SL300 SERIES

Electrooptically Q-switched SBS-compressed Nd:YAG Lasers

SL 300 series lasers are excellent solution for applications, where high energy picosecond pulses are needed.

Pulse compression during backward-stimulated Brillouin scattering (SBS), used in EKSPLA SL300 series lasers, is simple and cost effective way for generating high power picosecond pulses. In addition to it, SBS compression allows generation of pulses with exceptional pulse duration range: from few nanoseconds to 150 ps.

Electro-optically Q-switched single longitudinal mode (SLM) nanosecond generator is the heart of the system. It provides nanosecond optical pulse later compressed during SBS in a special cell. Self-seeding technique is used for SLM generation through the negative feedback control system.

After SBS compression, pulse is directed to multi-pass power amplifier system, providing high-energy pulses. Thermocontrolled harmonics' generators, based on angle-tuned KD*P and KDP crystals and harmonic separation optics are available as standard options. Each wavelength has a separate output port.

A power supply and water/water type cooling units, placed in standard 19" rack, requires a little space under the user's optical table.

The very low jitter of the optical pulse in respect to the triggering pulse ensures reliable synchronization of the laser with external equipment.

FEATURES

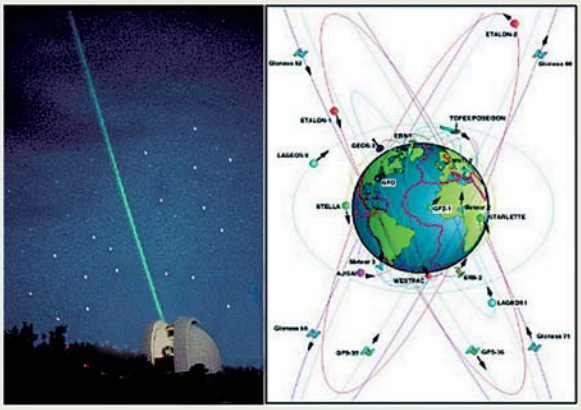
- Unique and cost-efficient design
- Up to **500 mJ** per pulse at **1064 nm**
- **150 ps** pulse duration
- Self seeding **SLM** master oscillator
- More than 10^5 **:1** pre-pulse contrast ratio
- **Low jitter external** triggering
- Versatile synchronization posibilities
- Up to **1500 ps variable** pulse duration option
- **LabView** drivers for convenient control via PC using RS232
- **Remote** control via keypad
- Compact laser head and power supply units

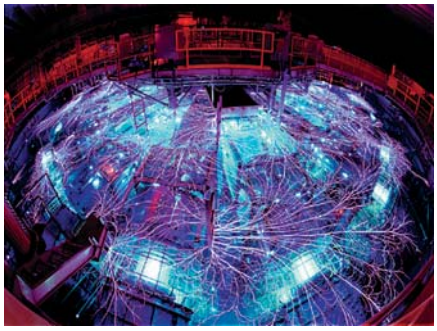
APPLICATIONS

- Plasma research
- Material ablation and deposition
- Holographic applications
- Absorption spectroscopy of laser induced plasmas
- Satellite ranging
- EUV Light source development for photolithography
- Seeding of amplification cascades
- Your application is welcome...

EKSPLA
An EKSMA Group Company

The SL300 series lasers are built in a way, which allows them to be used in variety of ranging applications. Our customers used it on the airborn, ship, truck and were satisfied with the outcome of their experiments.





SL312P laser is used as a flash in high speed photography of the wires as they explode.

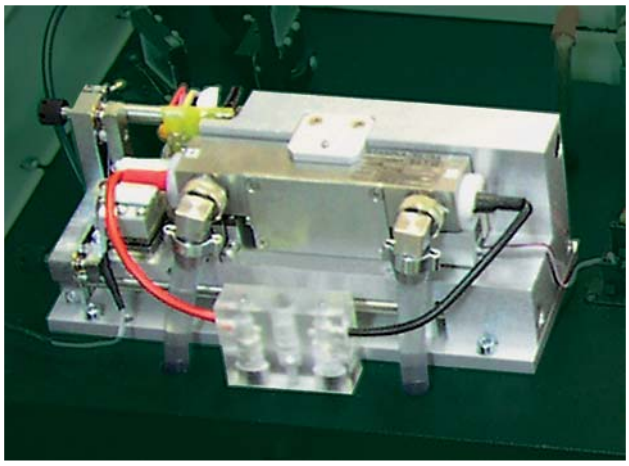
Courtesy of Dr. Randy Montoya, Sandia National Laboratories, USA

Master Oscillator

Master oscillator is a module of rigid design mounted on invar rods to ensure mechanical and thermal stability. Oscillator's cavity is formed by high reflectivity mirror and an uncoated glass Fabry-Perrot etalon used for the **longitudinal mode selection**. Part of the electro-optical Q-switch between electrodes is used as classical Q-switch, while another part together with the polarizer and PIN photodetector are forming **negative feedback system (NF system)**.

This negative feedback is used for selection of SLM lasing. When lasing appears, part of light reflected by polarizer hits PIN photodetector. Voltage generated by the FBC electronics and applied to the electrode is proportional to the light intensity registered by the PIN photodetector. In result the NF system allows master oscillator to keep lasing at certain low level for prolonged time (several tens of microseconds). During this time SLM (single frequency) is establishing due to the selective properties of Fabry-Perot etalon and lower gain for the other frequencies. YAG:Cr crystal improves SLM selection.

Laser control unit measures duration from the beginning of free running to Q-switch opening moment and adjusts FBC electronics to keep necessary value of that duration.

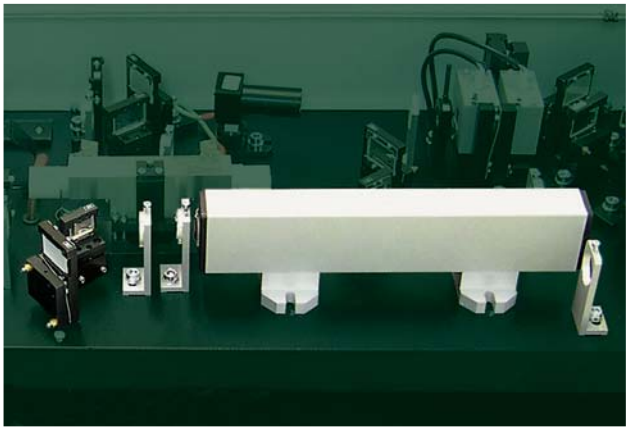


Oscillator contains aperture for the **single transversal mode selection**. Quarter wave plates prevents the interference and "hole burning" effects in the active element. Master oscillator's output pulse is ~ 2.5 ns duration and its energy is about 5 mJ. The pulse energy is monitored by pre-calibrated photodiode and displayed on the remote control pad.

Compression System

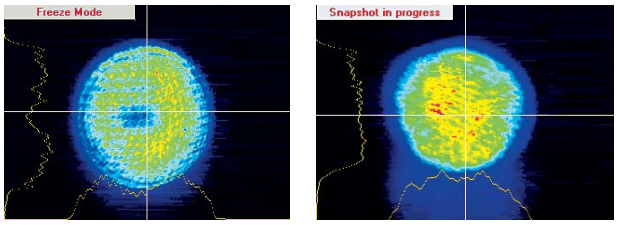
Pulse compressor consists of optical guiding system and SBS-cell with CCl_4 liquid. SBS cell is designed for safe and longlife maintenance free operation.

A linearly polarized light pulse from master oscillator passes through QWP and is focused into SBS-cell by lens. Focusing is arranged in the way to compress the pulse via SBS process. The backscattered **Stokes pulse**, as its phase is reversed, strictly repeats the path of pump pulse in the opposite direction and with a reversal divergence. The compressed pulse is guided into the amplification stage using polarizer and mirror.



Amplification System

SL312 model lasers use multi-pass amplifier system which is based on laser chamber containing Nd:YAG rod pumped by two flash lamps. For smooth obtaining output beam profile pre-amplifier and double-pass amplifier layout is used in SL300 series lasers. Power amplifier includes optical components arranging passes through the active element. Aperture is employed to prevent the returning depolarized radiation from getting back into the amplifier.

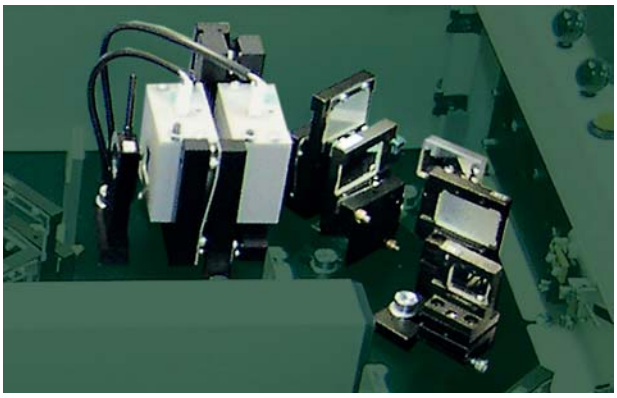


SL312 model laser *SL330/SL350 models lasers*

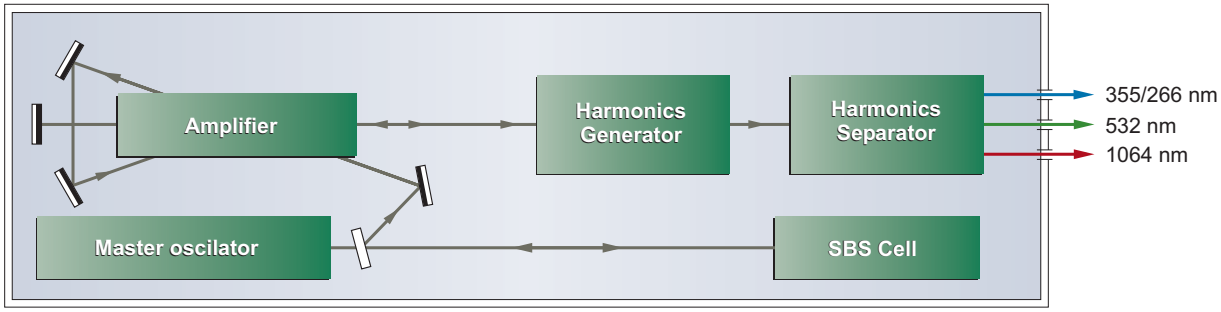
Beam profiles *(modulation on the near field's image are caused by CCD camera imperfection)*

Harmonics Generation

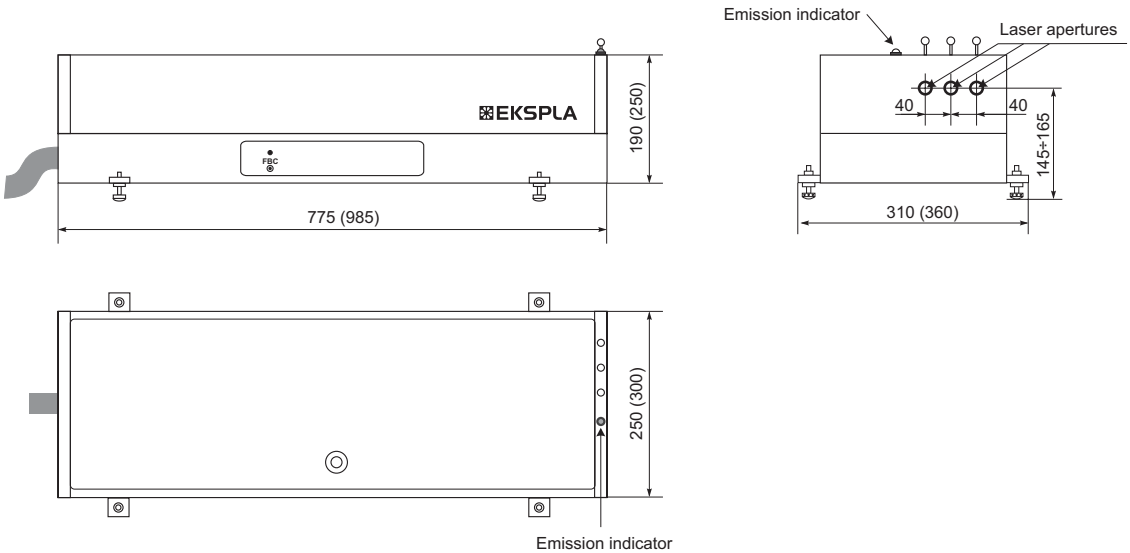
The Nd:YAG laser fundamental wavelength can be frequency doubled, tripled and quadrupled inserting into the beam pass the nonlinear crystals generating corresponding harmonics.
Harmonics' generators, based on angle-tuned KD*P and KDP crystals, mounted in temperature-controlled heaters and harmonic separation optics, are available as standard options. The fundamental and harmonics pulses are separated by dichroic mirrors and each wavelength has a separate output port.



Optical Layout



Laser Head Drawing



Laser head drawings of the SL312 (SL330) models

SPECIFICATIONS

MODEL	SL312	SL312P	SL332	SL333	SL334	SL350
Max. pulse energy, mJ						
at 1064 nm	250	500	150	250	500	200
at 532 nm	120	240	70	120	240	90
at 355 nm	80	140	40	80	140	60
at 266 nm	40	80	25	40	80	30
Pulse enegy stability (StDev), %						
at 1064 nm				4		
at 532 nm				7		
at 355 nm				9		
at 266 nm				12		
Pulse duration at 1064 nm (FWHM), ps [1]	150 ± 20	170 ± 20	150 ± 20	150 ± 20	150 ± 20	200 ± 50
Pulse duration stability at 1064 nm (StDev), %				± 10		
Repetition rate, Hz	10	5	10	10	5	50
Linewidth, cm^{-1}				≤ 0.1		
Polarization ratio at 1064 nm				>1:100		
Optical pulse jitter with respect to internal syncpulse (StDev), ns				± 0.5		
Optical pulse jitter with respect to external triggering pulse (StDev), ns				1		
Optical pulse delay with respect to syncpulse, ms				± 7.5		
Beam profile [2]				Hat Top		
Beam divergence at 1064 nm (full angle @ $1/e^2$), mrad				< 0.5		
Beam height, mm				155 ± 10		
Contrast ratio at 1064 nm				10^5 : 1		
Beam diameter, mm	~10	~ 12	~ 8	~ 10	~12	~10
PHYSICAL CHARACTERISTICS						
Laser Head Size Size (W×H×L), mm:	250×190×790	250×190×790	300×250×1000	300×250×1000	300×250×1000	300×250×1000
Electric Cabinet Size Size (W×H×L), mm:	550×525×590	550×525×590	550×525×590	550×525×590	550×525×590	550×850×590
Umbilical length, m				2.5		
OPERATING REQUIREMENTS						
Water consumption (max. 20 °C), liters/min				< 10		
Room temperature, °C				18 – 27		
Relative humidity (non-condensing), %				10 – 80		
Voltage	~ 220 VAC single phase 50/60 Hz	~ 380 VAC three phase 50/60 Hz	~ 220 VAC single phase 50/60 Hz	~ 380 VAC three phase 50/60 Hz	~ 380 VAC three phase 50/60 Hz	~ 380 VAC three phase 50/60 Hz
Powering, kVA	< 2.5	< 3.5	< 2.5	< 3.5	< 3.5	< 5

[1] *Variable pulse duration up to 1500 ps is available.*
[2] *Close to the Gaussian beam profile is available an request.*

Specifications are subject to changes without advance notice.

Requests for custom made products are welcome !

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