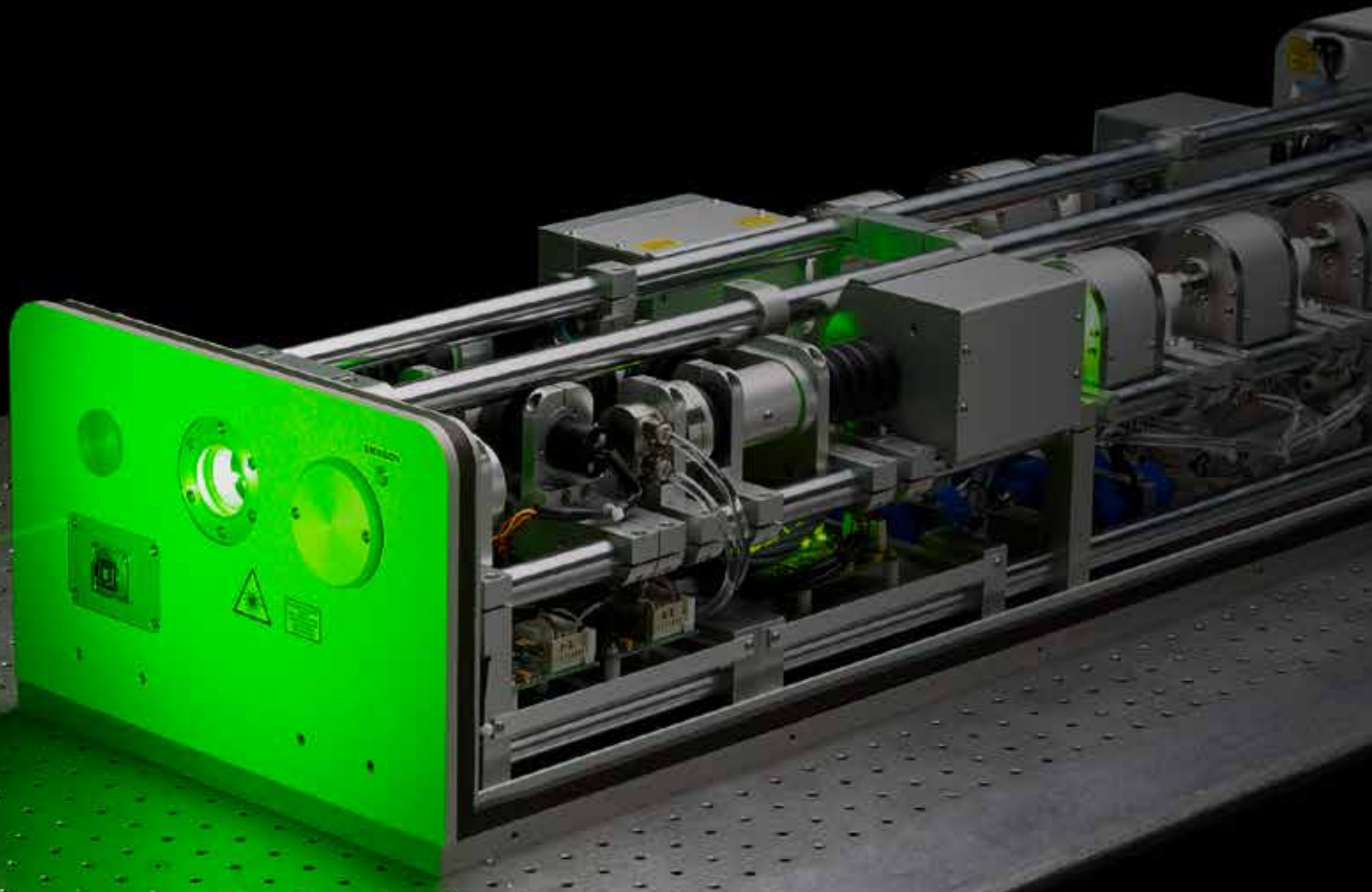




PRODUCT PORTFOLIO

2 0 1 9



Designed for Research Engineered for Industry

Litron Lasers has enjoyed continued growth and development since its inception in 1997 and now more than 20 years later we sit firmly at the forefront of solid state laser technology. An installed base of several thousand lasers spanning the globe is the result of many years development and interaction with our customers.

From the beginning Litron has developed lasers that can be operated 24/7 in the most demanding industrial environments. In order to supply a laser that is best suited to an application it is key to appreciate the process where it will be used. Litron's extensive knowledge of industrial and scientific applications enables the Company to produce lasers ideally matching customer requirements.



Litron's standard laser designs lend themselves to easy customisation, yielding fast, cost-effective solutions. For some highly specialised applications Litron can utilise its in-house machining capability to offer bespoke laser products to encompass the customer's key design constraints in a timely fashion. To this end Litron continues to invest in key areas to maintain long term industrial OEM partnerships.

Litron is continually improving and extending its product range. Please visit www.litronlasers.com or contact us directly for the latest information and developments.

Ultra-compact pulsed DPSS Q-switched Nd:YAG lasers

Up to 150mJ at 1064nm, repetition rates up to 300Hz
Available with all harmonics to 213nm



FEATURES

- Output energies up to 150mJ
- Repetition rates up to 300Hz
- Ultra stable pulse stability
- 2nd, 3rd, 4th and 5th harmonics available
- Motorised attenuator
- Interlocked electrical safety shutter
- Stable or super-Gaussian coupled resonator options
- TEM₀₀ option
- Compact and rugged
- Field replaceable diodes
- Compact PSU and detachable chiller

APPLICATIONS

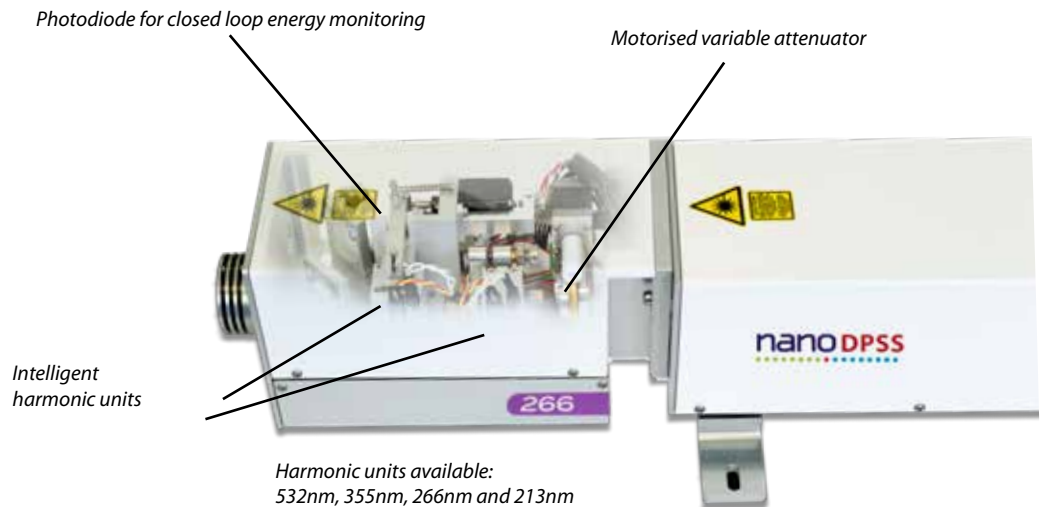
- Spectroscopy & LIBS
- LIF & ESPI
- LIDAR & Remote sensing
- Laser flash photolysis
- Laser ultrasonic testing
- Microscopy
- Sample testing
- Ablation



The Nano DPSS series comprises a set of pulsed fully diode pumped Q-switched Nd:YAG lasers with output energies up to 150mJ and repetition rates of up to 300Hz.

A fully sealed laser head and harmonics provide complete protection from external contamination.

All harmonics are automatically angle-tuned with high precision linear actuators, making Litron's unique motorised angle-tuning much faster than traditional thermal tuning. This feature has the option of single, on-demand tuning or continuous automatic tracking of the crystals for guaranteed long-term stability. Additionally, harmonic generation crystals are thermally stabilised to better than 0.1°C.



Compact High Energy Pulsed Nd:YAG Lasers

Flashlamp or fully diode pumped with a large range of intelligent accessories



APPLICATIONS

- **Semiconductor and display inspection**
- **LCD repair**
- **Ti:Sa pumping**
- **Laser cleaning**
- **LIBS & LIF**
- **PIV and visualisation**



The TRLi Series lasers are compact and versatile high energy or high repetition rate pulsed lasers.

A fully birefringence compensated twin-rod pulsed resonator design ensures a uniform beam profile at 1064nm. This, in turn, leads to exceptional beam homogeneity at 532nm and especially at 355nm and 266nm even at high average power outputs.

Resonator options include **super-Gaussian coupled, stable and stable-telescopic configurations.**

Bolt-and-Play interchangeable harmonic modules can be added and removed as required. The intelligent system controller automatically adapts to the set configuration and allows seamless control in any setup or application.



FEATURES

- **Output energies up to 850mJ**
- **Repetition rates up to 200Hz**
- **Lamp pumped**
- **Telescopic resonator $M^2 \leq 8$**
- **Super-Gaussian resonator $M^2 \leq 2$**
- **Motorised auto-stabilisation**
- **Rugged industrial design**
- **LUCi touchscreen control**

All harmonics are angle tuned with high precision linear actuators. Litron's unique **motorised angle-tuning** is many times faster than traditional thermal tuning. This feature has the option of single, on-demand tuning or continuous tracking of the crystals for guaranteed long-term stability. All harmonic generation crystals are thermally stabilised to better than 0.1°C.

Sealed against the ingress of moisture and dust, the TRLi series provides unrivalled flexibility both in laboratory research and for industrial applications.



FEATURES

- **Output energies up to 300mJ**
- **Repetition rates up to 300Hz**
- **Fully diode pumped**
- **Stable resonator $M^2 \leq 8$**
- **Super-Gaussian resonator $M^2 \leq 2$**
- **Ultra-stable output**
- **Diode life >4 billion pulses**
- **Field replaceable diodes**
- **Smooth, homogenous beam profile**
- **Compact PSU and detachable chiller**

Pulsed Diode Pumped Nd:YAG Lasers

Plasma Series, up to 1J at 1064nm, repetition rates up to 200Hz

Available with all harmonics to 213nm

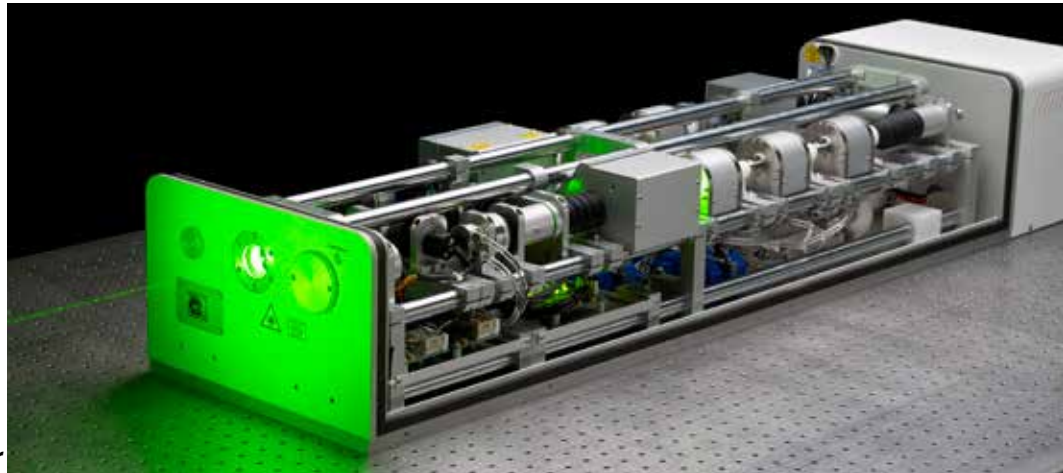
PLASMA

FEATURES

- Output energies up to 1J
- Repetition rates up to 200Hz
- Fully diode pumped
- Super-Gaussian resonator $M^2 \leq 2$
- Stable resonator $M^2 \leq 8$
- RMS stability <0.2% at 1064nm
- Diode life >4 billion pulses
- Smooth, homogenous beam profile
- Compact PSU and detachable chiller
- Field replaceable diodes

APPLICATIONS

- Semiconductor annealing
- Semiconductor and display inspection
- Laser shock peening
- Laser lift-off
- LCD repair
- Ti:Sa pumping
- Laser cleaning
- LIBS & LIF



The Plasma series of lasers are pulsed, diode pumped, Q-switched Nd:YAG lasers.

These systems use the very latest technology to replace traditional flashlamp pumping.

Litron's unique diode module design and diode drive electronics combined with the mechanically stable and rigid optical rail systems, deliver class leading pulse to pulse stability (0.2% RMS at 1064nm).

Using diode pumping provides a significant increase in pumping efficiency. This, in turn, reduces the laser heat management requirements, allowing a very compact, Litron-designed chiller to cool even the most powerful Plasma models. With only a single phase electrical supply, the Plasma series

are stand-alone, turn-key systems equally suited to continuous operation in industrial processes and high up-time scientific research applications, such as Ti:Sa pumping.

The Plasma series options include motorised auto-tuning and auto-tracking of the harmonics modules. Litron has developed industrially proven, hands-free tuning to obtain the maximum energy output from a given harmonic module in <20 seconds. The auto-tracking function significantly reduces long term energy drift, often observed at UV wavelengths.

SYSTEM OPTIONS

- High energy version of up to 1J available
- Motorised optical attenuator
- Auto-tuning harmonics at 532nm, 355nm, 266nm and 213nm
- Real time beam profile or pointing stability monitoring
- Real time energy monitoring



Real time beam profile monitoring option.



Sealed diode modules.

Ultra-compact Pulsed Nd:YAG Lasers

The Nano Series - Small in size, big in performance

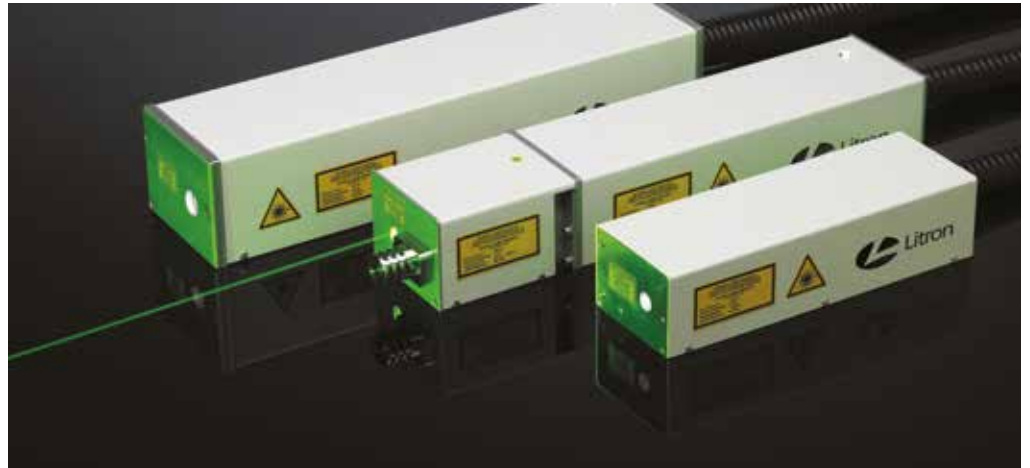
nano

FEATURES

- Output energies up to 340mJ
- Choice of 3 resonators
- Electronically verified safety shutter
- 2nd, 3rd, 4th and 5th harmonics
- High energy TEM₀₀ option
- Motorised variable attenuator

APPLICATIONS

- PIV
- LIBS
- Spectroscopy
- LIDAR
- ESPI
- Pump source
- Combustion research
- Laser ultrasonics



The **Nano series** comprise of compact and rugged Q-switched lasers suited to a multitude of applications including mask repair, LIBS, LIDAR, pump sources and spectroscopy.

With industry leading performance in every respect, unsurpassed design and build quality, the Nano series sets the benchmark for ultra-compact laser systems today.

At the heart of all lasers in the Nano series is a robust monolithic resonator machined from a solid piece of aluminium for a solid and stable build platform. Ultra-stable mirror mounts, a stainless steel pumping chamber with close coupled ceramic reflectors and proprietary long-life flashlamps ensure homogeneous, stable outputs.



Nano laser and compact power supply.

Nano Series Models

Nano S/SG

Small, rugged, reliable and efficient. Conventional stable/super-Gaussian coupled resonator with electronically verified intra-cavity safety shutter.

Repetition rate: up to 100Hz.

Energy: up to 150mJ at 10Hz.

Nano L/LG

Rigid, stable construction through elegant design lends itself to use in demanding industrial applications.

Repetition rate: up to 100Hz.

Energy: up to 340mJ at 10Hz.

Nano T

As the Nano L, but with a telescopic stable resonator for very low beam divergence and excellent uniformity.

Repetition rate: up to 50Hz.

Energy: up to 290mJ at 10Hz.

Ultra High Energy Pulsed Nd:YAG Laser Systems

Rugged, Invar stabilised, pulsed Nd:YAG lasers with high energy and high performance for industrial and scientific applications

LPY•10J

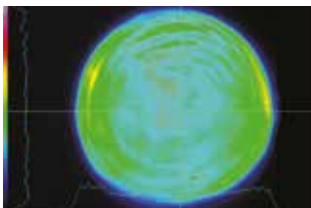
FEATURES

- Up to 10J at 1064nm
- Up to 5J at 532nm
- Repetition rates 1-5Hz
- Telescopic or super-Gaussian coupled resonators
- Birefringence compensation
- Rugged industrial build
- Optional seeder package
- 2nd, 3rd and 4th harmonics
- Full RS232 software control



APPLICATIONS

- Ti:Sa pumping
- Laser shock peening
- LIBS
- Holography
- Plasma physics



LPY10J super-Gaussian beam profile at 5J, 532nm, 5Hz.

The **LPY10J** laser systems offer Q-switched output energies of 10J at 1064nm from a proven design platform. The self-supporting Invar frame has been utilised for many years in industrial and scientific applications where robustness and stability are paramount.

In addition to the standard configuration, there are many options available: injection seeding for narrow linewidth; harmonic generation units to provide outputs up to the 4th harmonic; automated wavelength selection; energy monitoring and automatic output peaking and continuous tracking.



LPY10J laser system showing 2nd and 3rd harmonic stages.



10J output stage.

High Energy Pulsed Nd:YAG Lasers

LPY Series - High performance with a wide range of options

LPY•600 ●●●●●●
LPY•700 ●●●●●●
LPY•7000 ●●●●●●



FEATURES

- **Rugged industrial build**
- **Up to 3.5J at 1064nm**
- **Repetition rates up to 200Hz**
- **Telescopic or super-Gaussian resonators**
- **Optional seeder package**
- **2nd, 3rd, 4th and 5th harmonics**
- **Full RS232 software control**
- **Fully integrated power supply and water cooler**

APPLICATIONS

- **Dye laser pumping**
- **OPO pumping**
- **Spectroscopy**
- **LIBS**
- **LIDAR**
- **PIV**
- **Laser shock peening**

Superior performance through superior design.

The **LPY series** of pulsed lasers have been designed to suit almost any industrial or research application for a high energy or high specification Nd:YAG laser. Based around a fully self-supporting Invar rail, the LPY series provides both exceptional mechanical and thermal stability. A 'no-compromise' design approach is evidenced in the build quality, a parameter that sets these lasers well apart from any of their competitors.

The modular design of the laser head allows a wide variety of resonator configurations to be offered, from single rod oscillators to fully birefringence compensating twin-rod oscillator, twin-rod amplifier systems.

The lasers are provided in an oscillator, pre-amplifier, main-amplifier arrangement that can be configured as a stable-telescopic resonator offering a low order multimode output with a smooth spatial and temporal profile, or as a super-Gaussian coupled resonator offering a low M^2 single transverse mode output with slightly higher peak powers or as a true TEM_{00} resonator with an $M^2 < 1.2$. This allows the user to specify a system that is perfectly matched to their application requirements.

Rugged, Invar stabilised, pulsed Nd:YAG lasers with high energy and high performance for industrial and scientific applications.

The **LPY7000** lasers offer high energy Q-switched outputs up to 3.5J and repetition rates of up to 200Hz. Based around our proven self-supporting Invar rail, the LPY series' robust design is appropriate for both industrial and scientific applications.



LPY7000 with an output of 1J at 532nm, 30Hz.



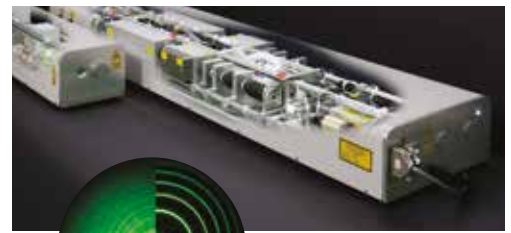
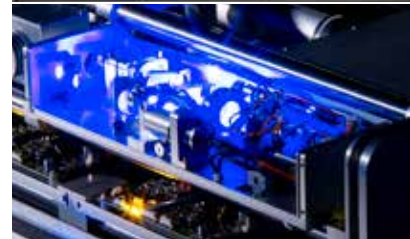
Flashlamp change is performed in a matter of minutes with no requirement for any re-alignment. An IP54 sealed case ensures that the laser is protected against the ingress of dirt and moisture when used in industrial environments.

All LPY harmonics are available with optional auto-tuning, such that the LPY system will automatically peak the output energy at startup or on request. In addition, auto-tracking provides continuous feedback from an integrated photodiode to maintain the maximum output energy during operation.

Motorised harmonic separation and switching allows remote selection of output wavelengths. When used in unison with the motorised harmonic generation and motorised mirror stages, each configurable wavelength can be selected and optimised remotely at the push of a button.

OPTIONS AND ACCESSORIES

- **Full system monitoring**
- **Remote automation and ease of integration**
- **Motorised harmonic generation stages**
- **Motorised harmonic separation and switching**
- **Integrated Type II BBO OPO**
- **Integrated injection seeder**
- **Line narrowing etalons**
- **Variable optical attenuator**
- **Integrated energy monitor and closed-loop stabilisation**
- **Inline beam profiling**
- **Options for systems integrators**



Tunable Pulsed Lasers

Integrated Nd:YAG pumped type II BBO OPO laser systems with either DPSS or lamp pump source



FEATURES

- Fully integrated Q-switched pump laser and OPO
- Continuous tuning range of 410 – 2600nm
- Pulse energies up to 45mJ
- 4cm^{-1} linewidth in the visible range
- 4% RMS stability in the visible range
- Repetition rates from 1 to 100Hz
- Motorised OPO wavelength tuning
- Simultaneous signal and idler access
- 355nm pump process shutter and energy monitoring
- No user-alignment required
- Full PC control

SYSTEM OPTIONS

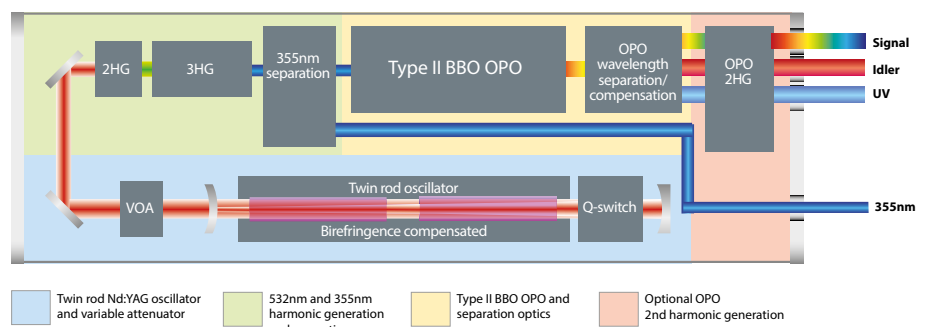
- UV harmonic option for 210 – 410nm
- Spectrometer for wavelength measurement and automatic tuning
- 1064nm variable optical attenuator (VOA)
- Direct access to 1064nm and 532nm 2nd harmonic via side ports
- Direct access to 355nm pump output via front panel
- Variable repetition rates
- 532nm pumping for high energy 670– 2600nm operation

Aurora II Integra OPO

The **Aurora II Integra series** combines a Type II BBO broadband OPO and Nd:YAG nanosecond pump source into a single laser head, using an ultra-rigid Invar optical rail to provide class-leading performance and stability. True no-gap tunable output from 410 to 2600nm with options to extend into the UV range (210-410nm) as well as direct access to the pump laser and its harmonics make the Aurora II the perfect choice for a wide range of research and industrial applications.

The integrated fully-motorised design eliminates the need for user alignment and adjustment even when relocating the laser head. With a choice of pump sources from Litron's wide range of Nd:YAG lasers, a highly modular layout and even bespoke component optimisation, tailoring the Aurora II into a flexible, customised solution has never been easier.

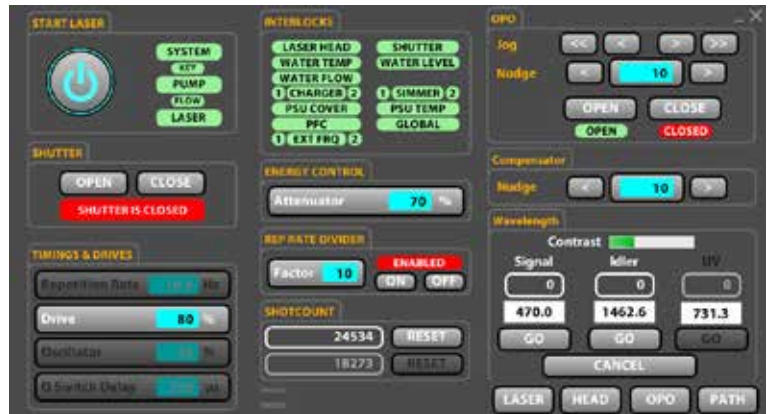
Aurora II Integra Type II BBO OPO Unit Schematic View



Schematic shows the compact arrangement of the combined pump laser and Aurora II Integra OPO in a single housing.

APPLICATIONS

- Photoacoustic imaging
- High resolution spectroscopy
- LIDAR & Remote sensing
- Laser-induced fluorescence
- Non-linear spectroscopy
- Combustion research
- Photobiology
- Process monitoring
- Display manufacture and testing



Aurora 1.57 - Fixed wavelength OPO optimised for 1.57µm operation

For IR applications in LIDAR and spectroscopy the Aurora 1.57 is a dedicated all-in-one sealed OPO for use in more extreme environments. Providing eye-safe 1.57µm output, the 1064nm pump laser and OPO are mounted in a single compact housing ensuring permanent alignment between the two components. The 1.57µm output can be integrated with any of Litron's laser systems.

Aurora II TRLi OPO, a 532nm pumped compact laser system

The **Aurora II TRLi OPO** combines a 532nm pump generation, variable attenuator and Type II BBO OPO resonator, into a single compact module that can be attached to any of Litron's TRLi series of Nd:YAG lasers to provide tunable no-gap output in the 670 to 2600nm range. Incorporating design features used throughout Litron's Aurora OPOs, the TRLi module provides high stability, narrow linewidth and simultaneous signal and idler output in a self-contained unit that is interchangeable with the other harmonic units within the TRLi range. With little to no realignment required on reattachment, the TRLi OPO expands the output of these high energy compact lasers into the NIR range without losing the flexibility of accessing the Nd:YAG harmonics.



Aurora TRLi DPSS OPO



Pulsed Nd:YAG Lasers for PIV

The world's most comprehensive range of PIV lasers from a single manufacturer

FEATURES

- **Outputs of up to 425mJ per laser head at 532nm**
- **Standard motorised attenuator**
- **Repetition rates of up to 300Hz**
- **Homogeneous beams**
- **Fully independently triggered**

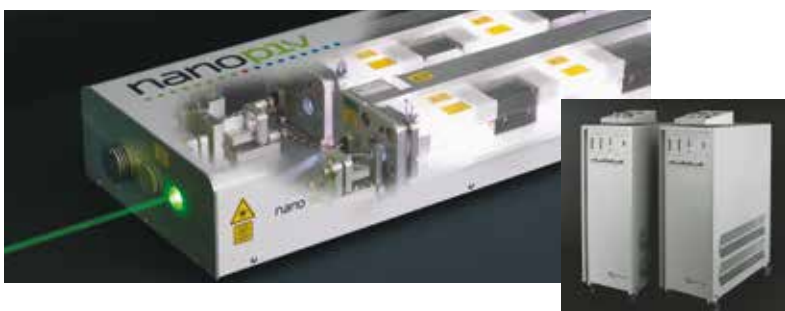
All of Litron's PIV laser systems are dual head devices, meaning that the PIV system contains two totally independent lasers.

The range of PIV systems is based around the compact Nano series and the Invar stabilised LPY series.

The overriding factor that sets Litron's products apart is quality. This is evidenced not only in the design and construction of the product, but also in their performance. In any imaging application the beam quality is of paramount importance as this completely determines the light sheet quality.

By choosing a suitable resonator configuration the output beam quality can be controlled to give a very smooth spatial profile, which remains homogeneous as it propagates into the far field.

It is our philosophy to provide a laser system that suits an application. A 'one system fits all' approach, as offered by most manufacturers, does not allow the customer to optimise their process. For applications such as PIV, Litron has developed resonators that will yield extremely uniform light sheets whose pulse-to-pulse structure and stability remains constant. These are based around our stable or stable-telescopic resonators.



Nano Series Models

Nano S PIV

The smallest in the series, comprising two Nano S laser heads mounted onto an aluminium gauge plate to provide robustness. Beam combination optics and any harmonic generation units are mounted onto this plate for increased stability. Both lasers share the same integral LPU450 power supply and cooling unit.

Nano L PIV

Exceptional industrial robustness. The Nano L laser can be run at 100Hz enabling results to be taken at 200Hz. Industry-leading specifications are achieved from a very compact laser head.

Nano T PIV

Like Nano L but with telescopic resonators for low divergence and low M^2 enabling light sheets up to four times thinner or longer than most other PIV laser systems.

TRL and LPY Models

TRL PIV

High energies from a compact package. Dual head high energy laser systems with output energies up to 425mJ at 532nm per laser head. Also uses the low M^2 stable telescopic resonator for thin, large area light sheets.

LPY PIV

Invar stabilised PIV lasers for high average power PIV and other double-pulse applications. Twin-rod birefringence compensation is used for stability and beam homogeneity.

Power supplies for the range include state-of-the-art IGBT switching into the flashlamp, giving increased efficiency and stability and significantly prolonging lamp life due to the much lower currents required.

High Repetition Rate Lasers for PIV

Diode pumped Nd:YLF and Nd:YAG lasers for time-resolved PIV applications

LD•PIV•••••

FEATURES

- **High energy at 527nm at 1kHz**
- **Output energies up to 30mJ**
- **Rugged industrial design**
- **0.2-20kHz continuously**
- **Variable repetition rate**
- **RS232 control with full software support**



The **LD-527 PIV series** lasers are diode pumped, intra-cavity doubled, dual-cavity, Nd:YLF laser systems ideally suited to imaging applications such as PIV and pump applications. Output energies of up to 30mJ, 527nm per cavity at 1kHz are available.

The lasers are built around a rugged self-supporting Invar rail that bestows excellent mechanical and optical stability. This, coupled with the proprietary resonator design, leads to excellent output beams that are spatially and temporally extremely smooth and stable,

giving rise to light sheets that offer almost identical shot to shot illumination.

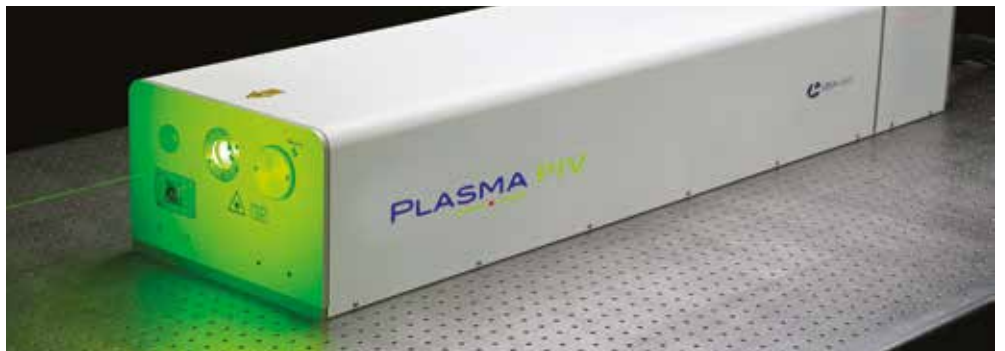
The system can be controlled either by the in-built LCD interface or via RS232 with the supplied software suite or dll. External triggering of the lasers is accessible via a TTL interface.

The LD-527 PIV lasers incorporate Litron's new diode pump module. This state-of-the-art module gives high homogeneity rod pumping, which, in turn, leads to a highly stable, uniform output.

PLASMA PIV

FEATURES

- **0-200Hz operation**
- **$M^2 < 10$**
- **Fully diode pumped**
- **Long diode life**
- **Fully independent laser operation and timing**
- **Smooth homogeneous profile**
- **Optimised for high brightness light-sheets**
- **Compact PSU and detachable chiller**



The DPSS **Plasma PIV** system is a dual resonator, pulsed, diode pumped laser designed specifically for PIV applications. The Plasma PIV comprises two fully independent extra-cavity frequency doubled, pulsed Q-switched Nd:YAG DPSS lasers that are beam combined to a common beam axis. Pulsed diode pumping provides an unprecedented level of flexibility not available previously in PIV lasers.

With an output of 75mJ per pulse up to 150Hz and 60mJ at 200Hz and with pulse lengths of <10ns, it is suited to a wide range of cameras and PIV setups.

With minimal maintenance requirements and few consumable parts, the Plasma offers high uptime, low cost of ownership and outstanding performance.

Ultra rugged pulsed Nd:YAG lasers for PIV & LIBS

Vibration and shock proof

bernoulli
p i v



LUCi touchscreen



The **Bernoulli PIV** is a fully integrated, fully sealed, shock and vibration proof PIV laser system. Machined from solid aluminium and sealed to IP65, the laser head is built for demanding applications where the environment would naturally preclude the use of many standard systems. Incorporating two fully independent laser heads the Bernoulli gives output energies of up to 200mJ at 532nm and repetition rates of up to 100Hz. Powered by a compact fully integrated power supply and cooler unit, and controlled via the LUCi touchscreen, the Bernoulli is both simple and intuitive to use. Industry standard mounting for light sheet optics is standard, as is a full suite of trigger and synchronisation inputs for absolute control of the laser output. Standard accessories such as a motorised

attenuator and PC software suite make the Bernoulli the most fully featured system of its type available.

Bernoulli LIBS - 1064nm low divergence version of Bernoulli is available, suitable for double pulsed LIBS. The Bernoulli LIBS contains two laser oscillators that are combined on to a single beam axis in a single head. The lasers are fitted with low divergence optics to ensure high focusability and make it highly suited to LIBS applications that utilise the double pulse technique. The pulses can be used to reheat the plasma or as cleaning pulses.



Compact Custom Laser Head.



Custom 10J Q-switched Laser.

Custom Laser Systems

Flexibility and expertise

Litron's flexible approach and expertise in laser design means custom lasers are a natural part of our production output.

In addition to its standard range, Litron produces a great variety of custom systems, either based on standard modules or, where necessary, a complete bespoke design to fit your specific needs.

The high degree of both mechanical and electrical modularity inherent in the design of Litron's lasers, yields a platform ideally suited to non-standard or bespoke systems.



Ultra rugged engineering for extreme environments.

The Invar rail structure and associated optical and mechanical mounts form a set of components whose placement within the rail are largely variable. Almost any optical configuration can be achieved with absolutely standard components. This is a significant advantage when adapting an existing design to a specific requirement or when producing an entirely new type of custom laser system.

Applications

Litron's lasers are suitable for many scientific and industrial applications including:

PIV & Visualisation

PIV
Time resolved PIV
PLIF
LIF
Holography
ESPI
Photoacoustic imaging

Scientific Research

Particle physics
Photochemistry
Nonlinear optics
Plasma physics
Flash photolysis
EUV generation
Combustion research

Spectroscopy & LIBS

LIBS
ICP-MS
MALDI-TOF
CARS
RAMAN
PLIF
High resolution spectroscopy
Molecular spectroscopy

LCD & Semiconductor

LCD/OLED repair
Laser lift-off (LLO)
Silicon annealing
Rapid thermal processing
Cleaning
Photovoltaic processing
Laser drilling
Laser marking

Remote Sensing

LIDAR
Environmental monitoring
Atmospheric research

Surface Processing

Laser shock peening (LSP)
De-flashing
Pulsed laser deposition (PLD)
Laser cleaning
LIBS
Laser marking
Annealing

Laser Pump Sources

Ti:Sapphire pumping
OPO pumping
Dye laser pumping
OPCPA

If you are looking for a laser system to fit your specific needs, contact Litron Lasers today to find out about our bespoke designs.

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