OXFORD INSTRUMENTS ANDOR

Laser Engines Highly Efficient, Multi-line Laser Sources

Key Features

- Single & multimode laser engines
- ✓ Up to 8 (ILE) or 10 (HLE) laser lines
- Up to 3 switched output ports
- Wavelength range 405-785 nm
- Classic wavelengths
- Active thermal stabilization
- Extended dynamic range

Key Applications

- Live cell bioimaging
- Photostimulation
- Super-resolution (dSTORM)
- DNA-PAINT applications
- Single molecule studies
- High-speed scanning
- Transcriptomics and multiplex



Introducing Laser Engines

The Andor HLE is a High Power Laser Engine utilizing the latest multimode laser diode technologies. HLE is a fourth-generation source which builds on the finest features of our ILE, integrated laser engine. ILE is the preeminent single mode laser engine for TIRF, widefield and confocal microscopy, providing exceptional stability, performance and flexibility. With more than a thousand ILEs in the field and more than 15 years' experience we build on this platform with confidence. ILE delivers between two and four laser lines per chassis and up to eight lines in a dual chassis configuration, HLE offers two to seven multimode laser lines in a single chassis and up to ten lines in dual configuration. Both engines can be outfitted with two or three fast galvo-switched fibre outputs. Active power and thermal management deliver longterm, ultra-stable, agile illumination. HLE and ILE wavelengths are closely matched, with selections from 405, 445, 488, 515, 560, 594, 640, 685, 730, 785 nm (nominal) allowing their use in a wide range of bioimaging applications.

The new HLE benefits from lower coherence multimode lasers and with power levels ranging from 400 to 2500 mW is suitable for studies like dSTORM and PAINT (point accumulation in nanoscale topography) single molecule applications and photostimulation. HLE is equipped with direct modulation (2-100%) as well as serial neutral density filters enabling a further 1,2 or 3 optical density units for ultra-low light live-cell imaging.

ILE with single mode laser powers 50-150 mW supports all applications including confocal, widefield, single mode TIRF and HiLo.

Feature	Benefit
Multi-line laser source	Up to 8 single mode (ILE) or 10 multimode (HLE) laser lines
Direct modulation	Supports dual laser simultaneous imaging with active blanking
405-785 nm	Excite DAPI to NIR fluorescent reporters
Three-port switch	Multi-function flexibility: stable, millisecond galvo switching
Field upgradeable•1	Protect your investment and expand capabilities as required
Huge dynamic range	Adapt easily from single molecule power blinking to gentle live cell imaging
Thermally managed	Long term, ultra-stable power delivery
Borealis compatible	Enhanced throughput and uniformity widefield and spinning disk confocal imaging Now supporting Borealis-TIRF (patent pending).

Rat brain oligodendendrocytes labelled with LI-CorlR[®]Dye 800CW NHS Volume projection with native rat brain tissue autofluorescence







Emission

510-540 & 770-800 nm Emission

Maximum intensity z-projection and 3D volume rendering of an aged rat brain slice containing oligodendrocytes and blood vessels fluorescently labelled with Invitrogen Alexa Fluor 488 dye and LI-COR® IRDye 800. Tissues like these accumulate autofluorescent lipofuscin pigments that create a high image background when excited and imaged with visible wavelengths. The same z-projection and volume rendering. of the brain slice when excited and imaged with infrared wavelengths show a greatly reduced autofluorescence background signal and a deeper imaging depth. Specimen kindly prepared by Dr. Claude Messier, University of Ottawa

Volume projection of only rat brain tissue autofluorescence





488 nm Excitation

510-540 nm Emission

Application Focus

Super-resolution (dSTORM)

The Borealis® optical configuration allows illumination zoom (iZoom) to be supported in Dragonfly 600 series. iZoom enables power density multiplication in reduced fields of illumination. HLE raises the bar on power density for single molecule localization techniques such as dSTORM especially when combined with B-TIRF - see single molecule studies.



Super-resolution image of microtubules with B-TIRF Image credits: F. Rivera-Molina, Yale University. Also on cover.



Live-cell expressing photo switchable fusion protein – emission changes with exposure to targeted 405 nm laser irradiation – Mosaic[®]. *Image credits: A. Gunjan, FSU*.

Photostimulation

The HLE extends Mosaic[®] photostimulation (PS) capabilities using fast port switching to deliver high power at peak absorption bands for many fluorescent probes. The microscope filter turret holds a beam combining dichroic or splitter enabling imaging and PS with minimal moving parts. Mosaic[®] is a digital mirror device (DMD) that can be readily utilized for FRAP, activation and optogenetics. Mosaic[®] can be equipped with laser and/or LED illumination depending on the applications requirements.

Single Molecule Studies

A single molecule focus led us to invent a new mode of total internal reflection imaging: Borealis-TIRF or B-TIRF. B-TIRF exploits super-critical angle incidence to create a uniform evanescent field with full control of power density. B-TIRF provides near perfect molecular blinking, when used with suitable chemistry.

B-TIRF utilizes a modified BCU light path and can be optimized for both 60x and 100x TIRF lenses, as well as highly inclined oblique illumination (HiLo) for deeper specimen penetration.



In re ar th la to

Large tissue section scanned for synaptic protein density mapping Dragonfly high speed confocal. *Image credits: S. Grant, University of Edinburgh.*

DNA-PAINT Applications

DNA-PAINT (point accumulation for imaging in nanoscale topology) is a super-resolution method that exploits transient hybridization between short oligonucleotides strands to visualize nanostructures Resolution of 5-10 nm can be routinely achieved. A "docking strand" is targeted to a motif of interest via antibody or aptamer or similar and the imager strand in solution binds stochastically, HLE or ILE with iZoom provides intense laser illumination to highlight binding events for high precision localization.



PAINT images of 20 nm DNA origami structures using B-TIRF. *Image credits: F. Schuder, Yale University.*

Live Cell Bioimaging

Phototoxicity can be a big problem for live specimens and a source should be adaptable. ILE and HLE are therefore designed to deliver extremely low light levels with fast switched neutral density (ND) filters in the excitation light path under user control. When we combine analogue control with ND filters laser power ranges from 100% down to 0.002% in HLE and 100% to 0.2% in ILE. Thus a 2 Watt laser can deliver a few microwatts in the full field of view of the microscope. This is well below the phototoxic level observed during mitosis of mammalian cells.^{•2}



Tracking single molecules for vesicle trafficking studies. *Image credits: T. Chaya, University of Delaware.*

Spatial Transcriptomics

Imaging tissue is the target of spatial "omics" research, which aims to understand tissue architecture, its spatial organization and how this impacts the genetic and functional profile of individual cells in-situ. In these situations, where large tissue volumes require fast imaging across many wavelengths, HLE and ILE are called upon to deliver the necessary power and spectral output for high performance imaging.



Observing synchronized mitosis in drosophila embryo. Image credits: I. Balao-Santos & A. Tavares, University of Algarve.

ILE & HLE Specifications

Model specifications	ILE-400	ILE-700	ILE-800	HLE-700
Max number of lasers	4	7	8	7
Output mode	At least 1 Single and/or multi (8 lines)			Multimode only
Wavelength range (nm)	405-640 single m	ode, 405-785 multir	node	405-785
Multiport switch outputs	2,	3	+1 or +2	Up to 3
Multiport switch time (ms)		3		<7
Blank/TTL modulation (diode) MHz	50			1
Blank/TTL modulation (fibre laser only) kHz	NA			0.1
Blank/TTL modulation (OPSL) kHz	50			
Computer control interface	RS-232 or USB 2.0			
TTL/analogue control interface	HD15 D-sub HD15 D-sub x2			Ext TTL only (no analogue)
Non-linearity (% full scale)	<5%			
Software requirements and compatibility	Fusion, Andor iQ, MetaMorph, Micro-Manager			Fusion, Andor iQ, Micro-Manager

ILE & HLE with Borealis for Superior Uniform Illumination

The laser engines are optimized for **Borealis**® illumination, with a multi-mode fibre output for direct coupling to the Beam Conditioning Unit (BCU). Homogenization of the multi-mode output provides outstanding illumination uniformity with our Dragonfly® high speed confocal platform,

Borealis illumination is further exploited in oblique conditioning Unit. and TIR (total internal reflection) imaging using our newly introduced and patented Borealis-TIRF (B-TIRF) modality, available on Dragonfly 600 series only. B-TIRF delivers superior uniformity, avoids fringing artefacts and enables high power densities for localization imaging techniques.

Both HLE and ILE can be used for all multimode illumination strategies, but ILE products can also be used for single mode applications including TIRF, which may be preferred in situation where extremely tight control of the evanescent field penetration depth is required. Find out more about Dragonfly and B-TIRF

Configuration with Mosaic and MicroPoint

HLE and ILE fast multiport switches are ideal for sharing imaging lasers for targeted photo-stimulation applications to get more value from your investment. HLE can be combined with Mosaic® or MicroPoint to deliver power for efficient photo-switching, bleaching (FRAP/FLIP) and optogenetics applications. While ILE with Mosaic® will find applications in Optogenetics, where the required power densities for activation are lower. These capabilities are currently under development.

Find out more about Photostimulation products.





BCU - Beam

Dragonfly confocal system



Mosaic



ILE Laser Options and Maximum Power

HLE Laser Options and Maximum Power



Wavelengths options for ILE and HLE are closely matched and so both are compatible with all Andor Dragonfly optical configurations. You can substitute or upgrade from ILE to HLE in situations where more power is required, with only one exception: single mode TIRF requires ILE. If upgrading from an older Dragonfly system, please check details of dichroic specifications. HLE and ILE can work together in a system requiring a combination of laser configurations, for example if single mode TIRF is required along with high powered Borealis illumination.

HLE			п	.E
Laser wavelength (nm)	Diode power (mW)	Max at 50 µm fibre output (mW)	Module Power (mW)	Max at 50 µm fibre output (mW)
405	1000	510	100/200	65/130
445	2400	1880	75	50
488	2000	1350	50/150	40/115
514	N/A	N/A	100/150	75/115
515	1000	440	N/A	N/A
560	1000	840	N/A	N/A
561	150	130	50/100/150	37/75/115
592	1000	840	N/A	N/A
594	100	90	N/A	N/A
637	N/A	N/A	140	110
640	700	480	N/A	N/A
685	400	190	40	35
730	1000	380	30	25
780	1200	250	N/A	N/A
785	N/A	N/A	100	65

HLE wavelength tolerances: 560, 592 & 642 ±0.5 nm; 561, 594 ±2 nm; 685±3 nm; 405, 515, 640 & 730 ±5 nm; 448 +5/-2 nm; 780 ±3 nm ILE wavelength tolerances: 488, 514, 561 & 594±2 nm; 405, 445, 637, 685, 730 & 785 ±5 nm Please contact Andor for more details on expected efficiencies.

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Build Your Product Continued.

Step 1.

L	

Step 1. **Build Your Product**

Select from the following options to build your specific product order code for our 400 and 700 ILE models.



Description	Mode	Ports	Part number
	Single mode only	1	LC-ILE-400-MOS1
	Single mode only	2	LC-ILE-400-M0S2
	Single mode only	3	LC-ILE-400-MOS3
4-line ILE	Multimode only	1	LC-ILE-400-M
	Mixed mode	2	LC-ILE-400-M1S1
	Mixed mode	3	LC-ILE-400-M1S2

MM indicates Multimode

LC-ILE-400-M2 and ILE-ILE-400-M3 options also available for all multi-mode excitation e.g. MIcroPoint FRAP.







Up to 7 lines (ILE-700)

Description	Mode	Ports	Part number
	Single mode only	1	LC-ILE-700-MS01
	Single mode only	2	LC-ILE-700-MS02
7-line ILE	Single mode only	3	LC-ILE-700-MS03
	Mixed mode	3	LC-ILE-700-M2S1
	Mixed mode	4	LC-ILE-700-M2S2

l ILE-4 line: ILE-4 line	LE-800: 8 lines : e.g.405/488/560/640 & e: e.g.445/514/594/685	Select from code for our	the following options to 800 model.	build your specif	ic product order
1		Up to 8 lii	nes (ILE-800)		
		Descriptio	n Mode	Ports	Part number
		8-line ILE	Multimode only	1	LC-ILE-800-M
	LC-ILE-800-M MM	8 Lines M	lixed Mode (by C	SR only) ●3	
			Description	Mode	Part number
		8-line ILE sin	gle port multimode only	Multimode only	LC-ILE-800-M1S
L	LC-ILE-800- M1S	Se	lect Ports - Up to maximı	Im of 2 single mode	e (SM) ports
	Choose number of additional	Firs	st SM port on primary ILE-	800 unit	LC-ILE-PORT-1S
+ ৪ LC-ILE-	ports (max 2) ↓ 2 LC-ILE- श	First	SM port on secondary ILE	-800 unit	LC-ILE-PORT-1S-2
PORT-1S	PORT-1S-2 S Or B	Seco	and SM port on primary ILE	-800 unit	LC-ILE-PORT-2S
EC-ILE-	3 LC-ILE-	Secon	d SM port on secondary II	_E-800 unit	LC-ILE-PORT-2S-2
	B-TIRF [®] or MicroPoint ◀	Coming soor Dragonfly.	n: HLE as the light sourc	ce for MicroPoint c	and Mosaic in
Step 2.	Select Additional Fibres				
© ©	Fibre selection is typically only	y required for	third party products		
SM MM	Single mode, polarization main	ntaining (PM) fib	re for applications that rea	quire angled fibre	LD-FIBR-PMTA
Additional Fibre	input. Typical applications are	standard CSU	heads and TIRF systems v	vith angled input.	
Selection	Micropoint	t - 25 micron/0.	12, 4 meter FC to SMA		SV-HLE-FIB-MIC
Chair 2					
Step 3. Select the Laser Powers and Wavelengths					
5	Some laser combinations may	not be suppor	ted if the wavelengths	are too close. Ple	ase contact your
,		it options.	Compatibility con	siderations	Part number
	Solid state 405 nm smart	laser	compatibility com	siderations	raithamber
	where XXX is 100 or 200) mW	> 4 lines place in pri	mary ILE unit	LM-405-XXX
	Solid state 445 nm smart lase	r at 75 mW	> 4 lines place in seco	ondary ILE unit	LM-445-075
	Solid state 488 nm smart laser where XXX is 050 or 150	r at xxx mW) mW	> 4 lines place in pri	mary ILE unit	LM-488-XXX
NH/	Solid state 514 nm smart lase	r at 45 mW	> 4 lines place in seco	ondary ILE unit	LM-514-45
	Solid state 561 nm smart laser where XXX is 050, 100 or 1	r at xxx mW 50 mW	> 4 lines place in pri	mary ILE unit	LM-561-XXX
Laser Power &	Solid state 594 nm smart laser where XXX is 060 or 100	r at xxx mW) mW	> 4 lines place in seco	ondary ILE unit	LM-594-XXXSL
vvavelength	Solid state 637 nm smart laser	at 140 mW	> 4 lines place in pri	mary ILE unit	LM-637-140
	Solid state 685 nm smart lase	r at 40 mW	> 4 lines place in seco	ondary ILE unit	LM-685-40
	Solid state 730 nm smart lase	r at 30 mW	> 4 lines place in seco	ondary ILE unit	LM-730-30
	Solid state 785 nm smart laser	at 100 mW	> 4 lines requires CSR (B	CU-200 dichroic)	LM-785-100

HLE

Industry-Leading Power, Flexibility, Classic Wavelengths for Bio-imaging+



Step 2.	Select Additional Fibres
SM MM	Fibre selection is typically only required for thi If purchasing for use with Borealis you do not for stand alone operation please select fibres
Additional Fibre	Description
Selection	Borealis – 50 micron/0.12, 1
	MicroPoint [®] – 25 micron/0.12,
	Mosaic® - 400 micron/0.22, 4
Step 3.	Select the Laser Wavelengths
	Four slots available per HLE: up to seven wave configurations see figures on page 12. If 56X r a single HLE.
	Description
	405 nm/1000 mW and 488/2000 dual laser ma (DLM)
NIZ	445/2400 and 515/1000 DLM
	560 nm, 1000 mW single mode fibre laser (SM
Laser Power &	561 nm, 150 mW single mode OPSL smart laser n
Wavelength	592 nm, 1000 mW SMFL
	594 nm, 100 mW single mode OPSL smart laser n
	640/700 multimode laser diode
	640/700 and 730/1000 DLM
	685/400 and 785/1200 DLM
	Note: Only one HLE can excite MicroPoint fibre input. Mosa

hird party products.

t need to specify a fibre for the M1 port. But if purchasing the for all ports.

ion	Part number
2, 3 meter, FC to FC	LD-FIBR-MM50
2, 4 meter FC to SMA	SV-HLE-FIB-MIC
2, 4 meter FC to SMA	SV-HLE-FIB-MOS

velengths with dual laser modules (DLM). For dual HLE https://www.englighted.com (DLM). For dual HLE

	Configuration notes	Part number
nodule	Requires one slot of four	LM-405-488-DUAL-MM
	Requires one slot of four	LM-445-515-DUAL-MM
SMFL)	If used with 592-1000 requires second HLE	LM-HLE-560-1000
r module.	Requires one slot of four	LM-561-150
	If used with 560/1000 requires second HLE	LM-HLE-592-1000
r module	Requires one slot of four	LM-594-100
	Requires one slot of four	LM-640-700-MM
	Requires one slot of four	LM-640-730-DUAL-MM
	Requires one slot of four	LM-685-785-DUAL-MM

saic can accept inputs from both HLE-700 units if required.

HLE





Front Panel

)

Right Side Panel





Rear Panel

Left Side Panel

Dimensions in mm

Model	HLE-700
Dimensions, cm	53 x 46 x 21
Weight, fully loaded, kg	35

Notes:

Allow 100 mm space around the HLE for ventilation Weight will vary with system configuration

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ILE



Front Panel



Dimensions in inches [mm]

Model	ILE-400	ILE-700/80
Dimensions, cm	46 x 46 x 20	46 x 46 x 41
Weight, fully loaded, kg	20	40

Notes:

Allow 100 mm space around the ILE for ventilation Weight will vary with system configuration





Right Side Panel



Top Panel

N STRUMENTS ANDOR

Order Today

Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products. For a full listing of our local sales offices, please see: andor.oxinst.com/contact

Our regional headquarters are:

Europe

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North America

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Items shipped with your system:

Fully configured platform Single or multimode fibres as ordered System performance sheet User manual in electronic format USB 2.0 cable Communication cable (RS-232) Triggering and interlock cables (BNC) Blanking cable: HD 15D-sub to 3x BNC male Country specific power cable

Minimum Computer Requirements:

 Compatible with Andor Fusion, iQ, Micro-Manager, MetaMorph (ILE only) and supported in Andor ALC SDK

Regulatory Compliance

- EU EMC/ LV/ Machinery/ RoHS Directives
- Registered with CDRH
- Laser safety compliant for IEC 60825-1 and CDRH 21 CFR 1040.10

Operating & Storage Conditions

- Operating Temperature: 18°C to 28°C ambient
 Operating Relative Humidity: < 70% (noncondensing)
- Storage Temperature: -20°C to 50°C ambient
- Power Requirements
- Mains Power supply: 100-240 VAC, 50/60 Hz
- Power consumption: HLE-700: 70 W typical (140 W max)
- Power consumption: ILE-400: 60 W typical (300 W max), ILE-700/800: 120 W typical (600 W max)

Japan

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China

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ILE&HLESS 0124 R1

Footnotes: Specifications are subject to change without notice

- 1. HLE-700-M1 has a single output on the top port. Field upgrade to multi-port is not supported. HLE-700-M2 can be field upgraded to HLE-700-M3.
- 2. Magidson V, Khodjakov A. Circumventing photodamage in live-cell microscopy. Methods Cell Biol. 2013;114:545-60. doi: 10.1016/B978-0-12-407761-4.00023-3.
- 3. For mixed mode systems, the multimode port is always the last port. i.e. port 2 of a 2 port, or port 3 of a 3 port ILE configuration.
- 4. The HLE-700 and some ILE configurations are Class 4 Laser Products and so must comply with IEC 60825-1 and the CDRH regulations for Manual Reset. An external manual reset box is provided for this purpose.
- 5. Standard warranty 12 months parts and labour.
- 6. Extended warranty up to 5 years, is available on request.
- 7. Installation, service and upgrade should be performed by qualified personnel.
- 8. All local safety standards should be followed by users.

HLE Class 4 laser safety classification labels

