EKSPLA

Advanced Laser Technologies

Picosecond
Lasers & Laser Systems

Narrowband short pulses

2025

Rev# 250328

About Company

Background

EKSPLA focuses on the design and manufacturing of advanced lasers & systems and employs 30 years' experience as well as a close partnership with the scientific community. 80 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 30 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

Picosecond Lasers

The first EKSPLA picosecond laser has been sold on its first launch event in exhibition in Germany more than 30 years ago. Due to their excellent stability and high output parameters EKSPLA scientific picosecond lasers established their name as "Gold Standard" among scientific picosecond lasers.

Innovative design of new generation of picosecond mode-locked lasers feature diode-pumping-only technology, thus reducing maintenance costs and improving output parameters. Second, third, fourth and fifth (on some versions) harmonic options combined with various accessories, advanced electronics (for streak camera synchronization, phase-locked loop, synchronization of fs laser) and customization possibilities make these lasers well suited for many scientific applications, including optical parametric generator pumping, time-resolved spectroscopy, nonlinear spectroscopy, remote sensing, metrology...

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

FEATURES

- *Millijoules up to 1 kHz*
- *From 10 to 90 picoseconds*
- *Narrowband, near transform-limited pulse*

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	Max pulse energy at fundamental wavelength	Repetition rate, up to	Pumping	Pulse duration	Special feature	Page
PL2210	5 mJ at 1064 nm	1000 Hz	Diode pumped solid state	29 ± 5 ps	kHz repetition rate	4
PL2230	40 mJ at 1064 nm	100 Hz	Diode pumped solid state	29 ± 5 ps	High pulse energy employing DPSS only technology	7
PL2250	100 mJ	20 Hz	Hybrid (DPSS master oscillator and flash-lamp pumped power amplifier)	29 ± 5 ps	High pulse energy	11

PL2210 SERIES

Diode Pumped Picosecond kHz Pulsed Nd:YAG Lasers

PL2210 series diode-pumped, air-cooled, mode-locked Nd:YAG lasers provide picosecond pulses at a kilohertz pulse repetition rate.

Short pulse duration, excellent pulse-to-pulse stability, superior beam quality makes PL2210 series diode pumped picosecond lasers well suited for many applications, including material processing, time-resolved spectroscopy, optical parametric generator pumping, and other tasks.

Flexible design

PL2210 series lasers offer a number of optional items that extend the capabilities of the laser.
A pulse picker option allows control of the pulse repetition rate of the laser and operation in single-shot mode.

The repetition rate and timing of pulses can be locked to an external RF source (with –PLL option) or other ultrafast laser system (with –FS option). The laser provides a triggering pulse for synchronization of the customer's equipment. A low jitter SYNC OUT pulse has a lead up to 500 ns that can be adjusted in ~0.25 ns steps from a PC. Up to 400 µs lead of triggering pulse is available as a PRETRIG feature that is designed to provide precise, very low jitter trigger pulses for a streak camera.

Built-in harmonic generators

Motorised switching of wavelength for PL2210A and PL2210B. Non-linear crystals mounted in temperature stabilized heaters are used for second, third and fourth high spectral purity harmonic generation.

Available models [1)]

Model	Features
PL2210A	Up to 0.9 mJ, 29 ps pulses at an up to 1 kHz repetition rate
PL2210B	Up to 2.5 mJ, 29 ps pulses at an up to 1 kHz repetition rate
PL2211A	Up to 5 mJ energy at a 1 kHz repetition rate at 29 ps pulses

[1)] Custom-built models with higher pulse energy are available on request.

FEATURES

- *High pulse energy at **kHz rates***
- *Diode pumped **solid state** design*
- ***Air cooled** – external water supply is not required (for PL2210A, PL2210B only)*
- *Turn-key operation*
- *Low maintenance costs*
- *Optional streak camera triggering pulse with <10 ps rms jitter*
- *Remote control pad*
- *PC control*
- *Optional temperature stabilized second, third and fourth **harmonic generators***

APPLICATIONS

- *Time resolved fluorescence (including streak camera measurements), pump-probe spectroscopy*
- *OPG/OPA/OPO pumping*
- *Remote Laser Sensing*
- *Other spectroscopic and nonlinear optics applications*

Simple and convenient laser control

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

SPECIFICATIONS [1]

Model	PL2210A	PL2210B	PL2211A
Output energy			
at 1064 nm	0.9 mJ	2.5 mJ	5 mJ
at 532 nm [2]	0.45 mJ	1.3 mJ	2.5 mJ
at 355 nm [3]	0.35 mJ	0.8 mJ	1.6 mJ
at 266 nm [4]	0.1 mJ	0.25 mJ	0.5 mJ
Pulse energy stability (StdDev) [5]			
at 1064 nm	0.5 %		
at 532 nm	0.8 %		
at 355 nm	1 %		
at 266 nm	2 %		
Pulse duration (FWHM) [6]	29 ± 5 ps		
Pulse repetition rate	1 kHz		
Triggering mode	internal/external		
Typical TRIG1 OUT pulse delay [8]	-500 ... 50 ns		
TRIG1 OUT pulse jitter	< 0.1 ns rms		
Spatial mode [9]	Close to Gaussian		
Beam divergence [10]	<1 mrad		
Beam diameter [11]	1.7 mm	~3 mm	
Beam pointing stability (RMS) [12]	< 30 µrad		
Pre-pulse contrast	> 200 : 1		
Polarization	linear, >100 : 1		
PHYSICAL CHARACTERISTICS			
Laser head size (W × L × H) [13]	500 × 1031 × 249 ±3 mm		
Power supply size (W × L × H)	365 × 392 × 290 ±3 mm	450 × 375 × 130 ±3 mm	550 × 600 × 550 ±3 mm (19" standard, MR-9)
OPERATING REQUIREMENTS			
Water service	not required, air cooled		stand-alone chiller
Relative humidity	20–80 % (non condensing)		
Ambient temperature	22 ± 2 °C		
Power requirements	100–240 V AC, single phase 50/60 Hz		
Power consumption [14]	<1 kW		<1.5 kW

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 1064 nm and for basic system without options.

2) For PL2210 series laser with –SH, -SH/TH, -SH/FH or -SH/TH/FH option. Outputs are not simultaneous.

3) For PL2210 series laser with –TH, -SH/TH or -SH/TH/FH option. Outputs are not simultaneous.

4) For PL2210 series laser with -SH/FH or -SH/TH/FH option. Outputs are not simultaneous.

5) Averaged from pulses, emitted during 30 sec time interval.

6) Optional 80 or 20 ps ± 10% duration. Pulse energy specifications may differ from indicated here.

7) With respect to optical pulse. <10 ps rms jitter is provided optionally with PRETRIG feature.

8) TRIG1 OUT lead or delay can be adjusted with 0.25 ns steps in specified range.

9) Near field Gaussian fit is >90%.

10) Average of X- and Y-plane full angle divergence values measured at the $1/e^2$ level at 1064 nm.

11) Beam diameter is measured at 1064 nm at the $1/e^2$ point.

12) Beam pointing stability is evaluated from fluctuations of beam centroid position in the far field.

13) 456×1233×249 mm (W×L×H) laser head size might be required for some optional configurations.

14) At 1 kHz pulse repetition rate.

OPTIONS

- **PRETRIG** provides low jitter pulse for streak camera triggering with lead/delay in -400...600 µs range and <10 ps rms jitter.
- **Option P80** provides 80 ps ± 10 % output pulse duration. Inquire for pulse energy specifications.
- **Option P20** provides 20 ps ± 10 % output pulse duration. Inquire for pulse energy specifications.
- **Option PC** allows reduction of the pulse repetition rate of the PL2210 series laser by integer numbers. Single shot mode is also possible. In addition, the –PC option reduces the low-intensity quasi-CW background that is present at laser output at 1064 nm wavelength. Please note that the output of fundamental wavelength and harmonic will be reduced by approx. 20% with installation of the –PC option.

BEAM PROFILE

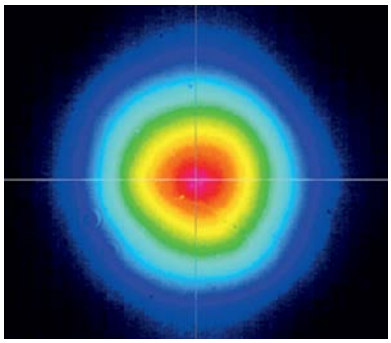

Fig 1. Typical PL2210 series laser near field beam profile at 1064 nm except PL2211A

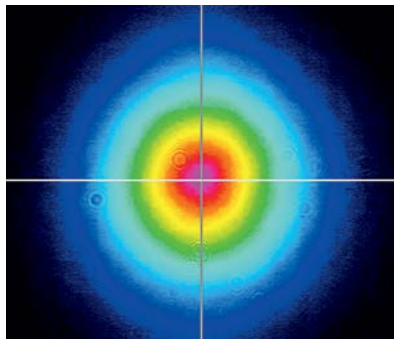

Fig 2. Typical PL2211A laser near field beam profile at 1064 nm

OUTLINE DRAWINGS

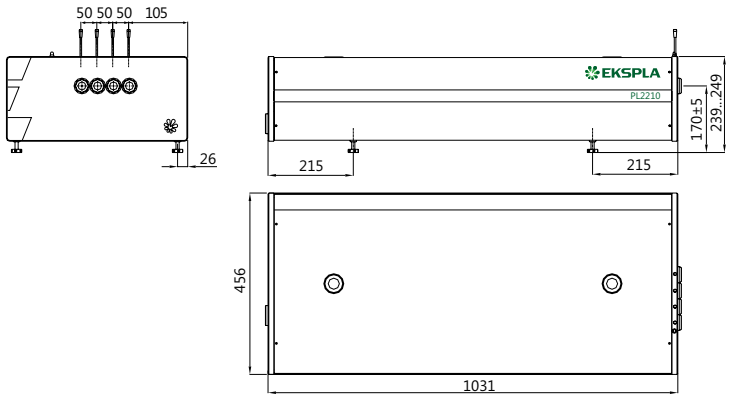

Fig 3. Dimensions of PL2210 series laser head

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.

PL2210A-SH/TH/FH-P20

Model

Harmonic generator options:
SH → second harmonic
TH → third harmonic
FH → fourth harmonic

Other options:
P80 → 80 ps pulse duration option
P20 → 20 ps pulse duration option
PC → pulse picker option
PLL → pulse repetition rate locking option

PL2230 SERIES

Diode Pumped High Energy Picosecond Nd:YAG Lasers

Innovative design

The heart of the system is a diode pumped solid state (DPSS) master oscillator placed in a sealed monolithic block, producing high repetition rate pulse trains (90 MHz) with a low single pulse energy of several nJ. Diode pumped amplifiers are used for amplification of the pulse to 30 mJ or up to 40 mJ output. The high-gain regenerative amplifier has an amplification factor in the proximity of 10^6. After the regenerative amplifier, the pulse is directed to a multipass power amplifier that is optimized for efficient stored energy extraction from the Nd:YAG rod, while maintaining a near Gaussian beam profile and low wavefront distortion. The output pulse energy can be adjusted in approximately 1% steps, while pulse-to-pulse energy stability remains at less than 0.5% rms at 1064 nm.

Angle-tuned KD*P and KDP crystals mounted in thermostabilised ovens are used for second, third, and fourth harmonic generation. Harmonic separators ensure the high spectral purity of each harmonic guided to different output ports.

Built-in energy monitors continuously monitor output pulse energy. Data from the energy monitor can be seen on the remote keypad or on a PC monitor. The laser provides triggering pulses for the synchronisation of your equipment. The lead of the triggering pulse can be up to 500 ns and is user adjustable in ~0.25 ns steps from a personal computer. Up to 1000 µs lead of triggering pulse is available as a pretrigger feature. Precise pulse energy control, excellent short-term and long-term stability, and a 50 Hz repetition rate makes PL2230 series lasers an excellent choice for many demanding scientific applications.

Simple and convenient laser control

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

FEATURES

- *Diode pumped power amplifier producing up to **40 mJ** per pulse at 1064 nm*
- *Beam profile improvement using advanced beam shaping system*
- *Hermetically sealed DPSS master oscillator*
- *Diode pumped regenerative amplifier*
- *Air-cooled*
- ***<30 ps** pulse duration*
- *Excellent pulse duration stability*
- *Up to **100 Hz** repetition rate*
- *Streak camera triggering pulse with <10 ps jitter*
- *Excellent beam pointing stability*
- *Thermo stabilized second, third or fourth harmonic generator options*
- *PC control*
- *Remote control via keypad*

APPLICATIONS

- *Time resolved fluorescence (including streak camera measurements)*
- *SFG/SHG spectroscopy*
- *Nonlinear spectroscopy*
- *Laser-induced breakdown spectroscopy*
- *OPG pumping*
- *Remote laser sensing*
- *Satellite ranging*
- *Other spectroscopic and nonlinear optics applications*

SPECIFICATIONS [1]

Model	PL2230-100	PL2230A-100	PL2231-50	PL2231A-50
Pulse energy [2]				
at 1064 nm	3 mJ	6 mJ	30 mJ	40 mJ
at 532 nm [3]	1.3 mJ	3 mJ	13 mJ	18 mJ
at 355 nm [4]	0.9 mJ	2 mJ	9 mJ	13 mJ
at 266 nm [5]	0.3 mJ	0.6 mJ	3 mJ	5 mJ
at 213 nm [6]	inquire			
Pulse energy stability (StdDev) [7]				
at 1064 nm	< 0.2 %	< 0.6 %	< 0.5 %	
at 532 nm	< 0.4 %		< 0.8 %	
at 355 nm	< 0.5 %		< 1.1 %	
at 266 nm	< 0.5 %		< 1.2 %	
at 213 nm	< 1.5 %		< 1.5 %	
Pulse duration (FWHM) [8]	29 ± 5 ps			
Pulse duration stability [9]	± 1 %			
Power drift [10]	± 2 %			
Pulse repetition rate				
At 1064, 532, 355 nm	0 – 100 Hz	100 Hz	50 Hz	
At 266, 213 nm	100 Hz		10 Hz	
Polarization	vertical, >99 % at 1064 nm			
Pre-pulse contrast	> 200 : 1 (peak-to-peak with respect to residual pulses)			
Beam profile [11]	close to Gaussian in near and far fields			
Beam divergence [12]	< 1.5 mrad	< 0.7 mrad		
Beam propagation ratio M^2	< 1.3		< 2.5	
Beam pointing stability (RMS) [13]	≤ 10 µrad	≤ 20 µrad		
Typical beam diameter [14]	~ 2 mm	~ 2.5 mm	~ 6 mm	~ 7 mm
Optical pulse jitter				
Internal triggering regime [15]	<50 ps (StdDev) with respect to TRIG1 OUT pulse			
External triggering regime [16]	~3 ns (StdDev) with respect to SYNC IN pulse			
TRIG1 OUT pulse delay [17]	-500 ... 50 ns			
Typical warm-up time	5 min	10 min	15 min	
PHYSICAL CHARACTERISTICS				
Laser head size (W × L × H)	456×1031×249 ± 3 mm			
Electrical cabinet size (W × L × H)	12 V DC power adapter, 85×170×41 ± 3 mm	471×391×147 ± 3 mm		
Umbilical length	2.5 m			
OPERATING REQUIREMENTS				
Cooling [18]	not required, air cooled		stand-alone chiller	
Room temperature	22 ± 2 °C			
Relative humidity	20 – 80 % (non-condensing)			
Power requirements	110–240 V AC, 50/60 Hz	Single phase, 110–240 V AC, 5 A, 50/60 Hz		
Power consumption	< 0.15 kVA	< 1.0 kVA		

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 1064 nm and for basic system without options.

2) Outputs are not simultaneous.

3) For PL2230 series laser with –SH, -SH/TH, -SH/FH or -SH/TH/FH option or –SH/TH/FH/FiH module.

4) For PL2230 series laser with –TH, -SH/TH or -SH/TH/FH option or –SH/TH/FH/FiH module.

5) For PL2230 series laser with -SH/FH or -SH/TH/FH option or –SH/TH/FH/FiH module.

6) For PL2230 series laser with –SH/TH/FH/FiH module.

7) Averaged from pulses, emitted during 30 sec time interval.

8) FWHM. Inquire for optional pulse durations in 20 – 90 ps range. Pulse energy specifications may differ from indicated here.

9) Measured over 1 hour period when ambient temperature variation is less than ±1 °C.

10) Measured over 8 hours period after 20 min warm-up when ambient temperature variation is less than ± 2 °C.

11) Near field Gaussian fit is >80%.

12) Average of X- and Y-plane full angle divergence values measured at the $1/e^2$ level at 1064 nm.

13) Beam pointing stability is evaluated from fluctuations of beam centroid position in the far field.

14) Beam diameter is measured at 1064 nm at the $1/e^2$ level.

15) With respect to TRIG1 OUT pulse. <10 ps jitter is provided optionally with PRETRIG feature.

16) With respect to SYNC IN pulse.

17) TRIG1 OUT lead or delay can be adjusted with 0.25 ns steps in specified range.

18) Air cooled. Adequate room air conditioning should be provided.

OPTIONS

- **Option P20** provides 20 ps ±10% output pulse duration. Pulse energies are ~ 30 % lower in comparison to the 29 ps pulse duration version. See table below for pulse energy specifications:

Model	PL2231-50	PL2231A-50
1064 nm	23 mJ	28 mJ
532 nm	9 mJ	13 mJ
355 nm	6 mJ	9 mJ
266 nm	2 mJ	4 mJ

- **Option P80** provides 80 ps ± 10% output pulse duration. Pulse energy specifications are same as those of 29 ps lasers.

- **Option P10**
10±2 ps pulse duration. Pulse energies are ~ 50% lower in comparison to the 29 ps pulse duration version. Valid only for PL2230A-100.

- **Option PLL** allows locking the master oscillator pulse train repetition rate to an external RF generator, enabling precise external triggering with low jitter. Inquire for more information.

- **Option PL2231A-50 HE**
Pulse repetition rate 50 Hz. The pulse energy is ~25% higher compared to the laser PL2231A. 29±5 ps output pulse duration. See table below for pulse energy specifications:

Model [1) 2)]	PL2231A-50 HE
1064 nm	50 mJ

- **Option PL2231A-10**
Pulse repetition rate 10 Hz. The pulse energy is ~2 times higher compared to the 50 Hz laser version. 29±5 ps output pulse duration. See table below for pulse energy specifications:

Model [1) 2)]	PL2231A-10
1064 nm	80 mJ
532 nm [3)]	50 mJ
355 nm	inquire
216 nm	inquire
213 nm	inquire

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 1064 nm and for basic system without options. Specifications for model PL2231C are preliminary and should be confirmed against quotation and purchase order.

2) Outputs are not simultaneous.

3) For PL2231A-10 series laser with –SH module.

BEAM PROFILE

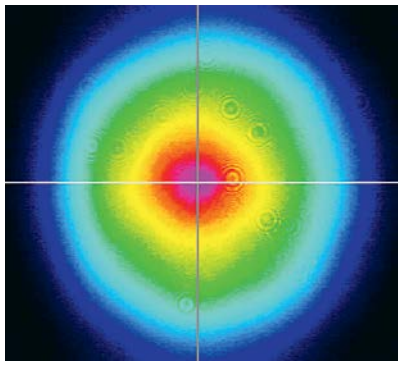

Fig 1. Typical near field output beam profile of PL2230 model laser

OUTLINE DRAWINGS

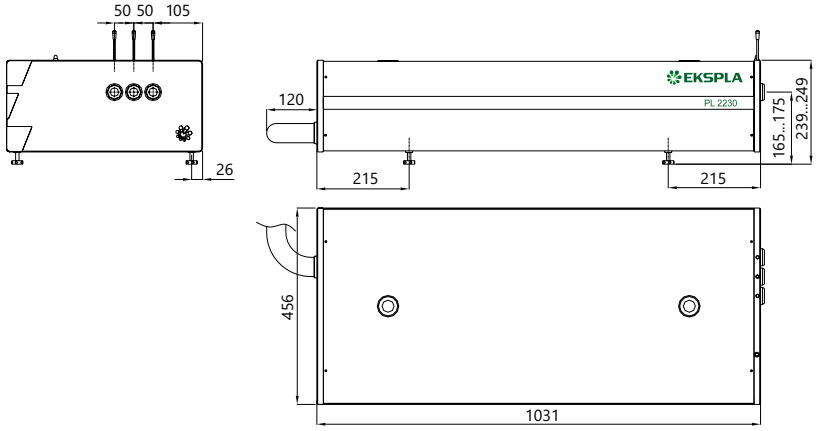

Fig 2. Dimensions of PL2230 series laser head

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.

PL2231-50-SH/TH/FH-P20

- Model
- Pulse repetition rate in Hz
- Harmonic generator options:
  - SH → second harmonic
  - TH → third harmonic
  - FH → fourth harmonic
- Other options:
  - P20 → 20±2 ps pulse duration option
  - P80 → 80 ps pulse duration option
  - PLL → pulse repetition rate locking option

PL2250 SERIES

Flash-Lamp Pumped Picosecond Nd:YAG Lasers

FEATURES

- *Hermetically sealed DPSS master oscillator*
- *Diode pumped regenerative amplifier*
- *Flashlamp pumped power amplifier producing up to **100 mJ** per pulse at 1064 nm*
- ***30 ps** pulse duration (20 ps optional)*
- *Excellent pulse duration stability*
- *Up to **20 Hz** repetition rate*
- *Streak camera triggering pulse with <10 ps jitter*
- *Excellent beam pointing stability*
- *Thermo-stabilized second, third, fourth and fifth harmonic generator options*
- *PC control*
- *Remote control via keypad*

APPLICATIONS

- *Time resolved fluorescence (including streak camera measurements)*
- *SFG/SHG spectroscopy*
- *Nonlinear spectroscopy*
- *Laser-induced breakdown spectroscopy*
- *OPG pumping*
- *Remote laser sensing*
- *Satellite ranging*
- *Other spectroscopic and nonlinear optics experiments*

PL2250 series lasers cost-effective design improves laser reliability and reduces running and maintenance costs.

Innovative design

The heart of the system is a diode pumped solid state (DPSS) master oscillator placed in a hermetically sealed monolithic block. The flashlamp pumped regenerative amplifier is replaced by an innovative diode pumped regenerative amplifier. Diode pumping results in negligible thermal lensing, which allows operation of the regenerative amplifier at variable repetition rates, as well as improved long-term stability and maintenance-free operation.

The optimized multiple-pass power amplifier is flashlamp pumped and is optimized for efficient amplification of pulse while maintaining a near Gaussian beam profile and low wavefront distortion. The output pulse energy can be adjusted in approximately 1% steps, at the same time as pulse-to-pulse energy stability remains less than 0.8% rms at 1064 nm.

Angle-tuned KD*P and KDP crystals mounted in thermostabilised ovens are used for second, third and fourth harmonic generation. Harmonic separators ensure the high spectral purity of each harmonic directed to different output ports.

Built-in energy monitors continuously monitor output pulse energy. Data from the energy monitor can be seen on the remote keypad or PC monitor. The laser provides several triggering pulses for synchronization of the customer's equipment. The lead or delay of the triggering pulse can be adjusted in 0.25 ns steps from the control pad or PC. Up to 1000 µs lead of triggering pulse is available as a pretrigger feature.

Precise pulse energy control, excellent short-term and long-term stability, and up to 20 Hz repetition rate makes PL2250 series lasers an excellent choice for many demanding scientific applications.

Simple and convenient laser control

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

SPECIFICATIONS [1]

Model	PL2251A	PL2251B	PL2251C
Pulse energy			
at 1064 nm	50 mJ [2]	80 mJ [2]	100 mJ
at 532 nm [3]	25 mJ	40 mJ	50 mJ
at 355 nm [4]	15 mJ	24 mJ	30 mJ
at 266 nm [5]	7 mJ	10 mJ	12 mJ
at 213 nm [6]	inquire		
Pulse energy stability, (StdDev.) [7]			
at 1064 nm	< 0.8 %		
at 532 nm	<1.0 %		
at 355 nm	< 1.1 %		
at 266 nm	< 1.2 %		
Pulse duration (FWHM) [8]	29 ± 5 ps		
Pulse duration stability [9]	± 1.0 ps		
Repetition rate	20 or 10 Hz		10 Hz
Polarization	linear, vertical, >99 %		
Pre-pulse contrast	>200:1 (peak-to-peak with respect to residual pulses)		
Optical pulse jitter	internal / external		
Internal triggering regime [10]	<50 ps (StdDev) with respect to TRIG1 OUT pulse		
External triggering regime [11]	~3 ns (StdDev) with respect to SYNC IN pulse		
SYNC OUT pulse delay [12]	-500 ... 50 ns		
Beam divergence [13]	< 0.5 mrad		
Beam pointing stability (RMS) [14]	≤ 20 µrad		
Beam diameter [15]	~ 8 mm	~10 mm	~12 mm
Typical warm-up time	30 min		
PHYSICAL CHARACTERISTICS			
Laser head size (W × L × H)	456×1233×249 mm ±3 mm (for PL2251A, B with harmonic and C models) 456×1031×249 mm ±3 mm (for PL2251A, B models without harmonic)		
Electric cabinet size (W × L × H)	550×600×550 ±3 mm (19" standard, MR-9)		
Umbilical length	2.5 m		
OPERATING REQUIREMENTS			
Water consumption (max 20 °C)	water cooled, water consumption (max. 20 °C), <8 l/min, 2 bar		
Room temperature	22 ± 2 °C		
Relative humidity	20–80 % (non-condensing)		
Power requirements [16]	single phase, 200–240 V AC, 16 A, 50/60 Hz		
Power [17]	< 1.5 kVA	< 2.5 kVA	< 2.5 kVA

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 1064 nm and for basic system without options.

2) PL2251B-20 has 70 mJ at 1064 nm output energy. Inquire for these energies at other wavelengths.

3) For -SH option. Outputs are not simultaneous. Please inquire for pulse energies at other wavelengths.

4) For -TH option. Outputs are not simultaneous. Please inquire for pulse energies at other wavelengths.

5) For -FH option. Outputs are not simultaneous. Please inquire for pulse energies at other wavelengths.

6) For PL2250 series laser with custom -FiH option.

7) Averaged from pulses, emitted during 30 sec time interval.

8) FWHM. Inquire for optional pulse durations in 20 – 90 ps range. Pulse energy specifications may differ from indicated here.

9) Measured over 1 hour period when ambient temperature variation is less than ±1 °C.

10) With respect to TRIG1 OUT pulse. <10 ps jitter is provided optionally with PRETRIG feature.

11) With respect to SYNC IN pulse.

12) TRIG1 OUT lead or delay can be adjusted with 0.25 ns steps in specified range.

13) Average of X- and Y-plane full angle divergence values measured at the $1/e^2$ level at 1064 nm.

14) Beam pointing stability is evaluated from fluctuations of beam centroid position in the far field.

15) Beam diameter is measured at 1064 nm at the $1/e^2$ point.

16) Three phase 208 or 380 VAC mains are required for 50 Hz versions.

17) For 10 Hz version.

If laser is optimised for pumping parametrical generator, maximum output energy may be different than specified for stand alone application.

OPTIONS

▶ **Option P20** provides 20 ps ± 10% output pulse duration. Pulse energies are 30% lower in comparison to the 30 ps pulse duration version. Linewidth <2 cm^{-1} at 1064 nm. See table below for pulse energy specifications:

Model	PL2251A-10	PL2251B-10	PL2251C -10
1064 nm	35 mJ	60 mJ	80 mJ
532 nm	17 mJ	30 mJ	40 mJ
355 nm	12 mJ	18 mJ	24 mJ
266 nm	5 mJ	8 mJ	10 mJ

▶ **Option P80** provides 80 ps ±10% output pulse duration. Pulse energy specifications as below:

Model	PL2251A	PL2251B	PL2251C
Pulse energy at 1064 nm	70 mJ	100 mJ	160 mJ

BEAM PROFILE

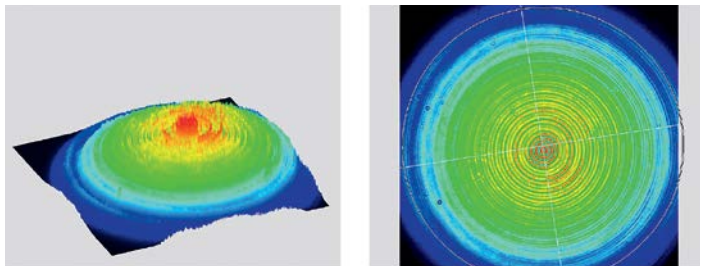

Fig 1. Typical near field output beam profile of PL2250 series laser

OUTLINE DRAWINGS

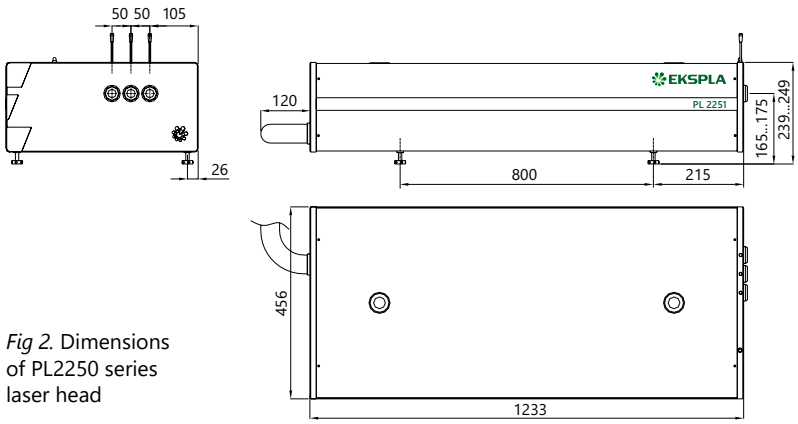

Fig 2. Dimensions of PL2250 series laser head

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.

PL2251A-50-SH/TH/FH-P20

Model

Pulse energy level, A for 50 mJ output

Pulse repetition rate in Hz

Harmonic generator options:
SH → second harmonic
TH → third harmonic
FH → fourth harmonic

Other options:
P20 → 20 ps pulse duration option
P80 → 80 ps pulse duration option
AW → water-air heat exchanger option
FS → seeding option

PRISM AWARDS FINALIST 2023

Single Housing MIR Tunable Picosecond Laser PT277-XIR integrate a picosecond optical parametric oscillator and DPSS pump laser into a single compact housing

Picosecond Tunable Wavelength Lasers

For researchers demanding wide tuning range, high conversion efficiency and narrow line-width, EKSPLA PG&PT 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 17000 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 (VCP, ASCII commands), RS232 (ASCII commands), LAN (REST API) or RS232 (ASCII commands), LAN (REST API) depending on the system configuration 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.

FEATURES

- *Wide spectral range*
- *Narrowband*
- *Pump laser from 8 to 30 picoseconds*

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	16
PT277	1403 – 17000 nm	87 MHz	< 5 cm^{-1}	Picosecond MHz rate MIR range laser system	20
PT403	210 – 2300 nm	1000 Hz	< 9 cm^{-1}	Pump laser and OPG integrated in 2-in-1 combo housing	23
PT501	2300 – 16000 nm	100 Hz	< 4 cm^{-1}	Picosecond 100Hz rate MIR range laser system	27

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*
- *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), LAN (REST API) or RS232 (ASCII commands), LAN (REST API) depending on the system configuration 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-DFG model is the optimal choice for vibrational-SFG spectroscopy setups.

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SPECIFICATIONS [1]

Model	PG401	PG401-SH	PG401-DUV	PG501-DFG1 [2]
Tuning range				
DUV	–		193 – 209.95 nm	–
SH	–	210 – 340, 370 – 419 nm	–	
Signal	420 – 680 nm	–		
Idler	740 – 2 300 nm	–		
DFG	–			2 300 – 16 000 nm
Output pulse energy [3]	> 1000 µJ at 450 nm	> 100 µJ at 300 nm	> 50 µJ at 200 nm	> 200 µJ at 3 700 nm, > 30 µJ at 10 000 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 [4]	~4 mm	~3 mm		~5 mm
Beam divergence [5]	< 2 mrad			–
Beam polarization	–	vertical		horizontal
Signal	horizontal	–		
Idler	horizontal	–		
Typical pulse duration	~20 ps			
PUMP LASER REQUIREMENTS				
Pump energy				
at 355 nm	10 mJ			–
at 532 nm	–			10 mJ
at 1064 nm	–		2 mJ	6 mJ
Recommended pump source [6]	PL2231-50-TH, PL2251A-TH			PL2231-50-SH, PL2251A-SH
Beam divergence	< 0.5 mrad			
Beam profile	homogeneous, without hot spots, Gaussian fit >90 %			
Pulse duration [7]	29 ± 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) Only as part of Double resonance SFG.

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

4) Beam diameter is measured at the $1/e^2$ level.

5) Full angle measured at the FWHM point.

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

7) 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 16000 nm

Gap free tuning extension for PG401:

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

TUNING CURVES

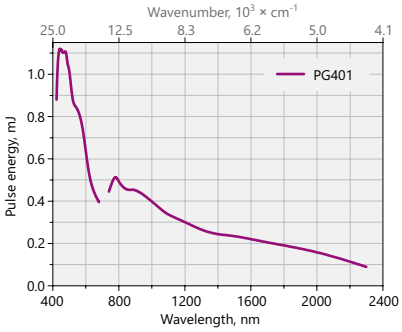

Fig 1. Typical PG401 model tuning curve
Pump energy: 10 mJ at 355 nm

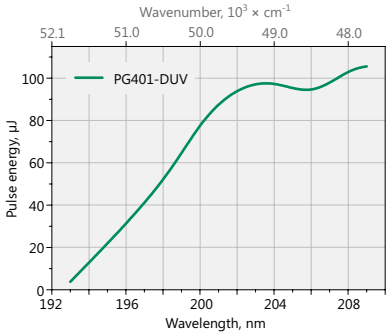

Fig 2. Typical PG401-DUV model tuning curve

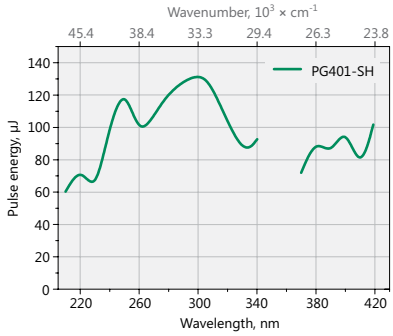

Fig 3. Typical PG401-SH model tuning curve. *Pump energy: 10 mJ at 355 nm*

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

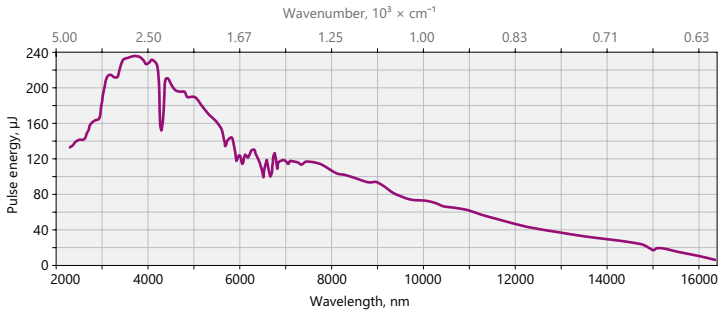

Fig 4. Typical PG501-DFG tuning curve

RECOMMENDED UNITS ARRANGEMENT ON OPTICAL TABLE

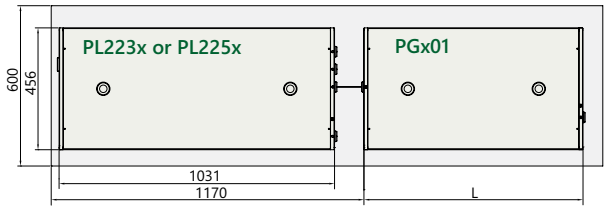

Fig 5. Arrangement of pump laser and PGx01 unit on optical table

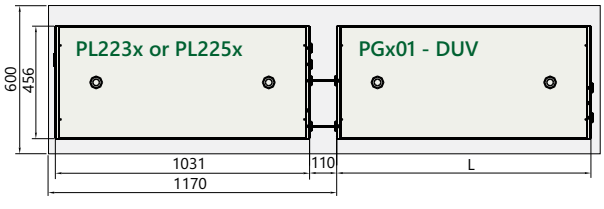

Fig 6. Arrangement of pump laser and PGx01-DUV unit on optical table

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OUTLINE DRAWINGS

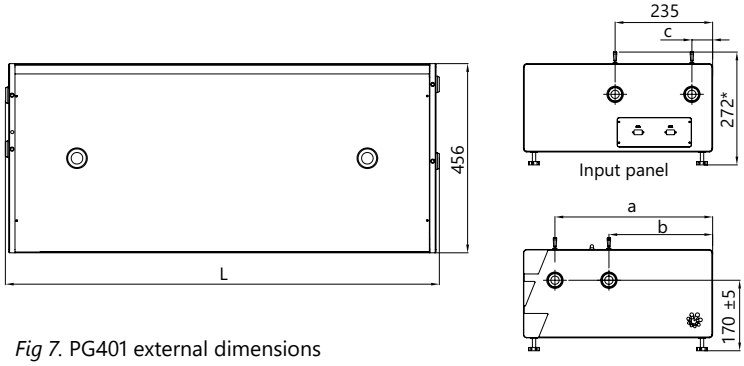

Fig 7. PG401 external dimensions

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.

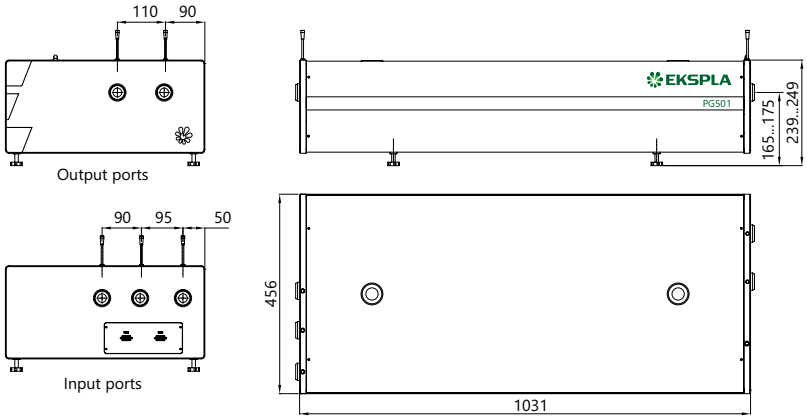

Fig 8. PG501 external dimensions

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 → 2300–16000 nm; >200 μJ at 3700 nm

PG501-DFG1

Model
PG5xx → 532 nm pump

01 → travelling wave, narrowed linewidth

Tuning range
DFG1 → 2300–16000 nm; >200 μJ at 3700 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.

PT277 SERIES

Single Housing Mid-Infrared Tunable Picosecond Laser System

PT277 series laser systems integrate a picosecond optical parametric oscillator (OPO) and a pump laser in a single compact housing. Mounting the components on the same frame provides a robust solution. It makes laser installation shorter, improves long-term stability, and reduces maintenance costs.

The laser is hermetic and has an internal air cleaning system to clean from water vapor and organics, making it an excellent source for spectroscopic applications.

Nearly diffraction-limited divergence and beam-direction stability throughout the entire spectral tuning range are essential in tunable radiation applications requiring high-precision laser beam focusing.

Fast and fully automatic wavelength tuning is achieved by advanced microprocessor control. The wavelength tuning elements are mounted on precise closed-loop micro-stepping motors. The temperatures of the nonlinear crystals are controlled by precise thermo-controllers. No additional manual adjustment of the laser system is needed.

For customer convenience the system can be controlled by a keypad and/or any controller running on any OS using REST API commands. Variety of interfaces USB, RS232, LAN, WLAN (optionally) ensures easy control and integration with other equipment.

FEATURES

- ***Tuning range 1403 – 17000 nm (7127 – 600 cm^{-1})***
- ***Hands-free tuning****: motorized for the entire tuning range*
- ***Linewidth <5 cm^{-1}*** *in the entire tuning range*
- *Nearly diffraction limited divergence*
- *Beam direction stability in the entire tuning range*
- ***Single housing****: integrates a pump laser and OPO in a single housing*
- *Internal air cleaning system*
- *PC control via USB (virtual COM port), RS232, LAN using REST API commands*

APPLICATIONS

- *Infrared spectroscopy*
- *SNOM (scanning near field microscopy)*

PT277 series features two models

Model	Features
PT277-SI	provides **a narrowband radiation** with a linewidth <5 cm^{-1} in the entire tuning range: 1403 – 2020 nm (7127 – 4951 cm^{-1}) 2250 – 4400 nm (4444 – 2273 cm^{-1})
PT277-XIR	provides **a narrowband radiation** with a linewidth <5 cm^{-1} in the entire tuning range: 1403 – 2020 nm (7127 – 4951 cm^{-1}) 2250 – 4400 nm (4444 – 2273 cm^{-1}) 12500 – 17000 nm (800 – 600 cm^{-1}) *

* Inquire about the available spectral range.

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SPECIFICATIONS [1]

Parameter	PT277-SI	PT277-XIR
OUTPUT SPECIFICATIONS		
Tuning range		
Signal	1403 – 2020 nm (7127 – 4951 cm^{-1})	
Idler	2250 – 4400 nm (4444 – 2273 cm^{-1})	
DFG	–	12500 – 17000 nm (800 – 600 cm^{-1}) [2]
Output power [3]		
@ 1403 – 2020 nm (Signal)	> 400 mW	
@ 2250 – 4000 nm (Idler)	> 100 mW	
@ 12500 nm (DFG)	–	> 10 mW
Linewidth	< 5 cm^{-1}	
Pulse repetition rate	~ 87 MHz (same as that of the pump laser)	
Pulse duration	~8 ps	
Typical beam diameter [4] (at $1/e^2$ level)	~ 3 mm @ 3000 nm	
Typical beam divergence [5]	< 5 mrad @ 1600 nm	
Beam pointing stability	< 50 µrad rms @ 1600 nm	
Polarization		
Signal and idler	linear, vertical	
DFG	–	linear, vertical
Fast spectral scan speed for spectral range		
From 1403 to 2020 nm (Signal)	< 4 s	
From 2250 to 4400 nm (Idler)	< 4 s	
From 12500 to 16000 nm (DFG)	–	< 2 s
Output power modulation frequency (AOM)	0 Hz – 2 MHz	
PHYSICAL CHARACTERISTICS		
Laser unit size (W×L×H)	320 × 766 × 241 mm	
Power supply size (W×L×H)	483 × 140 × 390 mm , stand-alone	
Chiller (third-party, approx.) (W×L×H)	290 × 420 × 290 mm , stand-alone	
Umbilical length	2.5 m	
SERVICE AND OPERATION REQUIREMENTS		
Cooling	water-air	
Room temperature	22 ± 2 °C	
Room temperature stability	± 1 °C	
Relative humidity	< 80 % (non-condensing)	
Power requirements	100 – 240 VAC (-10% / +5%), single phase, 50/60 Hz	
Power consumption	< 1 kW	
Cleanness of the room	not worse than ISO Class 9	

[1] All specifications are subject to change without notice. The parameters given in the table are indicators of the typical performance of the laser system. They may vary with each manufactured laser system.

[2] Inquire about the available spectral range.

[3] Output powers are specified at selected wavelengths. See typical tuning curves for power at other wavelengths. Power drops are possible.

[4] May vary depending on pump pulse energy.

[5] Full angle at FWHM level.

Note: The laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer than 1 hour then the laser system needs to warm up for a few hours before switching radiation on. The laser and auxiliary units must be installed in a place free from dust and aerosols. It is advisable to operate the laser in an air-conditioned room and to place the laser at a distance from air conditioning outlets. The laser should be positioned on a solid optical table. Access from both sides should be ensured. Intense sources of vibrations like freight elevators, railway stations, etc. should be avoided nearby.

TUNING CURVES

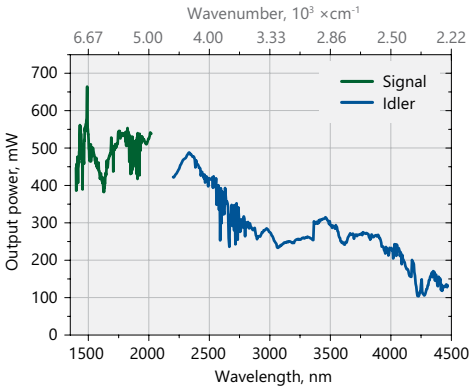


Fig 1. Typical PT277-SI laser system output tuning curve.
The actual tuning curve might differ from presented here.

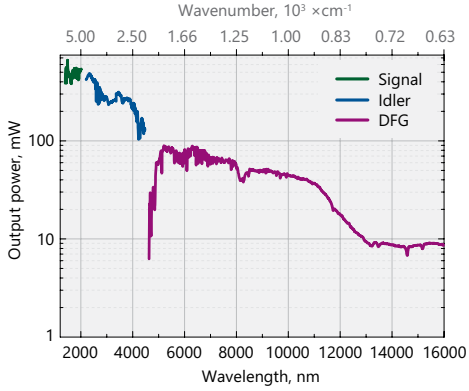


Fig 2. Typical PT277-XIR laser system output tuning curve.
The actual tuning curve might differ from presented here.
** Inquire about the available spectral range.*

OPTIONS

▶ **Option -H**

1064 nm output, <0.5 W at 1064 nm output power.

OUTLINE DRAWINGS

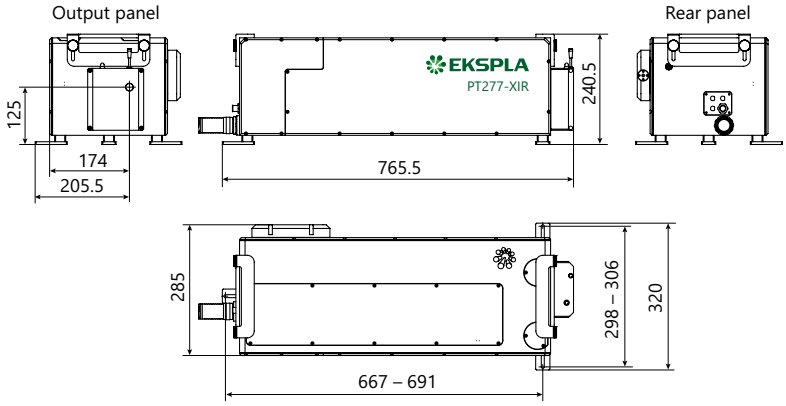


Fig 3. External dimensions of PT277-XIR and PT277-SI laser units (the same external housing)

Fig 4. PT277-SI laser features the same external housing as PT277-XIR

Fig 5. PT277-XIR and PT277-SI lasers feature easy attachable handles that enable easy transportation and installation

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 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.

Simple and convenient laser control

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

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 (including streak camera measurements), 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*

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]	> 75 µJ	
Idler [5]	> 25 µJ	
Pulse repetition rate	1000 Hz	
Linewidth	< 9 cm^{-1}	< 12 cm^{-1}
Typical pulse duration [6]	~ 20 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.

10) TRIG1 OUT lead or delay can be adjusted with 0.25 ns steps in specified range.

Communication module interfaces

Interface	Description
USB	virtual serial port, ASCII commands
RS232	ASCII commands

Interface	Description
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 [1] [2]

– H output energy 0.7 mJ;

– 2H output energy 0.3 mJ;

– 3H output energy 0.3 mJ.

[1] Outputs are not simultaneous.
[2] Inquire for outputs simultaneously with PG.

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.

PT503 FEATURES

- The higher pulse energy in the near-IR spectral range
- Tuning range from 700 to 2200 nm

TUNING CURVES

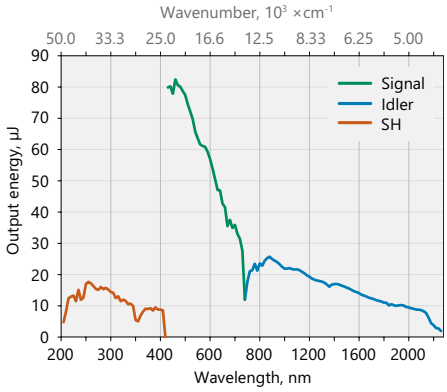


Fig 2. Typical PT403 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm) ranges, SH (210 – 409 nm) ranges

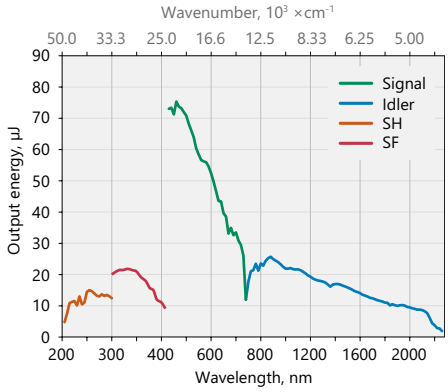


Fig 3. Typical PT403 tuning curves in signal (410 – 709 nm), idler (710 – 2300 nm) ranges, SH (210 – 300 nm), SF (300 – 409 nm) ranges

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

OUTLINE DRAWINGS

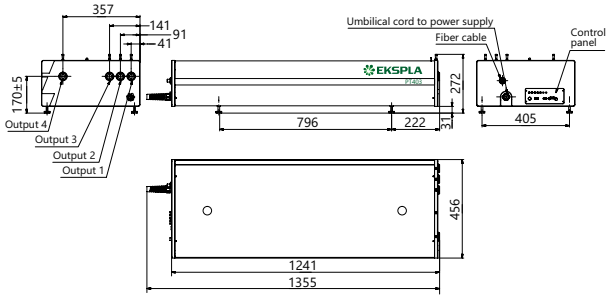


Fig 4. PT403 series laser head typical outline drawing

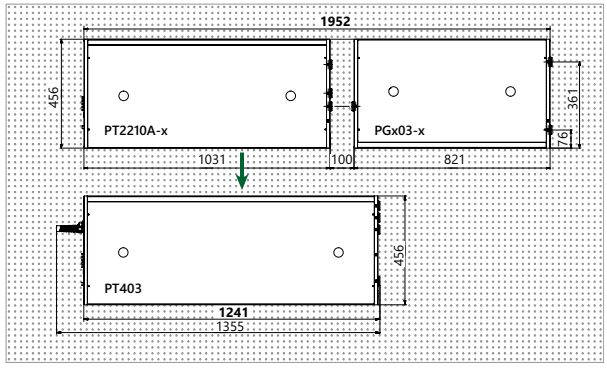


Fig 5. Compared with layout where laser and OPO are in different units, PT403 features almost twice smaller footprint

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.

PT501 SERIES

Single Housing Mid-Infrared Tunable Picosecond Laser System

PT501 series laser systems integrate a picosecond optical parametric oscillator (OPO) and a pump laser in a single compact housing. Mounting the components on the same frame provides a robust solution. It makes laser installation shorter, improves long-term stability, and reduces maintenance costs.

Fast and fully automatic wavelength tuning is achieved by advanced microprocessor control. The wavelength tuning elements are mounted on precise closed-loop micro-stepping motors. The temperatures of the nonlinear crystals are controlled by precise thermo-controllers. No additional manual adjustment of the laser system is needed.

For customer convenience the system can be controlled by a keypad and/or any controller running on any OS using REST API commands. Variety of interfaces USB, RS232, LAN, WLAN (optionally) ensures easy control and integration with other equipment.

FEATURES

- *Tuning range **2300 – 16000 nm (4345 – 625 cm^{-1})***
- ***Hands-free tuning**: motorized for the entire tuning range*
- *Linewidth **<4 cm^{-1}** in the entire tuning range*
- *Repetition rate **100 Hz***
- ***Air cooled** – external water supply is not required*
- *Beam direction stability in the entire tuning range*
- ***Single housing**: integrates a pump laser and OPO in a single housing*
- *PC control via USB (virtual COM port), RS232, LAN using REST API commands*

APPLICATIONS

- *Infrared spectroscopy*
- *SFG (sum frequency generation spectroscopy)*

PT501 series features

Model	Features
PT501	provides a **narrowband radiation** with a linewidth <4 cm^{-1} in the entire tuning range: 2300 – 16000 nm (4345 – 625 cm^{-1}). Repetition rate 100 Hz.

SPECIFICATIONS [1]

Model	PT501
Tuning range	2300–16000 nm
Output pulse energy	
at 3500 nm	> 200 µJ
at 10000 nm	> 50 µJ
Bandwidth	< 4 cm^{-1}
Pulse repetition rate	100 Hz
Tuning resolution	< 0.5 cm^{-1}
Typical beam size [2]	~4 mm
Beam divergence [3]	< 3 mrad
Beam pointing stability	≤ 100 µrad rms
Beam polarization	horizontal , > 100:1
Wavelength sweep	available
Optical pulse jitter	
Internal triggering regime [4]	< 50 ps (StdDev.) in respect to TRIG1 OUT pulse
External triggering regime [5]	~3 ns (StdDev.) in respect to SYNC IN pulse
TRIG1 OUT pulse delay	Positive pulse with controllable delay. Pulse width ~100 ns. Default delay – ~250 µs before optical pulse up to 10 ms.
PHYSICAL CHARACTERISTICS	
Laser head size (W × L × H)	~520 × 1050× 272 mm
Power supply size (W × L × H)	450 × 450 × 140 mm
OPERATING REQUIREMENTS	
Room temperature	22 ± 2 °C
Relative humidity	20–80 % (non-condensing)
Power requirements	100–240 V AC single phase, 47–63 Hz
Power consumption	< 0.5 kW
Cooling	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 3500 nm for PT501 units for basic system without options.

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

[3] At 3000 nm, Full angle measured at the FWHM point

[4] With respect to TRIG1 OUT pulse. <10 ps jitter is provided with PRETRIG option.

[5] With respect to SYNC IN pulse.

Nonlinear Spectroscopy Systems

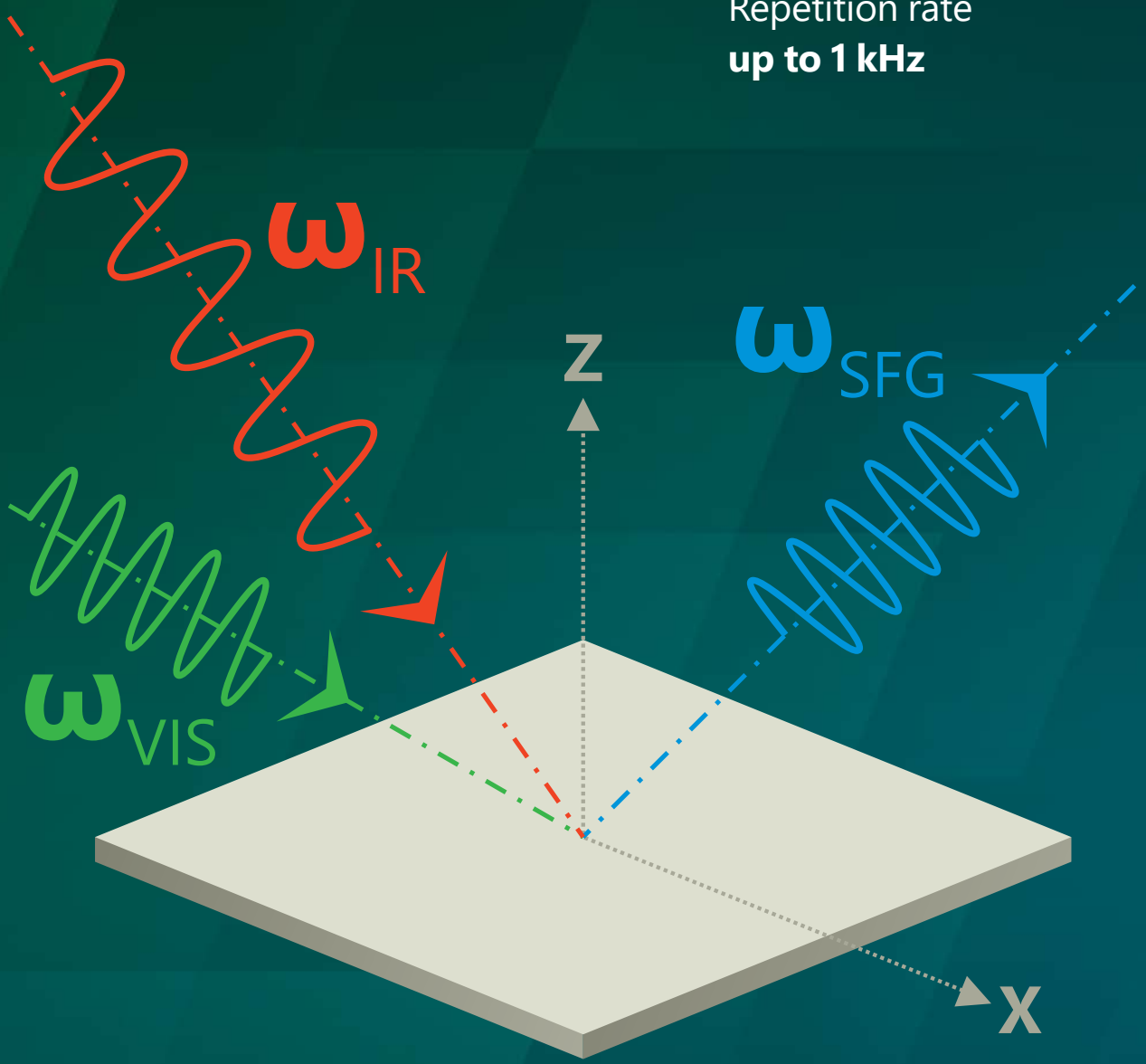
Picosecond scanning

Femtosecond broadband

Spectral resolution
< 5 cm^{-1}

Continuously tunable
625 – 4300 cm^{-1}

Repetition rate
up to 1 kHz



Sum Frequency Generation Vibrational Spectroscopy

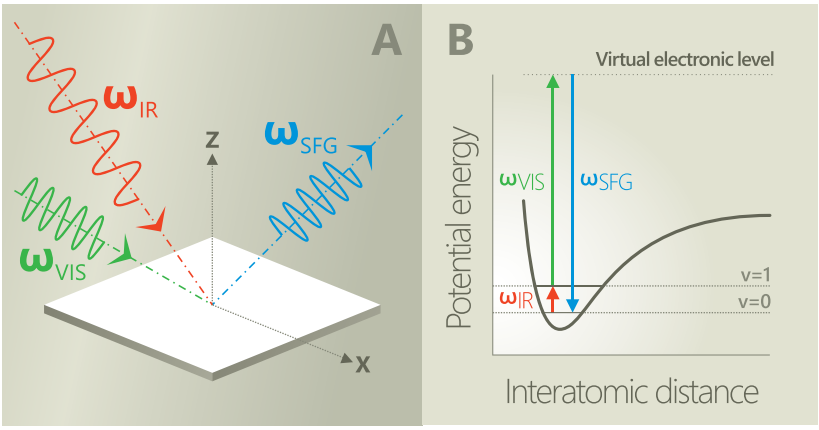
Picosecond Vibrational Sum Frequency Generation Spectrometer

Sum Frequency Generation Vibrational Spectroscopy (SFG-VS) is powerful and versatile method for in-situ investigation of surfaces and interfaces. In SFG-VS experiment a pulsed tunable infrared IR (ω_{IR}) laser beam is mixed with a visible VIS (ω_{VIS}) beam to produce an output at the sum frequency ($\omega_{SFG} = \omega_{IR} + \omega_{VIS}$). SFG is second order nonlinear process, which is allowed only in media without inversion symmetry. At surfaces or interfaces inversion symmetry is necessarily broken, that makes SFG highly surface specific. As the IR wavelength is scanned, active vibrational modes of molecules at the interface give a resonant contribution to SF signal. The resonant enhancement provides spectral information on surface characteristic vibrational transitions.

Vibrational sum frequency generation (SFG) spectroscopy holds several important advantages over traditional spectroscopy methods for the molecular level analysis of interfaces, including (i) surface sensitivity, (ii) vibrational specificity, and (iii) the possibility to extract detailed information on the ordering and orientation of molecular groups at the interface by analysis of polarization-dependent SFG spectra.

ADVANTAGES

- *Sensitive and selective to the orientation of molecules in the surface layer*
- *Intrinsically surface specific*
- *Selective to adsorbed species*
- *Sensitive to submonolayer of molecules*
- *Applicable to all interfaces accessible to light*
- *Nondestructive*
- *Capable of high spectral and spatial resolution*

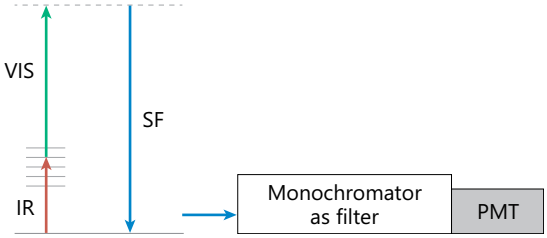


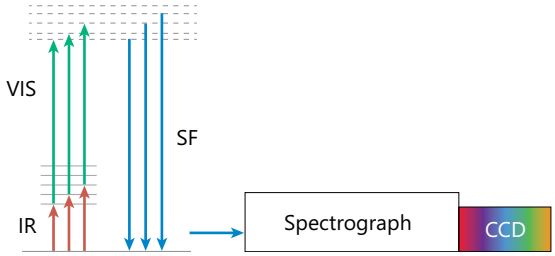
SFG signal generation diagram (a) and the molecular energy level diagram for the SFG process (b)

APPLICATIONS

- *Investigation of surfaces and interfaces of solids, liquids, polymers, biological membranes and other systems*
- *Studies of surface structure, chemical composition and molecular orientation*
- *Remote sensing in hostile environment*
- *Investigation of surface reactions under real atmosphere, catalysis, surface dynamics*
- *Studies of epitaxial growth, electrochemistry, material and environmental problems*

Narrowband picosecond scanning and broadband femtosecond SFG spectrometer





Narrowband picosecond scanning SFG spectrometer

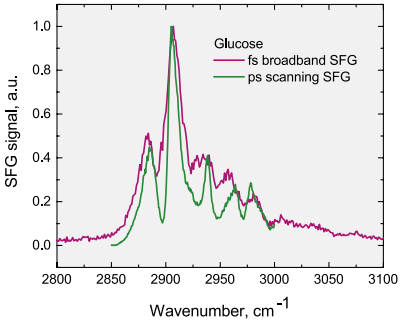
In order to get SFG spectrum during measurement wavelength of narrowband mid-IR pulse is changed point-by-point throughout the range of interest. Narrowband SFG signal is recorded by the time-gated photomultiplier. Energy of each mid-IR, VIS and SFG pulse is measured. After the measurement, the SFG spectrum can be normalised according to IR and VIS energy. Spectral resolution is determined by the bandwidth of the mid-IR light source. The narrower mid-IR pulse bandwidth, the better the SFG spectral resolution. Separate vibrational modes are excited during the measurement.

Broadband femtosecond SFG spectrometer

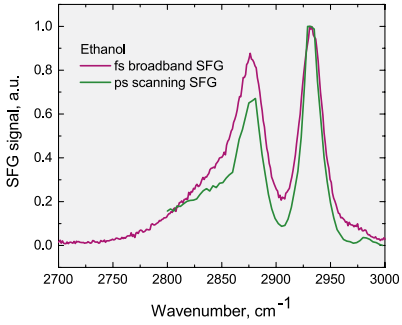
A broadband mid-IR pulse is mixed with a narrowband VIS pulse. The result is broadband SFG spectrum which is recorded using a monochromator and a sensitive CCD camera. The full spectrum is acquired simultaneously by integrating signal over time. Spectral resolution is determined by the bandwidth of the VIS pulse and the spectrograph resolution. The narrower the bandwidth of VIS pulse, the better the SFG spectral resolution.

COMPARISON OF DIFFERENT SFG SPECTROMETERS

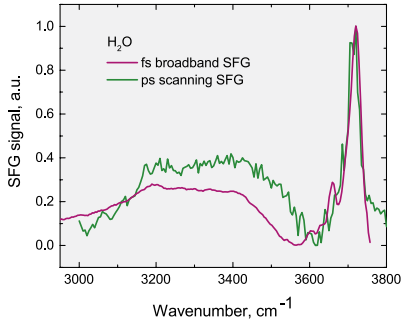
Narrowband picosecond scanning spectrometer	Broadband femtosecond high resolution spectrometer
Narrowband mid-IR excitation, only one band is excited. Coupled states can be separated.	Simultaneous excitation and recording of broad vibration spectrum with high resolution.
High mid-IR pulse energy. Less influence of IR absorbtion in the air.	High mid-IR intensity at low pulse energy – suitable for biological or other water containing samples.
No reference spectrum needed, IR energy measured at each spectral point.	Optically coupled IR and VIS channels. Reduced complexity and increased stability of the system.



SFG spectra of glucose



SFG spectra of ethanol



SFG spectra of water

Spectra are different because of different water samples. Water spectrum strongly depends on purity of the water.

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Features and design of the picosecond scanning SFG spectrometer

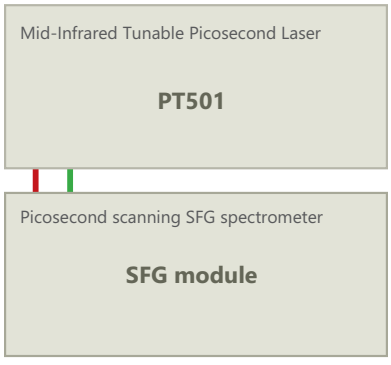
The SFG spectrometer developed by Ekspla engineers is a nonlinear spectrometry instrument, convenient for everyday use. Ekspla manufactures SFG spectrometers, which are used by chemists, biologists, material scientists, and physicists. The spectrometer has many features that help to set up measurements and to make successful vibrational spectroscopy studies. For chemical and biochemical laboratories, this makes the Ekspla SFG spectrometer a reliable workhorse with a broad spectral region, automatically tuned from 667 to 4300 cm^{-1}, a high spectral resolution (5 cm^{-1}), and easily controlled adjustment of polarisation optics.

The new SFG classic spectrometer consist of two units: laser light source PT501 and spectroscopy module.

The Ekspla SFG system is based on a mode-locked Nd:YAG laser with a 29 ps pulse duration, 100 Hz repetition rate. The VIS channel of the SFG spectrometer consists of part of a laser output beam, usually with doubled frequency (532 nm) up to 0.5 mJ. The main part of the laser radiation goes to an optical parametric generator (OPG) with a difference frequency generation (DFG) extension. The IR channel of the spectrometer is pumped by the DFG output beam with energy in the range of ~40 – 200 µJ. Infrared light can be tuned in a very broad spectral range from 2.3 up to 16 µm. The bandwidth is 4 cm^{-1} and it is one of the main factors of SFG spectrometer spectral resolution. The second beam (VIS) is also narrowband at <2 cm^{-1}. The spectrometer detection system has a temporal gate. It reduces noise collection and ambient light influence, which allows the spectrometer to be used even in a brightly illuminated room. The spectrometer does not have any acoustic noise because the laser is pumped by diodes. The spot size of the IR beam is adjustable. In this way, the appropriate energy density is achieved to avoid damaging the sample. Spectrum scanning, polarisation control and VIS beam attenuation are controlled from a computer. The spectrometer has a motorized polarisation switch for the IR, optionaly for the VIS, and optionaly the generated SFG light beams . Special detectors continuously monitor the energy of the VIS and mid-IR laser pulses, so IR energy is recorded at each measurement point. This makes it easy to normalize the resulting SFG vibrational spectrum.

SYSTEM COMPONENTS

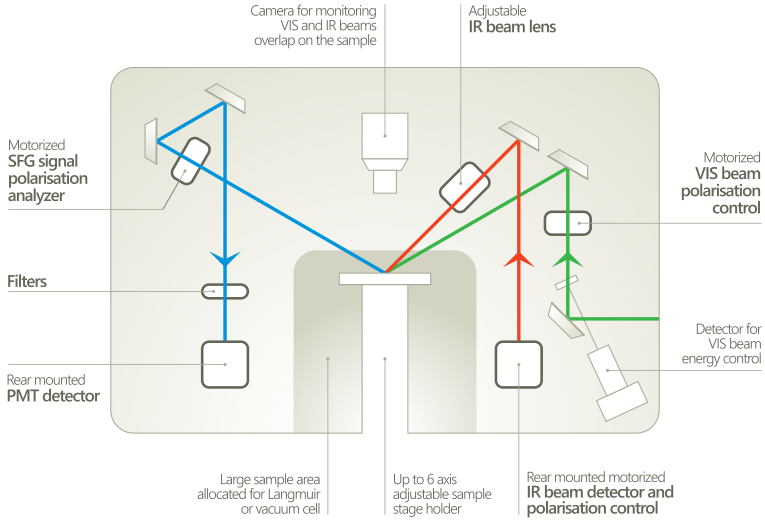
- *Picosecond mode-locked Nd:YAG laser*
- *Multichannel beam delivery unit*
- *Picosecond optical parametric generator*
- *Spectroscopy module*
- *Monochromator*
- *PMT based signal detectors*
- *Data acquisition system*
- *Dedicated LabView® software package for system control*



Schematic layout of **SFG Classic** spectrometer

SPECTROSCOPY MODULE, SAMPLE COMPARTMENT

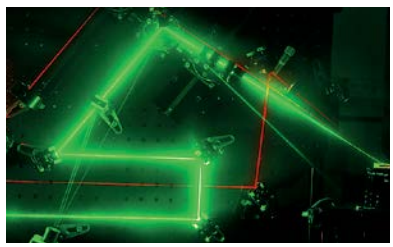
A large sample compartment can be customised and enables the use of various extensions and additional instruments for simultaneous control of the sample conditions, including a Langmuir-Blodgett trough for air/water and lipid/air interface studies, temperature and humidity-controlled cells, and other instruments.



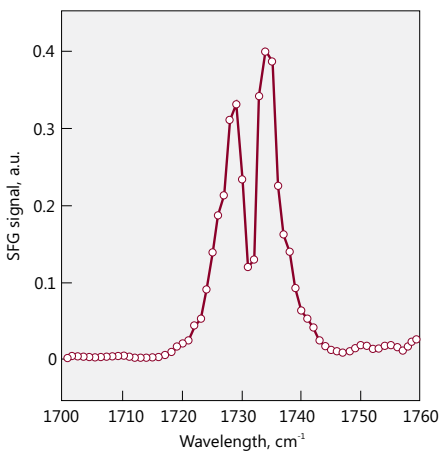
Standard layout of the vertically-arranged sample compartment of the SFG spectrometer

SAFETY OF THE SFG SPECTROMETER

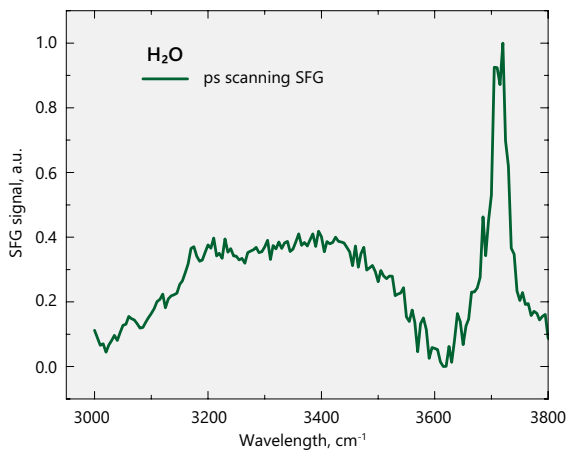
The spectrometer is safe to use: all high energy pulsed beams are enclosed. In addition, the sample area also has a special cover. During the measurements, it is possible to close the sample compartment so that radiation cannot penetrate outside. The automatic change of polarisation and energy attenuation makes it possible to perform measurements without opening the spectrometer. Laser safety precautions are required only for the alignment of the laser beams on the studied surface.



SPECTRA EXAMPLES



SFG spectra of monoolein surface, 1 cm^{-1} scan step, 200 acquisitions per step



Water-air interface spectra, 200 acquisitions per step

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Technical specifications [1] of picosecond scanning SFG spectrometer

Version	SFG Classic	SFG Double resonance	SFG Phase sensitive
SYSTEM (GENERAL)			
Spectral range	667 – 4300 cm^{-1}	1000 – 4300 cm^{-1}	1000 – 4300 cm^{-1}
Spectral resolution	<5 cm^{-1}	<10 cm^{-1}	<5 cm^{-1}
Spectra acquisition method	Scanning		
Sample illumination geometry	Top side, reflection (optional: bottom side, top-bottom side)		
Incidence beams geometry	Co-propagating, non-colinear		
Incidence angles	Fixed, VIS ~60°, IR ~55° (optional: tunable)		Fixed, VIS ~60°, IR ~55°
VIS beam wavelength	532 nm (optional: 1064 nm)	532 nm and tunable 420 – 680 nm	532 nm
Polarization (VIS, IR, SFG)	Linear, selectable “s” or “p”, purity > 1:100		
IR Beam spot on the sample	Selectable, ~150 – 600 µm		Fixed
Sensitivity	Air-water spectra		Solid sample
PUMP LASERS [2]			
Model	Integrated in PT501	PL2231A	Integrated in PT501
Pulse energy	Optimised to pump PG		
Pulse duration	29 ± 5 ps		
Pulse repetition rate	100 Hz	50 Hz	100 Hz
OPTICAL PARAMETRIC GENERATORS			
IR source	PT501	PG501- DFG1	PT501
UV-VIS source for Double resonance SFG	–	PG401	–

For standard specifications please check the brochure of particular model.

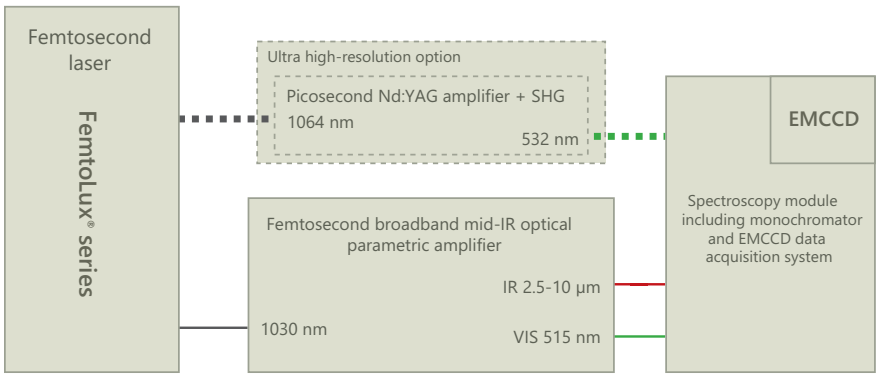
PHYSICAL DIMENSIONS (FOOTPRINT)			
Standard	1300 × 1200 mm	3000 × 1500 mm	1400 × 1200 mm

[1] Due to continuous improvement, all specifications are subject to change without advance notice.
[2] Laser is optimised for pumping parametrical generator, maximum output energy may be different than specified for stand alone application.

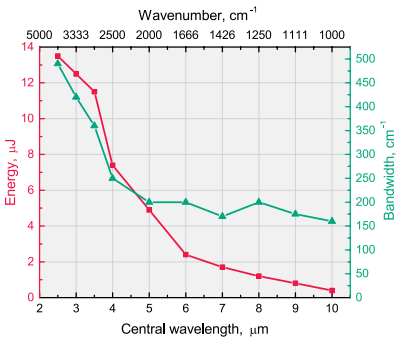
Features and design of the broadband femtosecond SFG spectrometer

Femtosecond broadband SFG (BB SFG) spectrometer allows fast SFG spectra acquisition since most vibrational modes can be resolved without scanning. The advantage of the broadband SFG system is that intense femtosecond pulses allow efficient sum frequency generation at low pulse energies thus reducing the possibility of sample modification. It is especially important for aqueous and biological samples.

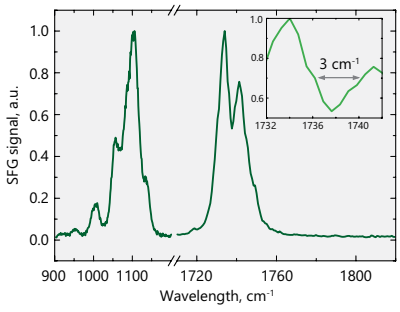
The system is based on a femtosecond industrial FemtoLux® series laser with 500 fs pulse duration, more than 1 mJ pulse energy at 1030 nm and a 1 kHz repetition rate. The main part of the laser radiation is directed to a broadband mid-IR OPA module. Broad bandwidth (150 – 450 cm^{-1}) mid-IR radiation can be continuously tuned in a spectral range from 2.5 up to 10 µm, providing from 0.5 to 12 µJ energy transform-limited pulses for the IR channel. The VIS channel realisation depends on the system configuration. In standard setup, a part of laser output radiation is frequency doubled (515 nm) ~20 µJ and then spectrally filtered to produce <8 cm^{-1} bandwidth pulses. High resolution version consists of optically synchronised femtosecond and picosecond lasers. The combination of broadband mid-IR and narrowband VIS radiation allows to get the broadband sum frequency signal with exceptionally high spectral resolution close to 3 cm^{-1}.



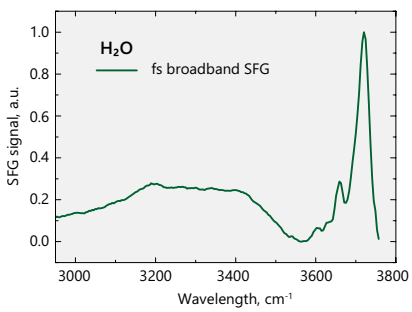
Schematic layout of BB SFG spectrometer



Mid-IR parametrical amplifier characteristics. Energy and spectral bandwidth versus central wavelength



Spectral resolution of 3 cm^{-1} demonstrated by measuring monoolein SFG spectrum



Pure water spectrum. Spectrum acquisition time 10 min

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Technical specifications [1)] of broadband femtosecond SFG spectrometer

Version	SFG fs	SFG fs High resolution
SYSTEM (general)		
Spectral range	1000 – 4300 cm^{-1}	1000 – 4300 cm^{-1}
Spectral resolution	< 9 cm^{-1}	< 5 cm^{-1}
Spectral bandwidth [2)]	150 – 450 cm^{-1}	
Spectra acquisition method	Broadband accumulative	
Sample illumination geometry	Top side, reflection (optional: bottom side, top-bottom side, total internal reflection)	
Incidence beams geometry	Co-propagating, non-colinear (optional: colinear)	
Incidence angles	Fixed, VIS ~60°, IR ~55° (optional: tunable)	
VIS beam wavelength	515 nm	532 nm
Polarization (VIS, IR, SFG)	Linear, selectable “s” or “p”, purity > 1:100	
Beam spot on the sample	Adjustable, ~150 – 600 µm	
Sensitivity	Air-water spectra	
PHYSICAL DIMENSIONS (footprint)		
Standard	2000 × 1500 mm	2200 × 1500 mm

1) Due to continuous improvement, all specifications are subject to change without advance notice.
2) Measured at 30% level.

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 – 250328

EKSPLA

Advanced Laser Technologies

Nanosecond
Lasers & Laser Systems

2025

Rev# 250306

About Company

Background

EKSPLA focuses on the design and manufacturing of advanced lasers & systems and employs 30 years' experience as well as a close partnership with the scientific community. 80 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 30 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

Nanosecond Tunable Wavelength 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
NT260	192–2600 nm	10 kHz	Diode pumped solid state	Narrow linewidth at kHz repetition rate	4
NT230	192–2600 nm	100 Hz	Diode pumped solid state	High, up to 15 mJ pulse energy from OPO	8
NT240	210–2600 nm	1000 Hz	Diode pumped solid state	Broadly tunable kHz pulsed DPSS lasers	12
NT250	335–2600 nm	1000 Hz	Diode pumped solid state	UV-NIR range DPSS lasers	16
NT270	2500–4475 nm	1000 Hz	Diode pumped solid state	Wide IR tuning range at kHz repetition rate	19
NT340	192–4400 nm	20 Hz	Flash-lamp pump laser	Wide range of modifications to tailor for specific applications	22

NT260 SERIES

Narrow Linewidth 10 kHz Tunable Lasers

BENEFITS

- *Hands-free wavelength tuning – no need for physical intervention*
- *High 10 kHz pulse repetition rate – fast data collection*
- *Narrow linewidth (~2 times better than traditional OPO) – high resolution of recorded spectrum*
- *Small M2 beam parameter (~2 times better than traditional OPO) – tight focusing of the beam*
- *Excellent stability (~2 times better than traditional OPO) – fast acquisition of data*
- *Lower generation threshold – increased reliability*
- *Motorized output shutters – increased safety*
- *Clean air purging for prolonged lifetime of optics*
- *Wavelength set in nm and cm^{-1} – easy operation of experiment*
- *High tuning resolution 1-2 cm^{-1} – high quality spectra*
- *Variety of control interfaces: USB, RS232, LAN and WLAN – easy integration with other equipment*
- *PC control using text commands – simple control from any OS*

FEATURES

- *Pioneering patented Q-switched/ mode-locked operation technology*
- *Hands-free no gap wavelength tuning in 192 – 2600 nm range*
- *10 kHz repetition rate*
- *Up to 0.7 W output*
- *Down to 1.5 cm^{-1} linewidth*
- *Integrated monitoring of pump and output power*
- *Integrated fast wavelength scan*
- *Monolithic rugged frame*
- *Transportation handles*
- *Flexible control from keypad or PC*
- *Two years warranty*

APPLICATIONS

- *Metrology & equipment calibration*
- *Alignment of a hyperspectral camera*
- *Time-of-flight mass spectrometry (TOF)*
- *Semiconductor inspection*
- *Evaluation of optical filters*
- *Photoacoustic microscopy*
- *Laser-induced luminescence spectroscopy*
- *Environment monitoring, LIDAR*

NT262 is a unique narrow linewidth 10 kHz OPO. Pioneering patented technology enables powerful up to 0.7 W output in 192 – 2600 nm wavelengths range while maintaining < 3 cm^{-1} (typically < 2 cm^{-1} at most wavelengths) linewidth that is highly beneficial for traditional and specific applications requiring narrow linewidth and high spectral brightness pulses. Thus, besides the most of popular applications, like fluorescence and pump-probe, the system is also suitable for such demanding applications where high resolution and narrow linewidth are required, like the calibration of detectors and spectroradiometers, metrology or gas spectroscopy. High 10 kHz repetition rate and hands-free wavelength tuning makes easy and fast experiment data collection as never before. The system is highly stable, ensures excellent short and long-term energy and power stability, has smaller M^2 value if compared with traditional OPO systems.

In addition to superior specifications, the laser is highly reliable due to low generation threshold and easy running regime. The system fits into monolithic, rugged housing that ensure high reliability and low costs of maintenance.

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SPECIFICATIONS [1]

Model	NT262
OPO	
Wavelength range [2]	
Signal	405 – 710 nm
Idler	710 – 2600 nm
SH/SF generator (optional)	210 – 405 nm
DUV generator (optional)	192 – 210 nm
Output pulse energy/ average power	
OPO [3]	70 µJ / 700 mW
SH/SF generator (optional) [4]	6 µJ / 60 mW
DUV generator (optional) [5]	1 µJ / 1 mW
Minimal tuning step	
Signal (405 – 710 nm)	1 cm^{-1}
Idler (710 – 2600 nm)	1 cm^{-1}
SH/SF (210 – 405 nm)	2 cm^{-1}
DUV (192 – 210 nm)	2 cm^{-1}
Pulse and beam parameters	
Pulse duration [6]	~7 ns
Linewidth [7]	<3 cm^{-1}
Typical beam diameter [8]	4.5 mm × 2.5 mm
Beam pointing stability [9]	≤ 50 µrad RMS
Polarization	
Signal beam	Horizontal
Idler beam	Horizontal
SH/SF	Horizontal
DUV	Vertical
PUMP LASER [10]	
Pump wavelength	355 nm
Typical pump pulse energy	0.3 mJ
Pulse duration	~7 ns
Beam quality	Near Gaussian in near and far fields
Beam divergence	< 1.5 mrad
Pulse energy stability (StdDev)	< 2.5 %
Pulse repetition rate	10 kHz
Nominal lifetime for pump diodes	20 000 hours
Typical warm-up time [11]	15 min
PHYSICAL CHARACTERISTICS	
Laser head size (W × L × H)	400 × 790 × 166 ± 3 mm
Power supply unit size (W × L × H)	553 × 510 × 529 ±3 mm
Umbilical length	3 m
OPERATING REQUIREMENTS	
Cooling [12]	Built-in chiller
Clean air purge	Built-in
Room temperature	18 – 27 °C
Ambient temperature stability	±2°C
Relative humidity	20 – 80 % (non-condensing)
Power requirements	100 – 240 VAC, single phase 50/60 Hz
Power consumption	<1 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.

2) Hands-free tuning range is from 210 nm to 2600 nm. Wavelengths values at margins are rounded.

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

4) Measured at 230 nm. See tuning curves for typical outputs at other wavelengths.

5) Measured at the peak of tuning curve. See tuning curves for typical outputs at other wavelengths.

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

7) In signal and idler range. Linewidth is <5 cm^{-1} for 210 – 480 nm range.

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

9) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element.

10) Laser output will be optimized for OPO operation and specifications may vary with each unit we manufacture.

11) Starting from 22 ºC and stand-by mode.

12) Air cooled. Water cooled under request.

Note: The laser and auxiliary units must be settled in such a place void of dust and aerosols. It is advisable to operate the laser in air conditioned room, provided that the laser is placed at a distance from air conditioning outlets. The laser should be positioned on a solid and flat worktable in horizontal position. Access from one side should be ensured. Intensive sources of vibration should be avoided near the laboratory (ex. railway station or similar).

OPTIONS

Option	Features
-SH/SF	Tuning range extension in 210 – 405 nm range by combining second harmonics and sum-frequency generator outputs for maximum possible pulse energy
-DUV	Deep UV option for 192 – 210 nm range output
-FC	Fiber coupled output in 350 – 2000 nm range
-ATTN	Attenuator output in 210 – 2600 nm range
-SCU	Spectral filtering accessory for improved spectral purity of pulses

PERFORMANCE

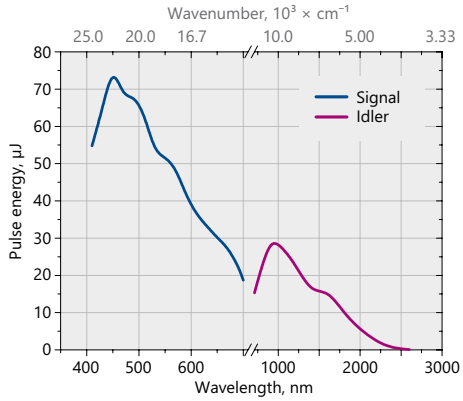

Fig 1. Typical (smoothed) NT262 laser tuning curves in signal (405 – 710 nm), idler (710 – 2600 nm) ranges

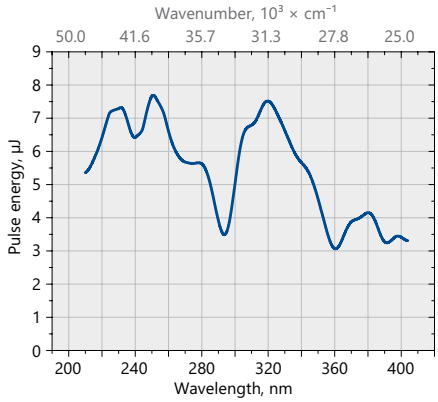

Fig 2. Typical (smoothed) NT262 laser output with –SH/SF option (210 – 405 nm) range

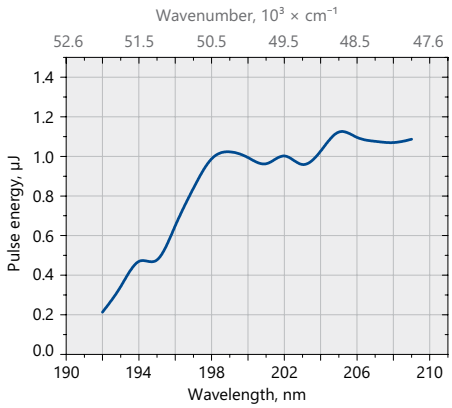

Fig 3. Typical (smoothed) NT262 laser output with –DUV option (192 – 210 nm) range

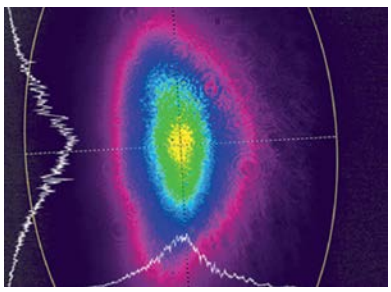

Fig 4. NT262 series laser beam profile at 450 nm in near field

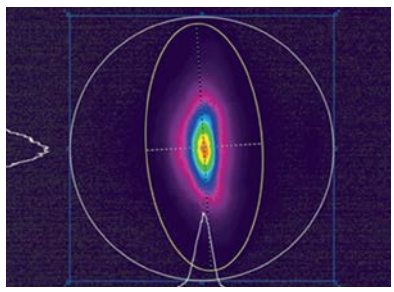

Fig 5. NT262 series laser beam profile at 450 nm in far field

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OUTLINE DRAWINGS

Fig 5. For easier transportation and integration NT262 features removable handles

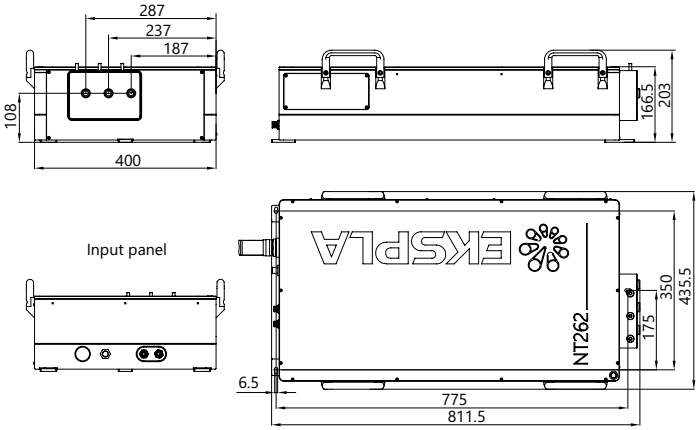


Fig 6. NT262 series laser head dimensions (without options)

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.

NT262-SH/SF-FC-ATTN

Model

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

Options:
FC → fiber coupled output
ATTN → attenuator output
SCU → spectral filtering accessory
H → extra 1064 nm output

NT230 SERIES

High Energy Broadly Tunable DPSS Lasers

BENEFITS

- *Hands-free wavelength tuning – no need for physical intervention*
- *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*
- *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

- *Customers recognized reliability*
- *Two years warranty*
- *Integrates DPSS pump laser and OPO into a single housing*
- *Hands-free no-gap wavelength tuning **from 192 to 2600 nm****
- *Up to **15 mJ** pulse energy from OPO*
- *Up to **100 Hz** pulse repetition rate*
- *Up to **2 mJ** output pulse energy **in UV***
- *Less than **5 cm^{-1}** linewidth*
- ***2–5 ns** pulse duration*
- *Electromechanical output shutters*
- *Transportation handles*
- *355 nm & 1064 nm laser outputs*
- *532 nm output (optional)*
- *Remote control via key pad or PC*

** Automatic wavelength scan is programmable*

APPLICATIONS

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

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. 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.

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	0.4 mJ	0.27 mJ
Pulse repetition rate	50 Hz	100 Hz
Pulse duration [5]	2–5 ns	
Linewidth [6]	<5 cm^{-1}	
Minimal tuning step [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 × 705 × 172 mm	
Power supply size (W × L × H)	449 × 376 × 140 mm	
External chiller	inquire	
Umbilical length	2.5 m	
OPERATING REQUIREMENTS		
Cooling	external chiller	
Room temperature	18–30 °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.

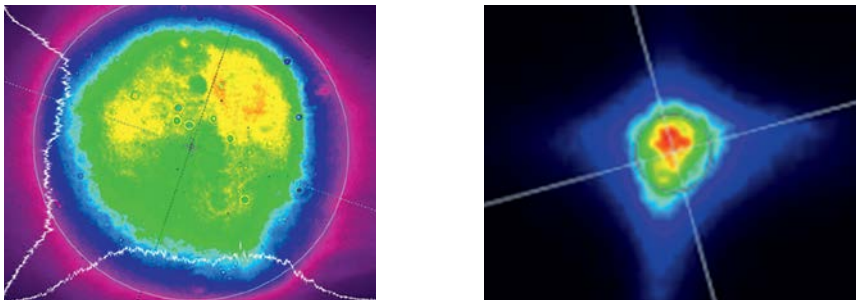
10) Separate output port for the fundamental and 3rd harmonic beam is standard. Output ports for other harmonic are optional.

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
-2H	532 nm output
-FC	Fiber coupled output in 350–2000 nm range
-ATTN	Attenuator output in 350–2600 nm range
-SCU	Spectral filtering accessory for improved spectral purity of pulses
-FWS	Fast wavelength scanning for signal or idler ranges, wavelength shift time <30 ms

PERFORMANCE



Near field Far field

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

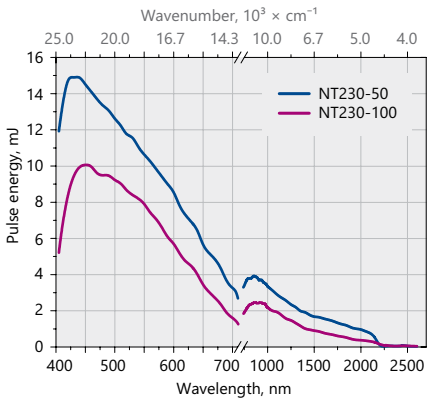


Fig 2. Typical output pulse energy of NT230 laser

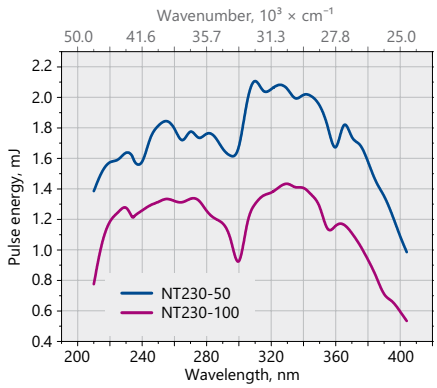


Fig 3. Typical output pulse energy of NT230 laser with SH/SF extension

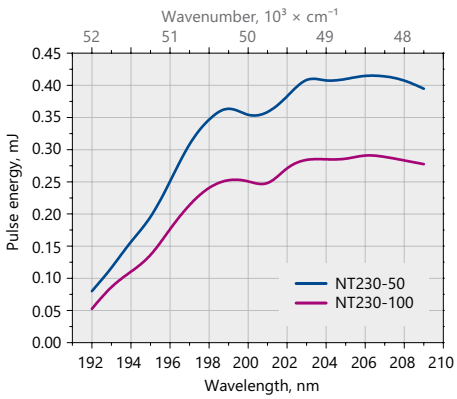


Fig 4. Typical output pulse energy of NT230 laser with DUV extension

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OUTLINE DRAWINGS

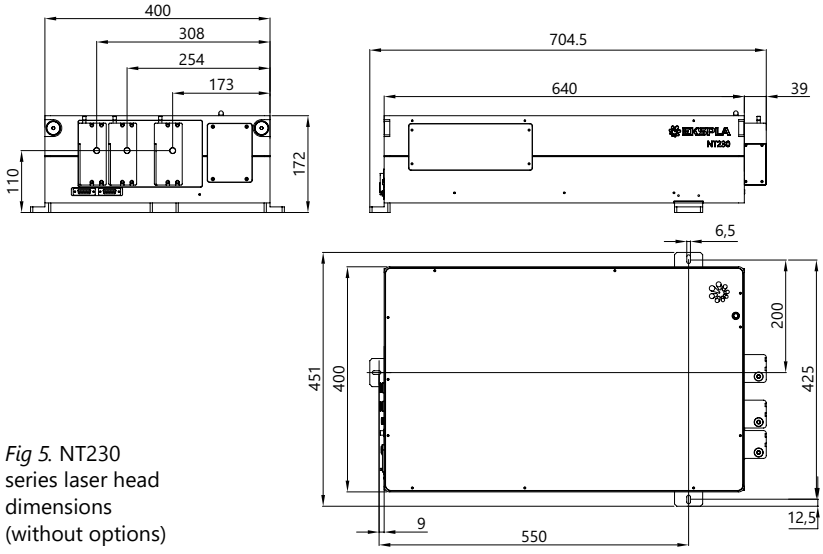


Fig 5. NT230 series laser head dimensions (without options)

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

Prism award nominee

NT240 SERIES

Broadly Tunable kHz Pulsed DPSS Lasers

BENEFITS

- *Hands-free wavelength tuning – no need for physical intervention*
- *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

- *Customers recognized reliability*
- *Two years warranty*
- *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*

** Automatic wavelength scan is programmable*

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}			
Minimal tuning step [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.

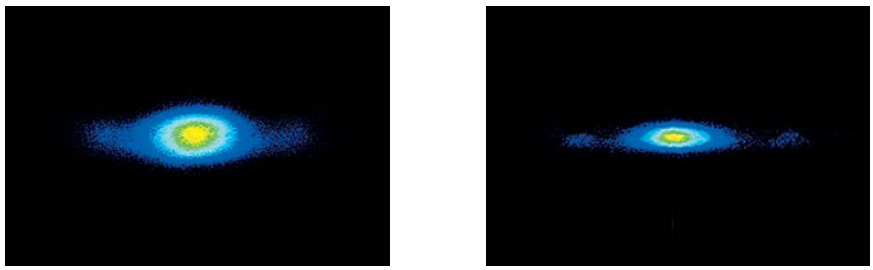
7) Separate output port for the 3rd and other harmonic is optional.

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 coupled output in 350 – 2000 nm range
-Attn	Attenuator output in 210 – 2600 nm range

PERFORMANCE



Near field Far field

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

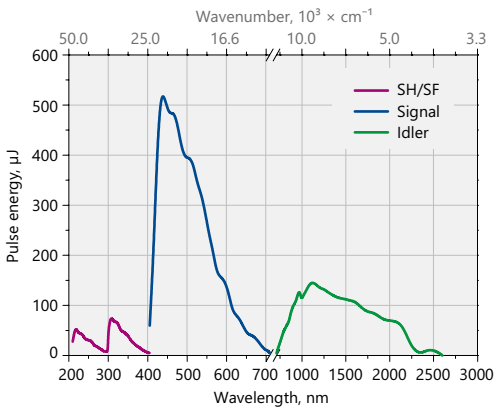


Fig 2. Typical output pulse energy of NT242 series tunable laser

OUTLINE DRAWINGS

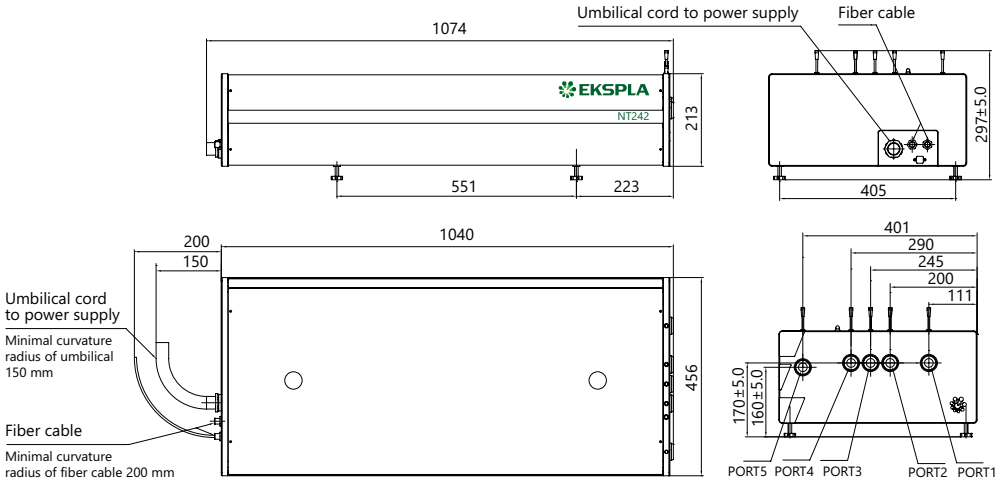


Fig 3. NT242 series laser head dimensions

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

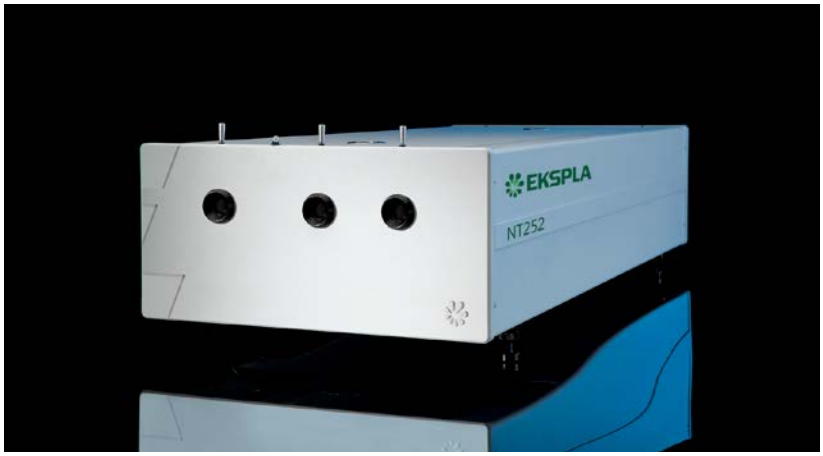
Model

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

- *Customers recognized reliability*
- *Two years warranty*
- *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*

** Automatic wavelength scan is programmable*

BENEFITS

- *Hands-free wavelength tuning – no need for physical intervention*
- *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 coupled output in 350 – 2000 nm range
-Attn	Attenuator output in 335 – 2600 nm range

SPECIFICATIONS [1]

Model	NT252
OPO	
Wavelength range	
Signal	670–1064 nm
Idler	1065–2600 nm
SH	335–669 nm
Pulse energy	
OPO [2]	1100 µJ
SH [3]	200 µJ
Pulse duration [4]	1–4 ns
Pulse repetition rate	1000 Hz
Linewidth [5]	<10 cm^{-1}
Minimal tuning step [6]	
Signal	1 cm^{-1}
Idler	1 cm^{-1}
SH	2 cm^{-1}
Polarization	
Signal	horizontal
Idler	vertical
SH	horizontal
Typical beam diameter [7] [8]	3 × 6 mm
PUMP LASER	
Pump wavelength [9]	532 nm
Typical pump pulse energy [10]	4 mJ
Pulse duration [11]	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) Measured at FWHM level with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.

5) In signal and idler range.

6) 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.

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

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

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

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

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

PERFORMANCE

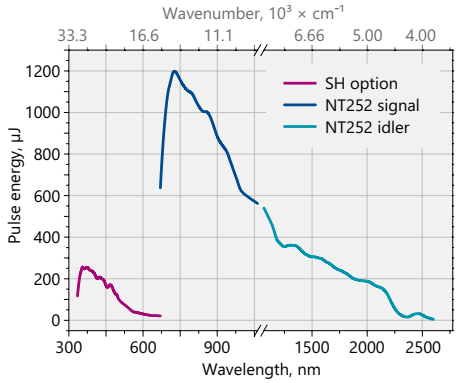


Fig 1. Typical output pulse energy of the NT252-SH tunable laser

OUTLINE DRAWINGS

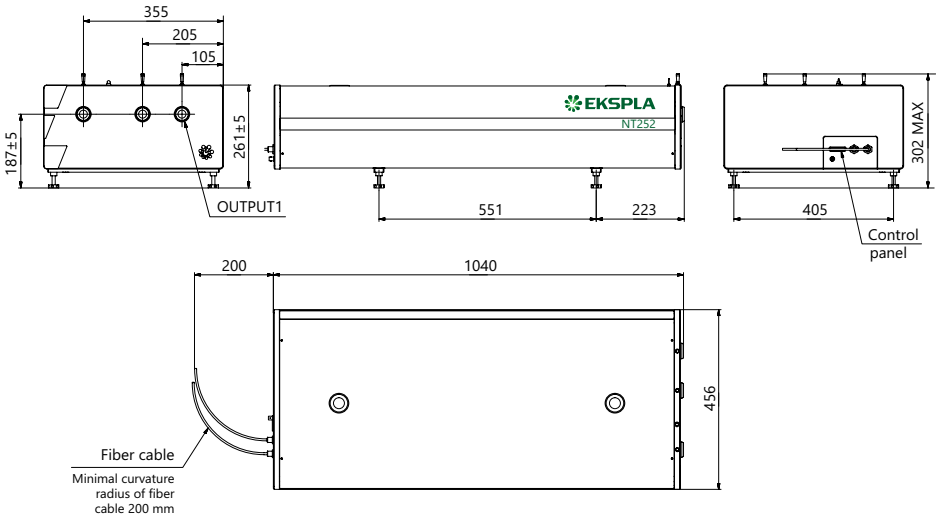


Fig 3. NT252 series laser head dimensions

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

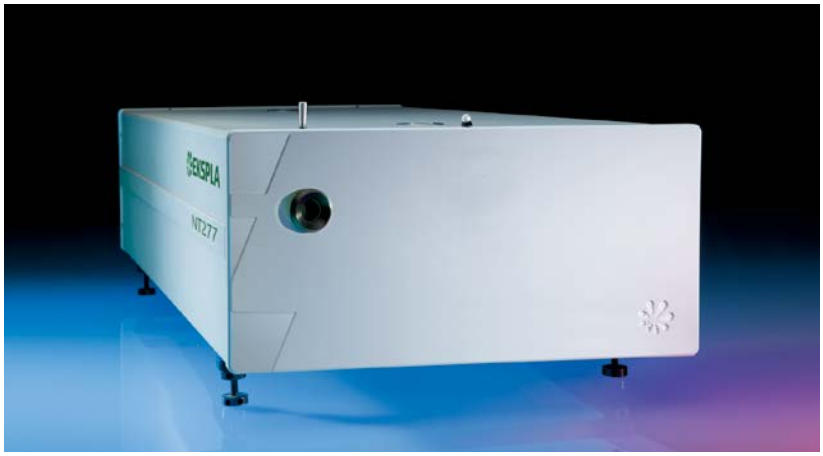
Model

Optional tuning range extension:
SH → 335–670 nm

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

NT270 SERIES

Tunable Wavelength NIR-MIR Range DPSS Lasers



FEATURES

- *Customers recognized reliability*
- *Two years warranty*
- *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 **4475 nm***
- *Narrow linewidth*
- *Hands-free, fast wavelength tuning**
- ***<7 ns** pulse duration*
- *Remote control via key pad or PC*

* *Including automatic wavelength scan*

BENEFITS

- *Hands-free wavelength tuning – no need for physical intervention*
- *Wide (2500 – 4475 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.

SPECIFICATIONS [1]

Model	NT277
OPO	
Wavelength range [2]	
Idler	2500 – 4475 nm
Pulse energy [3]	
Idler	80 µJ at 3000 nm
Pulse duration [4]	5 – 7 ns
Pulse repetition rate	1000 Hz
Linewidth [5]	<10 cm^{-1}
Minimal tuning step [6]	
Idler	1 cm^{-1}
Polarization	vertical
Typical beam diameter [7] [8]	4 mm
PUMP LASER	
Pump wavelength	1064 nm
Typical pump pulse energy [9]	1.9 mJ
Pulse duration [10]	<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)	449 × 376 × 140 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 and for basic system without options.

2) Available wavelength range. Inquire for custom IR option with tuning up to 12 µm.

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

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

5) 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.

6) For manual input from PC. When wavelength is controlled from keypad, tuning resolution is 1 nm.

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

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

9) 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.

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

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.

PERFORMANCE

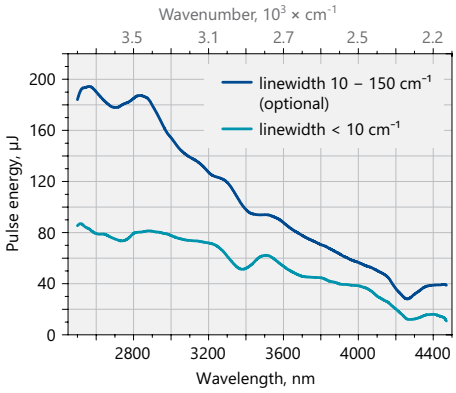


Fig 1. Typical output pulse energy of the NT277 and NT277-XIR tunable laser

OUTLINE DRAWINGS

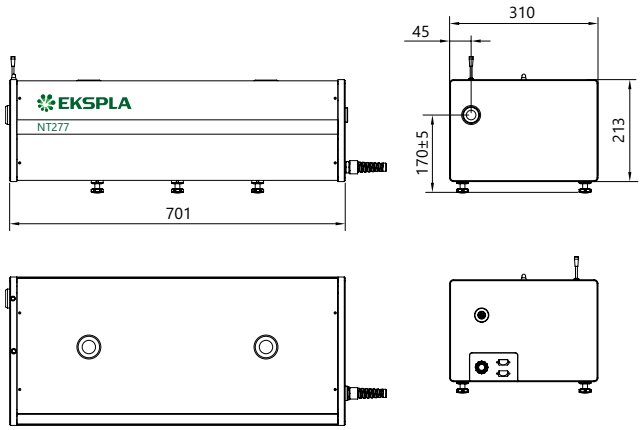
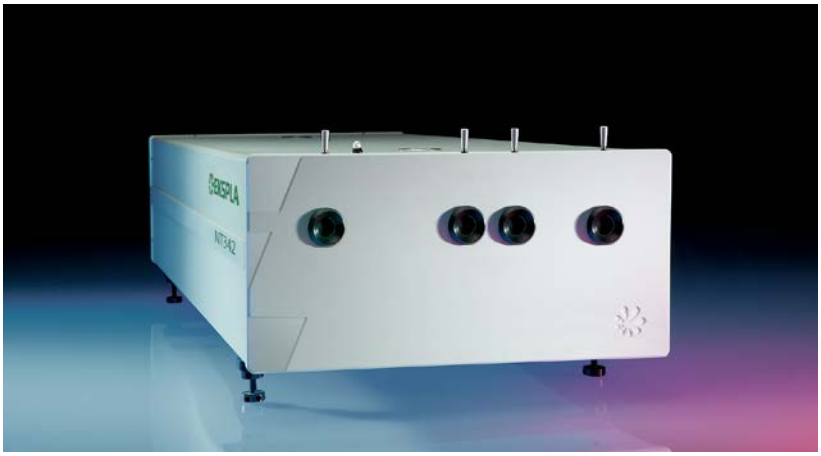


Fig 3. NT277 series laser head dimensions

A dream box with the widest tuning in the market

NT340 SERIES

High Energy Broadly Tunable Lasers



BENEFITS

- *Hands-free wavelength tuning – no need for physical intervention*
- *The system is widely tunable 192 – 4400 nm and delivers high pulse energy (up to 90 mJ) that allows the investigation of an extensive range of materials*
- *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

- *Customers recognized reliability*
- *Two years warranty*
- *Hands-free no gap wavelength tuning from **192** to **4400 nm** **
- *Up to **90 mJ** pulse energy in visible spectral range*
- *Up to **15 mJ** pulse energy in UV spectral range*
- *Up to **20 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*

** Automatic wavelength scan is programmable*

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. 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.

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*

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REV. 250306

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 output in 350–2600 nm range
-H, -2H	Separate shared output port for pump laser harmonic (532 or 1064 nm wavelengths)
-AW	Air cooled power supply
-FWS	Fast wavelength scanning option for all ranges (excluding between ranges), wavelength shift on laser shot

SPECIFICATIONS [1]

Model	NT342B	NT342C	NT342E
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)	n/a	2500–4400 nm	n/a
Output pulse energy			
OPO [4]	30 mJ	60 mJ	90 mJ
SH generator (optional) [5]	4 mJ	6.5 mJ	10 mJ
SH/SF generator (optional) [6]	6 mJ	10 mJ	15 mJ
DUV generator (optional) [7]	0.6 mJ	1.2 mJ	2 mJ
MIR generator (optional) [8]	n/a	20 mJ	n/a
Linewidth		< 5 cm^{-1} [9]	
Minimal tuning step [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)	n/a	1 cm^{-1}	n/a
Pulse duration [11]		3–5 ns	
Typical beam diameter [12]	5 mm	8 mm	10 mm
Typical beam divergence [13]		< 2 mrad	
Polarization			
Signal		horizontal	
Idler		vertical	
SH/SF		horizontal	
DUV		vertical	
MIR	n/a	horizontal	n/a

SPECIFICATIONS [1]

Model	NT342B	NT342C	NT342E
PUMP LASER [14]			
Pump wavelength	355 nm		
Typical pump pulse energy	100 mJ	150 mJ	250 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. Up to 2500 nm idler tuning with MIR option.

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 2700 nm. See tuning curves for typical outputs at other wavelengths.

9) Linewidth is <8 cm^{-1} for 210–410 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.

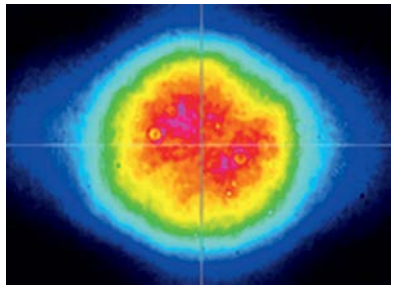

Fig 1. NT340 series laser typical beam profile at 450 nm after ~1.5 m distance from output

PERFORMANCE

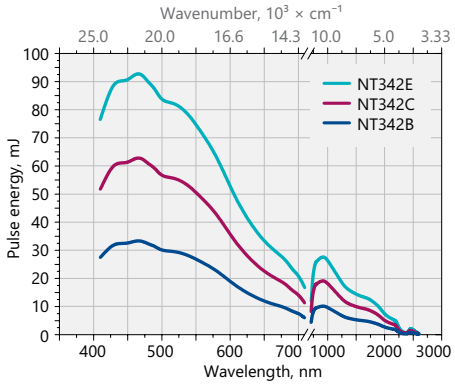

Fig 2. Typical output energy of the NT340 series tunable wavelength systems

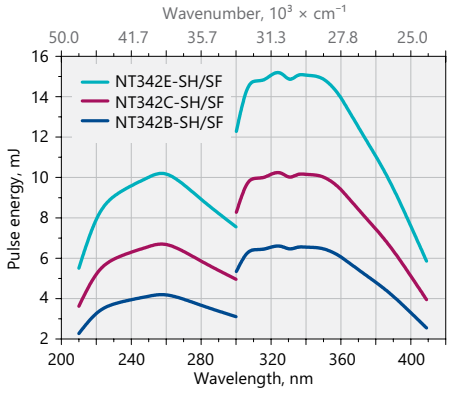

Fig 3. Typical output energy of the NT340 series tunable wavelength systems with SH/SF extension

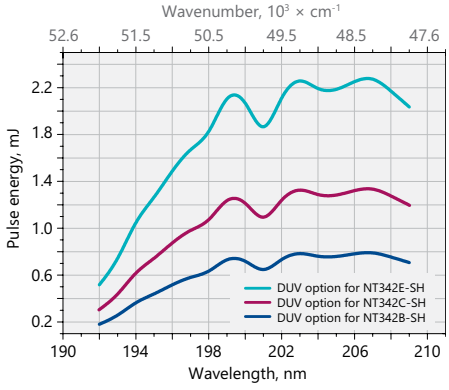

Fig 4. Typical output energy of the NT340 series tunable wavelength systems with SH/DUV extension

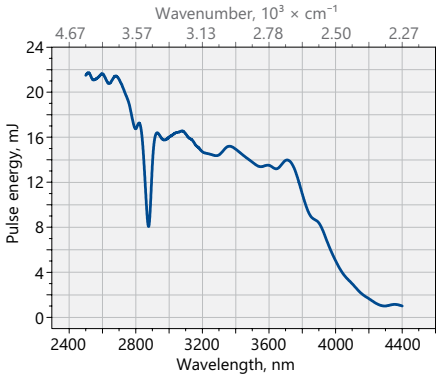

Fig 5. Typical output energy of the NT340 series tunable wavelength systems with MIR extension

OUTLINE DRAWINGS

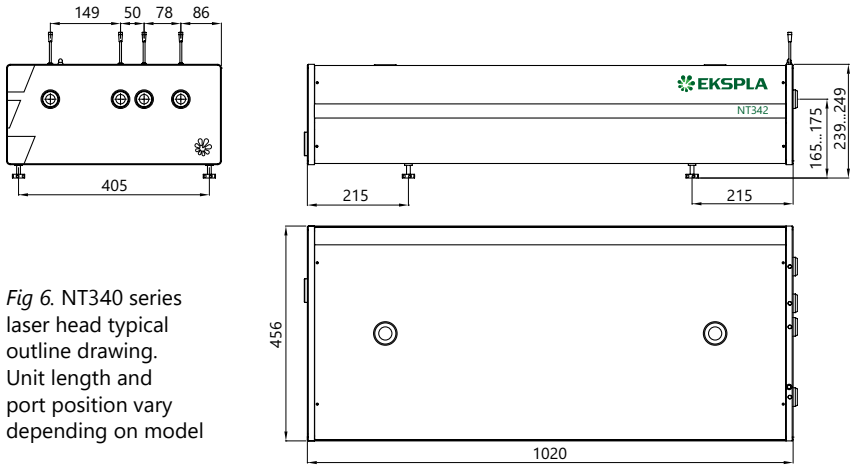

Fig 6. NT340 series laser head typical outline drawing. Unit length and port position vary depending on model

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.

NT342C-SH-10-AW-H/2H

Model

Output pulse energy:
B → 30 mJ
C → 50 mJ
E → 90 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

Nanosecond Lasers

Short pulse duration, wide range of customization options and high stability are distinctive features of EKSPLA nanosecond lasers. Employing latest achievements in laser technologies, team of dedicated engineers designed wide range of products tailored for specific applications: from compact, simple and robust DPSS NL200 series lasers for OEM manufacturers to high energy customized flash-lamp or diode pumped multijoule systems for research laboratories.

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

Second (532 nm), third (355 nm), fourth (266 nm) and fifth (213 nm) (where available) harmonic options combined with various accessories and customization possibilities make these lasers well suited for many OEM and laboratory applications like OPO, OPCPA, Ti:Sapphire and dye laser pumping, spectroscopy, remote sensing, plasma research ...

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	Max. pulse energy at fundamental wavelength	Repetition rate, up to	Pumping	Pulse duration	Special feature	Page
NL200	4 mJ at 1064 nm	10 – 2500 Hz	Diode pumped solid state	<10 ns	Compact and robust	28
NL230	190 mJ at 1064 nm	100 Hz	Diode pumped solid state	3–6 ns	Diode pumped only	31
NL300	1100 mJ at 1064 nm	20 Hz	Flash-lamp pumped	3–6 ns	Versatile, compact nanosecond laser	34

World leading reliability

NL200 SERIES

Compact Q-switched DPSS Lasers

BENEFITS

- *Continuous tuning of repetition rate while maintaining constant pulse energy, superior beam pointing and energy stability make the laser the first choice for micromachining, marking, thin film removing applications*
- *Close to Gaussian smooth beam profile with low value $M^2 < 1.3$ and good focusability is beneficial for such applications, as LCD and OLED display repair*
- *Compactness and lightness make a laser easy transportable, saves on valuable laboratory space*
- *Fast wavelength selection is superior for applications where alternating wavelengths are required, like material ablation, LIBS*
- *Air cooling, cheap and reliable end-pumping technology, amplifiers free DPSS design guarantee easy operation and alignment of laser, simple installation and low life-time ownership cost*
- *Variety of control interfaces USB, RS232, LAN, WLAN ensure easy control and integration of laser with laboratory or OEM equipment*

FEATURES

- *Customers recognized reliability*
- *Two years warranty*
- *Up to **4 mJ** pulse energy at **1064 nm***
- *Up to **2500 Hz** variable repetition rate*
- ***532 nm, 355 nm, 266 nm, 213 nm** wavelengths as standard options*
- ***<10 ns** pulse duration at 1064 nm*
- *Electro-optical Q-switching*
- *Turn-key operation*
- *Rugged sealed cavity*
- *Compact size*
- *Simple and robust*
- *Air cooled*
- *External TTL triggering*
- *Remote control via keypad and/or any controller running on any OS using REST API commands*

APPLICATIONS

- *Material processing*
- *LCD and OLED display panel repair*
- *Marking*
- *Micromachining*
- *Engraving*
- *Laser deposition*
- *Laser cleaning*
- *Ablation*
- *Spectroscopy*
- *OPO pumping*
- *Remote sensing*

NL200 series DPSS air-cooled nanosecond lasers offer high pulse energy at kHz repetition rates. End-pumped design makes this laser compact and easy to integrate into various laser equipment both industrial and R&D. Featuring short nanosecond pulse duration, variable repetition rate and external TTL triggering, nanosecond diode pumped NL200 series Q-switched lasers are excellent and cost-effective sources for specific applications, when higher pulse energy is required, like material processing, LCD and OLED display panel repair, ablation, marking, engraving, laser cleaning, laser deposition and many more.

This laser can be equipped with harmonic generation modules for 532 nm, 355 nm, 266 nm and 213 nm wavelengths. Excellent energy stability and a wide range of wavelength options make this laser a perfect tool for spectroscopy, photoacoustic imaging and remote sensing applications. The mechanically stable and hermetically sealed design ensures reliable operation and long lifetime of the laser components.

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SPECIFICATIONS [1]

Model [2]	NL201 [3]	NL202 [4]	NL204 [4]
Pulse energy			
at 1064 nm	0.9 mJ	2.0 mJ	4.0 mJ
at 532 nm	0.3 mJ	0.9 mJ	2.0 mJ
at 355 nm	0.2 mJ	0.6 mJ	1.3 mJ
at 266 nm	0.08 mJ	0.2 mJ	0.6 mJ
at 213 nm	0.04 mJ	0.1 mJ	0.2 mJ
Pulse to pulse energy stability (StdDev) [5]			
at 1064 nm	<0.5 %		
at 532 nm	<2.5 %		
at 355 nm	<3.5 %		
at 266 nm	<4 %		
at 213 nm	<5 %		
Typical pulse duration [6]	7 – 10 ns		
Power drift [7]	± 2 %		
Pulse repetition rate	0–2500 Hz	0–1000 Hz	
Beam spatial profile	close to Gaussian in near and far fields		
Ellipticity	0.9–1.1 at 1064 nm		
M^2	<1.3		
Beam divergence [8]	<3 mrad		
Polarization	linear		
Typical beam diameter [9]	0.7 mm		
Beam pointing stability (RMS) [10]	≤10 µrad		
Optical jitter (StdDev) [11]	<0.5 ns		

PHYSICAL CHARACTERISTICS	
Laser head (W × L × H) [12]	164 × 320 × 93 mm
Power supply unit (W × L × H)	470 × 390 × 140 mm
Umbilical length	3 m

OPERATING REQUIREMENTS	
Cooling	air cooled
Ambient temperature	18–30 °C
Realtive humidity	20–80 % (non-condensing)
Power requirements	100–240 V AC, single phase, 50/60 Hz
Power consumption	<600 W
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 1064 nm and maximal pulse repetition rate and for basic system without options.

2) Please indicate clearly if 1064 nm output is required in case harmonics options are ordered (except H200STHC module). In such a case, the energy of 1064 nm is optimized for harmonics generation and may differ from specified in the table.

3) Unless stated otherwise all specifications are measured at 2500 Hz pulse repetition rate.

4) Unless stated otherwise all specifications are measured at 1000 Hz pulse repetition rate.

5) Averaged from pulses emitted during 30 sec time interval.

6) FWHM at 1064 nm.

7) Measured over 8 hours period after 20 min warm-up when ambient temperature variation is less than ± 2 °C and humidity <± 5%.

8) Full angle measured at the $1/e^2$ level at 1064 nm.

9) Beam diameter is measured at 1064 nm at the $1/e^2$ level.

10) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element.

11) With respect to QSW IN or SYNC OUT pulse.

12) Without optional harmonic module.

PERFORMANCE

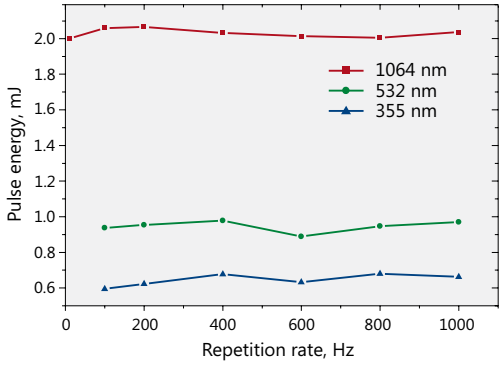


Fig 1. Typical performance data of model NL202 laser

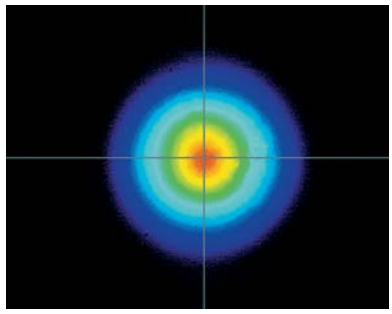


Fig 2. Typical beam intensity profile in the far field

OUTLINE DRAWINGS

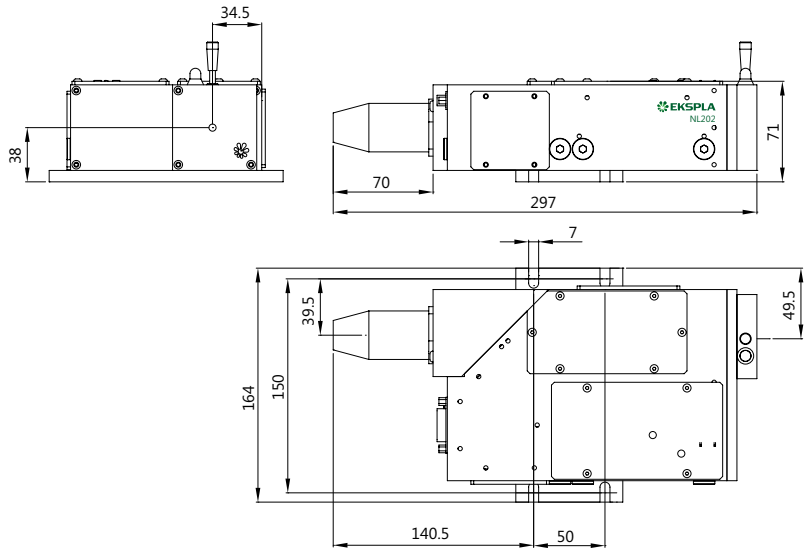


Fig 3. NL202 laser head drawing

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.

NL201-H200SHC

Model

Harmonic generator options:
H200SHC → second harmonic
H200THC → third harmonic
H200FHC → fourth harmonic

NL230 SERIES

High Energy Q-switched DPSS Nd:YAG Lasers

BENEFITS

- *Short duration 3 – 6 ns pulses ensures strong interaction with material, are highly suitable for LIBS*
- *User selectable wavelength single axis output is superior for experiments, where alternating wavelengths are required, like material ablation, LIBS*
- *Rugged, monolithic design enables laser usage in hash environment*
- *Diode pumped design provides quiet operation, eliminates the irritation of flash light*
- *Variety of interfaces USB, RS232, LAN, WLAN ensures easy control and integration with other equipment*

FEATURES

- *Customers recognized reliability*
- *Two years warranty*
- *Diode-pumped*
- *Rugged sealed laser cavity*
- *Up to **190 mJ** at **1064 nm** pulse energy*
- *Up to **100 Hz** pulse repetition rate*
- *Short pulse duration in the **3–6 ns** range*
- *Variable reflectivity output coupler for low-divergence beam*
- *Quiet operation: no more flashlamp firing sound*
- *Remote control via keypad and/or any controller running on any OS using REST API commands*
- *Optional temperature-stabilized second and third harmonic generators*
- *Electromechanical shutter (optional)*
- *Easy replaceable output window*

The NL230 series diode-pumped short nanosecond lasers are designed to produce high-intensity, high-brightness pulses and are targeted for applications such as material ablation, Light Detection And Ranging (LIDAR), remote sensing, mass spectroscopy, OPO, Ti:Sapphire or dye laser pumping and many more. Diode pumping allows maintenance-free laser operation for an extended period of time - more than 3 years for an estimated eight working hours per day.

Because laser head components are placed in a robust, sealed and precisely machined monolithic aluminium block, this laser can reliably work in a harsh industrial environment with applications such as laser-induced breakdown spectroscopy (LIBS).

Second and third harmonic options allows for an expanded range of applications, where high pulse energy and high pulse to pulse stability are required.

For easy and seamless control and integration with other industrial equipment, the NL230 series laser is equipped with USB/RS232 interfaces and can be externally triggered with a jitter as low as < 0.5 ns StDev.

NL230 series lasers are designed to work reliably 24/7 in an industrial environment.

APPLICATIONS

- *LIBS (Light Induced Breakdown Spectroscopy)*
- *Material ablation*
- *OPO pumping*
- *Remote Sensing*
- *LIDAR (Light Detection And Ranging)*
- *Mass Spectroscopy*
- *LIF (Light Induced Fluorescence)*

SPECIFICATIONS [1]

Model	NL231-50	NL231-100
Pulse energy (not less than) [2]		
at 1064 nm	190 mJ	150 mJ
at 532 nm	110 mJ	90 mJ
at 355 nm	55 mJ	40 mJ
at 266 nm	3 mJ	1.2 mJ
Pulse energy stability (StdDev) [3]		
at 1064 nm	< 1 %	
at 532 nm	< 2.5 %	
at 355 nm	< 3.5 %	
at 266 nm	< 5 %	
Pulse repetition rate	50 Hz	100 Hz
Power drift [4]	< ±3 %	
Pulse duration [5]	3 – 6 ns	
Linewidth	< 1 cm^{-1} at 1064 nm	
Beam profile [6]	"Top Hat" in near field and close to Gaussian in far field	
Beam divergence [7]	< 0.8 mrad	
Beam pointing stability (RMS) [8]	≤ 60 µrad	
Polarization	linear, > 90 % at 1064 nm	
Typical beam diameter [9]	5 mm	
Optical pulse jitter (StDev)		
Internal triggering regime	< 0.5 ns	
External triggering regime	< 0.5 ns	
Typical warm-up time	10 min	
PHYSICAL CHARACTERISTICS		
Laser head size (W × L × H)	251 × 290 × 167 ± 3 mm	
Power supply unit (W × L × H)		
Desktop case	449 × 390 × 140 ± 3 mm	
19" module	483 × 390 × 140 ± 3 mm	
External chiller	inquire	
Umbilical length	3 m	
OPERATING REQUIREMENTS		
Cooling (air cooled) [10]	external chiller	
Ambient temperature	18–30 °C	
Relative humidity (non-condensing)	20–80 %	
Power requirements	100–240 V AC, single phase, 50/60 Hz	
Power consumption	< 1.0 kW	
Cleanliness of the room	not worse than ISO Class 9	

1) Due to continuous improvement, all specifications are subject to change. The parameters marked typical may vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 1064 nm and for basic system without options.

2) Outputs are not simultaneous. Inquire for higher energy (up to 350 mJ at 50 Hz, 250 mJ at 100 Hz) custom models.

3) Averaged from pulses, emitted during 30 sec time interval.

4) Measured over 8 hours period after 20 min warm-up when ambient temperature variation is less than ± 2 °C and humidity < ± 5%.

5) FWHM.

6) Near field (at the output aperture) TOP HAT fit is >80%.

7) Full angle measured at the $1/e^2$ level.

8) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element.

9) Beam diameter is measured at 1064 nm at the $1/e^2$ level.

10) Adequate room air conditioning should be provided.

PERFORMANCE

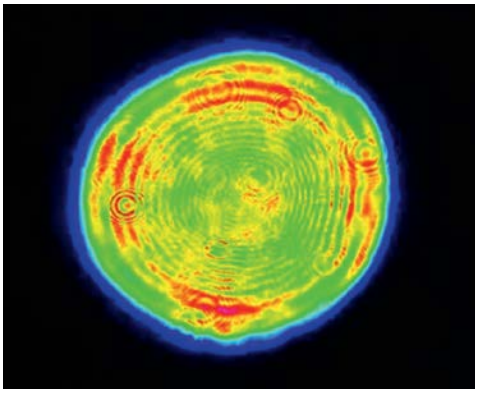


Fig 1. NL230 series laser typical near field beam profile

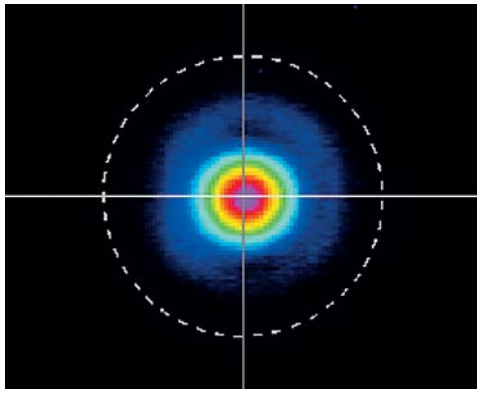


Fig 2. NL230 series laser typical far field beam profile

Measure	P1.ddelay	P2.width	P3.area
value	72.011 ns	5.507 ns	2.358455 mVs
mean	72.044 ns	5.482 ns	2.355738 mVs
min	71.456 ns	5.167 ns	2.277066 mVs
max	72.552 ns	5.970 ns	2.409653 mVs
sdev	156.11 ps	81.27 ps	16.89196 pVs
num	4.697×10^3	4.697×10^3	4.697×10^3

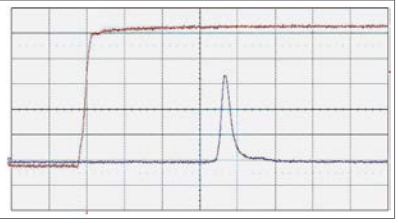


Fig 3. NL230 laser pulse waveform

OUTLINE DRAWINGS

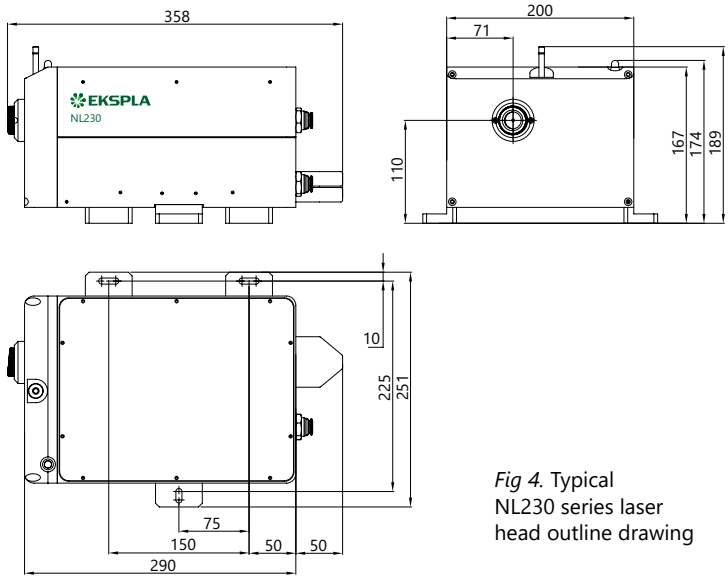


Fig 4. Typical NL230 series laser head outline drawing

ORDERING INFORMATION

NL231-H230THC

Model

Optional harmonic generator modules

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.

NL300 SERIES

Compact Flash-Lamp Pumped Q-switched Nd:YAG Lasers

BENEFITS

- *High pulse energy (up to 1100 mJ at 1064 nm, 700 mJ at 532 nm and 450 mJ at 355 nm) ensures strong interaction with material which is excellent for LIBS and material ablation applications*
- *Cost-effective, single-cavity design with no amplifiers for easy alignment, high reliability and low maintenance costs*
- *Small size saves valuable space in the laboratory room*
- *Fast flashlamp replacement without realignment of laser cavity ensures easy maintenance*
- *Air cooling enables simple installation, easy operation and low maintenance costs*
- *Variety of interfaces: USB, RS232, optional LAN and WLAN ensures easy integration with other equipment*

FEATURES

- *Customers recognized reliability*
- *Two years warranty*
- *Rugged sealed laser cavity*
- *Up to **1100 mJ** pulse energy*
- *Better than 1 % StDev pulse energy stability*
- ***5–20 Hz** pulse repetition rate*
- ***3–6 ns** pulse duration*
- *Thermo stabilized second, third, fourth and fifth harmonic generator modules*
- *Optional attenuators for fundamental and/or harmonic wavelengths*
- *Water-to-water or water-to-air cooling options*
- *Replacement of flashlamps without misalignment of laser cavity*
- *Remote control via keypad and/or RS232/USB port*

APPLICATIONS

- *Material ablation*
- *LIBS (Light Induced Breakdown Spectroscopy)*
- *OPO pumping*
- *Remote Sensing*
- *LIDAR (Light Detection And Ranging)*
- *Mass Spectroscopy*
- *LIF (Light Induced Fluorescence)*

NL300 series electro-optically Q-switched nanosecond Nd:YAG lasers produce high energy pulses with 3–6 ns duration. Pulse repetition rate can be selected in range of 5–20 Hz. NL30×HT models are designed for maximum energy extraction from the active element. Up to 1100 mJ pulse energy can be produced at a 5 Hz pulse repetition rate.

A wide range of harmonic generator modules for generation up to a 5th harmonic is available. Harmonic generators can be combined with attenuators that allow smooth output energy adjustment without changing other laser parameters, i.e. pulse duration, pulse-to-pulse stability, divergence or beam profile. For a more detailed description of harmonic and attenuator modules please check our harmonic generators selection guide on the page 36.

The extremely compact laser head is approximately 480 mm long and can be fitted into tight spaces. The laser power supply has a 330 × 490 mm footprint. Easy access to the water tank from the back side of the power supply facilitates laser maintenance. Replacement of flashlamp does not require removal of pump chamber from the laser cavity and does not lead to possible misalignment.

The powering unit can be configured with water-to-water or water-to-air heat exchangers. The latter option allows for laser operation without the use of tap water for cooling.

For customer convenience the laser can be controlled via PS with LabView™ drivers (included) or a remote control pad. Both options allow easy control of laser settings.

SPECIFICATIONS [1]

Model	NL303HT		NL305HT	
Pulse repetition rate	10 Hz	20 Hz	10 Hz	5 Hz
Pulse energy:				
at 1064 nm	750 mJ	700 mJ	1000 mJ	1100 mJ
at 532 nm [2]	380 mJ	320 mJ	500 mJ	700 mJ
at 355 nm [3]	250 mJ	210 mJ	320 mJ	450 mJ
at 266 nm [4]	80 mJ	60 mJ	100 mJ	120 mJ
at 213 nm [5]	13 mJ	10 mJ	20 mJ	25 mJ
Pulse energy stability (StdDev) [6]				
at 1064 nm	1 %			
at 532 nm	1.5 %			
at 355 nm	3 %			
at 266 nm	3.5 %			
at 213 nm	6 %			
Power drift [7]	±2 %			
Pulse duration [8]	3–6 ns			
Polarization	vertical, >90 %		vertical, >65 %	vertical, >90 %
Optical pulse jitter [9]	<0.5 ns StDev			
Linewidth	<1 cm^{-1}			
Beam profile [10]	Hat-Top in near and near Gaussian in far fields			
Typical beam diameter [11]	~8 mm		~10 mm	
Beam divergence [12]	<0.6 mrad			
Beam pointing stability [13]	50 µrad RMS			
Beam height	68 mm			
PHYSICAL CHARACTERISTICS				
Laser head size (W × L × H) [14]	154 × 475 × 128 mm			
Power supply unit (W × L × H)	330 × 490 × 585 mm			
Umbilical length	2.5 m			
OPERATING REQUIREMENTS				
Water consumption (max 20 °C) [15]	<8 l/min	<12 l/min	<10 l/min	<6 l/min
Ambient temperature	15–30 °C			
Relative humidity	20–80 % (non-condensing)			
Power requirements [16] [17]	208–240 V AC, single phase 50/60 Hz			
Power consumption [18]	<1 kVA	<1.5 kVA	<1.5 kVA	<1 kVA
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 1064 nm and for basic system without options.

2) With H300SH, H300S or H300SHC harmonic generator modules. See harmonic generator selection guide on the page 36 for more detailed information.

3) With H300THC harmonic generator modules. See harmonic generator selection guide on the page 36 for more detailed information.

4) With H300SH and H400FHC harmonic generator modules. See harmonic generator selection guide on the page 36 for more detailed information.

5) With H300FiHC harmonic generator module. See harmonic generator selection guide on the page 36 for more detailed information.

6) Averaged from pulses, emitted during 30 sec time interval.

7) Measured over 8 hours period after 20 min warm-up when ambient temperature variation is less than ± 2 °C and humidity <± 5%.

8) FWHM.

9) With respect to SYNC OUT pulse.

10) Near field (at the output aperture) TOP HAT fit is >70%.

11) Beam diameter is measured at 1064 nm at the $1/e^2$ level.

12) Full angle measured at the $1/e^2$ level.

13) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element.

14) See harmonic generator selection guide on the page 36 for harmonic generators units sizes.

15) For water cooled version. Air cooled version does not require tap water for cooling.

16) Power requirements should be specified when ordering.

17) 110 V AC powering is available, please inquiry for details.

18) Required current rating can be calculated by dividing power value by mains voltage value.

OPTIONS

- **Option -AW** – air-cooled power supply option. An adequate air conditioner should be installed in order to keep room temperature stable.
- **Harmonic generator options** – an extensive selection of harmonic generators up to 5th harmonic.
- **Attenuator options** allow a smooth change of laser pulse energy, while other laser pulse parameters, such as pulse duration, jitter, pulse-to-pulse stability, beam divergence and profile remain the same.

OPTIONAL HARMONIC GENERATOR AND ATTENUATOR MODULES

Module	Description	Output ports	Output pulse energy specifications	Dimensions W×L×H, mm	Extension possible?	Notes
H300A	Attenuator for 1064 nm beam	Port 1: 1064 nm beam	Transmission in 5–90% range at 1064 nm		No	Integrated into a laser head
H300SH	Second harmonic generator	Port 1: 1064, 532 nm	n/d	154×160×128	Yes	
H300S	532 nm beam separator	Port 1: 532 nm Port 2: residual 1064 nm	See NL300 specifications for 532 nm beam	154×160×128	No	Should be used with H300SH
H300SHC	Second harmonic generator with 532 nm beam separator	Port 1: 532 nm Port 2: residual 1064 nm	See NL300 specifications for 532 nm beam	154×210×128	No	
H300SHA	Second harmonic generator, beam separator and attenuator for 532 nm beam	Port 1: 532 nm Port 2: residual 532 nm	Transmission in 5–90% range at 532 nm	154×260×128	No	
H300THC	Third harmonic generator with 355 nm beam separator	Port 1: 355 nm Port 2: residual 1064 & 532 nm	See NL300 specifications for 355 nm beam	154×210×128	No	Should be used with H300SH
H300THA	Third harmonic generator, beam separator and attenuator for 355 nm beam	Port 1: 355 nm Port 2: residual 355 nm	Transmission in 5–90% range at 355 nm	154×260×128	No	Should be used with H300SH
H300FHC	Fourth harmonic generator with 266 nm beam separator	Port 1: 266 nm Port 2: residual 532 nm	See NL300 specifications for 266 nm beam	154×260×128	No	Should be used with H300SH
H300FHA	Fourth harmonic generator, beam separator and attenuator for 266 nm beam	Port 1: 266 nm Port 2: residual 266 nm	Transmission in 5–75% range at 266 nm	154×430×128	No	Should be used with H300SH
H300FiHC	Fifth harmonics generator with 213 nm beam separator	Port 1: 213 nm Port 2: residual 1064, 532 & 266 nm	See NL300 specifications for 213 nm beam	154×350×128	No	

OUTLINE DRAWINGS

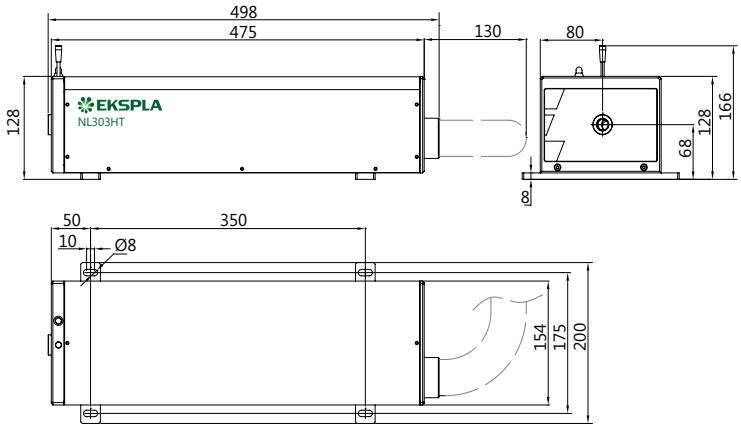


Fig 1. Typical NL300 series laser head outline drawing

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.

NL303HT-10-AW-H300SH-H300THC

- Model
- Pulse repetition rate in Hz
- Options: AW → water-air heat exchanger
- Optional harmonic generator modules and other accessories

HARMONIC GENERATORS & ATTENUATORS

For NL300 Series Lasers

Nanosecond Q-switched lasers enable simple and cost effective laser wavelength conversion to shorter wavelengths through harmonic generation. EKSPLA offers a broad selection of wavelength conversion accessories for NL300 series lasers. The purpose of this guide is to help configure available harmonic generator and attenuator modules for NL300 series lasers for optimal performance.

The harmonic module uses a modular design that allows reconfiguration of laser output for the appropriate experiment wavelength. A typical module houses a non-linear crystal together with a set of dichroic mirrors for separating the harmonic beam from the fundamental wavelength. Nonlinear crystals used for the purpose of wavelength conversion are kept at an elevated temperature in a thermo-stabilized oven.

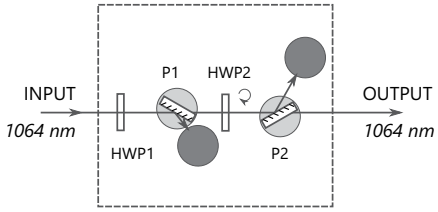
Two or more modules can be joined together for higher harmonic generation: attaching one extra module to a second harmonic generator allows for the generation of 3rd or 4th harmonic wavelengths. It should be noted that only modules with a single output port can be joined together: it is possible to attach a H300S module to a H300SH unit for 532 nm beam separation, or a H300FHC module for 4th harmonic generation (see detailed description below). Modules with two output ports (e.g., H300SHC) cannot be attached to extra units.

FEATURES

- *Compact harmonic modules*
- *Thermo stabilized crystals for long lifetime*
- *Dichroic mirrors*
- *AR coatings on crystals*
- *Phase matching by mechanical adjustment*
- *High conversion efficiency*
- *Wide selection of different configurations*
- *Smooth adjustment of output pulse energy with attenuator*

H300A attenuator

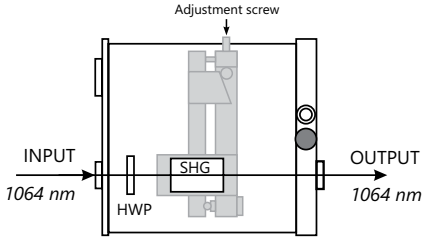
The H300A1 module is integrated into the laser head and designed to attenuate a **1064 nm**. Beam (the length of the laser head extends to 619 mm). Optical layout includes half-wave plates HWP1, HWP2 and polarizers P1, P2. Rotation of the HWP2 half-wave plate changes the polarization of the laser beam and its transmission factor via the P2 polarizer.



H300A

H300SH harmonic generators

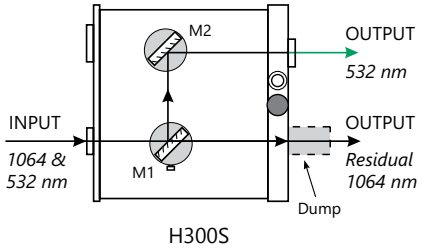
H300SH module contains a SH crystal with a half-wave plate for input polarization adjustment. The output of the H300SH module has both **532 nm** and **1064 nm** wavelengths.



H300SH

H300S harmonic separator

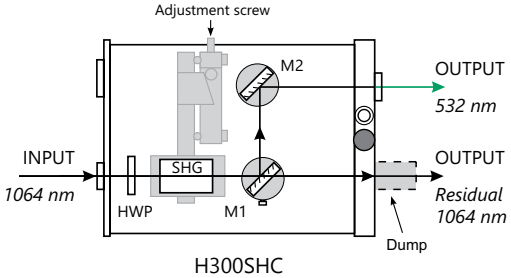
The H300S module has two output ports for the separation of **1064 nm** and **532 nm** wavelengths.



H300S

H300SHC harmonic generator

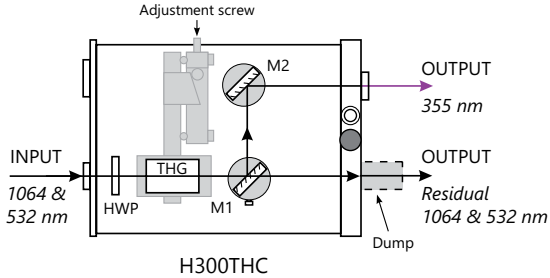
The most cost-effective solution for customers who need a **532 nm** wavelength only, the H300 SHC module combines a SHG crystal and beam separators and has two output ports for **532 nm** and **1064 nm** beams.



H300SHC

H300THC harmonic generator

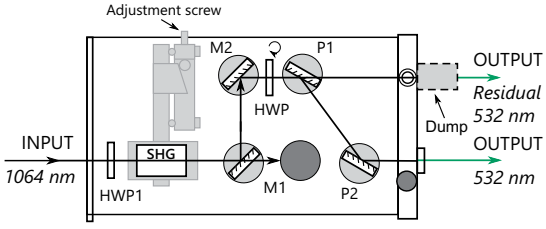
The H300THC module is a third harmonic generator and beam separator with two output ports for a 355 nm beam, and for a residual **532 nm + 1064 nm** beam. This module should be used with the H300SH module.



H300THC

H300SHA harmonic generator & attenuator

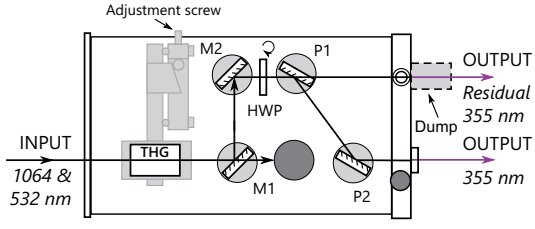
The cost-effective solution for customers who need an attenuated **532 nm** wavelength, the H300SHA module combines a SHG generator with attenuator.



H300SHA

H300THA harmonic generator & attenuator

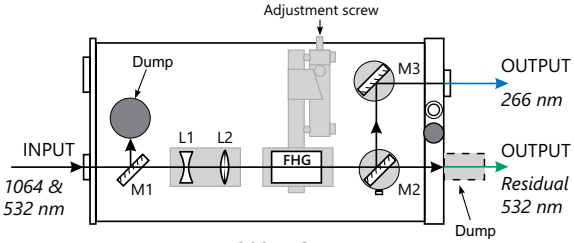
The cost-effective solution for customers who need an attenuated **355 nm** wavelength, the H300THA module combines a THG generator with attenuator.



H300THA

H300FHC harmonic generator

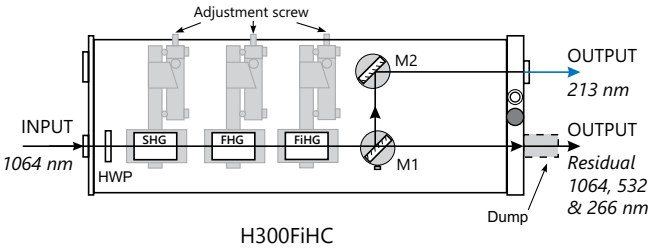
The H300FHC module is a fourth harmonic generator and beam separator for a 266 nm wavelength, with two output ports for a **266 nm** beam, and for a residual **532 nm** beam. This module should be used with the H300SH module.



H300FHC

H300FiHC harmonic generator

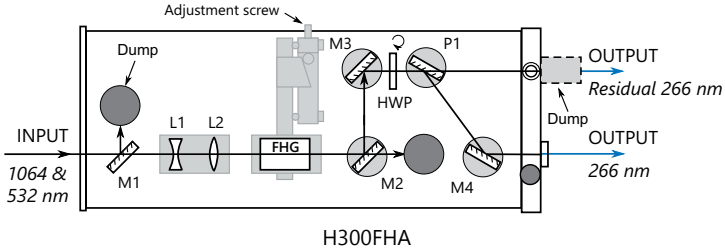
The H300FiHC module is designed to produce a 5th harmonic output. As it requires only a 1064 nm input, the unit contains SH, FH and FiH crystals together with a beam separator for a **213 nm** beam.



H300FiHC

H300FHA harmonic generator & attenuator

The cost-effective solution for customers who need an attenuated **266 nm** wavelength, the H300FHA module combines a FHG generator with attenuator.



H300FHA

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**.
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Lithuania
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Fax: +370 5 264 18 09
E-mail: sales@ekspla.com

Ask for quotation online at www.ekspla.com.

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Notes

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