

# Andor Laser Engines

## Highly Efficient, Multi-line Laser Sources

### Key Features

- ✓ Multi-mode laser engines
- ✓ Up to 10 laser lines
- ✓ Up to 3 switched output ports
- ✓ Wavelength range 405-785 nm
- ✓ Classic wavelengths
- ✓ Active thermal stabilisation
- ✓ Extended dynamic range

### Key Applications

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

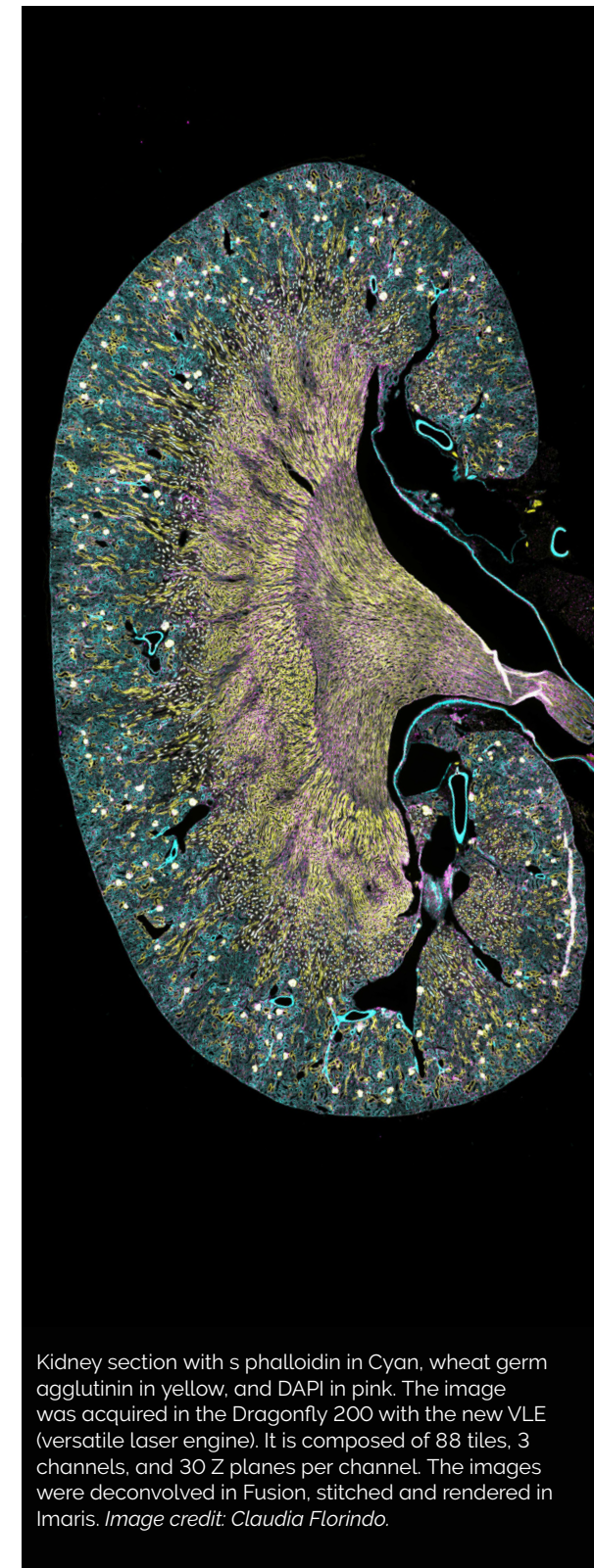


# Introducing Laser Engines

Andor's laser engine portfolio offers exceptional quality packed into highly flexible devices. Aiming to meet users' current and future needs, our laser engines are fully configurable with a wide range of applications in life sciences from Super Resolution Microscopy to long-term, gentle live imaging, TIRF and photostimulation. We offer two solutions where users can select the lasers needed for their applications and add more lasers if needed.

- ✓ **VLE** - Versatile laser engine - Andor's new laser engine delivers high-quality illumination for live or fixed cell imaging using confocal or widefield. VLE also delivers enough power for photostimulation applications using MicroPoint, and users can add up to 10 lasers from UV to NIR. Further, when higher laser power is needed, the VLE can be field upgraded to HLE.
- ✓ **HLE** - High Power Laser Engine - Andor's high-end laser engine delivers high power for SMLM applications and photostimulation imaging with Mosaic and MicroPoint. Further, the user can perform gentle live imaging for days using the neutral density filters.

Feature	Benefit
Multi-line laser source	Up to 10 multimode laser lines
Direct modulation	Supports dual laser simultaneous imaging with active blanking
405-785 nm	Excite DAPI to NIR fluorescent reporters
Multi-port switch	Multi-function flexibility: stable, millisecond galvo switching (dual port VLE, triple port HLE)
Field upgradeable* <sup>1</sup>	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).



Kidney section with s phalloidin in Cyan, wheat germ agglutinin in yellow, and DAPI in pink. The image was acquired in the Dragonfly 200 with the new VLE (versatile laser engine). It is composed of 88 tiles, 3 channels, and 30 Z planes per channel. The images were deconvolved in Fusion, stitched and rendered in Imaris. *Image credit: Claudia Florindo.*

Applications Matrix	VLE	HLE
Cell cycle	■■■	■■■
Cilia imaging (live cell > 50 fps)	■■■	■■■
Limb formation	■■■	■■■
Mouse embryo development	■■■	■■■
Mitochondria Imaging (live)	■■■	■■■
Blood flow	■■■	■■■
Pathogen - host interactions	■■■	■■■
Organoids < 500 μm thick <sup>(1)</sup>	■■■	■■■
Whole brain imaging < 500 μm thick <sup>(1)</sup>	■■■	■■■
Whole organism < 500 μm thick <sup>(1)</sup>	■■■	■■■
Cell substrate interaction and adhesion (B-TIRF) <sup>(3)</sup>	■■□	■■■
Cell surface dynamics (B-TIRF) <sup>(3)</sup>	■■□	■■■
Spatial-omics <sup>(2)</sup>	■■□	■■■
Whole brain imaging > 500 μm thick <sup>(1)</sup>	■■□	■■■
Whole organism > 500 μm thick <sup>(1)</sup>	■■□	■■■
Expansion microscopy <sup>(2)</sup>	■■□	■■■
Mitochondria Imaging - ultrastructure	-	■■■
Ultra structure of centrioles	-	■■■
3D ultrastructure of synapses	-	■■■
Localisation based super resolution	-	■■■
Nuclear pore complex	-	■■■

■■■ Suitable ■■■□ Partially Suitable - Not Suitable

(1) dependent on sample transparency & staining penetration. If the sample is transparent, with the Dragonfly any laser engine should be able to achieve 500 μm.

(2) Dependent on sample transparency & staining penetration.

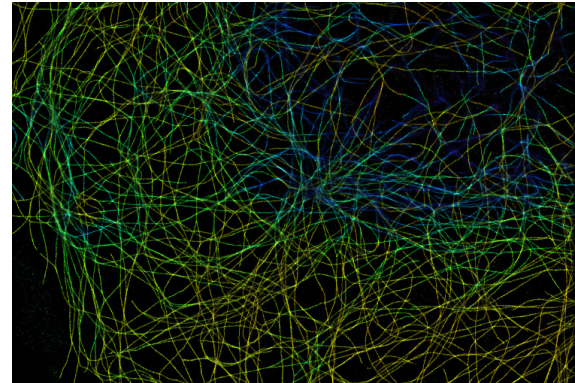
(3) Must be combined with B-TIRF.



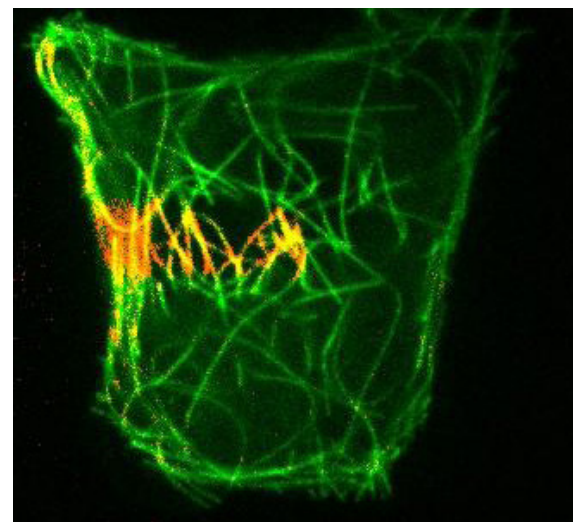
# Application Focus

## 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 localisation techniques such as dSTORM especially when combined with B-TIRF - delivering enough power to reach the dark state and to perform dSTORM experiments even without the need of iZoom.



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

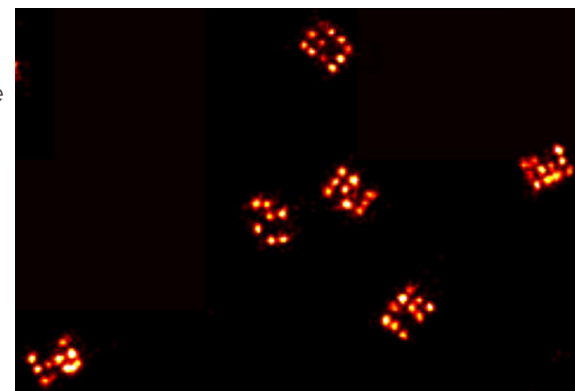
Photostimulation uses light to activate compounds in cells, tissues or organisms. This non-invasive process addresses several biological questions such as mapping neuronal connections, timely tracking protein cells, etc. Andor manufactures two photostimulation devices: Mosaic 3 (DMD based) and MicroPoint 4 (fast galvo scanning). HLE can be used as a light source for Mosaic and MicroPoint. Whereas, VLE can be used as light source for MicroPoint.

Application examples:

- ✓ Map gene expression, e.g. in live lymph node sections
- ✓ Understand the mechanisms of mitotic fidelity.
- ✓ Study the effect of DNA damage.
- ✓ Understand wound healing and repair *C. elegans*.

## DNA-PAINT Applications

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



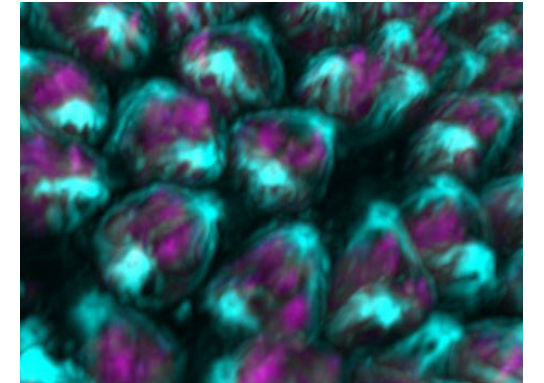
PAINT images of 20 nm DNA origami structures using B-TIRF. Image credits: F. Schuder, Yale University.

## Live Cell Bioimaging

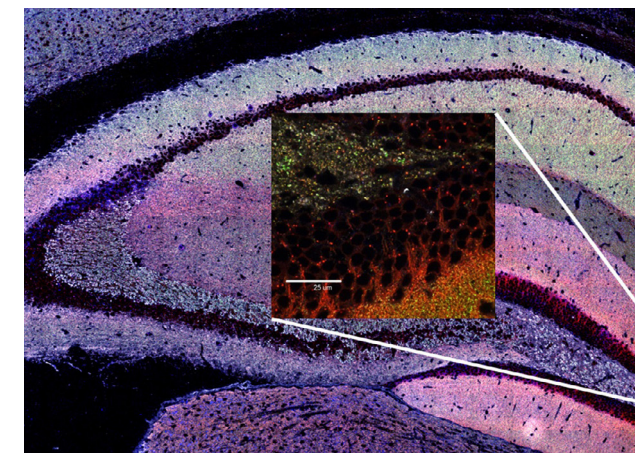
Phototoxicity can be a big problem for live specimens and a source should be adaptable. The VLE and HLE are designed to deliver extremely low light levels. For example, using the HLE, a 2 W laser can deliver a few microwatts in the full field of view of the microscope. This is well below the phototoxic level observed during mitosis of mammalian cells.\*2

Application examples:

- ✓ Image tumour development or hours or days with VLE or HLE
- ✓ Image deeper into live thick brain tissue with NIR wavelengths



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



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

## Spatial Transcriptomics

Imaging tissue is the target of spatial "omics" research, which aims to understand tissue architecture, its spatial organisation and how this impacts the genetic and functional profile of individual cells in-situ. These large tissue volumes require fast imaging across many wavelengths.

- ✓ HLE, and VLE deliver the spectral output for high performance imaging.
- ✓ HLE, and VLE deliver the necessary power for high performance omics imaging.
- ✓ HLE delivers the next level of productivity due to high laser powers combined with decreased image acquisition time.

Technology	Confocal Microscopy	Widefield	SRRF-Stream+	Live Cell Imaging	Borealis TIRF	Spatial Transcriptomics	Photostimulation (MicroPoint)	Photostimulation (Mosaic)	SMLM - DNA Point or d-STORM
VLE	■■■	■■■	■■■	■■■	■■■	■■■	■■■	-	-
HLE	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■

■■■ Suitable ■■■□ Partially Suitable - Not Suitable

# VLE & HLE Specifications

Model specifications	VLE-700	HLE-700
Max number of lasers	up to 10	
Output mode	Multimode only	
Wavelength range (nm)	405-785	
Multiport switch outputs	Up to 2	Up to 3
Multiport switch time (ms)	<7	
Blank/TTL modulation (diode) MHz	1	
Blank/TTL modulation (fibre laser only) kHz	0.1	
Blank/TTL modulation (OPSL) kHz	50	
Computer control interface	RS-232 or USB 2.0	
TTL/analogue control interface	Ext TTL only (no analogue)	
Non-linearity (% full scale)	<5%	
Software requirements and compatibility	Fusion, Andor iQ, Micro-Manager	

## VLE and HLE with Borealis for Superior Uniform Illumination

Both VLE and HLE laser engines are optimised for Borealis® illumination, with a multi-mode fibre output for direct coupling to the Beam Conditioning Unit (BCU). Homogenisation of the multi-mode output provides outstanding illumination uniformity with our Dragonfly® high-speed confocal platform.



BCU - Beam conditioning Unit.

Dragonfly confocal system

Borealis illumination is further exploited in oblique and TIR (total internal reflection) imaging using our newly introduced and patent pending Borealis-TIRF (B-TIRF) modality, available on Dragonfly 600 series only. B-TIRF delivers superior uniformity, avoids fringing artefacts delivering exceptional results in imaging events at the edge of the coverslip. Further B-TIRF enables high power densities for localisation imaging techniques.

The HLE can be used for all multimode illumination methodologies. [Find out more about Dragonfly and B-TIRF](#)

## Configuration with Mosaic and MicroPoint

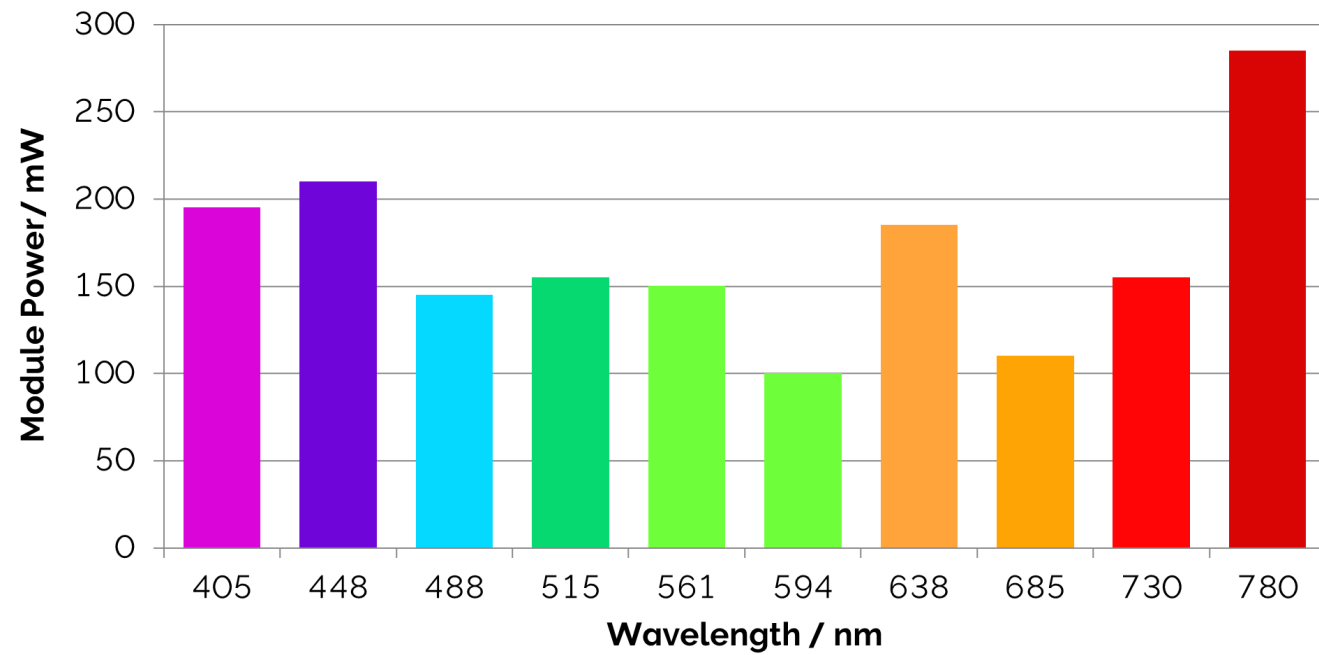
VLE and HLE fast multiport switches are ideal for sharing imaging lasers for targeted photo-stimulation applications to get more value from your investment. VLE can be combined with MicroPoint and HLE can be combined with Mosaic® or MicroPoint. When combined with the specific photostimulation devices both VLE and HLE deliver power for applications such as photo-switching, bleaching (FRAP/FLIP), and optogenetics applications.



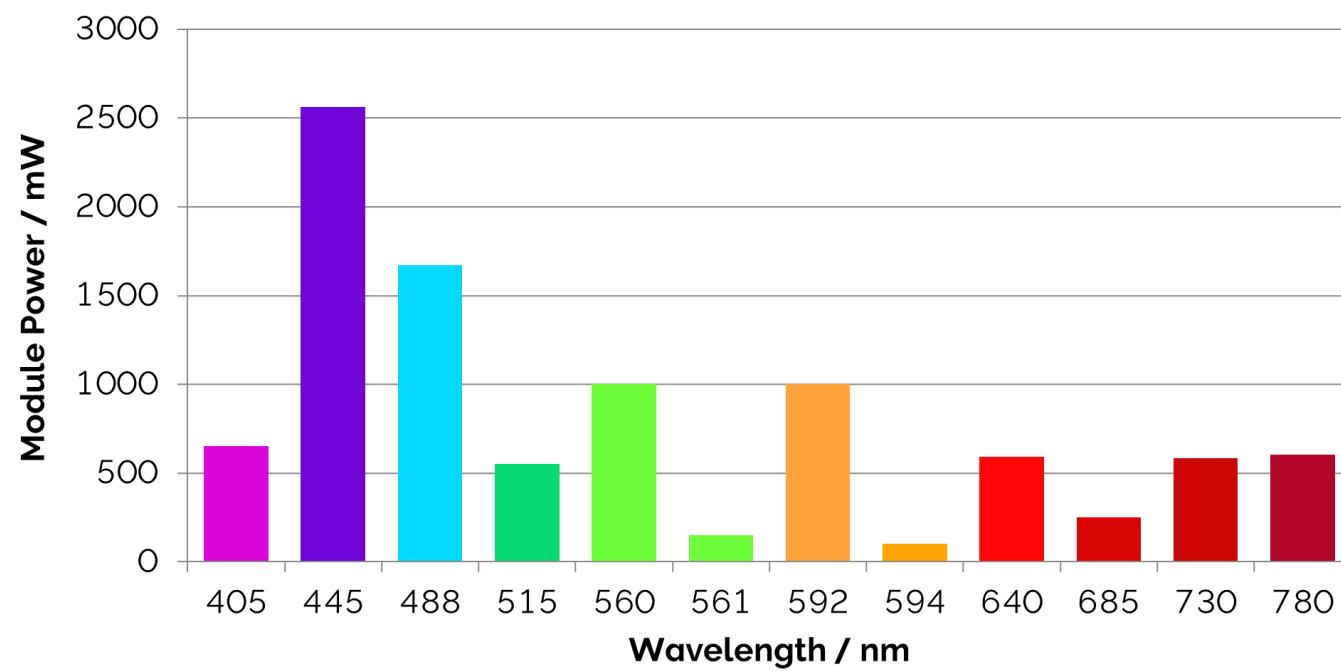
Mosaic

[Find out more about Photostimulation products.](#)

## VLE Laser Options and Module Power



## HLE Laser Options and Module Power



**Wavelength options** for VLE and HLE are closely matched and so both are compatible with all Andor Dragonfly optical configurations. You can substitute or upgrade from VLE to HLE in situations where more power is required. If upgrading from an older Dragonfly system, please check details of dichroic specifications. HLE and VLE can work together in a system requiring a combination of laser power.

Laser wavelength (nm)	VLE		HLE	
	Module Power (mW)	Power at 50 $\mu$ m fibre output (mW)	Module power (mW)	Power at 50 $\mu$ m fibre output (mW)
405	195	150	650	430
445	210	160	2560	1450
488	145	120	1670	1130
515	155	120	550	360
560	N/A	N/A	1000	720
561	50	35	150	110
	100	75		
	150	110		
592	N/A	N/A	1000	720
594	100	80	100	80
640	185	140	590	330
685	110	75	250	150
730	155	95	580	285
780	285	125	600	250

HLE and VLE wavelength tolerances: 560, 592 & 642  $\pm$ 0.5 nm; 561, 594  $\pm$ 2 nm; 685  $\pm$ 3 nm; 405, 515, 640 & 730  $\pm$ 5 nm; 448  $\pm$ 5/-2 nm; 780  $\pm$ 3 nm  
 Please contact Andor for more details on expected efficiencies.



# VLE

Flexibility, Classic Wavelengths and In-Field Upgradeability

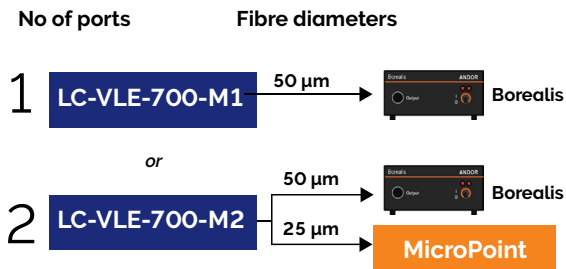
## Step 1. Build your VLE Product

### VLE: 7 lines

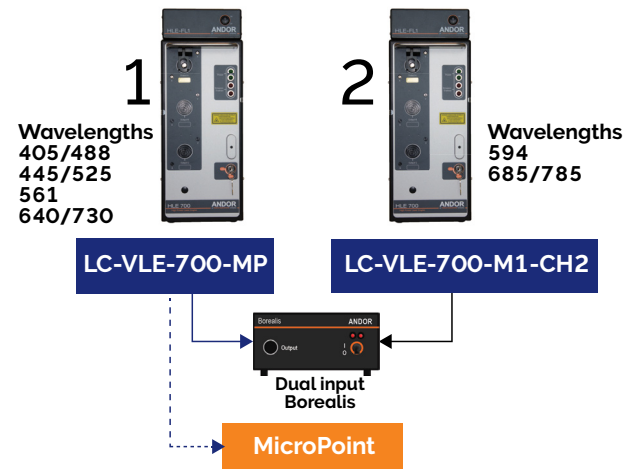


### Up to 7 lines (VLE-700)

Description	Ports	Part number
7-line HLE	1	LC-VLE-700-M1
	2	LC-VLE-700-M2



### VLE up to 10 lines



### Up to 10 lines, select VLE-700 and VLE-700-M1-CH2

Description	Ports	Part number
7-line HLE	1	LC-VLE-700-M1
	2	LC-VLE-700-M2
3-line HLE	1	LC-VLE-700-M1-CH2

Replace P in MP in the product codes (in blue box) with 1 or 2 depending on information above.

## Step 2. Select Additional Fibres



Please discuss fibre options for your specific configuration with your sales representative.

Dragonfly – 50 micron/0.12, 3 meter, FC to FC	<b>LD-FIBR-MM50</b>
MicroPoint® – 25 micron/0.12, 4 meter FC to FC	<b>SV-HLE-FIB-MIC</b>

## Step 3. Select the Laser Powers and Wavelengths

Some laser combinations may not be supported if the wavelengths are too close. Please contact your Andor representative for current options.



Description	Compatibility considerations	Part number
405nm-195mW / 488nm-145 mW dual laser module	Requires one slot of four	<b>LM-405-488-DUAL-VLE</b>
445nm-210mW / 515nm-155 mW dual laser module	Requires one slot of four	<b>LM-445-515-DUAL-VLE</b>
561, 50 mW laser module	Requires one slot of four Use <b>LM-561-50-VLESLSLT3</b> if 594 laser module is in the same chassis.	<b>LM-561-50-VLE</b> <b>LM-561-50-VLESLSLT3</b>
561, 100 mW laser module	Requires one slot of four Use <b>LM-561-100-VLESLSLT3</b> if 594 laser module is in the same chassis.	<b>LM-561-100-VLE</b> <b>LM-561-100-VLESLSLT3</b>
561, 150 mW laser module	Requires one slot of four Use <b>LM-561-150-VLESLSLT3</b> if 594 laser module is in the same chassis.	<b>LM-561-150SL-VLE</b> <b>LM-561-150SL-VLESLSLT3</b>
594	Requires one slot of four	<b>LM-594-100SL-VLE</b>
638 and 730	Requires one slot of four	<b>LM-640-730-DUAL-VLE</b> <b>LM-640-VLE</b>
685 and 780	Use <b>LM-685-780-VLE-SLT2</b> if either <b>LM-640-730-DUAL-VLE</b> or <b>LM-640-VLE</b> module is in the same chassis.	<b>LM-685-780-DUAL-VLE</b> <b>LM-685-780-VLE-SLT2</b>

# HLE

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

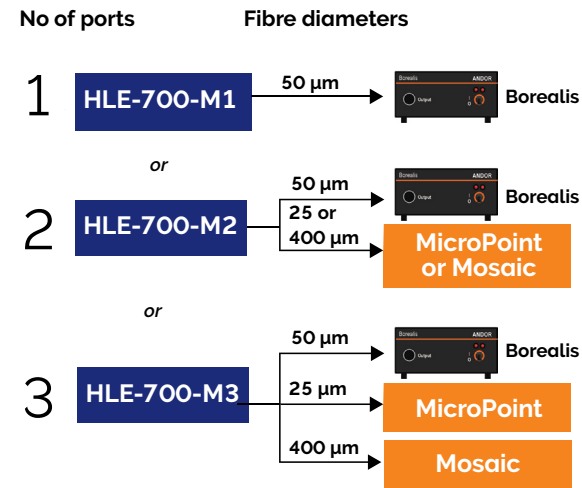
## Step 1. Build your HLE Product

### HLE-700: 7 lines



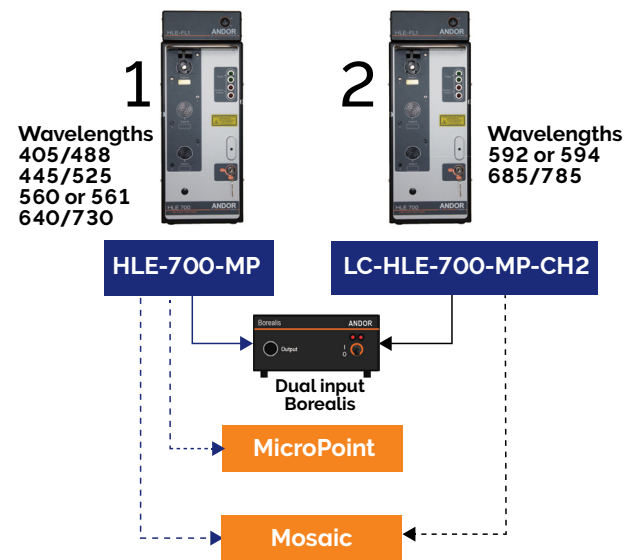
### Up to 7 lines (HLE-700)

Description	Ports	Part number
7-line HLE	1	LC-HLE-700-M1
	2	LC-HLE-700-M2
	3	LC-HLE-700-M3



The M1 requires return to base for future addition of ports. M2 can be field upgraded to M3.

### HLE up to 10 lines



### Up to 10 lines, select HLE-700 and HLE-700-MP-CH2

Description	Ports	Part number
7-line HLE	1	LC-HLE-700-M1
	2	LC-HLE-700-M2
	3	LC-HLE-700-M3
3-line HLE	1	LC-HLE-700-M1-CH2
	2	LC-HLE-700-M2-CH2

Replace P in MP in the product codes (in blue boxes) with 1, 2 or 3 depending on information above.

## Step 2. Select Additional Fibres



### Additional Fibre Selection

Please discuss fibre options for your specific configuration with your sales representative.

Description	Part number
Dragonfly – 50 micron/0.12, 3 meter, FC to FC	LD-FIBR-MM50
MicroPoint® – 25 micron/0.12, 4 meter FC to FC	SV-HLE-FIB-MIC
Mosaic® - 400 micron/0.22, 4 meter FC to SMA	SV-HLE-FIB-MOS

## Step 3. Select the Laser Wavelengths

Four slots available per HLE: up to seven wavelengths with dual laser modules (DLM). For dual HLE configurations see figures on page 12. If 56X nm and 59X nm selected 6 lines can be configured in a single HLE.

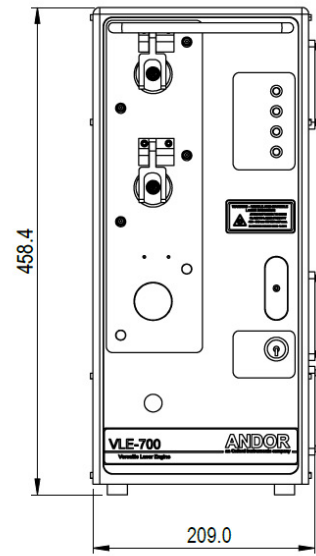


### Laser Power & Wavelength

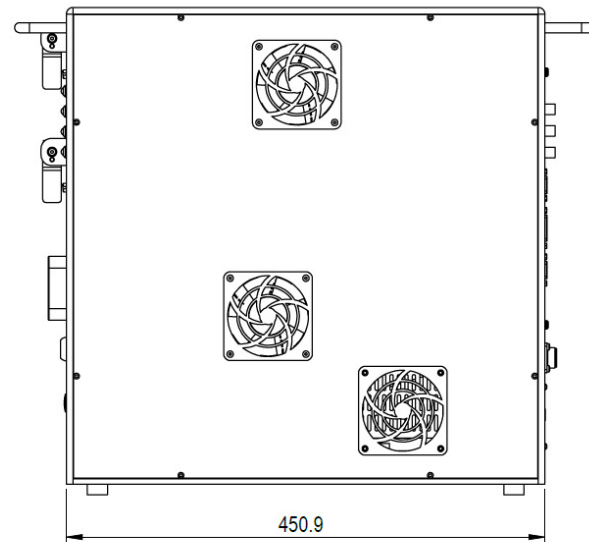
Description	Configuration notes	Part number
405nm-650mW / 488nm-1670 mW dual laser module	Requires one slot of four	LM-405-488-DUAL-MM
445nm-2560 mW / 515nm-550 mW dual laser module	Requires one slot of four	LM-445-515-DUAL-MM
560 nm, 1000 mW single mode fibre laser	If used with 592-1000 requires second HLE	LM-HLE-560-1000
561nm - 150 mW laser module. 150 mW single mode OPSEL smart laser module	Use LM-561-150SL-HLESLSLT3 if 561 - 150 mW and LM-592-1000-MM are in the same chassis	LM-561-150SL-HLE LM-561-150SL-HLESLSLT3
592 nm - 1000 mW single mode fibre laser	If used with 560/1000 requires second HLE	LM-HLE-592-1000
594 nm, 100 mW single mode OPSEL smart laser module	Requires one slot of four	LM-594-100
640 nm- 590 mW laser module	Requires one slot of four	LM-640-MM
640 nm- 590 mW / 730 - 580 dual laser module	Requires one slot of four	LM-640-730-DUAL-MM
685 nm- 250 mW / 780 - 600 dual laser module	Use LM-685-780-STL2 if LM-640-MM or LM-640-730-MM are in the same chassis	LM-685-780-DUAL-MM LM-685-780-DUAL-SLT2

**Note:** Only one HLE can excite MicroPoint fibre input. Mosaic can accept inputs from both HLE-700 units if required.

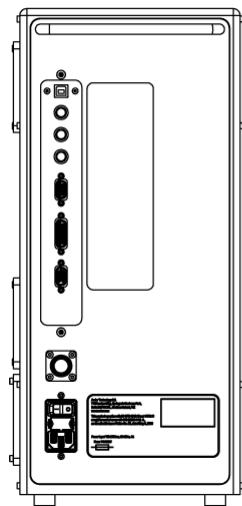
# VLE



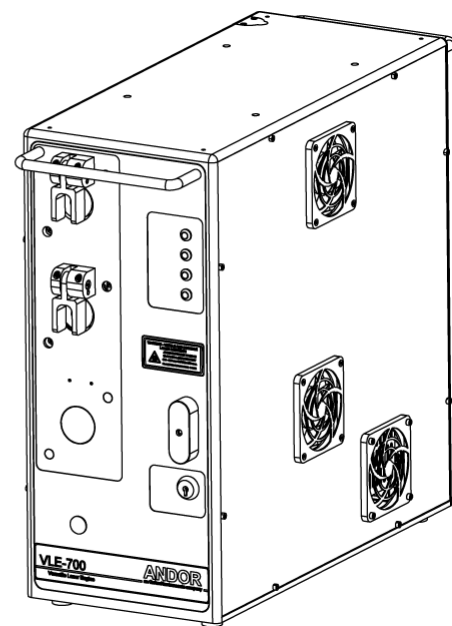
Front Panel



Right Side Panel



Rear Panel



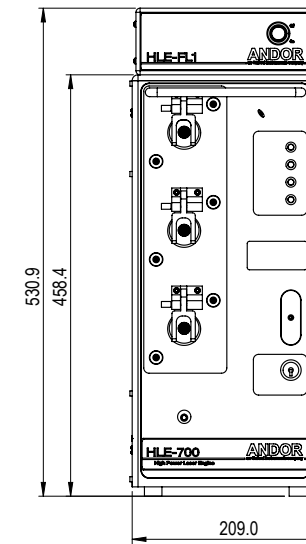
Left Side Panel

Dimensions in mm

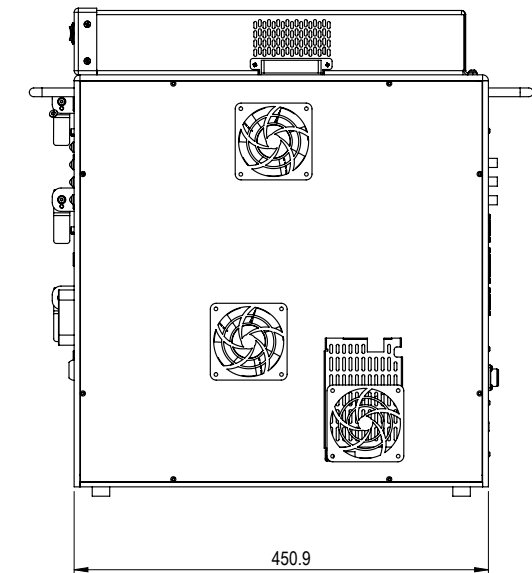
Model	VLE-700
Dimensions, cm	46 x 46 x 21
Weight, fully loaded, kg	30

Notes:  
 Allow 100 mm space around the VLE for ventilation  
 Weight will vary with system configuration

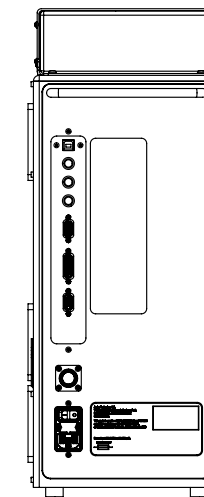
# HLE



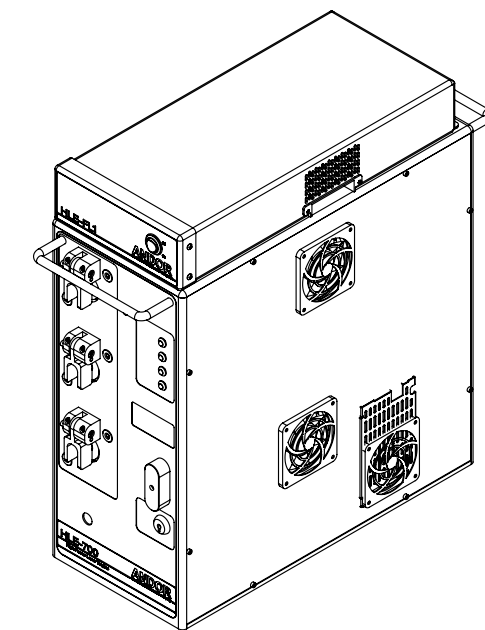
Front Panel



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



## 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](http://andor.oxinst.com/contact)

Our regional headquarters are:

### Europe

Belfast, Northern Ireland  
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Fax +81 (3) 3446 8320

### China

Beijing | Shanghai | Guangzhou  
Phone +86 (400) 678 0609  
Fax +86 (10) 5884 7901



### 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, 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% (non-condensing)
- Storage Temperature: -20°C to 50°C ambient

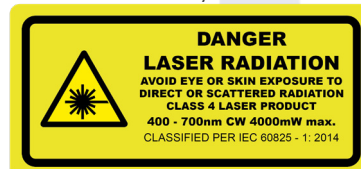
### Power Requirements

- Mains Power supply: 100-240 VAC, 50/60 Hz
- Power consumption: VLE-700: 45 W typical (60 W max)
- Power consumption: HLE-700: 70 W typical (140 W max)

### Footnotes: Specifications are subject to change without notice

- HLE-700-M1 and VLE-700-M1 have a single output. Field upgrade (HLE & VLE) to multi-port is not supported. HLE-700-M2 can be field upgraded to HLE-700-M3. VLE can be upgraded to HLE in-field.
- 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.
- The HLE-700 is a 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.
- Standard warranty - 12 months parts and labour.
- Extended warranty - up to 5 years, is available on request.
- Installation, service and upgrade should be performed by qualified personnel.
- All local safety standards should be followed by users.

### HLE Class 4 laser safety classification labels



### VLE Class 3B laser safety classification labels

