Litron Tunable Wavelength Lasers

Aurora II Integra OPO

Integrated Nd:YAG Pumped Type II BBO OPO

Litron Total Laser Capability

Litron Lasers

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

- *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*
- *Direct access to 355nm pump output*
- *No user-alignment required*
- *Full PC control*

Options Include

- *UV harmonic option for 210 – 410nm*
- *Spectrometer for wavelength*
- *measurement and automatic tuning*
- *1064nm variable optical attenuator*
- *Direct access to 1064nm and 532nm*
- *2nd harmonic*
- *Variable repetition rates*
- *532nm pumping for high energy*
- *670 – 2600nm operation*

Applications

Photoacoustic Imaging

Laser Induced Fluorescence

Photobiology

High Resolution Spectroscopy

Non Linear Spectroscopy

Remote Sensing

Process Monitoring

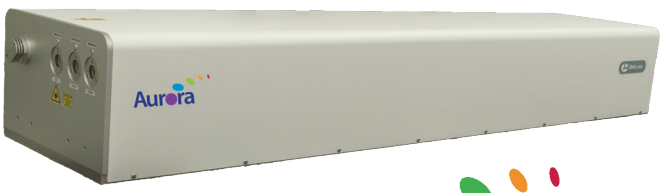
Combustion Research

Display Manufacture and Testing

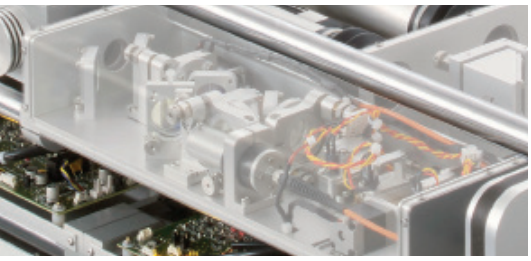
The Aurora II Integra range of type II BBO OPOs has been designed with reliability, stability and ease of use in mind. This allows researchers to concentrate on their experiments and industrial system integrators the peace of mind that their process will be consistent and robust. With a wide choice of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

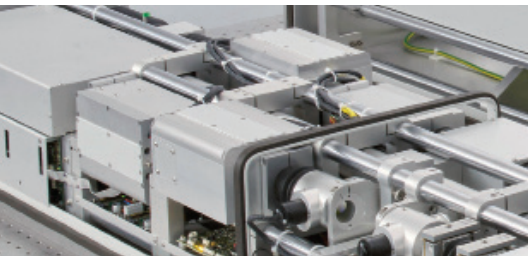
The Aurora II Integra is the first of a growing range of multi-wavelength systems where the OPO and pump source are supplied by the same manufacturer to offer a fully integrated single and matched source solution. The Aurora II Integra builds on this with fully featured computer control of both the pump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

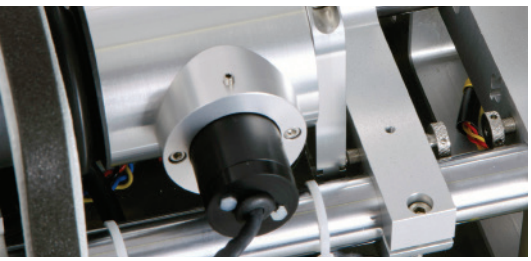
Integrators will benefit from the unprecedented flexibility and usability of this system. Researchers will appreciate its modularity and how the many possible upgrades can support their changing research objectives.



Aurora II
INTEGRA







The 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 410nm 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 210nm to 410nm 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

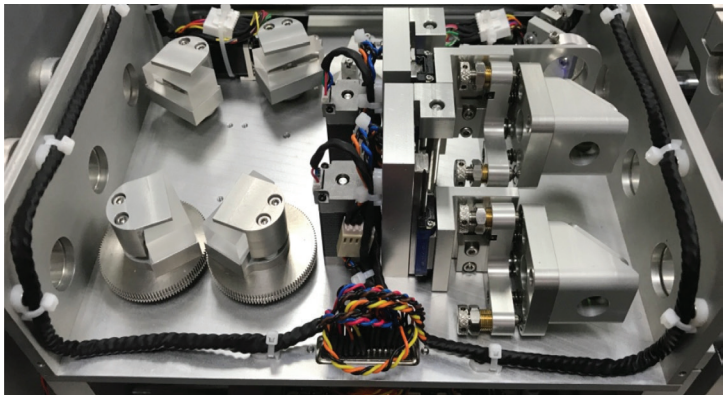
All harmonics modules feature thermally stabilised mounts coupled with optional photodiode based auto-tuning. A beam dump process shutter is included as standard to allow the pump laser to warm up and stabilise internally with no external output.

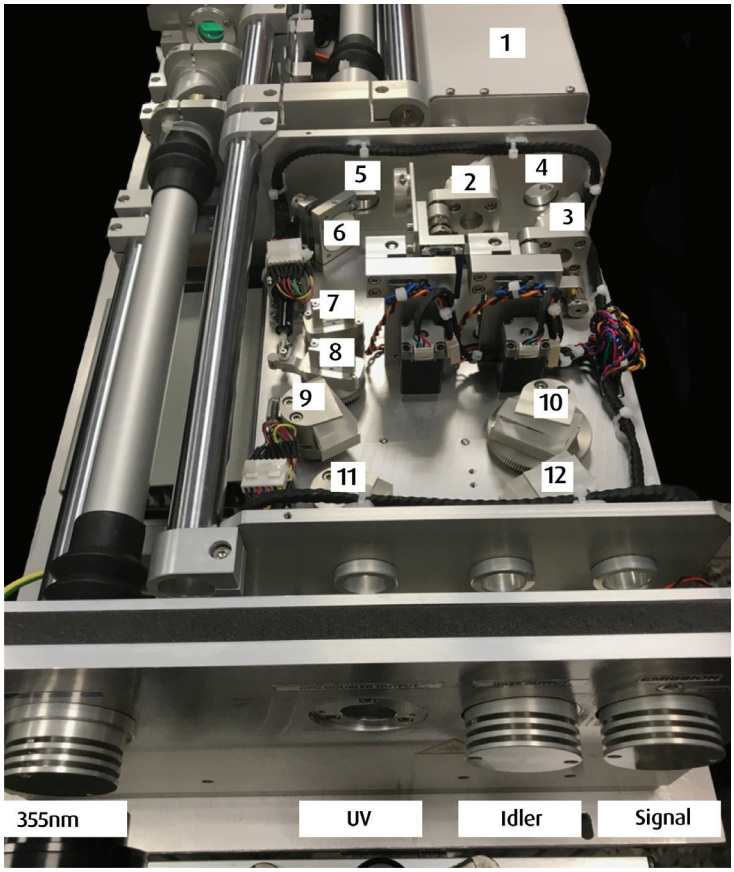
MOBIUS - Microprocessor Laser Control

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.

Aurora II INTEGRA

Aurora UV Module - optional access to UV wavelengths





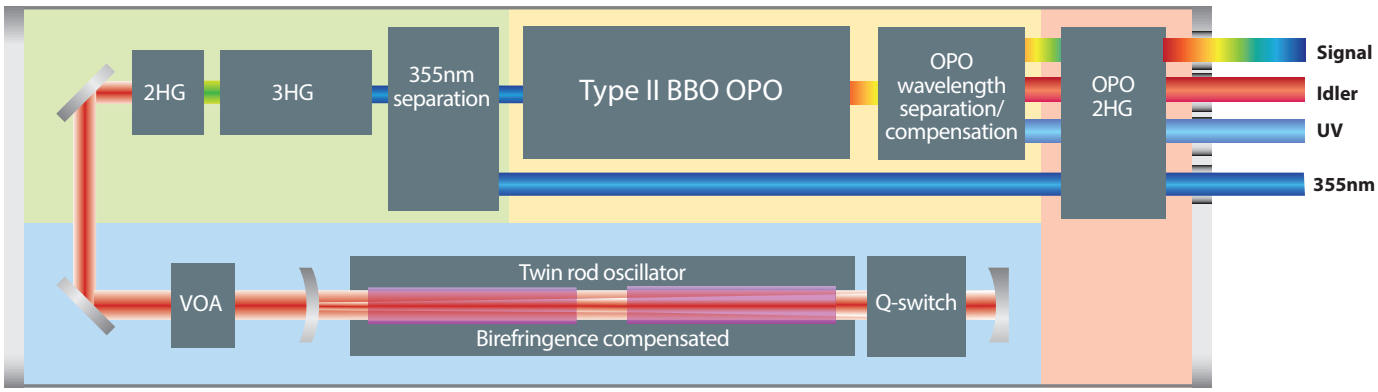
The fully integrated and motorised Aurora UV module extends the Aurora performance into the UV range.
The UV module is controlled via the standard software for simple, responsive control. A spectometer, internally mounted within the OPO (1), provides closed loop feedback to automatically tune to the selected wavelength. Alternatively, the user can tune manually the OPO in steps using the jog up/ down buttons in the software.

The UV range from 210nm to 410nm is generated by frequency doubling of the signal (4) and idler (5) beams. Both the signal and idler have separate motorised mirror movers (2&3) which allow each beam to exit from the front port of the laser or, alternatively, be diverted (6) through the UV doubler (7&8).

A motorised four prism arrangement (9-12) with internal beam blocks is used to separate the UV from the fundamental wavelength. Pellin-Broca prisms used in this way give a very pure separation of the wavelegths. The prisms also allow for fine optimisation for maximum energy and accurate positioning of the output beam.

1 - OPO
2 & 3 - mirror movers
4 - signal
5 - idler
6 - steering mirror
7 & 8 - doubling crystals
9-12 - motorised Pellin-Broca separators

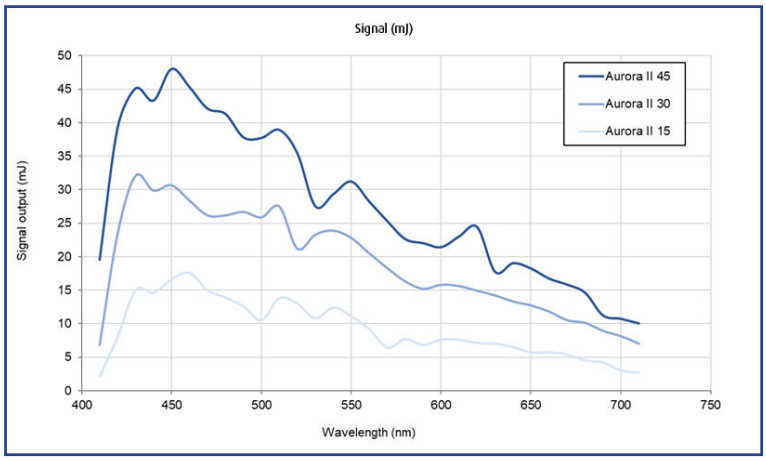
Aurora II Integra Type II BBO OPO Unit Schematic View

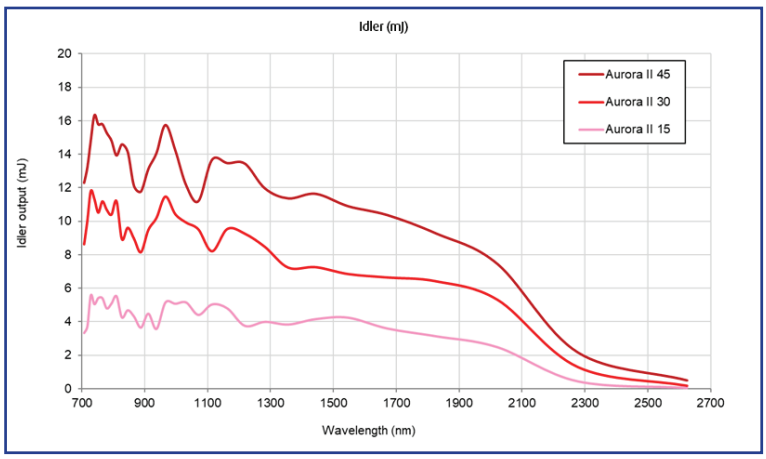


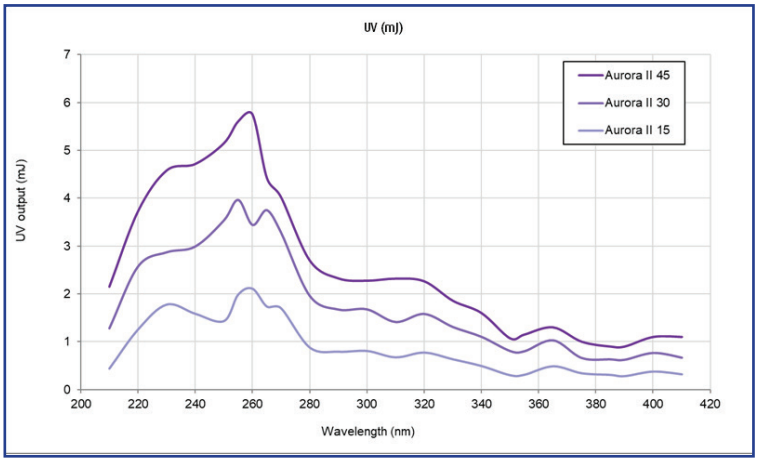
Twin rod Nd:YAG oscillator and variable attenuator
532nm and 355nm harmonic generation and separation
Type II BBO OPO and separation optics
Optional OPO 2nd harmonic generation

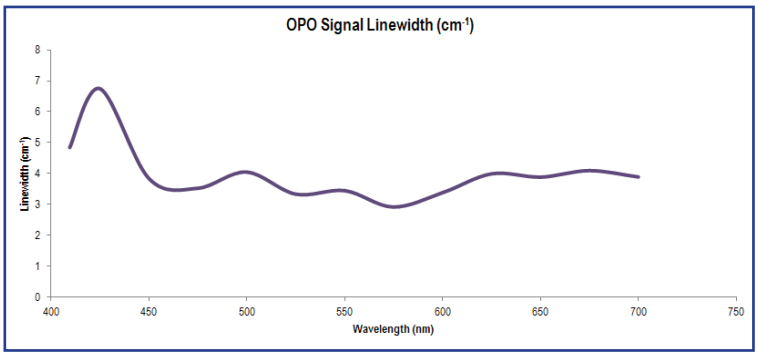
Schematic shows the compact arrangement of the combined pump laser and Aurora II Integra OPO in a single housing.

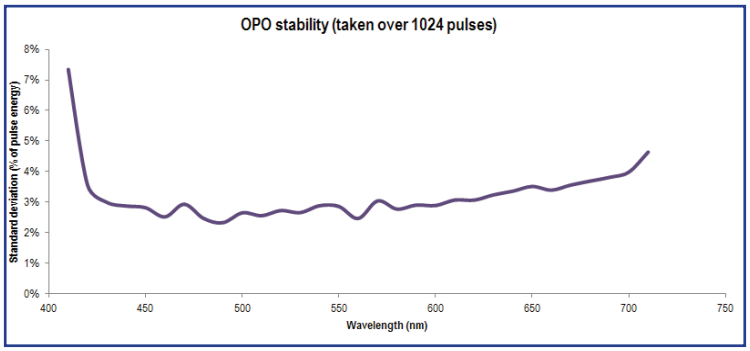
System Performance











Aurora II INTEGRA

Technical Data

Model	Aurora II 15	Aurora II 30	Aurora II 45
OPO			
Wavelength Range (1)			
Signal (nm)	410-710	410-710	410-710
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 (▯ %) (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-2.3µm.
2. Signal at 470nm. See graphs for output at other wavelengths.
3. Signal at 210nm.
4. Linewidth <3cm^{-1} for 470nm<▯<710nm. 2HG linewidth is <8cm^{-1} for 210nm<▯<355nm range.
5. ▯ % stability at 440nm. See graph for stability at other wavelengths.
6. FWHM – Measured with fast photodiode and 300MHz 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.

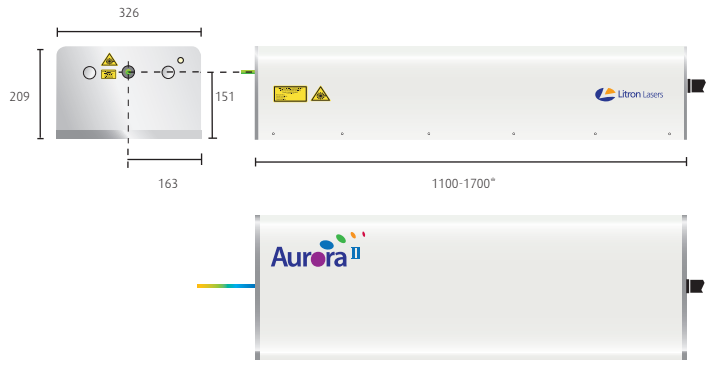
Cooling Requirements	
Air	
Max. air temp (°C)	35
Min. air temp (°C)	5
Humidity % (non condensing)	0-80
Ambient heating (kW)	<2
Water	
Max water temp (°C)	20
Nominal flow rate (lpm)	4-6
Min water pressure (Bar [psi])	2 [30]
Max water pressure (Bar [psi])	4.5 [65]
External water filtration (micron)	100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

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)

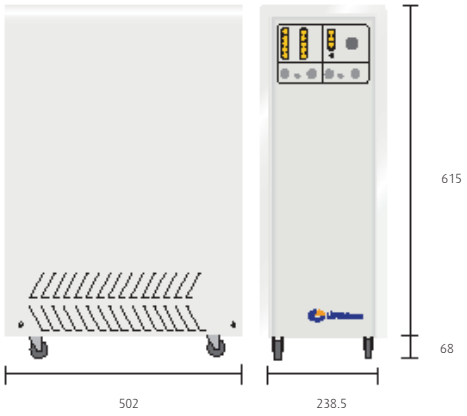
*** High frequency versions available for 50Hz & 100Hz.**

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

Laser head



LPU1000 PSU



All dimensions in mm unless stated.

** Depending on configuration*

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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.

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