

PhotoSonus X

High Output Power DPSS Tunable Laser for Photoacoustic Imaging



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

quieter operation (< 60 dB) compared with flash-lamp pumped lasers, which is very beneficial for clinical use.

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

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

FEATURES

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

PERFORMANCE

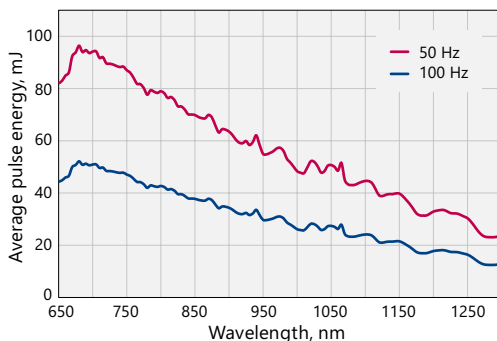


Fig 1. Typical PhotoSonus X free space extended range signal output energy vs. wavelength

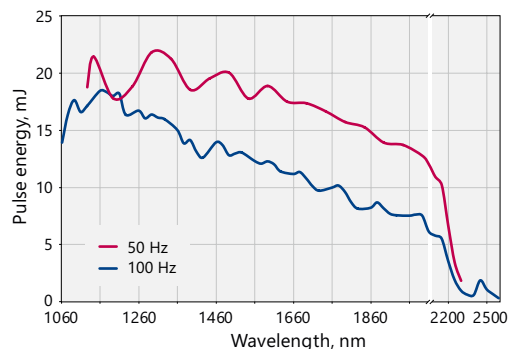


Fig 2. Typical PhotoSonus X free space idler output energy vs. wavelength

SPECIFICATIONS ¹⁾

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

¹⁾ Due to continuous improvement, all specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 700 nm.
²⁾ Free space measurement at 700 nm. See tuning curves for typical outputs at other wavelengths.

³⁾ Other fixed pulse repetition rates are available upon request.
⁴⁾ FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.
⁵⁾ At 700 nm or higher wavelength.
⁶⁾ Measured at the free space output at 700 nm wavelength.
⁷⁾ Using external chiller.



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

OUTLINE DRAWINGS

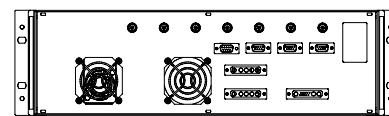
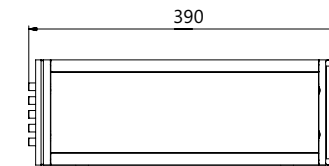
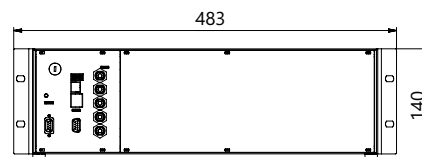
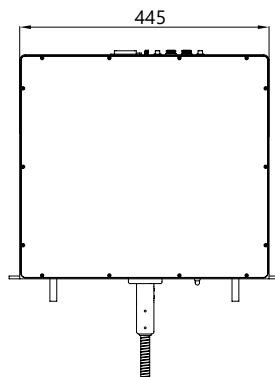
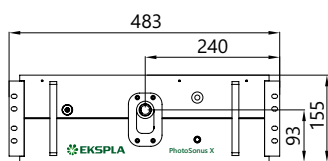
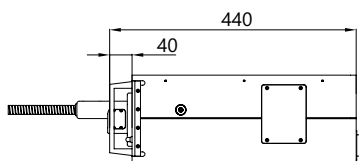


Fig 3. PhotoSonus X series laser head dimensions

Fig 4. Outline drawing of PhotoSonus X power supply unit

PhotoSonus M



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

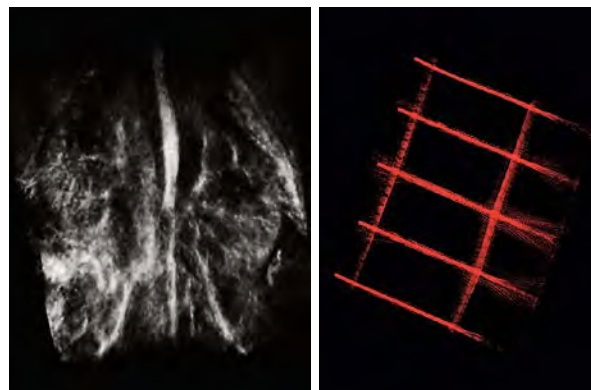
Recently, a fast wavelength switching option was introduced that enables each laser pulse to have a different wavelength within the entire signal or idler range and at any sequence. This new feature, combining high pulse energy (up

to 180 mJ) and wide wavelength tuning range (330 – 2300 nm) makes PhotoSonus M the irreplaceable imaging source for any photo acoustic system.

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

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

SAMPLE PHOTOACOUSTIC IMAGES



Courtesy of PhotoSound Technologies, Inc.

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

FEATURES

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

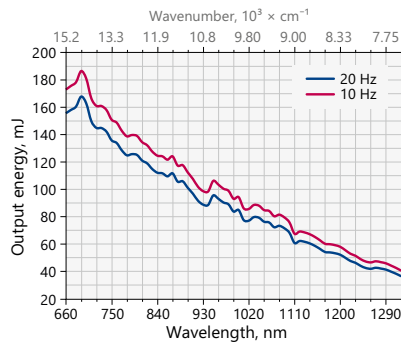
SPECIFICATIONS ¹⁾

Model	PhotoSonus M-10	PhotoSonus M-20	PhotoSonus M+
OPO			
Wavelength range			
Signal	660 – 1064 nm		
Signal Extended range (optional)	660 – 1030 nm		
SH extension range (optional)	330 – 530 nm (330 – 659 nm ²⁾)		
Idler (optional)	1065 – 2300 nm		
OPO output MAX pulse energy ³⁾	> 180 mJ	> 160 mJ	> 250 mJ
Pulse repetition rate	10 Hz	20 Hz	10 Hz
Scanning step:			
Signal (660 – 1064 nm)	0.1 nm		
Idler (1065 – 2300 nm)	1 nm		
Pulse duration ⁴⁾	3 – 5 ns		
Signal linewidth	< 10 cm ⁻¹		< 20 cm ⁻¹
Typical signal beam diameter (1/e ²) ⁵⁾	7 ± 2 mm		9 ± 2 mm
PHYSICAL CHARACTERISTICS			
Unit size (W × L × H mm)	434 × 672 × 887 mm		
OPERATING REQUIREMENTS			
Room temperature	18 – 27 °C		
Relative humidity	20 – 80 % (non-condensing)		
Power requirements ⁶⁾	208 or 240 VAC, single phase 50/60 Hz		
Power consumption	< 1.0 kVA	< 1.5 kVA	< 1.5 kVA

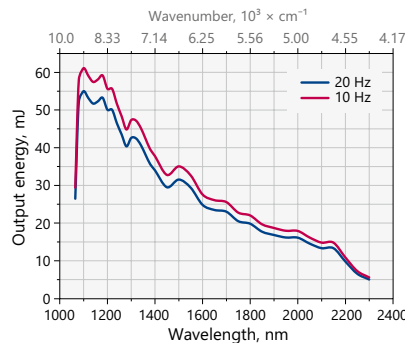
- Due to continuous improvement, all specifications are subject to change without notice. The parameters marked typical are not specifications. They are indications of typical performance and will vary with each unit we manufacture. Unless stated otherwise all specifications are measured at 700 nm.
- When Extended Signal range is selected.
- Free space measurement at 700 nm. See tuning curves for typical outputs at other wavelengths.
- FWHM measured with photodiode featuring 1 ns rise time and 300 MHz bandwidth oscilloscope.
- Measured at the free space output at 700 nm. Can be adjusted as per request.
- Mains voltage should be specified when ordering.



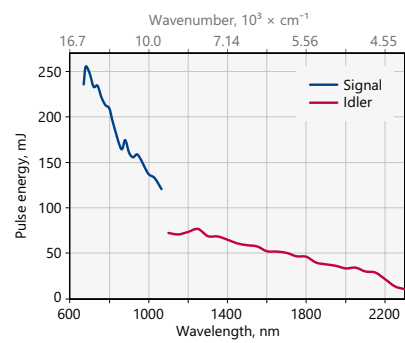
PERFORMANCE



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

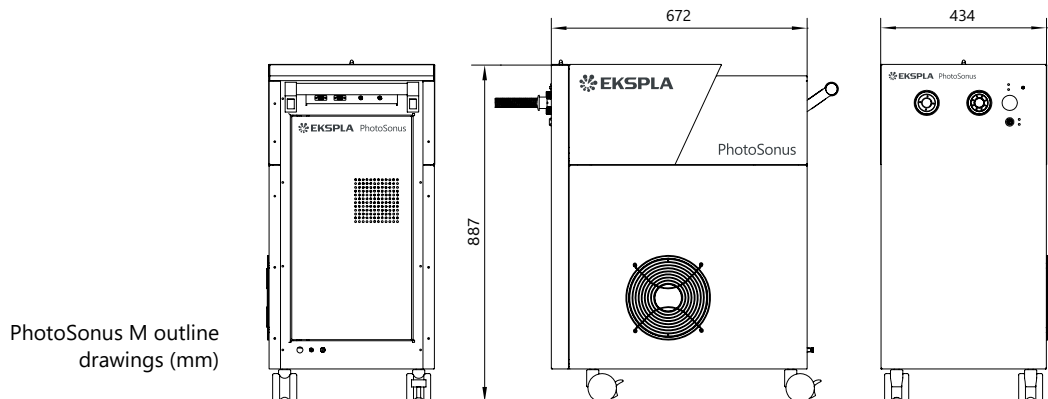


Typical PhotoSonus M-10 and M-20 Idler output pulse energy vs. wavelength curve



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

DRAWINGS



PhotoSonus M outline drawings (mm)