



## Pre-clinical *in vivo* imaging

### Key Features

- Optical and X-ray imaging
- Multi-species imaging including mice and rats
- High resolution, low dose digital X-ray
- Exquisite sensitivity in bioluminescence
- Compute Pure Spectrum (CPS) spectral unmixing for ultimate fluorescence sensitivity
- Full fluorescence tunability through the NIR Spectrum

## Multi-species Optical Imaging with Integrated X-ray

The IVIS® Lumina XRMS Series III from PerkinElmer integrates the best in class *in vivo* bioluminescence and fluorescence imaging with 2D X-ray capability. The IVIS Lumina XRMS offers the flexibility to image small as well as large animals with precise optical and X-Ray overlay, giving anatomical context to the optical signal. The system includes state of the art spectral unmixing for sensitive multispectral imaging to monitor multiple biological events in the same animal.

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## Leading Innovator in Bioluminescence, Multispectral Fluorescence and Integrated X-Ray 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. The IVIS Lumina XRMS Series III offers leading bioluminescence, low dose X-Ray imaging and ultra sensitive 2D (two dimensional) *in vivo* fluorescence imaging. With the IVIS Lumina XRMS, get an anatomical context to optical signal in mice and rats and other large species.

The system is equipped with up to 26 filters tunable to image fluorescent sources that emit from green to near-infrared. All Lumina Series III systems come with a novel illumination technology that effectively increases fluorescent transmission deep into the near infrared range with full transmission through 900 nm. Moreover, the Lumina III series instruments incorporate PerkinElmer's patented Compute Pure Spectrum (CPS) algorithm

for 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 from one instrument to any another IVIS instrument within an organization or around the world.

## Flexibility-image Small and Large Animals

The IVIS Lumina XRMS offers the flexibility to image mice, rats and other animals up to 500-600 g in weight with an accurate optical overlay on X-ray image. The X-ray scintillator can easily be moved to effectively image mice and rats with ease and is the only instrument that can overlay an optical signal to the X-ray image at all Fields of View (FOV's), as shown in Figures 1 and 2.

### Large Animal Imaging

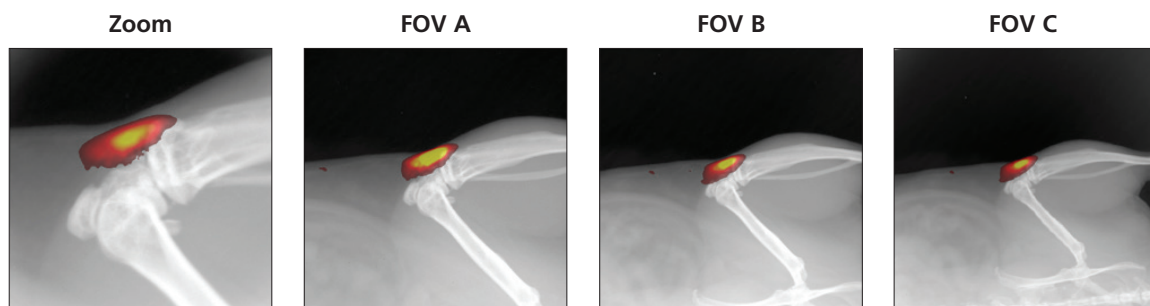


Figure 1. Optical overlay of FolateRSense™ 680 fluorescence signal on X-ray image at multiple FOV's in a 560 gram rat. Optional accessory ZFOV lens is needed for zoom image.

### Small Animal Imaging

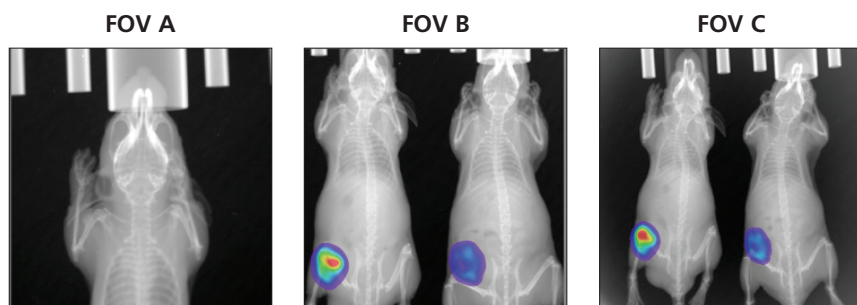


Figure 2. Optical overlay of bioluminescent signal with X-ray image at multiple FOV's in mice.

## Applications in Multimodal Imaging

Precise optical and X-ray overlay brings your optical signal into anatomical context. Key applications in oncology, infectious diseases, implant biology or any model that requires anatomical context, the IVIS Lumina XRMS Series III will offer complete and rich calibrated datasets for longitudinal studies with supporting analysis software.

### Oncology

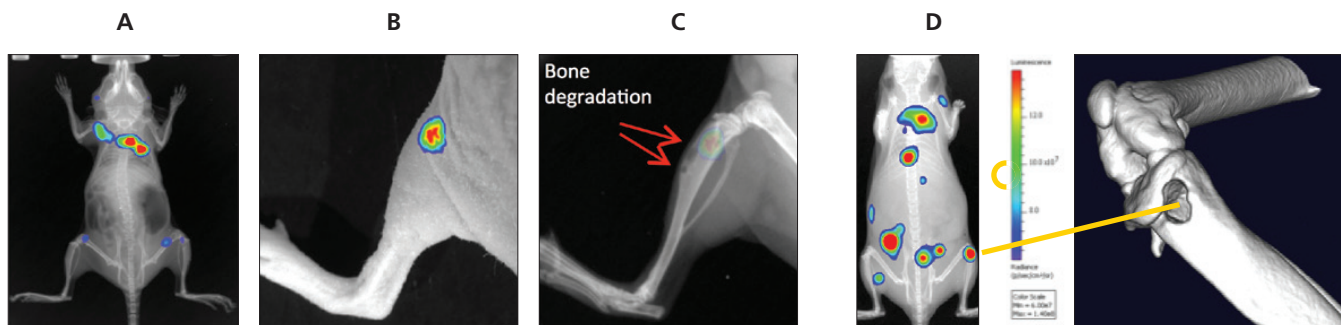


Figure 3. A)  $5 \times 10^5$  4T1-luc2 cells were intravenously by tail vein injection. Bioluminescence image was taken of cells colonized in the various parts of body. B) Two dimensional overlaid photographic and bioluminescent image. C) Two dimensional overlaid X-ray and bioluminescent image. Red arrows highlight areas osteolysis. D) MicroCT image (Quantum microCT system) confirming bone degradation in the right tibia.

### Infectious Disease

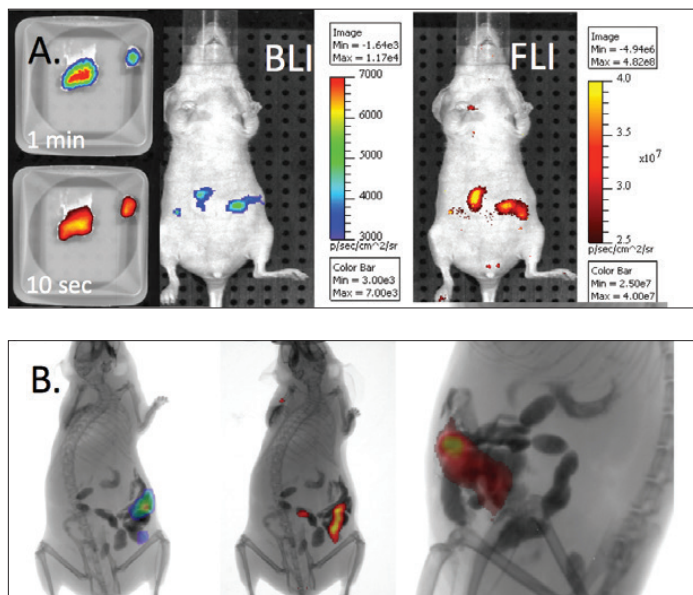


Figure 4. GI tract infection model was established by feeding contaminated peanut butter, which contained bioluminescence and fluorescence dually labeled *Salmonella typhimurium*. Bioluminescence and fluorescence (Ex605/Em660 nm) images were taken at 3 hours. A) At 5 hours, tri-modality imaging was performed and the overlaid images were shown B) The GI tract was highlighted due to the presence of barium sulfate (150 mg) in the peanut butter.

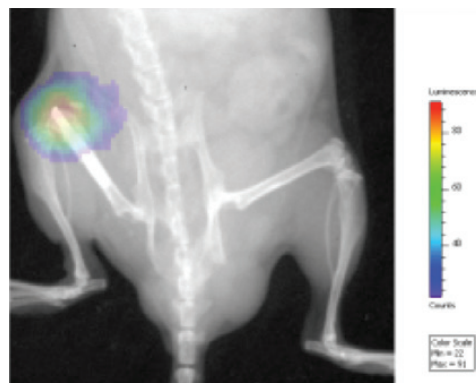


Figure 5. Chronic post-arthroplasty infection. Monitoring bacterial burden, inflammation and bone damage longitudinally using optical and X-ray imaging in an orthopedic implant infection model.

### Inflammation

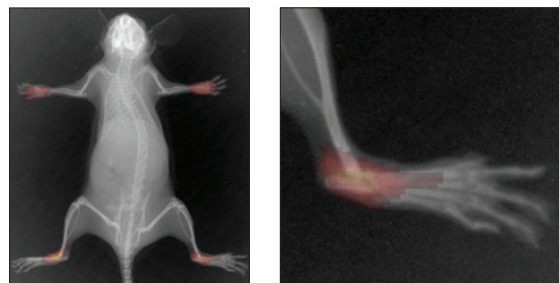


Figure 6. Detection of rheumatoid arthritis with fluorescent probe

## Living Image Software

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's design creates an intuitive, seamless workflow for researchers of all skill levels. Features include: wizard based guidance for advanced imaging protocols, spectral unmixing tools, 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 a 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.

## Inside the IVIS Lumina XRMS Series III

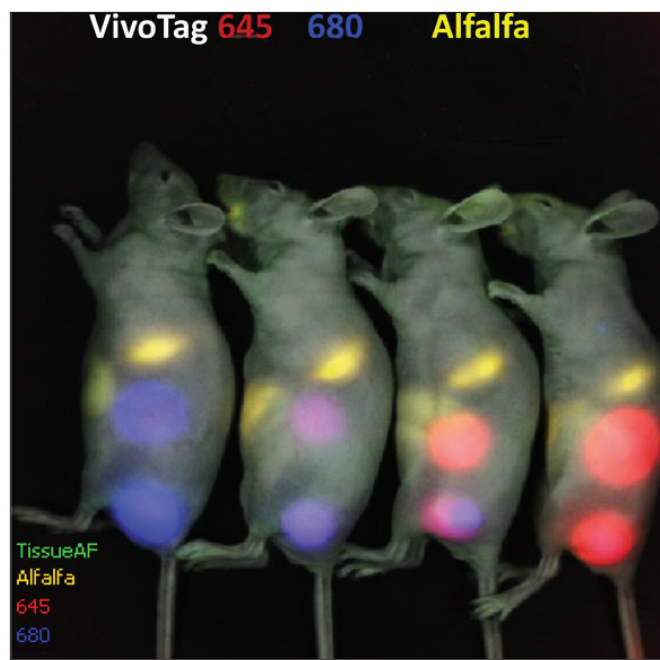
- Back-thinned, back-illuminated grade 1 CCD provides high quantum efficiency over the entire visible to near-infrared spectrum
- Light-tight imaging chamber
- Five filter wheel choices for a broad range of fluorescence applications
- LED lamps for photographic images
- Heated stage to maintain optimum body temperature
- Motor controlled stage, filter wheels, lens position, and f-stop

## X-Ray Module

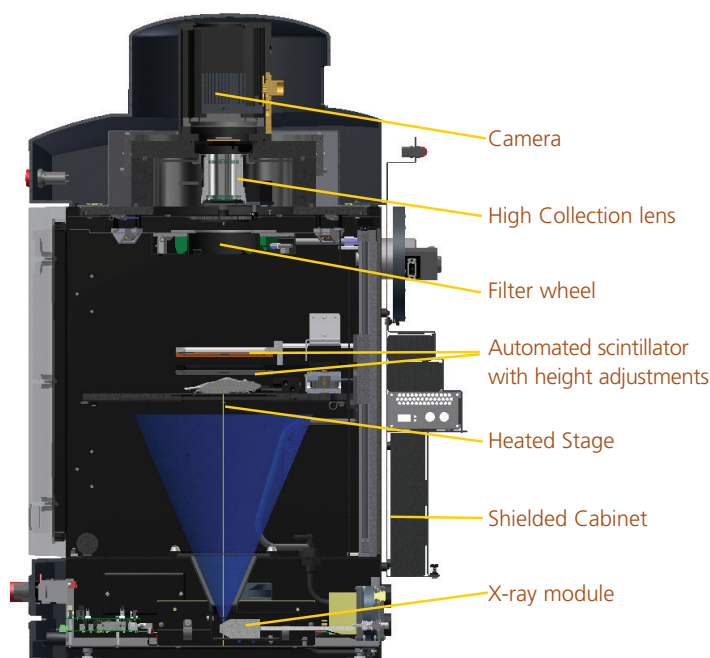
- Large and Small Animal X-ray
- The high sensitivity camera allows fast X-Ray image acquisition times of 1-10 seconds reducing radiation exposure
- Radiation shielded cabinet
- Exceeds standards set by the U.S. FDA Center for Devices and Radiological Health (21 CFR 1020.40)
- Automated image integration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

## Optional Accessories

- Optical Zoom Lens attachment for close up and high resolution X-Ray images
- Gas anesthesia ports and 3 or 5 position manifold within imaging chamber allows anesthesia to be maintained during imaging sessions
- Syringe injection system, integrated with Living Image, allows the user to acquire real time functional responses to compounds



Nu/nu mice received local injections of different ratios of VivoTag645 and VivoTag 680 in two sites per mouse to provide full titrations from 0-100 pmols of fluorescence per spot. Tissue autofluorescence (green), chow autofluorescence (yellow), VivoTag 645 (red), and VivoTag 680 (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.

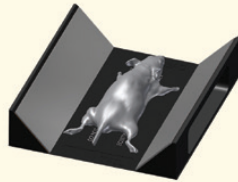


## Accessories for the IVIS Lumina XRMS Series II Imaging System

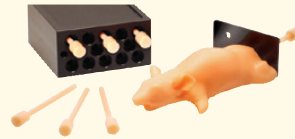
Expand your Series III Instrument with features when you need them!



**Animal Isolation Chamber Kit XIC-3**  
Cat No. 123997



**Multi-View Platform**  
Cat No. CLS134956



**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



**RAS-4 Anesthesia System**  
Cat No. 146737



**IVIS Syringe Injection System**  
Cat No. 124633



**ZFOV Zoom Lens**  
Cat No. 127285



**IWB-60 Workbench**  
Cat No. 149578



**ECG Monitoring System**  
Cat No. 124229

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

Features	IVIS Lumina	IVIS Lumina XRMS	IVIS Lumina LT
Bioluminescence	✓	✓	✓
Radioisotopic Cerenkov Imaging	✓	✓	✓
Fluorescence	✓	✓	✓
Compute Pure Spectrum Spectral Unmixing	✓	✓	
Integrated Small and Large Animal X-Ray		✓	
Extended NIR Range 150W Tungsten EKE	✓	✓	✓
Absolute Calibration to NIST® Standards	✓	✓	✓

## IVIS Lumina XRMS Series III Imaging System

Imaging System Components:	Specifications
Camera Sensor	Back-thinned, back-illuminated, cooled Grade 1 CCD, frame transfer
CCD Size	13 x 13 mm
CCD Operating Temperature	-90 °C
Imaging Pixels	1024 x 1024
Quantum Efficiency	>85% at 500-700 nm, >30% at 400-900 nm
Pixel Size	13 microns
Optical Field of View (FOV) cm	5 x 5, 7.5 x 7.5, 10 x 10, 12.5 x 12.5 (Optional zoom 2.4 x 2.4)
X-Ray Field of View (FOV) cm	5 x 5, 7.5 x 7.5, 10 x 10 (Optional zoom 2.4 x 2.4)
Lens	f/9.5 – f/16, 50 mm
Minimum Image Pixel Resolution	50 microns
Minimum Read Noise (e <sup>-</sup> )	Better than 5
Dark Current (Typical)	<3 x 10 <sup>-4</sup> e <sup>-</sup> /pixel/s
Illumination Source	Extended NIR Range 150W Tungsten EKE
Excitation Fluorescence Filters	19
Emission Fluorescence Filters	7
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
Automated Aluminum Filter	0.4 mm
Plate Voltage Range	10-40 kV
Tube Current Range	1-100 uA
Anode Material	Tungsten
Typical X-Ray Image Acquisition Time	10 s
Average Mouse Dosage	1-3 mGy
X-Ray Tube Window	0.127 mm beryllium
Animal Height (cm)	0-5.3 (average mouse is 2 cm, average rat is 4.5 cm)
Scintillator	Automated CsI plate placement during X-Ray acquisition
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	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](http://www.perkinelmer.com/invivo)

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