

# NL941 SERIES

## High Energy Temporally Shaped DPSS Nanosecond Lasers



NL941 and NL942-SH lasers were designed and manufactured according to custom request and are used for plasma research. They are good examples of what can be achieved when long time experience and latest technologies are put together.

Main laser feature is output of temporally shaped pulses based on electrooptical modulator driven by programmable arbitrary wave generator (AWG). Pulse shaping resolution is 125 ps and pulse duration up to 50 ns. Start of the system is a single mode CW laser. Then light is amplified in fiber amplifier, later AWG driven modulator transmits only required

temporal shape and duration pulse which is amplified in diode pumped regenerative amplifier in order to reach energy level sufficient to amplify in single-pass / double-pass diode pumped amplifiers. Diode pumping enables generating bursts of pulses with up to 20 kHz frequency in burst mode.

Power amplifier is a chain of diode pumped single-pass amplifiers where pulse is amplified up to required energy. During amplification spatial beam shaping is employed in order to get a flat top shape at the output. Optional second and third harmonic generators are based on angle tuned nonlinear crystals placed in heaters.

Tailored according to specific requirements

### NL941 FEATURES

- ▶ Up to **2 J** at **1064 nm** output pulse energy
- ▶ Bursts of up to **30 pulses** at **1 kHz** repetition rate or **4 pulses** at **20 kHz** repetition rate in 20 sec periods available in burst mode
- ▶ **5 ns** pulse duration
- ▶ Spatial flat top beam profile
- ▶ Temporal shaping by pulse processing with electrooptical modulator driven by arbitrary wave generator (AWG)
- ▶ High efficiency diode pumping chambers
- ▶ **1×2 m** laser head footprint

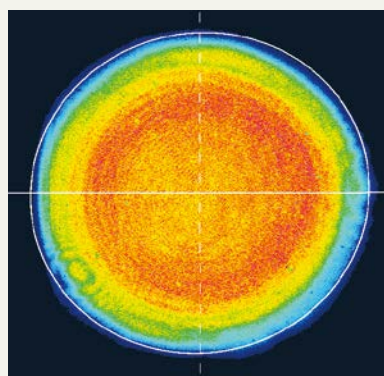
### NL942-SH FEATURES

- ▶ Two outputs up to **1.7 J** at **1064 nm** each
- ▶ Two outputs up to **0.9 J** at **532 nm** each
- ▶ **100 Hz** repetition rate
- ▶ **50 ns** pulse duration
- ▶ Spatial flat top beam profile
- ▶ Temporal shaping by pulse processing with electrooptical modulator driven by arbitrary wave generator (AWG)
- ▶ Internal system diagnostics
- ▶ High efficiency diode pumping chambers
- ▶ Industrial grade, portable laser housing with integrated power supplies and cooling unit

**SPECIFICATIONS** <sup>1)</sup>

Model	NL941	NL942-SH
<b>MAIN SPECIFICATIONS</b>		
Pulse energy		
at 1064 nm	2000 mJ	2 × 1700 mJ
at 532 nm <sup>2)</sup>	–	2 × 900 mJ
Pulse energy stability (StdDev): <sup>3)</sup>		
at 1064 nm	1.0 %	1.0 %
at 532 nm	–	2.0 %
Power drift <sup>4)</sup>	± 2 %	
Pulse duration <sup>5)</sup>	5 ns	50 ns
Repetition rate	bursts of 20 kHz every 20 s	100 Hz
Polarization at 1064 nm	vertical, > 90 %	
Optical pulse jitter <sup>6)</sup>	< 30 ps	
Linewidth	< 1 cm <sup>-1</sup>	
Beam profile	Hat-Top (at laser output), without diffraction rings	
Typical beam diameter <sup>7)</sup>	~12 mm	~10 mm
Beam divergence <sup>8)</sup>	< 0.5 mrad	
Beam pointing stability	± 50 μrad	
<b>PHYSICAL CHARACTERISTICS</b>		
Laser head (W × L × H)	1000 × 2000 × 400 mm	1000 × 2000 × 1800 mm
Power supply unit (W × L × H)	550 × 600 × 500 mm	–
Umbilical length	3 m	–
<b>OPERATING REQUIREMENTS</b>		
Facility water consumption (max 20° C)	8 l/min	20 l/min
Ambient temperature	22 ± 2 °C	
Relative humidity	20 – 80 % (non-condensing)	
Power requirements <sup>9)</sup>	208/240 V AC, single phase 50/60 Hz or 220, 380 or 400 V AC, three phases 50/60 Hz	208, 380 or 400 V AC, three phase, 50/60 Hz
Power consumption	2.0 kW	9.4 kW

- <sup>1)</sup> Due to continuous improvement, all specifications subject to change without notice. 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.
- <sup>2)</sup> For NL94X-SH harmonic generator option. Harmonic outputs are not simultaneous; only single wavelength beam is present at the output at once.
- <sup>3)</sup> Standard deviation value averaged over 30 s after 20 minutes of warm-up.
- <sup>4)</sup> Deviation from average value measured over 8 hours of operation when room temperature variation is less than ±2 °C.
- <sup>5)</sup> Measured with photodiode with 100 ps rise time and oscilloscope with 600 MHz bandwidth.
- <sup>6)</sup> Standard deviation value, measured with respect to triggering pulse.
- <sup>7)</sup> Beam diameter is measured at 1064 nm at laser output at the 1/e<sup>2</sup> level and can vary with each unit we manufacture.
- <sup>8)</sup> Full angle measured at the 1/e<sup>2</sup> level at 1064 nm.
- <sup>9)</sup> Mains voltage should be specified when ordering.



Typical beam profile of ANL4001k laser

