*

NT250 series tunable laser systems integrates into a single compact housing a nanosecond Optical Parametric Oscillator (OPO) and Diode-Pumped Solid–State (DPSS) Q-switched pump laser.

Diode pumping enables fast data acquisition at high pulse repetition rates up to 1 kHz while avoiding frequent flashlamp changes that are common when flashlamp pumped lasers are used. Special cooling technology eliminates the need for tap water, thus further reducing running and maintenance costs.

All lasers feature motorized tuning across the specified tuning range. The output wavelength can be set from control pad with backlit display that is easy to read even while wearing laser safety glasses. Alternatively, the laser can be also controlled from personal computer using supplied LabVIEW™ drivers.

High conversion efficiency, stable output, easy maintenance and compact size make our systems excellent choice for many applications.

Accessories and Optional Items

Option	Features
-SH	Tuning range extension in UV range (335 – 670 nm) by second harmonic generation
-H, -2H	1064 and 532 nm output via separate port
-FC	Fiber coupler
-Attn	Attenuator option

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SPECIFICATIONS [1]

Model	NT252
OPO	
Wavelength range	
Signal	670–1063 nm
Idler	1064–2600 nm
SH	335–670 nm
Pulse energy	
OPO [2]	1100 µJ
SH [3]	200 µJ
Pulse repetition rate	1000 Hz
Linewidth [4]	<10 cm^{-1}
Tuning resolution [5]	
Signal	1 cm^{-1}
Idler	1 cm^{-1}
SH	2 cm^{-1}
Polarization	
Signal	horizontal
Idler	vertical
SH	horizontal
Typical beam diameter [6] [7]	3 × 6 mm
PUMP LASER	
Pump wavelength [8]	532 nm
Typical pump pulse energy [9]	4 mJ
Pulse duration [10]	2 – 5 ns
Pulse energy stability (StdDev)	<2.5 %
PHYSICAL CHARACTERISTICS	
Unit size (W × L × H)	456 × 1040 × 297 mm
Power supply size (W × L × H)	520 × 400 × 286 mm
Umbilical length	2.5 m
OPERATING REQUIREMENTS	
Cooling	air-cooled
Room temperature	18–27 °C
Relative humidity	20–80 % (non-condensing)
Power requirements	100–240 V AC, single phase 50/60 Hz
Power consumption	<1.5 kW
Cleanliness of the room	not worse than ISO Class 9

1) Due to continuous improvement, all specifications are subject to change. Parameters marked typical are illustrative; they are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 750 nm and for basic system without options.

2) Measured at maximum in the interval 700 – 750 nm. See tuning curves for typical outputs at other wavelengths.

3) Measured at 400 nm. See tuning curves for typical outputs at other wavelengths.

4) In signal and idler range.

5) For manual input from PC. When wavelength is controlled from keypad, tuning resolution is 0.1 nm for signal, 1 nm for idler and 0.05 nm for SH.

6) Measured at the wavelength indicated in the "Pulse energy" specification row.

7) Beam diameter is measured at the $1/e^2$ level at the laser output and can vary depending on the pump pulse energy.

8) Separate output port for the 2nd and other harmonic are optional.

9) The pump laser pulse energy will be optimized for best OPO performance. The actual pump laser output can vary with each unit we manufacture.

10) Measured at FWHM level with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

PERFORMANCE

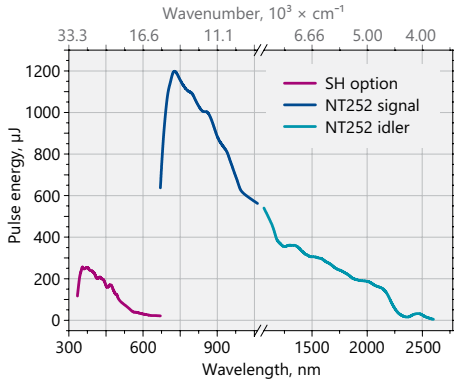


Fig 1. Typical output pulse energy of the NT252-SH tunable laser

OUTLINE DRAWINGS

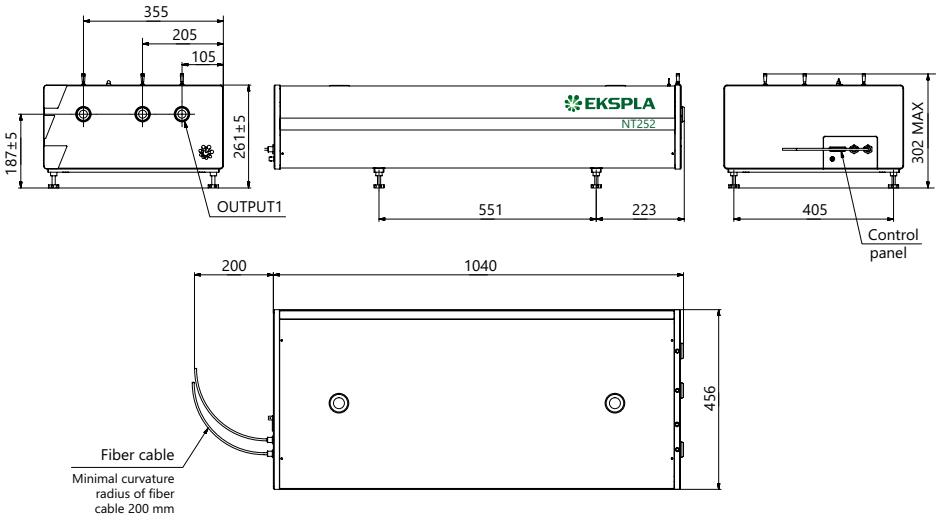


Fig 3. NT252 series laser head dimensions

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

NT252-SH-2H

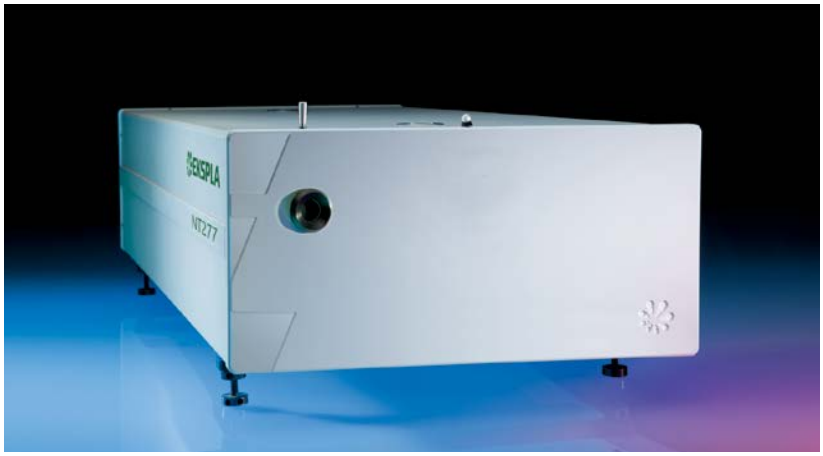
Model

Optional tuning range extension:
SH → 335–670 nm

Options:
2H → extra 532 nm output
H → extra 1064 nm output

NT270 SERIES

Tunable Wavelength NIR-IR Range DPSS Lasers



FEATURES

- *Integrates DPSS pump laser and OPO into single housing*
- *Separate output ports for the pump laser and OPO beams*
- *OPO output wavelength range from **2500 nm** to **12000 nm** (depending on model)*
- *Narrow linewidth*
- *Hands-free tuning*
- *<**7 ns** pulse duration*
- *Remote control via key pad or PC*

BENEFITS

- *Wide (2500 – 12000 nm) tuning range is highly useful for s-SNOM and other IR applications*
- *NT270 is the cost effective solution covering a wide tuning range from a single source*
- *End pumping with diode technology ensures high reliability and lots of fired shots leading to low maintenance costs*
- *High integration level saves valuable space in the laboratory*
- *Air cooling eliminates the need for water, ensuring easy operation and simple installation or integration*
- *In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply*
- *Variety of control interfaces: USB, RS232, LAN and WLAN ensures easy control and integration with other equipment*

APPLICATIONS

- *Scanning Near-field Optical Microscopy (s-SNOM) microscopy*
- *Single molecule vibrational spectroscopy*
- *IR spectroscopy*
- *Gas spectroscopy*

NT270 series tunable laser systems integrate into a single compact housing a nanosecond Optical Parametric Oscillator (OPO) and Diode-Pumped Solid–State (DPSS) Q-switched pump laser.

Diode pumping enables fast data acquisition at high pulse repetition rates up to 1 kHz while avoiding frequent flashlamp changes that are common when flashlamp pumped lasers are used.

The pump lasers do not require water for cooling, thus further reducing running and maintenance costs.

All lasers feature motorized tuning across the specified tuning range. The output wavelength can be set from control pad with backlit display that is easy to read even while wearing laser safety glasses. Alternatively, the laser can be controlled also from personal computer using supplied LabVIEW™ drivers.

High conversion efficiency, stable output, easy maintenance and compact size make our systems excellent choice for lots of applications.

NT270 series available models

Model	Features
NT277	High pulse repetition rate OPO producing tunable output in 2500 – 4475 nm spectral range
NT277-XIR	Tunable output from NIR to far-IR range, 2500 nm to 12 000 nm

SPECIFICATIONS [1]

Model	NT277	NT277-XIR
OPO		
Wavelength range		
Idler	2500–4475 nm	2500–4475 nm 4500–12000 nm [2]
Pulse energy [3]		
Idler	80 µJ at 3000 nm	80 µJ at 3000 nm 20 µJ at 7000 nm
Pulse repetition rate	1000 Hz	
Linewidth [4]	<10 cm^{-1}	<12 cm^{-1}
Tuning resolution [5]		
Idler	1 cm^{-1}	
Polarization		
Idler	vertical	horizontal
Typical beam diameter [6] [7]	4 mm	6 mm
PUMP LASER		
Pump wavelength	1064 nm	
Typical pump pulse energy [8]	1.9 mJ	
Pulse duration [9]	<10 ns	
Beam quality	fit to Gaussian >90%	
Pulse energy stability (StdDev)	<0.5 %	
PHYSICAL CHARACTERISTICS		
Unit size (W × L × H)	305 × 701 × 270 mm	
Power supply size (W × L × H)	365 × 395 × 290 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Cooling	by air	
Room temperature	18–27 °C	
Relative humidity	20–80 % (non-condensing)	
Power requirements	100–240 V AC, single phase 50/60 Hz	
Power consumption	< 0.5 kW	
Cleanliness of the room	not worse than ISO Class 9	

[1] Due to continuous improvement, all specifications are subject to change. Parameters marked typical are illustrative; they are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 3000 nm for NT277, NT277-XIR unit and at 7000 nm for NT277-XIR units and for basic system without options.

[2] Available wavelength range. Custom tuning ranges are available.

[3] See tuning curves for typical outputs at other wavelengths.

[4] Higher energy 10 – 150 cm^{-1} option is available for 2500 – 4475 nm tuning range. Narrow linewidth (<10 cm^{-1}) operation mode is impossible with this option.

[5] For manual input from PC. When wavelength is controlled from keypad, tuning resolution is 1 nm.

[6] Measured at the wavelength indicated in the "Pulse energy" specification row.

[7] Beam diameter is measured at the $1/e^2$ level at the laser output and varies depending on the wavelength.

[8] The pump laser pulse energy will be optimized for the best OPO performance. The actual pump laser output can vary with each unit we manufacture.

[9] Measured at FWHM level with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

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PERFORMANCE

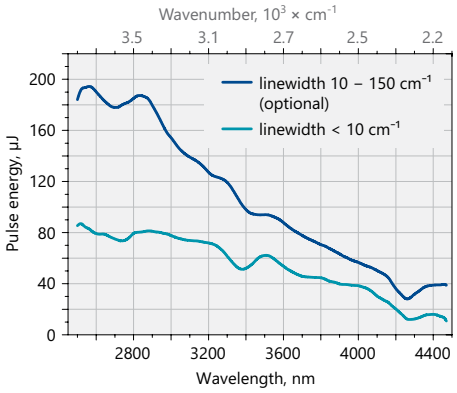


Fig 1. Typical output pulse energy of the NT277 and NT277-XIR tunable laser

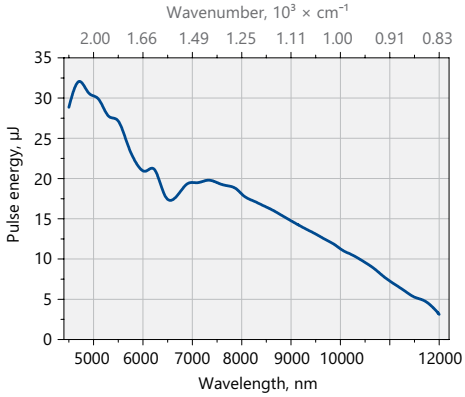


Fig 2. Typical output pulse energy of the NT277-XIR tunable laser

OUTLINE DRAWINGS

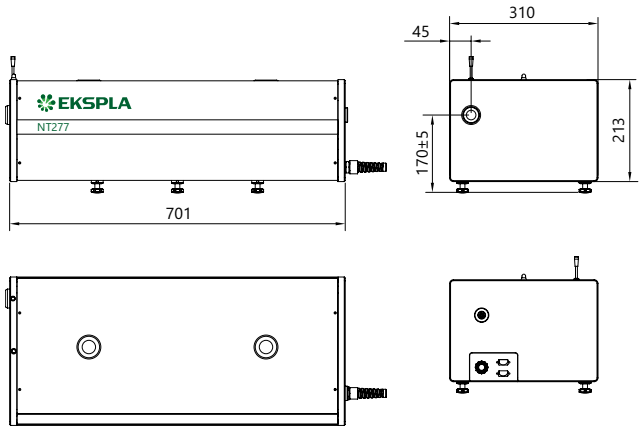


Fig 3. NT277 series laser head dimensions

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

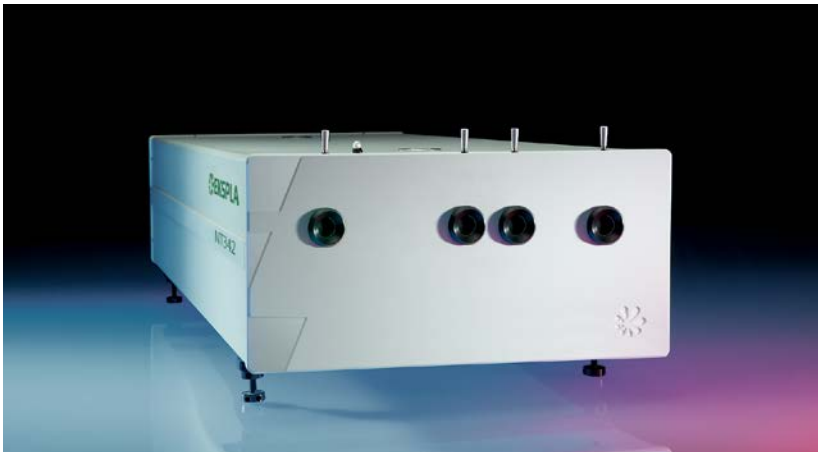
NT277-XIR

Model

Tuning range extension:
XIR → 4500–12000 nm

NT340 SERIES

High Energy Broadly Tunable Lasers



BENEFITS

- *The system is widely tunable 192 – 2600 nm and delivers high pulse energy (up to 60 mJ) that allows the investigation of an extensive range of materials*
- *Up to 18 µm customization possibility enables studies of IR vibrations of molecules*
- *Narrow linewidth (down to 3 cm^{-1}) and superior tuning resolution (1 – 2 cm^{-1}) allows recording of high quality spectra*
- *Flashlamps replacement without misalignment of the laser cavity saves on maintenance costs*
- *High integration level saves valuable space in the laboratory*
- *In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply*
- *Variety of control interfaces: USB, RS232 and optional LAN, WLAN ensures easy control and integration with other equipment*
- *Attenuator and fiber coupling options facilitate incorporation of NT340 systems into various experimental environments*

FEATURES

- *Hands-free no gap wavelength tuning from **192** to **4400 nm***
- *Up to **60 mJ** pulse energy in visible spectral range*
- *Up to **10 mJ** pulse energy in UV spectral range*
- *Up to **15 mJ** pulse energy in MIR spectral range*
- ***3 – 5 ns** pulse duration*
- *Up to **20 Hz** pulse repetition rate*
- *Remote control via key pad or PC*
- *Optional separate shared output port for 532/1064 nm beam (separate output port for the 355 nm beam is standard)*
- *OPO pump energy monitoring*
- *Hermetically sealed oscillator cavity protects non-linear crystals from dust and humidity*

APPLICATIONS

- *Laser-induced fluorescence*
- *Flash photolysis*
- *Photobiology*
- *Remote sensing*
- *Time-resolved spectroscopy*
- *Non-linear spectroscopy*
- *Vibrational spectroscopy*
- *Cavity ring-down CRDS, cavity ring-down laser absorption CRLAS spectroscopy*
- *Infrared spectroscopy*
- *Gas spectroscopy*

The NT340 series tunable wavelength nanosecond laser seamlessly integrates the nanosecond optical parametric oscillator and the Nd:YAG Q-switched nanosecond laser – all in a compact housing.

The main system features are: hands-free wavelength tuning from UV to IR, high conversion efficiency, optional fiber-coupled output and separate output port for pump laser beam.

NT340 has a linewidth of less than 5 cm^{-1}, which is ideal for many spectroscopic applications.

The laser is designed for convenient use. It can be controlled from remote keypad or PC using LabView™ drivers that are supplied with the system. The remote keypad features a backlit display that is easy to read even through laser safety googles. The OPO pump energy monitoring system helps to control pump laser parameters. Replacement of laser flashlamps can be done without misalignment of the laser cavity and/or deterioration of laser performance.

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Tuning range extending optional add-ons

Option	Features
-SH	Second harmonic generator for 210–410 nm range
-SF	Sum-frequency generator for 300–410 nm range with high pulse energy
-SH/SF	Combined option for highest pulse energy in 210–410 nm range
-DUV	Deep UV option for 192–210 nm range output
-MIR	Mid infrared option for 2500–4400 nm range output

Accessories and other optional add-ons

Option	Features
-FC	Fiber coupled output in 350–2000 nm range
-ATTN	Attenuator
-H, -2H	Separate shared output port for pump laser harmonic (532 or 1064 nm wavelengths)
-AW	Air cooled power supply

SPECIFICATIONS [1]

Model	NT342B	NT342C
OPO		
Wavelength range [2]		
Signal	410–710 nm [3]	
Idler	710–2600 nm	
SH generator (optional)	210–410 nm	
SH/SF generator (optional)	210–410 nm	
DUV generator (optional)	192–210 nm	
MIR generator (optional)	2500–4400 nm	
Output pulse energy		
OPO [4]	30 mJ	60 mJ
SH generator (optional) [5]	4 mJ	6.5 mJ
SH/SF generator (optional) [6]	6 mJ	10 mJ
DUV generator (optional) [7]	0.6 mJ	1 mJ
MIR generator (optional) [8]	15 mJ	
Linewidth	< 5 cm^{-1} [9]	
Tuning resolution [10]		
Signal (410–710 nm)	1 cm^{-1}	
Idler (710–2600 nm)	1 cm^{-1}	
SH/SF/DUV (192–410 nm)	2 cm^{-1}	
MIR (2500–4400 nm)	1 cm^{-1}	
Pulse duration [11]	3–5 ns	
Typical beam diameter [12]	5 mm	7 mm
Typical beam divergence [13]	< 2 mrad	
Polarization		
Signal	horizontal	
Idler	vertical	
SH/SF	horizontal	
DUV	vertical	
MIR	horizontal	

SPECIFICATIONS [1]

Model	NT342B	NT342C
PUMP LASER [14]		
Pump wavelength	355 nm	
Typical pump pulse energy	100 mJ	150 mJ
Pulse duration	4–7 ns	
Beam quality	Hat-top in near field, without hot spots	
Beam divergence	< 0.6 mrad	
Pulse energy stability (StdDev)	< 3.5 %	
Pulse repetition rate	10 or 20 Hz	10 Hz
PHYSICAL CHARACTERISTICS		
Unit size (W × L × H) [15]	456 × 821 × 270 mm	
Power supply size (W × L × H)	330 × 490 × 585 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Water consumption (max 20 °C) [16]	< 10 l/min	
Room temperature	18–27 °C	
Relative humidity	20–80 % (non-condensing)	
Power requirements	200 – 240 VAC, single phase, 50/60 Hz	
Power consumption	< 1.5 kVA	
Cleanliness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change. Parameters marked typical are illustrative; they are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise, all specifications are measured at 450 nm and for basic system without options.

2) Hands-free tuning range is from 192 nm to 4400 nm. MIR option is not compatible with SF and DUV option. Inquire for custom IR option with tuning up to 18 µm.

3) Tuning range extension to 400 – 709 nm is optional.

4) Measured at 450 nm. See tuning curves for typical outputs at other wavelengths.

5) Measured at 260 nm. See tuning curves for typical outputs at other wavelengths.

6) Measured at 340 nm. SF generator is optimized for maximum output in 300 – 410 nm range. See tuning curves for typical outputs at other wavelengths.

7) Measured at 200 nm. See tuning curves for typical outputs at other wavelengths.

8) Measured at 3000 nm. See tuning curves for typical outputs at other wavelengths.

9) Linewidth is <8 cm^{-1} for 210–409 nm, 2500–4400 nm ranges.

10) When wavelength is controlled from PC. When wavelength is controlled from keypad, tuning resolution is 0.1 nm for signal, 1 nm for idler, MIR and 0.05 nm for SH, SF and DUV.

11) FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

12) Beam diameter is measured at 450 nm at the FWHM level. It is approximate and can vary depending on the pump pulse energy and wavelength.

13) Full angle measured at the FWHM level at 450 nm, < 5 mrad at 3000 nm with MIR option.

14) Separate output port for the 355 nm beam is standard. Outputs for 1064 nm and 532 nm beams are optional. Laser output will be optimised for the best OPO operation and specifications may vary with each unit we manufacture.

15) Length from 821 to 1220 mm depending on configuration.

16) Air cooled power supply is available as an option.

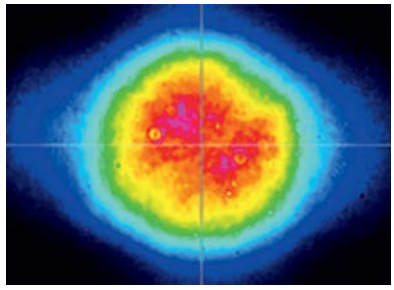

Fig 1. NT340 series laser typical beam profile at 450 nm after ~1.5 m distance from output

PERFORMANCE

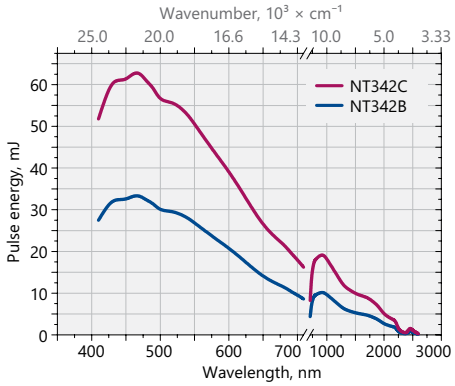

Fig 2. Typical output energy of the NT340 series tunable wavelength systems

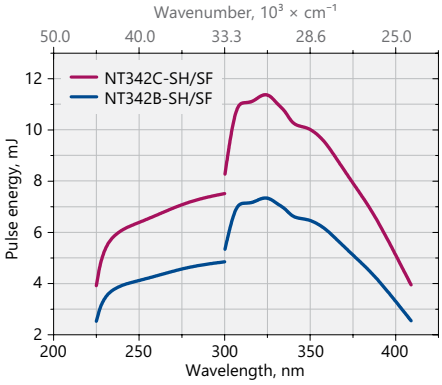

Fig 3. Typical output energy of the NT340 series tunable wavelength systems with SH/SF extension

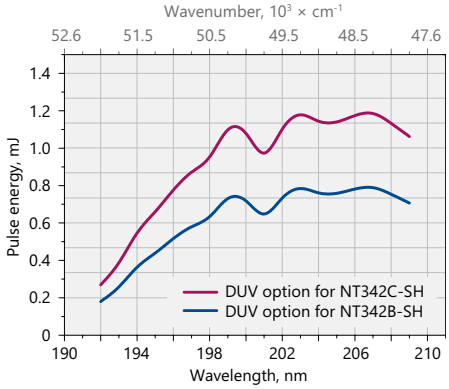

Fig 4. Typical output energy of the NT340 series tunable wavelength systems with SH/DUV extension

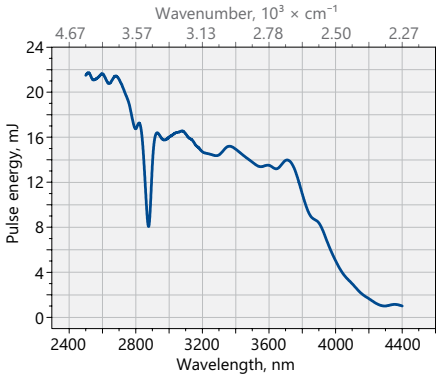

Fig 5. Typical output energy of the NT340 series tunable wavelength systems with MIR extension

OUTLINE DRAWINGS

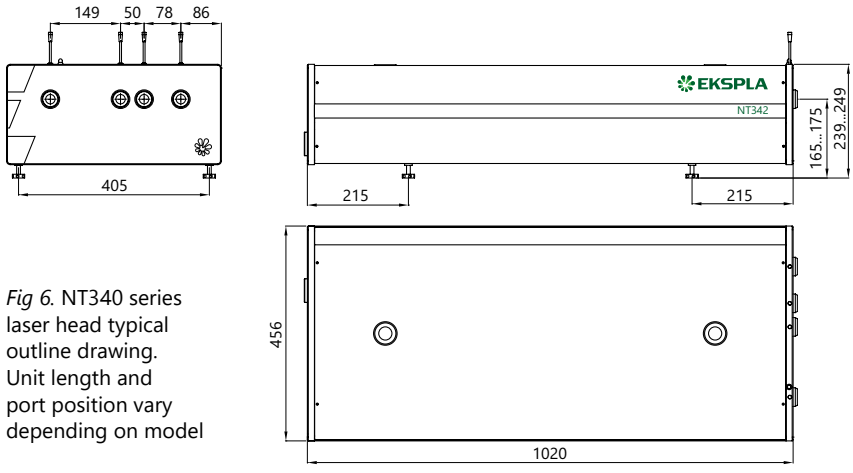

Fig 6. NT340 series laser head typical outline drawing. Unit length and port position vary depending on model

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

NT342B-SH-10-AW-H/2H

Model

Output pulse energy:
B → 30 mJ
C → 50 mJ

Pulse repetition rate, in Hz

Optional tuning range extension
SH → 210–410 nm
DUV → 192–210 nm
MIR → 2500–4400 nm

Options:
AW → water-air heat exchanger
H → 1064 nm output
2H → 532 nm output

NT350 SERIES

High Energy NIR Range Tunable Lasers

BENEFITS

- *High pulse energy (up to 230 mJ) is highly beneficial for photoacoustics imaging applications*
- *Superior tuning resolution (1 – 2 cm^{-1}) allows recording of high quality spectra*
- *High integration level saves valuable space in the laboratory*
- *Flashlamps replacement without misalignment of the laser cavity saves on maintenance costs*
- *In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply*
- *Variety of control interfaces: USB, RS232, optional LAN and WLAN ensures easy control and integration with other equipment*
- *Attenuator and fiber bundle coupling options facilitate incorporation of NT350 systems into various experimental environments*

FEATURES

- *Hands-free, automated wavelength tuning from **330** to **2600 nm***
- *Up to **230 mJ** in range 660 – 2600 nm, **35 mJ** in range 330 – 660 nm*
- *Narrow linewidth across tuning range*
- ***3–5 ns** pulse duration*
- *Remote control via key pad or PC*
- *Separate output port for 532 nm beam. Output for 1064 nm is optional*
- *OPO pump energy monitoring*
- *Hermetically sealed oscillator cavity protects non-linear crystals from dust and humidity*

APPLICATIONS

- *Photoacoustic imaging*
- *Flash photolysis*
- *Photobiology*
- *Remote sensing*
- *Non-linear spectroscopy*

NT352 series tunable laser seamlessly integrates in a compact housing a nanosecond optical parametric oscillator and Nd:YAG Q-switched laser.

Two models with different output pulse energy values are offered. The most powerful model has more than 230 mJ pulse energy at 700 nm. Narrow linewidth (<10 cm^{-1}) is nearly constant trough whole tuning range, which makes laser suitable for many spectroscopy application.

The device is controlled from the remote keypad or PC using LabVIEW™ drivers that are supplied with the system. The remote pad features a backlit display that is easy to read even while wearing laser safety glasses.

System is designed for easy and cost-effective maintenance. Replacement of flashlamps can be done without misalignment of the laser cavity and deterioration of laser performance. OPO pump energy monitoring system helps to increase lifetime of the optical components.

Options

Optional items are available allowing optimization of the laser system for Your application, for example:

- Fiber bundle coupled output;
- Energy meter;
- Efficient second harmonic generator for 330–660 nm range;
- Pulse energy attenuator;
- Water-air cooled power supply.

Please inquire custom-build versions and options.

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SPECIFICATIONS [1]

Model	NT352C	NT352E
OPO		
Wavelength range		
Signal	660–1064 nm	
Idler	1065–2600 nm	
SH	330–660 nm	
Output pulse energy [2]		
OPO	150 mJ	230 mJ
SH	25 mJ	35 mJ
Linewidth [3]	<10 cm^{-1}	
Tuning resolution [4]		
Signal (660–1064 nm)	1 cm^{-1}	
Idler (1064–2450 nm)	1 cm^{-1}	
SH (330–530 nm)	2 cm^{-1}	
Pulse duration [5]	3–5 ns	
Typical beam diameter [6]	7 mm	9 mm
Typical beam divergence [7]	<2 mrad	
Polarization		
Signal beam	horizontal	
Idler beam	vertical	
SH beam	vertical	
PUMP LASER [8]		
Pump wavelength	532 nm	
Typical pump pulse energy	450 mJ	700 mJ
Pulse duration	4 – 7 ns	
Beam quality	"Hat-Top" in near field. Close to Gaussian in far field	
Beam divergence	<0.6 mrad	
Pulse energy stability (StdDev)	<2.5 %	
Pulse repetition rate	10 Hz	
PHYSICAL CHARACTERISTICS		
Unit size (W × L × H)	456 × 821 × 270 mm	
Power supply size (W × L × H)	330 × 490 × 585 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Water consumption (max 20 °C) [9]	<10 l/min	
Room temperature	18–27 °C	
Relative humidity	20–80 % (non-condensing)	
Power requirements [10]	200 – 240 VAC, single phase, 50/60 Hz	
Power consumption	< 1.5 kW	
Cleanliness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 700 nm and for basic system without options.

2) Measured at 700 nm for OPO and 350 nm for SH. See tuning curves for typical outputs at other wavelengths.

3) In signal and idler range.

4) When wavelength is controlled from PC. When wavelength is controlled from keypad, tuning resolution is 0.1 nm for signal, 1 nm for idler and 0.5 nm for SH.

5) FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

6) Beam diameter is measured at 700 nm at the $1/e^2$ level and can vary depending on the pump pulse energy.

7) Full angle measured at the FWHM level at 700 nm.

8) Separate output port for the 532 nm beam is standard. Output for 1064 nm beam is optional. Pump laser output will be optimized for the best OPO operation and specification may vary with each unit we manufacture.

9) Air cooled power supply is available as option.

10) Mains voltage should be specified when ordering.

PERFORMANCE

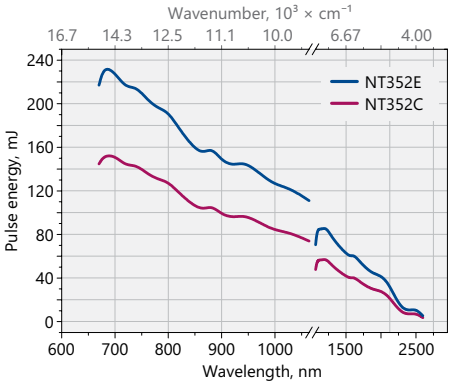

Fig 1. Typical output energy of the NT350 series tunable wavelength systems

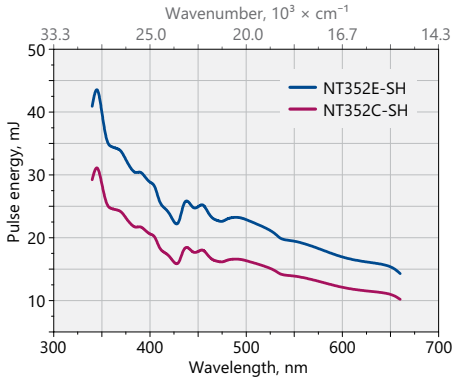

Fig 2. Typical output energy of the NT350 series tunable wavelength systems with SH option

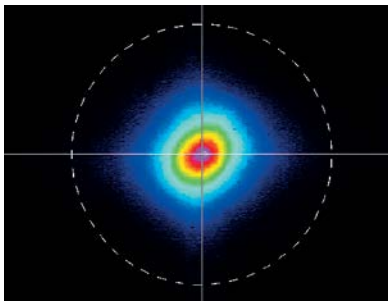

Fig 3. Typical far field beam profile of NT352B laser at 800 nm

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

NT352C-10-SH-AW-H

- Model
  - Output pulse energy:
    - C → 150 mJ
    - E → 250 mJ
- Pulse repetition rate, in Hz
- Optional tuning range extension
  - SH → 330–660 nm
- Options:
  - AW → water-air heat exchanger
  - H → 1064 nm output

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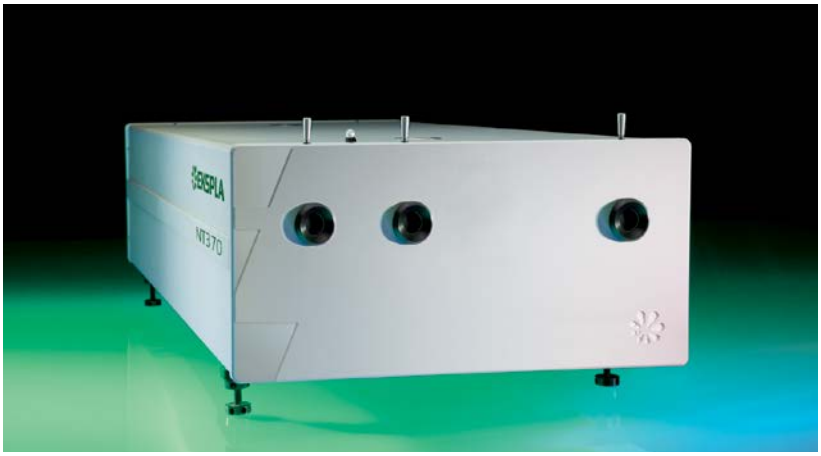
NT370 SERIES

High Energy IR Range Tunable Lasers



BENEFITS

- Wide tuning range in 2500 – 4400 nm or 5500 – 18 000 nm is highly useful for s-SNOM and other IR applications
- NT370 is a cost effective solution covering a wide tuning range from a single source
- Superior tuning resolution (1 cm^{-1}) allows recording of high quality spectra
- High integration level saves on valuable space in the laboratory
- Flashlamps replacement without misalignment of the laser cavity saves on maintenance costs
- In-house design and manufacturing of complete systems, including pump lasers, guarantees on-time warranty and post warranty services and spares supply
- Variety of control interfaces: USB, RS232, optional LAN and WLAN ensures easy control and integration with other equipment

FEATURES

- *Hands-free, automated wavelength tuning*
- *Up to **15 mJ** pulse energy in mid and **1 mJ** in far IR spectral range*
- *Less than **8 cm^{-1}** linewidth*
- ***3 – 5 ns** pulse duration*
- ***10 or 20 Hz** pulse repetition rate*
- *Remote control via key pad or PC*
- *Separate output port for 1064 nm pump beam option*
- *OPO pump energy monitoring*
- *Replacement of the flashlamps without misalignment of the laser cavity*

APPLICATIONS

- *Vibrational spectroscopy*
- *Cavity ring-down CRDS, cavity ring-down laser absorption CRLAS spectroscopy*
- *Infrared spectroscopy*
- *Gas spectroscopy*

NT370 series tunable laser seamlessly integrates in a compact housing the nanosecond optical parametric oscillator and Nd:YAG Q-switched laser. Pumped by fundamental harmonics output the lasers provides tuning in mid- and far-infrared spectral ranges.

NT373-XIR model uses IR crystal based cascade OPO for tunable output in 5500–18000 nm range. Customized tuning ranges are available upon request. The linewidth of NT373-XIR model is nearly constant across tuning range and it is less than 8 cm^{-1}.

NT377 model produces tunable output in 2500–4400 nm range. Pulse energy is exceeding 10 mJ for wavelengths shorter than 3600 nm, while linewidth is below 8 cm^{-1}. Because of narrow linewidth of output radiation the laser is suitable for many infrared spectroscopic applications, for example cavity ring-down spectroscopy, gas detection and remote sensing.

The device is controlled from the remote keypad or from PC using LabView™ drivers that are supplied together with the system. The remote pad features a backlit display that is easy to read even while wearing laser safety glasses. System is designed for easy and cost-effective maintenance. Replacement of flashlamps can be done without misalignment of the laser cavity and deterioration of laser performance. OPO pump energy monitoring system helps to increase lifetime of the optical components.

Accessories and optional add-ons

Option	Features
-AW	Water-air cooling option
-20	20 Hz PRR option
-H	Optional 1064 nm output

SPECIFICATIONS [1]

Model	NT377	NT373-XIR
OPO		
Wavelength range	2 500–4 400 nm	5 500–18 000 nm [2]
Output pulse energy [3]	15 mJ	1 mJ
Linewidth [4]	< 8 cm^{-1}	
Tuning resolution [5]	1 cm^{-1}	
Typical pulse duration [6]	3–5 ns	
Typical beam diameter [7]	8 mm	10 mm
Polarization	horizontal	
PUMP LASER [8]		
Pump wavelength	1064 nm	
Typical pump pulse energy	250 mJ	300 mJ
Pulse duration	4–7 ns	
Beam quality	"Hat-Top" in near field	
Beam divergence	< 0.5 mrad	
Pulse energy stability (StdDev)	< 1 %	
Pulse repetition rate	10 or 20 Hz	
PHYSICAL CHARACTERISTICS		
Unit size (W × L × H)	456 × 820 × 274 mm	456 × 1030 × 274 mm
Power supply size (W × L × H)	330 × 490 × 585 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Water consumption (max 20 °C) [9]	<10 l/min	
Room temperature	18–27 °C	
Relative humidity	20–80 % (non-condensing)	
Power requirements [10]	200 – 240 VAC, single phase, 50/60 Hz	
Power consumption	< 1.5 kVA	
Cleanliness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 3000 nm for NT377 unit and at 7000 nm for NT373-XIR unit and for basic system without options.

2) Additional output in 1780 – 2010 nm and 2300 – 2645 nm ranges is possible. Please contact Ekspla for more detailed specifications.

3) Output is specified at wavelengths defined in note 1. See tuning curves for typical outputs at other wavelengths.

4) Linewidth is specified at wavelengths defined in note 1.

5) When wavelength is controlled from PC. When wavelength is controlled from keypad, tuning resolution is 1 nm

6) Measured art FWHM level with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

7) Beam diameter is measured at the $1/e^2$ level and varies depending on the wavelength.

8) Laser output will be optimized for the best OPO operation and specification may vary with each unit we manufacture.

9) Air cooled power supply is available as an option.

10) Should be specified when ordering.

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PERFORMANCE

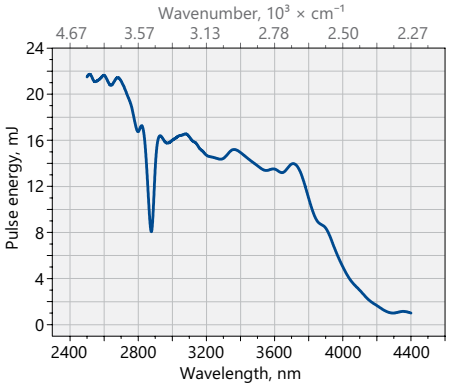


Fig 1. Typical output energy of the NT377 tunable wavelength laser

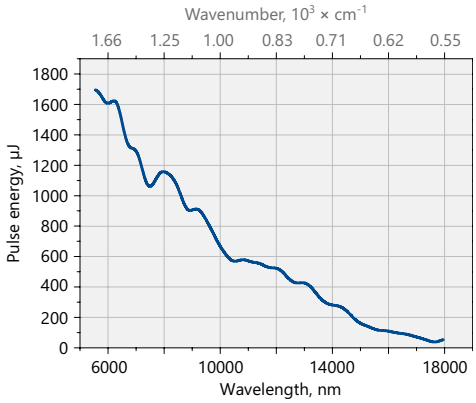


Fig 2. Typical output pulse energy of the NT373-XIR tunable wavelength laser

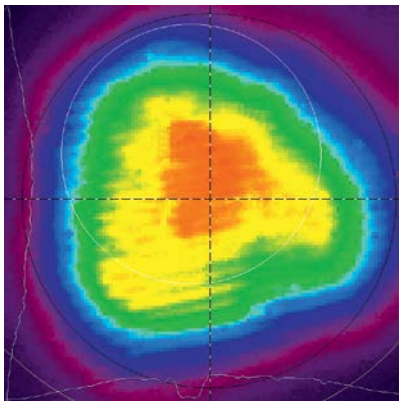


Fig 3. Typical beam profile at 3000 nm and 7000 nm wavelengths in near field

PhotoSonus M

High Energy, Mobile, Tunable Wavelength Laser Source for Photoacoustic Imaging

FEATURES

- *High **up to 250 mJ** output energy*
- *Wide tuning range **from 330 to 600 nm** and **from 660 to 2300 nm***
- ***10 Hz** or **20 Hz** pulse repetition rate*
- *Integrated pump laser, OPO and PSU in single mobile unit*
- *Low maintenance cost*
- *Fiber bundle connectors with safety interlock*
- *Fast Wavelength Switching within entire Signal or Idler range between two consecutive pulses (optional)*
- *Electromechanical output shutter (optional)*
- *Integrated energy meter (optional)*
- *Motorized attenuator (optional)*
- *Access to pump laser wavelengths 1064/532 nm (optional)*
- *Signal and Idler through the same output (optional)*

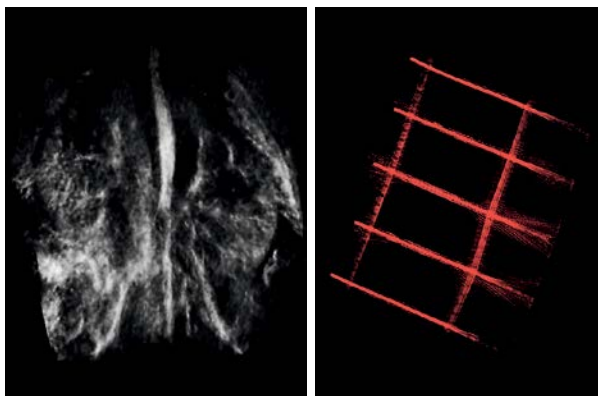
Following the demand for high output energies in the photoacoustic market for imaging larger volumes of tissue, PhotoSonus M, an updated high energy tunable laser source for photo-acoustic imaging, was introduced. Time-tested Ekspla nanosecond pump laser, parametric oscillator, power supply and cooling unit are integrated in a single robust housing to provide mobility, ease of use and low maintenance cost. The highly flexible PhotoSonus M platform makes it easily integrated and used in a photoacoustic imaging system. It is fully motorized and computer controlled, with user trigger outputs and inputs and special options such as motorized switching between OPO Signal and Idler, motorized attenuator, internal energy meter and electromechanical output shutter.

Recently, a fast wavelength switching option was introduced that enables each laser pulse to have a different wavelength within the entire signal or idler range and at any sequence. This new feature, combining high pulse energy (up to 180 mJ) and wide wavelength tuning range (330 – 2300 nm) makes PhotoSonus M the irreplaceable imaging source for any photo acoustic system.

For even higher sample imaging depth and resolution a PhotoSonus M+, with up to 250 mJ maximum pulse energy, was introduced.

For convenience, the outputs of PhotoSonus M and PhotoSonus M+ lasers can be coupled with almost any type of fiber bundle.

SAMPLE PHOTOACOUSTIC IMAGES



Courtesy of PhotoSound Technologies, Inc.

PhotoSonus M

SPECIFICATIONS [1]

Model	PhotoSonus M-10	PhotoSonus M-20	PhotoSonus M+
OPO			
Wavelength range			
Signal	660 – 1064 nm		
Signal Extended range (optional)	660 – 1300 nm		
SH extension range (optional)	330 – 530 nm (330 – 659 nm [2])		
Idler (optional)	1065 – 2300 nm		
OPO output MAX pulse energy [3]	> 180 mJ	> 160 mJ	> 250 mJ
Pulse repetition rate	10 Hz	20 Hz	10 Hz
Scanning step:			
Signal (660 – 1064 nm)	0.1 nm		
Idler (1065 – 2300 nm)	1 nm		
Pulse duration [4]	3 – 5 ns		
Signal linewidth	< 10 cm^{-1}		< 20 cm^{-1}
Typical signal beam diameter ($1/e^2$) [5]	7 ± 2 mm		9 ± 2 mm
PHYSICAL CHARACTERISTICS			
Unit size (W × L × H mm)	434 × 672 × 887 mm		
OPERATING REQUIREMENTS			
Room temperature	18 – 27 °C		
Relative humidity	20 – 80 % (non-condensing)		
Power requirements [6]	208 or 240 VAC, single phase 50/60 Hz		
Power consumption	< 1.0 kVA	< 1.5 kVA	< 1.5 kVA

1) Due to continuous improvement, all specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 700 nm.

2) When Extended Signal range is selected.

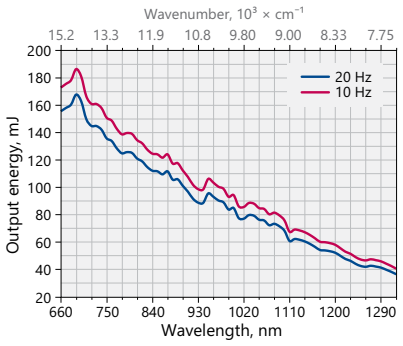
3) Free space measurement at 700 nm. See tuning curves for typical outputs at other wavelengths.

4) FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

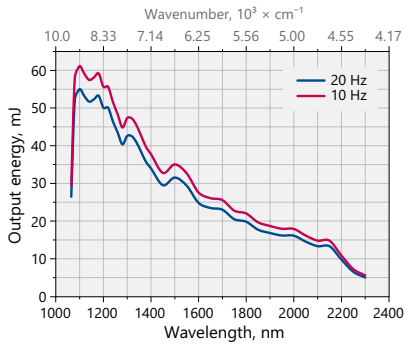
5) Measured at the free space output at 700 nm. Can be adjusted as per request.

6) Mains voltage should be specified when ordering.

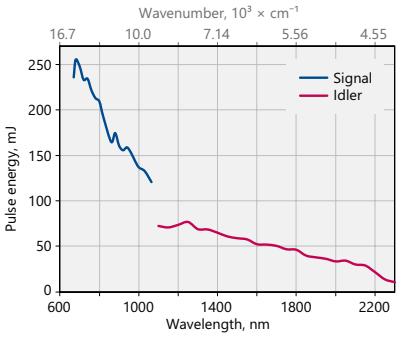
PERFORMANCE



Typical PhotoSonus M-10 and M-20 Extended signal output pulse energy vs. wavelength curve

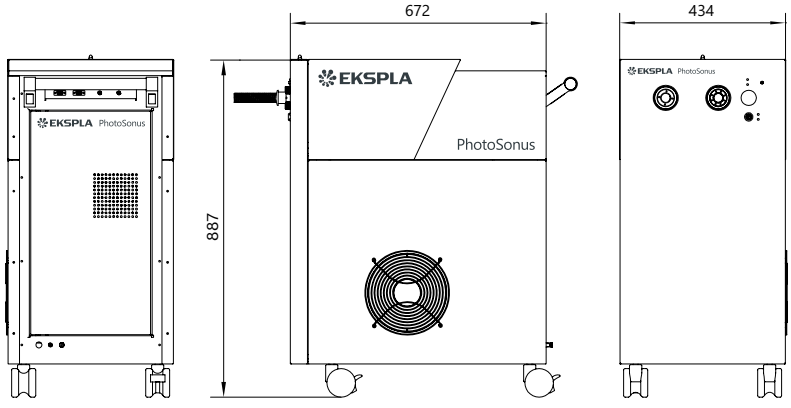


Typical PhotoSonus M-10 and M-20 Idler output pulse energy vs. wavelength curve



Typical PhotoSonus M+ signal and idler output pulse energy vs. wavelength curve

DRAWINGS



PhotoSonus M outline drawings (mm)

PhotoSonus X

High Output Power DPSS Tunable Laser for Photoacoustic Imaging

PhotoSonus X is a perfect solution for photoacoustic imaging in pre-clinical and clinical use and when fast sample scanning is required. Having high output energy of up to 90 mJ at the peak, a broad wavelength tuning range from 660 to 2600 nm, high pulse repetition rate up to 100 Hz and fast wavelength switching makes it a perfect photoacoustic imaging source for gaining high-resolution images and ensuring high data acquisition rate. Moreover, being built on a diode pumped solid-state laser platform, PhotoSonus X assures significantly quieter operation (< 60 dB) compared with flash-lamp pumped lasers, which is very beneficial for clinical use.

Diode pumped laser technology and well-engineered system design ensures high reliability and low-cost system operation. PhotoSonus X output can be coupled with almost any type of fiber bundle.

With additional options of an internal energy meter and electromechanical shutter with laser self-test capability, PhotoSonus X can be ready for certification in clinical photoacoustic applications.

FEATURES

- *Hands-free wavelength tuning from **660 to 2600 nm***
- *Fully motorized wavelength tuning*
- *Externally triggerable*
- *High, up to **90 mJ** pulse energy from OPO*
- ***100 Hz** or **50 Hz** pulse repetition rate*
- *Low-cost maintenance*
- *Certification ready*
- *Quite operation < **60 dB***
- *Integrated DPSS pump laser and OPO into a single housing*
- *Fiber bundle holder with safety interlock*
- *Signal and Idler through the same output (optional)*
- *Fast Wavelength Switching of up to 300 nm range between two consecutive pulses (optional)*
- *Motorized attenuator (optional)*
- *Integrated energy meter (optional)*
- *Electromechanical output shutter with laser self-test capability (optional)*

PERFORMANCE

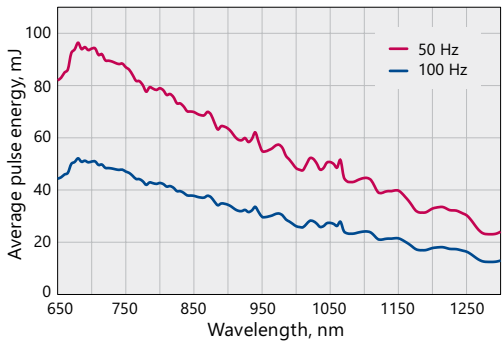


Fig 1. Typical PhotoSonus X free space extended range signal output energy vs. wavelength

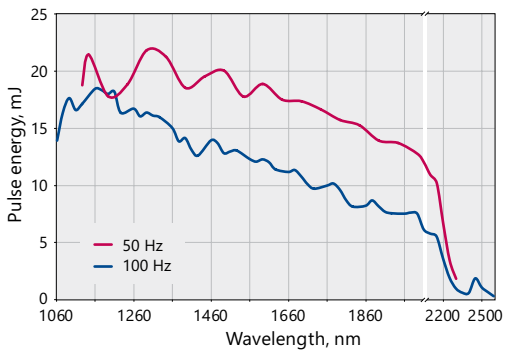


Fig 2. Typical PhotoSonus X free space idler output energy vs. wavelength

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PhotoSonus X

SPECIFICATIONS [1]

Model	PhotoSonus X-50	PhotoSonus X-100
OPO		
Wavelength range		
Signal	660 – 1064 nm	
Signal extended range (optional)	660 – 1300 nm	
Idler (optional)	1065 – 2600 nm	
OPO output pulse energy [2]	> 90 mJ	> 50 mJ
Pulse repetition rate [3]	50 Hz	100 Hz
Scanning step		
Signal (660–1064 nm)	0.1 nm	
Idler (1065 –2600 nm)	1 nm	
Pulse duration [4]	2 – 5 ns	
Signal linewidth [5]	< 15 cm^{-1}	< 10 cm^{-1}
Typical signal beam diameter ($1/e^2$) [6]	5 ± 1 mm	
Control interfaces	USB, LAN, RS232	
PHYSICAL CHARACTERISTICS		
Cooling	Closed loop air-water cooled [7]	
Unit size (W × L × H)	551 × 400 × 162 mm	
Power supply size (W × L × H)	483 × 390 × 140 mm	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Room temperature	18 – 27 °C	
Relative humidity	20 – 80 % (non-condensing)	
Power requirements	100 – 240 VAC, single phase 50/60 Hz	
Power consumption	< 2 kW	

1) Due to continuous improvement, all specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 700 nm.

2) Free space measurement at 700 nm. See tuning curves for typical outputs at other wavelengths.

3) Other fixed pulse repetiton rates are available upon request.

4) FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

5) At 700 nm or higher wavelength.

6) Measured at the free space output at 700 nm wavelength.

7) Using external chiller.

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

OUTLINE DRAWINGS

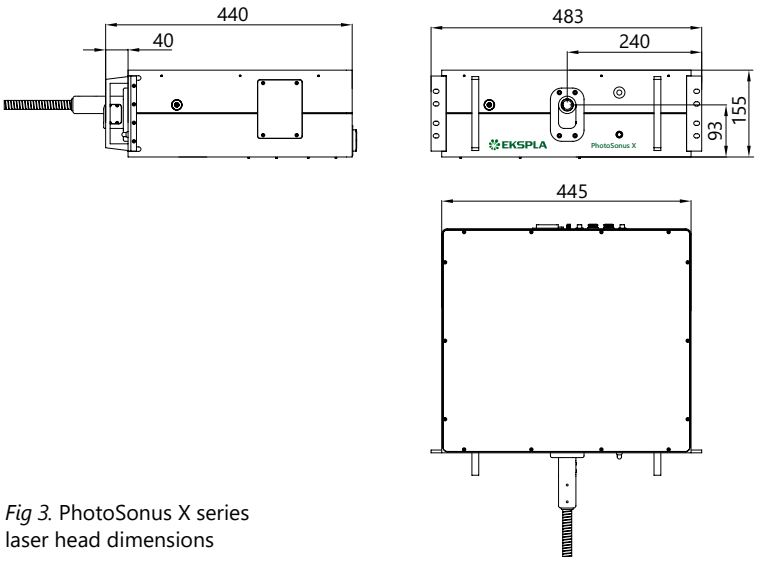

Fig 3. PhotoSonus X series laser head dimensions

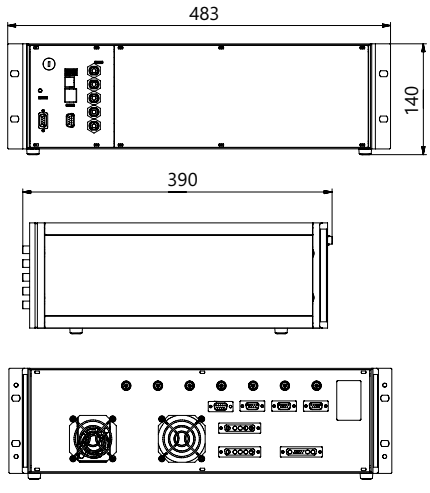

Fig 4. Outline drawing of PhotoSonus X power supply unit

Ordering Information

Delivery

Products are made and dispatched within agreed term. Shipping charges are object of agreement between EKSPLA and customer.

Ordering

Orders may be placed by mail, fax or e-mail.
All orders are object of General Sales Conditions, which can be found on **www.ekspla.com**.
Mail orders should be sent to:

EKSPLA, UAB
Savanoriu Av. 237
LT-02300 Vilnius
Lithuania
Phone: +370 5 264 96 29
Fax: +370 5 264 18 09
E-mail: sales@ekspla.com

Ask for quotation online at www.ekspla.com.

Certicate of Origin

All items shown in this catalogue are of Lithuanian Origin (EU). Certificate of Origin is available under request.

Warranty

All products are guaranteed to be free from defects in material and workmanship.
The warranty period depends on the product and is object of agreement between EKSPLA and customer. Warranty period can be extended by separate agreement. EKSPLA does not assume liability for unproper installation, labour or consequential damages.

Specifations

Due to the constant product improvements, EKSPLA reserves its right to change specifications without advance notice.

For latest information visit **www.ekspla.com**.

Notes

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Revision number – 20210722