IVIS® Lumina X5™

PRODUCT NOTE

Pre-clinical *In Vivo* Imaging

Key Features:

- High-throughput (five mouse) optical and X-ray
- High-resolution, low dose X-ray with optical overlay
- Supports mouse and rat imaging
- Compute Pure Spectrum (CPS) spectral unmixing
- Full fluorescence tunability through the NIR spectrum
- Unique accessories to streamline work-flow, data acquisition and analysis

High-Sensitivity Optical Meets High-Resolution X-ray

The IVIS Lumina X5 combines best in class high-throughput in vivo bioluminescence and fluorescence imaging with high-resolution 2D X-ray into a compact benchtop system. With an expanded five mouse field of view for 2D optical and X-ray imaging plus our unique line of accessories to accelerate setup and labeling, it has never been easier or faster to get robust data – and answers – on anatomical and molecular aspects of disease. For greater detail, high-resolution X-ray image capture with optical overlay provides industry leading resolution in a multimodality imager. The IVIS Lumina X5 also includes state of the art spectral unmixing features for sensitive multispectral imaging to monitor multiple biological events in the same animal.

PerkinElmer®
For the Better

High-throughput Optical and X-ray Imaging - No Compromise

The IVIS Lumina X5 integrates a one inch CCD camera into our benchtop Lumina instrument providing a high throughput 20 x 20 cm FOV sufficient for imaging five animals at a time with bioluminescence and fluorescence. Moreover, the newly designed scintillator allows anatomical X-ray overlays for optical images at any field of view.

Furthermore the automatic and independently deployed scintillator provides the flexibility to image larger rodents up to 500-600 g in weight with seamless, accurate optical overlay.

As with other IVIS Lumina systems, the X5 is equipped with 26 filters tunable to image fluorescent sources that emit from green to near-infrared. Novel illumination technology effectively increases fluorescent transmission through 900 nm. Moreover, the IVIS Lumina X5 incorporates PerkinElmer's patented Compute Pure Spectrum (CPS) algorithms and spectral library generation software tools to ensure accurate autofluorescence removal, unmixing and fluorophore quantitation.

Standard on all IVIS instruments, absolute calibration affords consistent and reproducible results independent of magnification, filter selection, or acquisition settings from one instrument to any IVIS instrument within an organization or around the world.

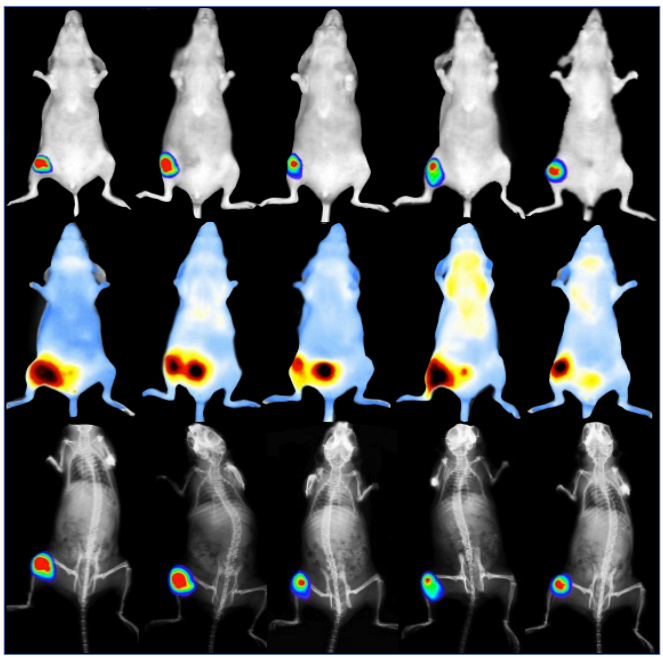

Figure 1. Bioware® Brite 4T1-Red-Fluc orthotopic knee tumor imaged on IVIS Lumina X5: (top) bioluminescent signal acquisition, (middle) fluorescence detection of IntegriSense 750 accumulation at tumor site, and (bottom) five mouse X-ray overlaid with bioluminescent signal from knee.

Industry Leading X-ray Resolution

The IVIS Lumina X5 is equipped with a microfocus X-ray source and high-resolution imaging modes that set a new standard in multimodal 2D imaging resolution. With optical image overlays at every X-ray resolution, never miss underlying anatomical and structural changes. Get more from your data and explore new applications.

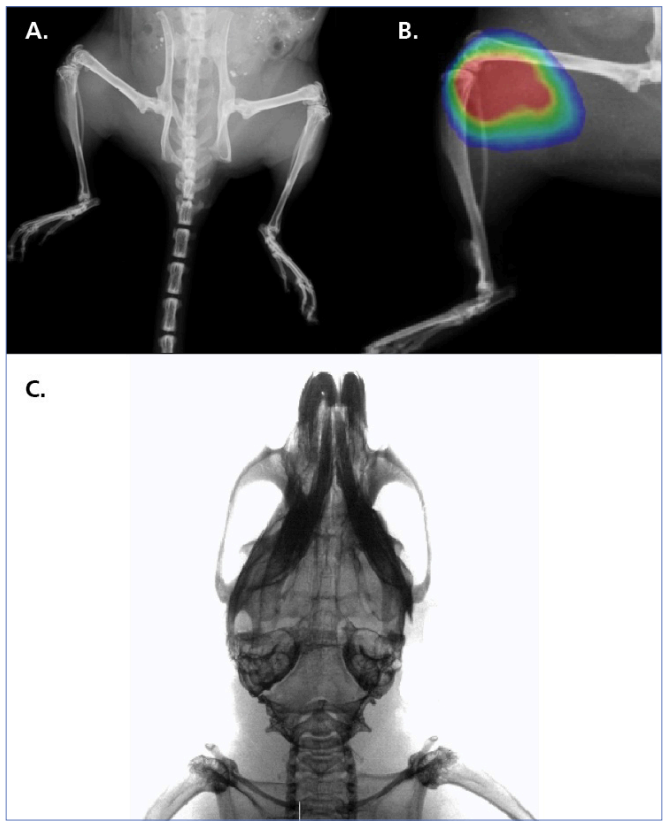

Figure 2. Bioware® Brite 4T1-Red-Fluc orthotopic knee tumor showing X-ray imaging of injected knee and contralateral control, (b) high-resolution X-ray image of knee with bioluminescent overlay showing signal localization and intensity, and (c) cranium of control animal imaged in the IVIS Lumina X5.

IVIS Lumina X5 – A High Throughput Solution

Not only does the IVIS Lumina X5 offer higher throughput via the one inch CCD, but it is also compatible with a set of smart animal handling accessories (purchased separately) designed with throughput and safety in mind.

Smart loading trays (Figure 3) will allow users to pose animals on the benchtop before placing the tray into the IVIS. Using fiducials built into the tray, the software can automatically recognize and draw ROIs providing automated animal identification.

Animal trays are designed with ease of use and user safety in mind. No nose cones are required thus minimizing cleanup. All tray parts have been tested and are resistant to repeated use with common laboratory disinfectants. Furthermore when used with the next generation anesthesia unit (RAS-4), strong vacuum capabilities minimize excess gas from escaping thus preventing exposure of users to anesthetic gas.

Finally, Living Image® software brings IVIS technology to life by facilitating an intuitive workflow for in vivo optical, X-ray image acquisition, analysis and data organization. The software will support input of unique animal IDs when using chip technologies and readers from third party vendors thus streamlining labeling, setup and subsequent export of data for analysis.

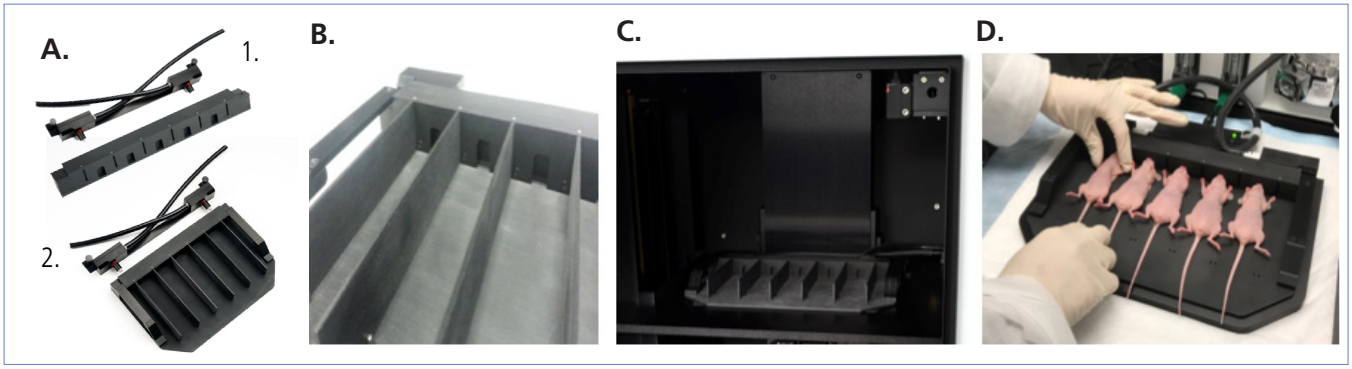

Figure 3. PerkinElmer's new mouse handling accessories were designed with safety, ease of use and speed of acquisition in mind. A quick connect anesthesia port and 5 mouse/2 rat manifold come standard with the IVIS Lumina XS (a1). The high throughput five mouse tray (purchased separately) connects seamlessly to the supplied quick connect port (a2). The ergonomic tray design does not require nose cones; new baffles securely isolate signal for data integrity; and fiducials present in the tray allow automatic subject recognition during image acquisition (b). The tray can connect either inside the IVIS (c) or it can be used for prepositioning animals (d) on the benchtop when used in conjunction with the benchtop posing station (sold separately).

Inside the IVIS Lumina X5

- Back-illuminated AR coated 2.7 x 2.7 cm grade 1 CCD provides high quantum efficiency over the entire visible to near-infrared spectrum
- Light-tight imaging chamber
- 19 excitation filters and eight emission filters support CPS spectral unmixing
- LED lamps for photographic images
- Heated stage to maintain optimum body temperature
- Motor controlled stage, filter wheels, lens position, and f-stop

X-Ray Module

- Supports small and large rodent models
- The high sensitivity camera allows fast X-Ray image acquisition times of 1-10 seconds reducing radiation exposure
- Radiation shielded cabinet
- Exceeds standards set by the U.S. FDA Center for Devices and Radiological Health (21 CFR 1020.40)
- Automated image integration to overlay with Bioluminescence, Fluorescence and Photograph

Optional Accessories

- Animal tray to accelerate setup, labeling and analysis with benchtop posing accessory
- Syringe injection system, integrated with Living Image, allows the user to acquire real time functional responses to compounds
- Animal ID software support
- MVI-2™ for 360 degree surface mapping

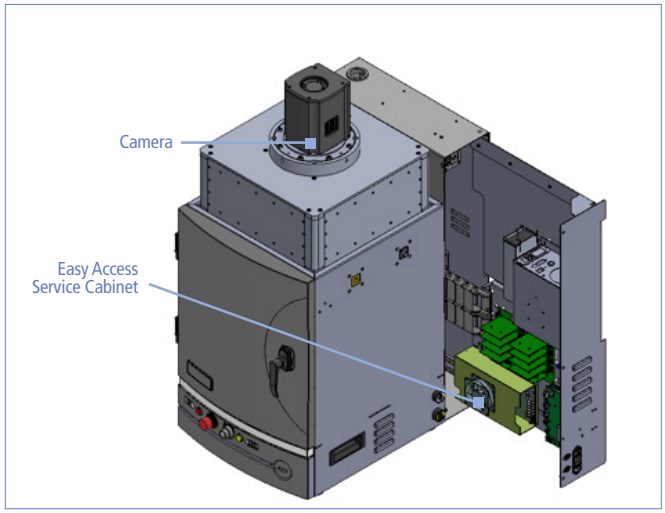

Figure 4. Diagram of external features of IVIS Lumina XS.

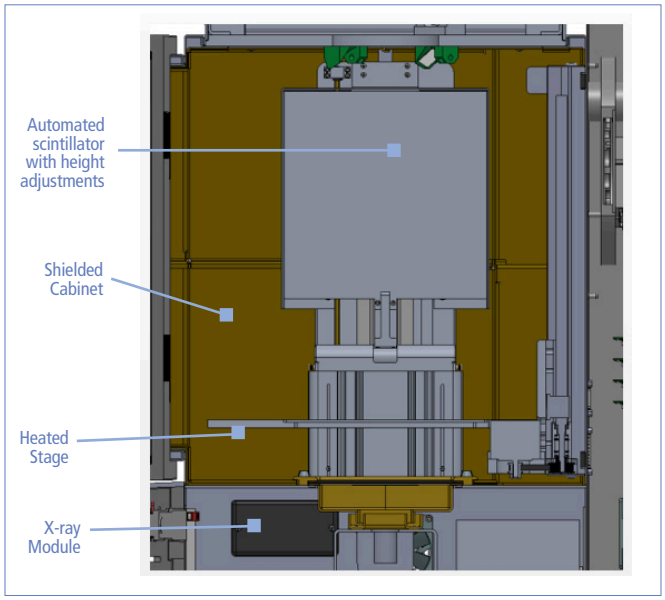

Figure 5. Cross-section of IVIS Lumina XS imaging chamber.

IVIS Lumina Platform System Accessories - Expand your IVIS Lumina Instrument with features when you need them!

XPM-2 Phantom Mouse for Bioluminescent Imaging
Cat No. 118993

XFM-2 Phantom Mouse for Fluorescent Imaging
Cat No. 133803

XRM-5 X-RAY Phantom Mouse
Cat No. 133793

Smart High Throughput Imaging Kit
CLS148874

MVI-2 Module for 360 Degree Surface Mapping
CLS143807

RAS-4 Rodent Anesthesia System
CLS146737

IVIS Syringe Injection Sytem
Cat No. 124633

IWB-60 60" Workbench
Cat No. CLS149578

Table 1. IVIS Lumina platform comparison.

Features	Lumina LT	Lumina III	Lumina XRMS	Lumina S5	Lumina X5
Capacity	3 mice	3 mice	3 mice	5 mice	5 mice
1.3 x 1.3 cm CCD -90 °C	√	√	√		
2.7 x 2.7 cm CCD -90 °C				√	√
2D Bioluminescence	√	√	√	√	√
2D Epifluorescence Imaging	√	√	√	√	√
Extended Range 150 W Tungsten EKE	√	√	√	√	√
Narrow Bandpass Excitation Filters Supporting CPS Spectral Unmixing		√	√	√	√
Standard X-ray Package			√		
Microfocus X-ray Source – High-Resolution X-ray					√
Animal ID Support (optional)				√	√
Mouse Tray with Automatic Subject Recognition (optional)				√	√

Table 2. . IVIS Lumina XS Specifications.

Imaging System Components:	Specifications
Camera Sensor	Back-illuminated AR coated, cooled Grade 1 CCD
CCD Size	2.7 x 2.7 cm
CCD Operating Temperature	-90 °C
Imaging Pixels	2048 x 2048
Quantum Efficiency	>85% at 500 nm, >80% at 650 nm
Pixel Size	13.5 microns
Optical Field of View (FOV)	10 x 10, 15 x 15, 22.5 x 22.5 cm
X-ray Field of View (FOV)	10 x 10, 15 x 15, 20 x 20 cm
Lens	f/1 – f/8
Minimum Image Pixel Resolution	50 microns
Minimum Read Noise (e^-)	$2e^-$ RMS for Bin 1
Dark Current	< 0.0008e^-/pix/sec
Illumination Source	Extended NIR Range 150W Tungsten EKE
Excitation Fluorescence Filters, Number/ Range	19/410 - 790 nm
Emission Fluorescence Filters, Number/Range	7/500 - 865 nm
X-ray Resolution	>21 lp/mm (25 lp/mm typical)
Radiation Shielded Cabinet	Exceeds standards set by the U.S. FDA Center for Devices and Radiological Health (21 CFR 1020.40)
Radiation Leakage	<0.1 mR/hr
Plate Voltage Range	0-50 kV
Tube Current Range	0-1mA
Anode Material	Tungsten
Typical X-Ray Image Acquisition Time	10 sec
X-Ray Tube Window	0.254 um beryllium
Animal Height (cm)	0-5.3 (average mouse is 2 cm, average rat is 4.5 cm)
Multimodality	Automated optical/X-ray overlays in all FOVs
Imaging System Space Requirement	48 x 69 x 122 cm (W x D x H)
Imaging Chamber Interior Dimension	37 x 37 x 43 cm (W x D x H)
Power Requirements	6A at 120V
Stage Temperature	20-40 °C
Computer (Minimum specifications)	Windows® 10, 4 GB RAM, nVidia Quadro 600, 250 GB and 1 TB HD, 24" widescreen LED Monitor
Living Image® Software	1 acquisition copy and 4 analysis copies of Living Image® software version 4.0 and higher

For more information, please visit our website at www.perkinelmer.com/*invivo*

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