2D bioluminescence with enhanced fluorescence tunability.

The IVIS® Lumina Series III from Revvity provides an expandable, sensitive imaging system in a benchtop format that is easy to use for *in vivo* 2D fluorescence and bioluminescence imaging. The IVIS Lumina Series III platform offers a full spectrum of wavelengths to perform almost any *in vivo* optical application with a tunability of 20 nm. The system includes a highly sensitive CCD camera, light-tight imaging chamber and complete automation and analysis capabilities. As the leading optical imaging platform for *in vivo* analysis, IVIS systems include a range of practical accessories developed through experience in research laboratories worldwide.

Key features

- Imaging capacity of up to 5 mice

- Full fluorescence tunability through the NIR spectrum

- High sensitivity bioluminescence with imaging down to a single cell

- Spectral unmixing for enhanced signal separation and improved fluorescence sensitivity

- Expandable system tailored to your workflow

- Software wizard for simplified experimental workflow

Leading bioluminescence and multispectral fluorescence technologies

The IVIS Lumina Series III platform brings together years of leading optical imaging technologies into one easy to use and exquisitely sensitive bench-top system and is capable of imaging both full spectrum fluorescence and bioluminescence. The system is equipped with 26 filters that can be used to image reporters that emit from green to near-infrared. Superior spectral unmixing can be achieved by IVIS Lumina III's high resolution short cut off filters.

IVIS Lumina Series III
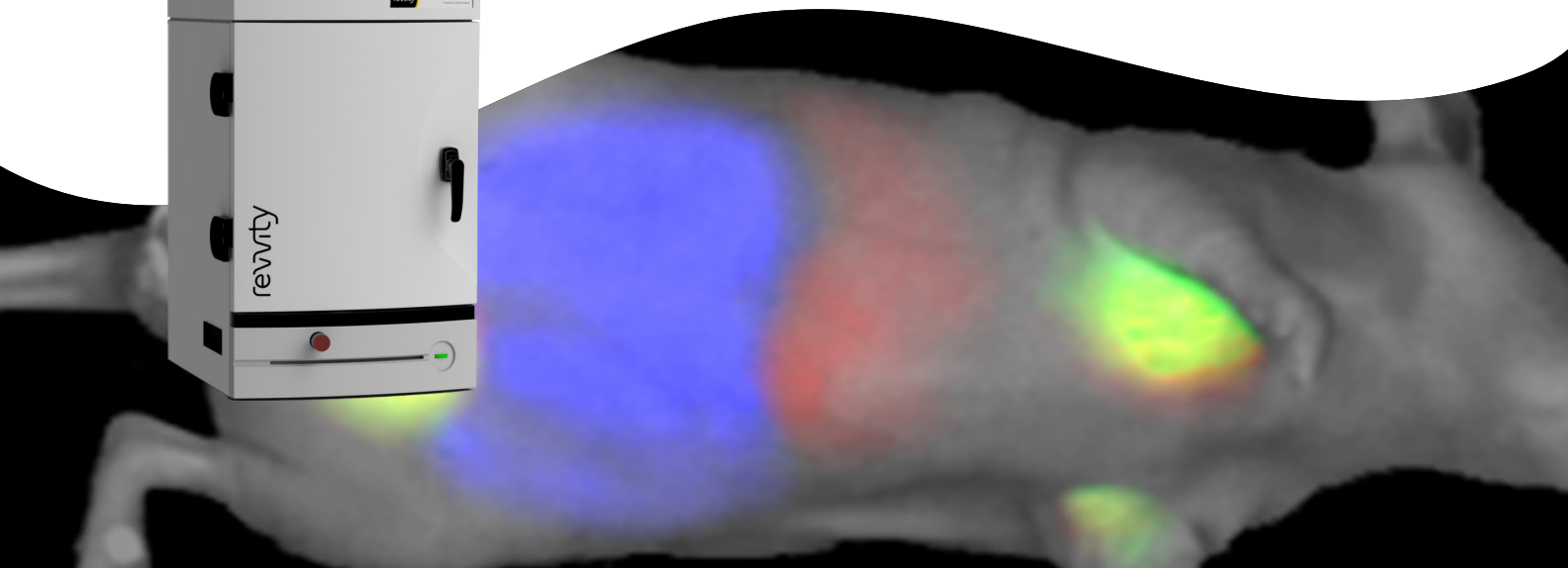
Absolute calibration coupled with our Living Image® software affords you consistent and reproducible results independent of magnification and/or filter selection. This allows you to compare results from one IVIS system to another, either within your organization or around the world. The IVIS Lumina III incorporates Revvity's proprietary Compute Pure Spectrum (CPS) algorithm for spectral library generation software tools to ensure accurate autofluorescence removal, unmixing and fluorophore quantitation.

Market leading sensitivity

The IVIS Lumina Series III enables high sensitivity bioluminescence and fluorescence imaging and represents the gold standard for non-invasive small animal optical imaging. This degree of sensitivity is achieved through the combination of optimized luciferase reporters, agents, and unique platform technologies including an ultra-cooled CCD USB camera to -90 °C, low readout noise, dark current and exceptionally high quantum efficiency throughout the NIR spectrum.
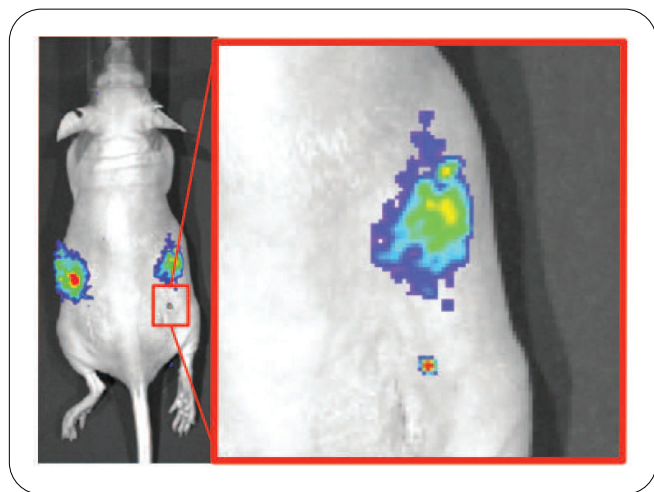

Figure 1: Single cell imaging of a 4T1 Red F-luc tumor cell *in vivo*. IVISbrite™ Red F-luc tumor cell lines used in conjunction with IVIS imaging systems enable researchers to measure and monitor tumor growth and metastasis, non-invasively, using a small number of cells before tumors are palpable.
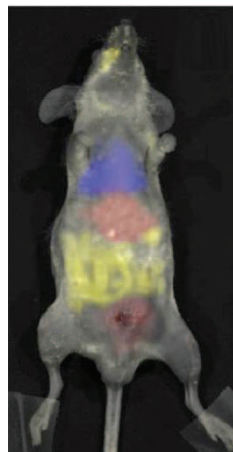

Figure 2: Spectral unmixing of four separate spectral paths to identify the lungs (800 nm), liver (680 nm), gut (660 nm) and auto-fluorescence.
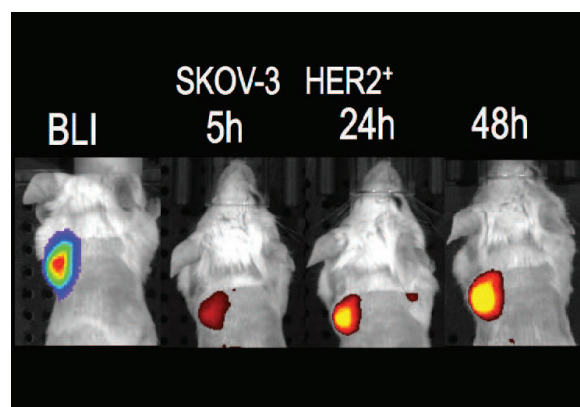

Figure 3: Imaging studies were performed using SKOV-3 tumor-bearing female Scid/Beige mice injected i.v. with 40 mg of Her2Sense 645 and imaged at 5, 24, and 48 hours post injection.

An adjustable field of view from 5 – 12.5 cm and an optional 24 cm lens allows imaging of up to 5 mice or 2 medium size rats or zoom lens capability increasing the resolution to 35 µm at a field of view of 2.5 cm. The IVIS Lumina Series III can also accommodate petri dishes or micro-titer plates for *in vitro* imaging. The system also includes premium animal handling features such as a heated stage, and gas anesthesia connections.
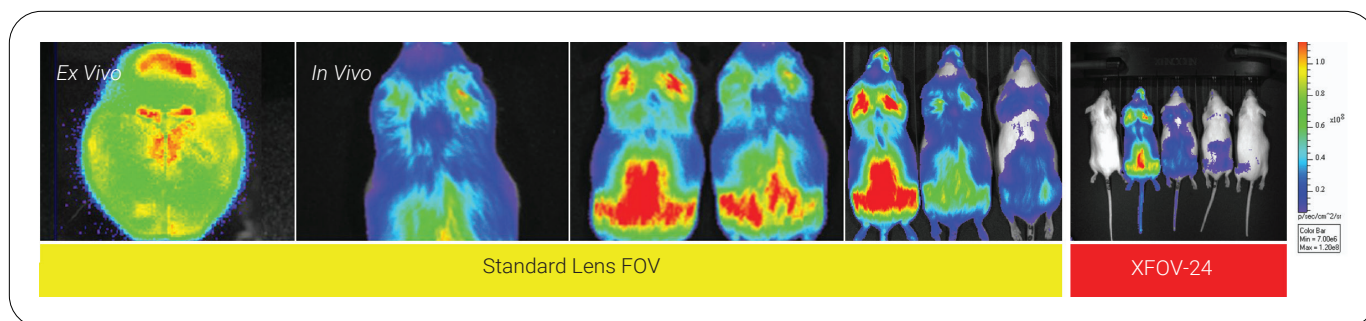
2D bioluminescence with enhanced fluorescence tunability.

Figure 4: The IVIS Lumina Series III imaging system showing 5 fields of view.

Image software

Living Image software is an advanced tool designed specifically for the IVIS Imaging system platform and contains features to help design image acquisition and analysis. The software's design creates an intuitive, seamless workflow for researchers of all skill levels. Features include: wizard based guidance for advanced imaging protocols, spectral unmixing, expanded fluorescent agent database, and a simplified tool palette.

Multispectral imaging with advanced spectral unmixing algorithms

With 2D fluorescence imaging, the presence of multiple spectrally overlapping fluorophores in the subject can present challenges for interpreting imaging results. With the Living Image spectral unmixing (SPUM) tool you can easily identify, separate, isolate, visualize and quantify multiplexed fluorescent signals.

Living Image software is designed to simplify advanced and complex biological models by intuitively guiding the user through experiential setup and analysis. The imaging wizard with probe library helps design imaging settings and select the right filter pair for fluorescence studies.

Advanced spectral unmixing algorithms and a broad range of high spectral resolution filter sets minimize autofluorescence and provides the opportunity to image a wide variety of targeted and activatable fluorescent probes and reporters.
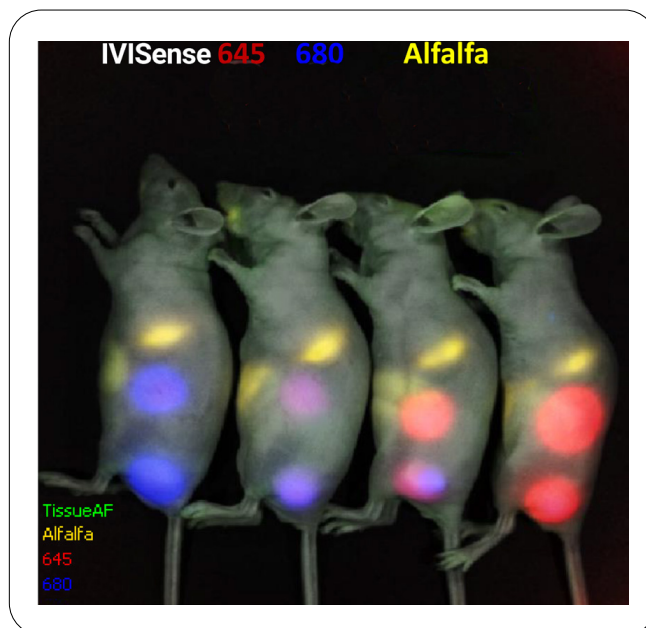

Figure 5: Nu/nu mice received local injections of different ratios of IVISense™ 645 NHS fluorescent dye per spot. Tissue autofluorescence (green), chow autofluorescence (yellow), IVISense 645 NHS (red), and IVISense 680 NHS (blue) were separated by guided spectral unmixing (SPUM). This dataset yielded pure spectra for each component allowing the independent quantification of each of the individual fluorescence signals respectively and a composite image of all four components was generated.

IVIS Lumina Series III - standard excitation and emission filter sets

Excitation filter ranges (nm)	Emission filter ranges (nm)	Common dyes/agents/reporters
410-430	500-540	IVISense™ targeted, vascular, & activatable probes
430-450	550-590	
450-470	600-640	
470-490	650-690	IVISense dyes
490-510	690-730	IVISense self-quenching dyes
510-530	770-810	
530-550	825-865	IVISense cell labeling dyes
550-570		Alexa Fluor® 600-750
570-590		Cy5-Cy7.5
590-610		DsRed, Doxorubicin**
610-630		mCherry**
630-650		tdTomato**
650-670		GFP*
670-690		FITC*
690-710		ICG
710-730		
730-750		
750-770		
770-790		

* Best used with *in vitro*, *ex vivo* and surface imaging techniques

** Enhanced quantification with Spectral Unmixing
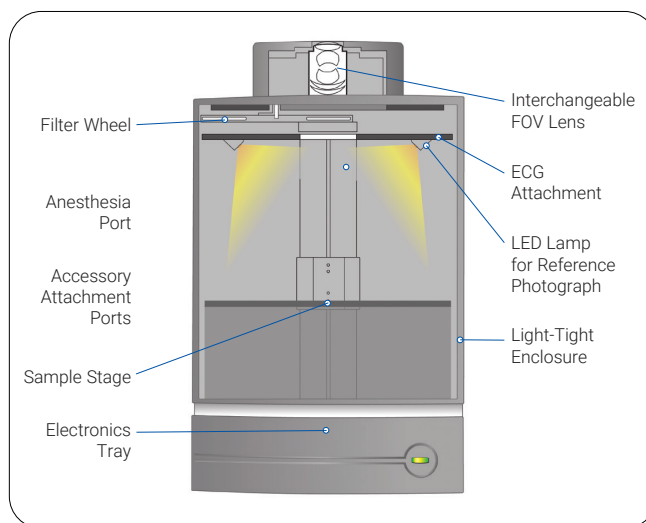
Inside the IVIS Lumina Series III

CCD camera

- The IVIS Lumina Series III CCD camera is 13 x 13 mm square, with 1024 x 1024 pixels, 13 micron in width

- Back-thinned, back-illuminated grade 1 CCD provides high quantum efficiency over the entire visible to near-infrared spectrum

- 16-bit digitizer delivers broad dynamic range

- The CCD is thermoelectrically (Peltier) cooled to -90 ˚C ensuring low dark current and low noise

Imaging chamber

- Light-tight imaging chamber

- High light collection lens, f/0.95 – f/16

- Optional 24 cm FOV lens attachment for 5 mice imaging

- 8-position emission filter wheels – 7 filters

- 20-position excitation filter wheels – 19 filters

- LED lamps for photographic images

- Heated stage to maintain optimum body temperature

- Motor controlled stage, filter wheel, lens position, and f-stop

Integrated gas anesthesia

- Gas anesthesia ports and 5 position manifold within imaging chamber allow anesthesia to be maintained during imaging sessions

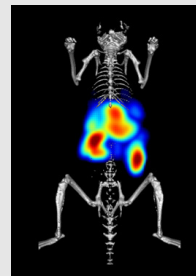2D bioluminescence with enhanced fluorescence tunability.

The IVIS Lumina Series III platform offers a selection of instruments tailored to your in vivo imaging needs

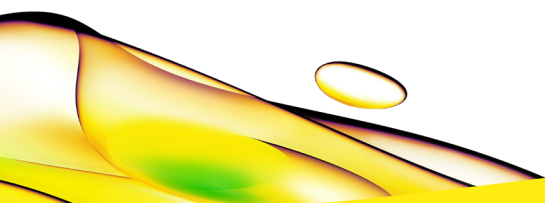| Features	IVIS Lumina LT	IVIS Lumina	IVIS Lumina XRMS
Capacity	▪ Up to 5 mice	▪ Up to 5 mice	▪ Up to 3 mice
Bioluminescence	✓	✓	✓
Fluorescence	✓	✓	✓
Enhanced fluorescence		✓	✓
Radioisotopic cerenkov imaging	✓	✓	✓
Proprietary spectral unmixing algorithm		✓	✓
Integrated X-Ray			✓
Absolute Calibration to NIST® Standards	✓	✓	✓

IVIS Lumina Series III imaging system

Imaging system components	Specifications
Camera sensor	Back-thinned, back-illuminated, cooled Grade 1 CCD
CCD size	1.3 x 1.3 cm
Imaging pixels	1024 x 1024
Quantum efficiency	>85% at 500 – 700 nm, >30% at 400 – 900 nm
Pixel size	13 microns
Minimum Field of View (FOV)	5 x 5 cm
Maximum Field of View (FOV)	12.5 x 12.5 cm (optional 24 x 24 cm)
Minimum image pixel resolution	50 microns
Read noise	< 3 electrons for bin = 1, 2, 4; < 5 electrons for bin = 8, 16
Dark current (Typical)	< 120 electrons/s/cm^2; or 2 x 10^{-4} electrons/s/pixel
Lens	f/.95 – f/16, 50 mm
Illumination source	Extended NIR Range 150W Tungsten EKE
Fluorescence capability	Standard
Excitation fluorescence filters	19 hard-coated narrow band pass
Emission fluorescence filters	7
CCD operating temperature	-90 °C
Imaging system space requirement	48 x 71 x 104 cm (W x D x H)
Imaging chamber interior dimension	43 x 38 x 43 cm (W x D x H)
Power requirements	6A at 120V
Stage temperature	20 – 40 °C
Computer (Minimum specifications)	Dell Precision 5820, Intel Xeon Quad Core 3.6 GHz; 32 GB RAM; Nvidia Quadro P620 2 GB; 500 GB system HD, 2TB data HD; 8x DVD+/-RW Drive; 24" widescreen LED Monitor; 24" Dell Monitor, Win 10 Enterprise
Living image software	Included with IVIS purchase

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In vivo imaging solutions

Optical			Micro-CT	Ultrasound	Reagents

IVIS® Lumina Series III	**IVIS® Lumina 5 Series**	**IVIS® Spectrum 2**	**Quantum GX3**	**Vega®**	**IVISbrite™**
▪ 2D optical imaging	▪ 2D optical imaging	▪ 2D & 3D optical imaging	▪ High spatial resolution	▪ Scan times in < 1 minute	▪ Bioluminescent substrates, cells, and lentiviral particles
▪ Imaging up to 5 mice	▪ Imaging of up to 10 mice using optional manifold	▪ Imaging of up to 10 mice using optional manifold	▪ Low dose microCT for longitudinal imaging	▪ Whole body field of view	**IVISense™**
▪ Optional integrated x-ray	▪ Optional integrated high-resolution x-ray	▪ Fully automated, one-click co-registration with IVIS SpectrumCT	▪ Wide FOV range (8 mm - 86 mm)	▪ Multiple 3D imaging modes	▪ Fluorescent probes, labels, and dyes
	▪ Optional Smart accessories to streamline imaging workflow	▪ Seamlessly co-register 3D optical and hi-res, microCT data	▪ Step and continuous imaging modes	▪ Elastography (tissue stiffness)	**VesselVue®**
	▪ MVI-2 for automated 360 degree imaging	▪ Two powerful modes of fluorescence excitation— epi-fluorescence and transillumination	▪ Cardiac and respiratory gating	▪ B-mode (soft tissue imaging)	▪ Microbubble contrast agents for vascular ultrasound imaging
				▪ 4D B-mode/ M-mode (cardiac imaging)	
				▪ Acoustic angiography (microvessel networks)	

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For a complete listing of our global offices, visit www.revvity.com

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