PICOSECOND TUNABLE SYSTEMS

PGx01 • PGx03 • PGx11 • PT277 • PT403

PT403 SERIES



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

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

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

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

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

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

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

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

Tunable Wavelength Picosecond Laser

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</p>
- ► 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)

PICOSECOND TUNABLE SYSTEMS

Model	PT403	PT403-SH		
OPA SPECIFICATIONS				
Output wavelength tuning range				
SH	-	210 – 409 nm		
Signal	410	– 709 nm		
ldler	710 – 2300 nm			
Output pulse energy 2)				
SH ³⁾	-	15 µJ		
Signal ⁴⁾	ليا 80			
Idler 5)	25 μJ			
Pulse repetition rate	1000 Hz			
Linewidth	< 9 cm ⁻¹	< 12 cm ⁻¹		
Typical pulse duration ⁶⁾	~ 15 ps			
Scanning step				
SH	-	0.05 nm		
Signal	0.1 nm			
Idler	1 nm			
Typical beam size 7)	~ 2 mm			
Beam divergence 8)	< 2 mrad			
Beam pointing stability	≤ 100 µrad rms			
Beam polarization				
SH	-	horizontal		
Signal	horizontal			
ldler	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			

- 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.
- 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.
- $^{70}\,$ Beam diameter at the 1/e² level. Can vary depending on the wavelength.
- ⁸⁾ Beam divergence measured at FWHM.
- $^{9)}$ < 10 ps jitter is provided with PRETRIG option.



Communication module interfaces

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



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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 μ J @ 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			

- Due to continuous improvement, all specifications are subject to change without notice. Parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture.
- 2) Measured at 260 nm.
- 3) Measured at 450 nm.
- 4) Measured at 1000 nm.

▶ Options -H, -2H, -3H

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

- H output energy 0.7 mJ;
- 2H output energy 0.3 mJ;
- 3H output energy 0.3 mJ.

TUNING CURVES

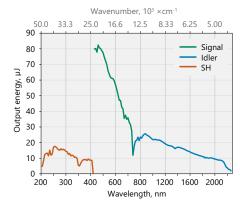


Fig 2. Typical PT403 tuning curves in signal (420 – 709 nm) and idler (710 – 2300 nm) ranges.

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



OUTLINE DRAWINGS

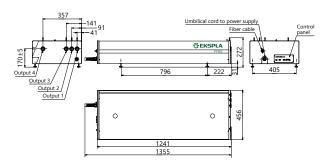


Fig 3. PT403 series laser head typical outline drawing

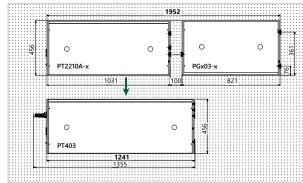


Fig 4. Compared with layout where laser and OPO are in different units, PT403 features almost twice smaller footprint

OUTPUTS PORTS

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

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