Litron Tunable Wavelength Lasers

Aurora II Integra OPO

Integrated Nd:YAG Pumped Type II BBO OPO

GMP
GENERAL MICROTECHNOLOGY & PHOTONICS

Litron Lasers

Litron Total Laser Capability

The Litron Aurora II Integra is an innovative, fully motorised, type II BBO OPO and Nd:YAG pump laser integrated into a single system.

Key Features

- *Tuning range 400-710nm and 710nm to 2.3µm*
- *UV harmonic option for 205-419nm*
- *Linewidth <3cm^{-1}*
- *Fully integrated pump laser and OPO*
- *Motorised OPO tuning with optional closed loop wavelength feedback*
- *OPO optical compensation and 1064nm variable optical attenuator*
- *Highly stable pump laser and corresponding OPO pulse energy*
- *355nm process shutter with energy monitoring as standard*
- *Full PC control via RS232*

Options Include

- *Motorised and closed loop automatic tuning of pump laser harmonics*
- *Auto-stabilisation of pump energy including power supply control*
- *Automated no gap output tuning from 205nm to 2.3µm*

Applications

Photo Acoustic Imaging

Laser Induced Fluorescence

Photobiology

High Resolution Spectroscopy

Non Linear Spectroscopy

Remote Sensing

Process Monitoring

Combustion Research

Display Manufacture and Testing

The Aurora II Integra range of type II BBO OPOs has been designed with reliability, stability and ease of use in mind. This allows researchers to concentrate on their experiments and industrial system integrators the peace of mind that their process will be consistent and robust. With a wide choice of integrated and optimised Nd:YAG pump lasers from 10Hz to 200Hz these are truly flexible systems.

The Aurora II Integra is the first of a growing range of multi-wavelength systems where the OPO and pump source are supplied by the same manufacturer to offer a fully integrated single and matched source solution. The Aurora II Integra builds on this with fully featured computer control of both the pump laser and OPO which allows ease of use and simple system integration.

Integrators will benefit from the unprecedented flexibility and usability of this system. Researchers will appreciate its modularity and how the many possible upgrades can support their changing research objectives.

Aurora II INTEGRA

The LUCi control interface can be used on many of Litron's laser systems. From a one-touch laser startup procedure to a full suite of user functions the laser can be controlled effortlessly.

The Aurora II Integra OPO

High efficiencies are achieved by employing a double pass pump configuration in an elegant and yet robust design. The reliability is further enhanced by using coated and temperature stabilised crystals in a sealed housing to ensure the longevity of the system. Changes in the crystal tuning angle lead to small changes in the beam direction due to beam translation. Compensation for beam translation is provided as standard to maintain the output beam direction which is useful in pointing sensitive applications such as fibre coupling.

Wavelengths are available in a continuously tunable range from 400nm to 2.3µm and this can be extended into the UV with a separate, compact second harmonic housing. The UV extension frequency doubles the output from the OPO to cover the wavelength range of 205nm to 419nm and further broadens its capability. Users then have the option of using either the standard dichroic mirrors or the more robust optional hands free motorised Pellin-Broca prisms to separate the output wavelengths.

Both the pump laser and the compact OPO are controlled and tuned via the intuitive computer interface that adjusts the angle of the BBO crystal using high resolution stepper motors. Automatic closed loop tuning is available as an option using an in-built spectrometer and a feedback loop that automatically adjusts the OPO crystal angle to achieve the specified wavelength.

The entire system requires minimal adjustment due to the integrated Invar optical rail construction delivering excellent output stability as standard. Optional auto-stabilisation and auto-tuning of the 355nm pump laser provide an additional level of automation and long-term stability control for continuous operation and industrial applications.

The Aurora II Integra uses a highly modular system component design suitable for customised solutions tailored to the user's individual needs

The LPY Pump Laser

The pump laser is a critical part of any OPO based laser system and plays a significant part in guaranteeing its performance. To ensure reliability and prevent future damage, the OPO must be matched to the laser. The Aurora is matched to Litron's proven pulsed Q-switched Nd:YAG LPY laser platform.

The LPY platform is constructed on a self-supporting industrial Invar optical rail that provides both thermal and mechanical stability to deliver 24/7 class leading laser performance. A rugged industrially sealed case is then used to protect the enclosed optical rail and microprocessor control systems from environmental damage and contamination leading to both longevity and reliability over many years of service.

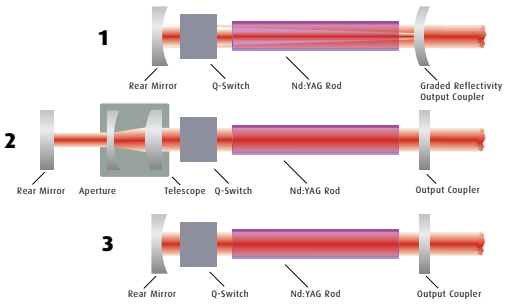
Twin Rod Birefringence Compensation

The twin rod configuration compensates for thermally induced birefringence associated with the high average pump powers needed for high frequency or high average energy operation. By maintaining a high degree of polarisation fidelity in the 1064nm beam, harmonic conversion efficiency, overall system pulse stability and spatial homogeneity are maintained even at high pulse frequencies and pump energies.

Motorised Harmonics with Auto-tuning

All harmonics modules feature thermally stabilised mounts coupled with optional photodiode based auto-tuning. A beam dump process shutter is included as standard to allow the pump laser to warm up and stabilise internally with no external output.

Aurora II INTEGRA



MOBIUS - Microprocessor Laser Control
The MOBIUS microprocessor system continuously monitors the whole laser system to ensure fast and detailed feedback of the laser status. MOBIUS measures temperatures and water flow rates along with other key system parameters and displays them via the PC user interface.

Choice of Resonator Options

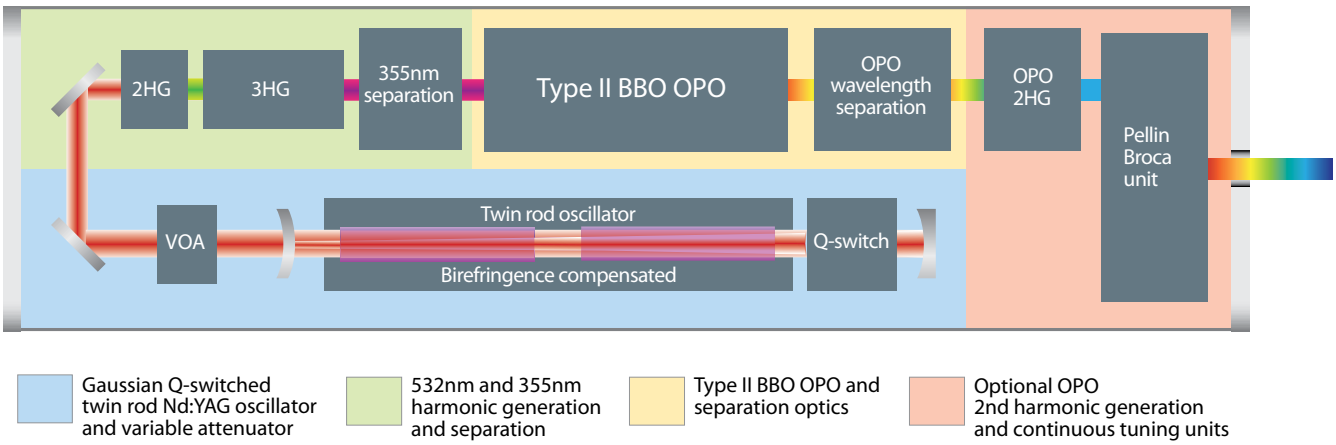
The pump laser is supplied with three resonator options that deliver industry leading spatial homogeneity and a range of pump energies at frequencies from 10Hz to 200Hz.

1 Gaussian Resonator Option - 10Hz to 30Hz
The Gaussian resonator configuration provides the lowest values for divergence and M^2 and delivers the highest efficiencies from both the OPO and harmonics. The output OPO beam is ideal for applications requiring uniform concentrated energy in the smallest focused spot size.

2 Stable Telescopic Resonator Option - 10Hz to 50Hz
The stable telescopic resonator has a very low divergence low M^2 multimode output. This provides an ideal beam for pumping the OPO with a final output more suitable for applications where the OPO will be used in the near field and where a smoother unfocused spatial profile is required.

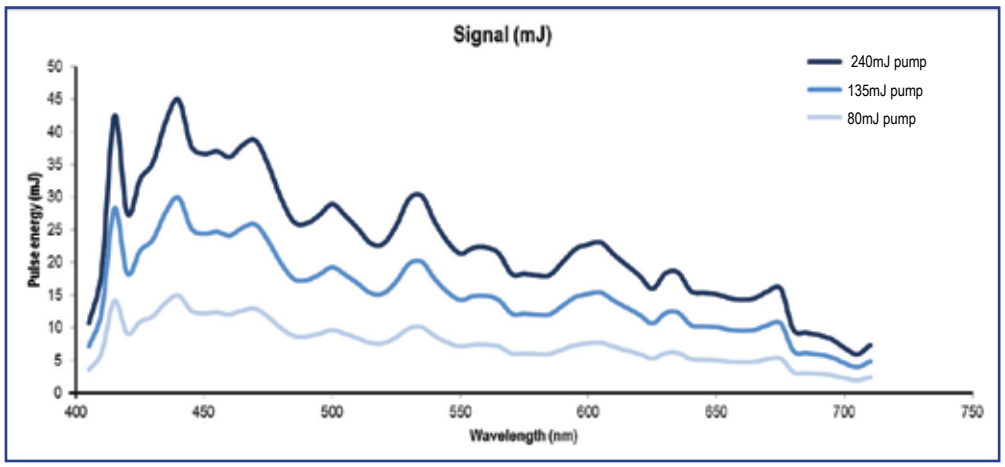
3 Stable Resonator Option - 50Hz to 200Hz
The stable resonator configuration has a very even beam profile and allows OPO configurations in the higher pulse frequency domain up to 200Hz. While overall efficiency of the OPO is lower the higher average power options available with this resonator make this version ideal for industrial applications where a uniform beam and higher throughputs are needed.

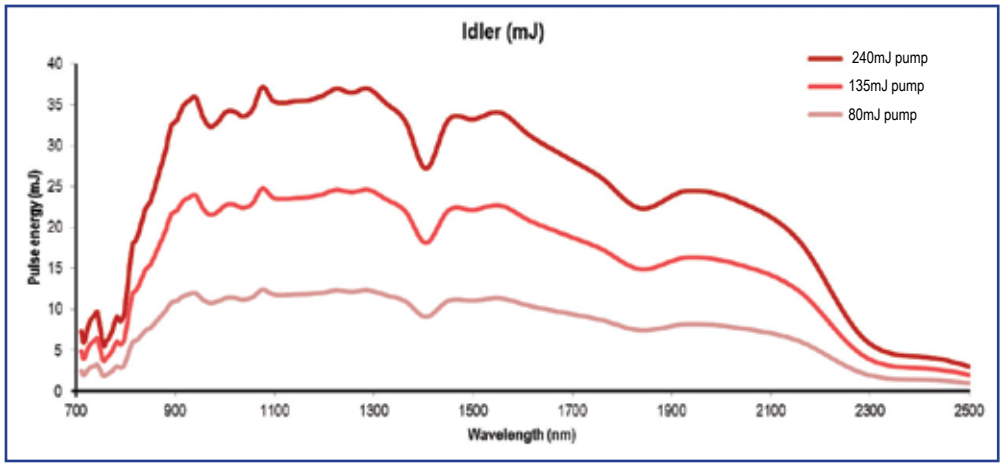
Aurora II Integra Type II BBO OPO Unit Schematic View

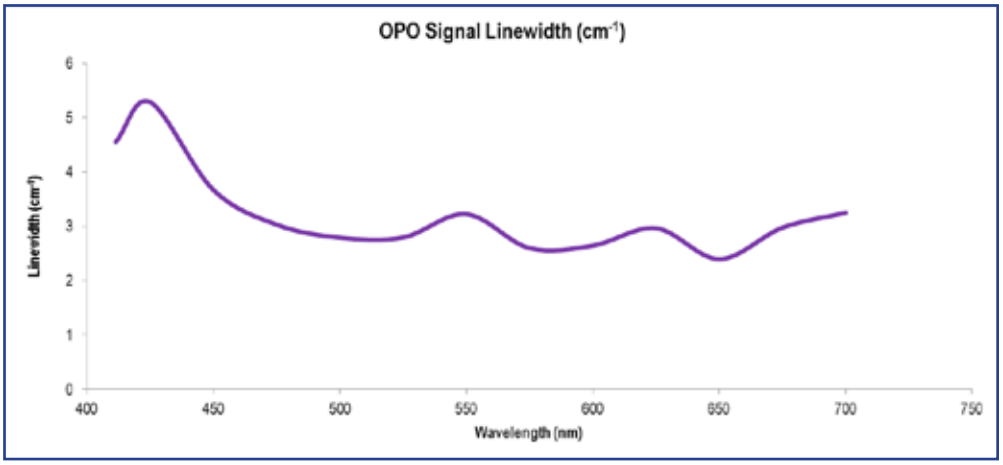


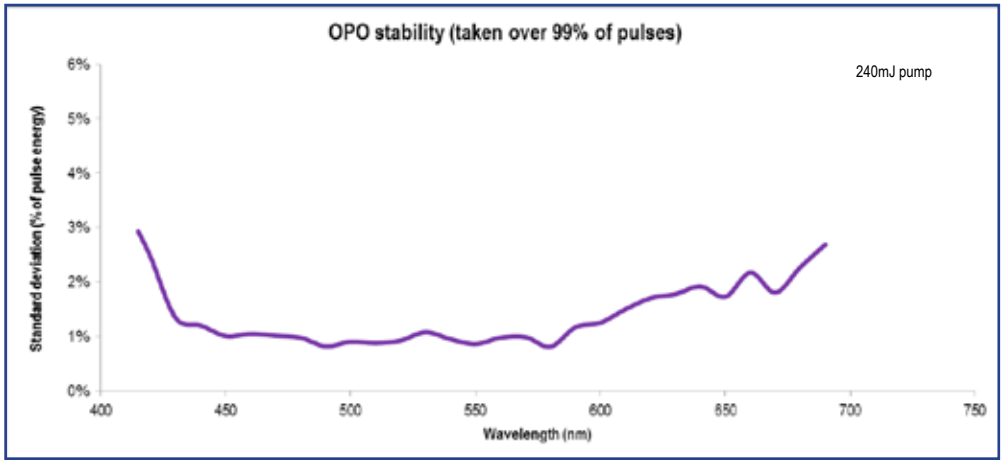
Schematic shows the compact arrangement of the combined pump laser and Aurora II Integra OPO in a single housing.

System Performance - Gaussian Resonator Pump









Aurora II INTEGRA

Technical Data

Model	Aurora II 15	Aurora II 30	Aurora II 45
OPO			
Wavelength Range [1]			
Signal (nm)	400-710	400-710	400-710
Idler (nm)	710-2300	710-2300	710-2300
SH generator (nm)	205-419	205-419	205-419
Output Pulse Energy			
OPO (mJ) [2]	15	30	45
SH generator (mJ) [3]	2	4	6
Linewidth (cm^{-1}) [4]	<3	<3	<3
Pulse stability (σ %) [5]	<4	<4	<4
Scanning Step			
Signal (420-710nm)	~0.01	~0.01	~0.01
Idler (710-2300nm)	~0.5	~0.5	~0.5
Pulse duration (ns) [6]	5-7	5-7	5-7
Beam diameter (mm) [7]	5	5	6
Polarisation			
Signal beam	vertical	vertical	vertical
Idler beam	horizontal	horizontal	horizontal
PUMP LASER [8]			
Repetition rate (Hz) [9]	10-30*	10-30*	10-30*
Pump wavelength (nm)	355	355	355
Max. pump pulse energy (mJ)	70	135	240
Pulse duration (ns) [6]	6-10	6-10	6-10
Resonator type	Gaussian	Gaussian	Gaussian
M^2	<2	<2	<2
Beam divergence (mrad)	<0.5	<0.5	<0.5
Pulse stability (±%) [10]	4	4	4
Services			
Voltage (VAC)	220-250	220-250	220-250
Frequency (Hz)	50/60	50/60	50/60
Power phase	single	single	single
Operating amb temp (°C)	5-35	5-35	5-35
Laser cooling	see table**	see table**	see table**

Notes

1. Optional hands free tuning range 210nm-2.3μnm.
2. Signal at 440nm. See graphs for output at other wavelengths.
3. Signal at 210nm.
4. Linewidth <3cm^{-1} for 470nm<**λ**<710nm. 2HG linewidth is <8cm^{-1} for 210nm<**λ**<355nm range.
5. σ % stability at 440nm. See graph for stability at other wavelengths.
6. FWHM – Measured with fast photodiode and >1GHz oscilloscope.
7. Measured near field, $1/e^2$ diameter at 440nm.
8. LPY70X pump laser. Access port for 355nm is standard. Output ports for 1064nm and 532nm are available as an option.
9. Repetition rates up to 100Hz are available, please see table. All data provided within this table is for 10Hz models.
10. Peak to Peak Energy 100% of pulses.

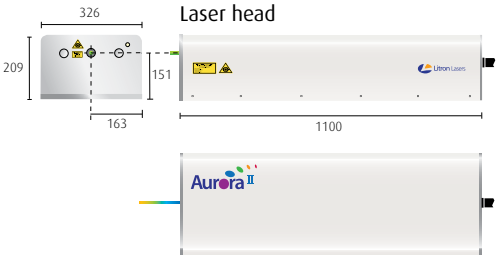
*** High frequency versions available for 50Hz & 100Hz.**

Pump Laser - External Cooling Options			
Pump Energy	**80mJ**	**135mJ**	**240mJ**
Frequency			
10Hz	Air	Air	Air
20Hz	Air	Chiller	Chiller
30Hz	Chiller	Water/water	Water/water
50Hz	Water/water	Water/water	
100Hz	Water/water		

**** Air and water cooled versions available** (see table).

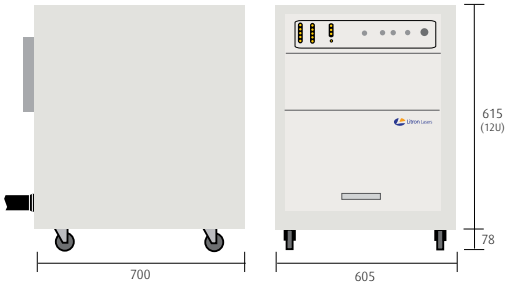
Dimensions	
Laser Head	
(mm)	326 (W) x 209 (H) x 1100 (L)
(Inches)	12.8 (W) x 8.2 (H) x 43.3 (L)
PSU	
12U (mm)	605 (W) x 700 (D) x 615 (H)
(Inches)	23.8 (W) x 27.5 (D) x 24.2 (H)
LPU1000 (mm)	238.5 (W) x 502 (D) x 615 (H)
(Inches)	9.4 (W) x 19.7 (D) x 24.2 (H)

Cooling Requirements	
Air	
Max. air temp (°C)	35
Min. air temp (°C)	5
Humidity % (non condensing)	0-80
Ambient heating (kW)	<2
Water	
Max water temp (°C)	20
Nominal flow rate (lpm)	4-6
Min water pressure (Bar [psi])	2 [30]
Max water pressure (Bar [psi])	4.5 [65]
External water filtration (micron)	100
Ext. chiller high pressure bypass (Bar [psi])	5 [73]
Ext. chiller thermal load (kW)	~4

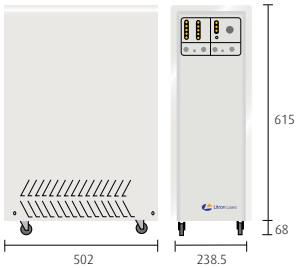


Laser head

All dimensions in mm unless stated.



Rackmount PSU



LPU1000 PSU

Our policy is to improve the design and specification of our products. The details given in this document are not to be regarded as binding.

Litron Lasers

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