

IVIS | Lumina XR

High Resolution Digital X-Ray

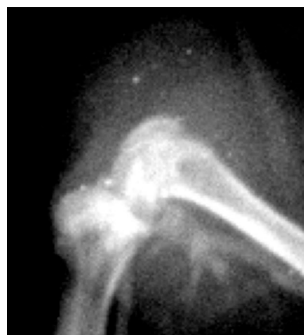
Bioluminescence & Fluorescence

Spectral Unmixing

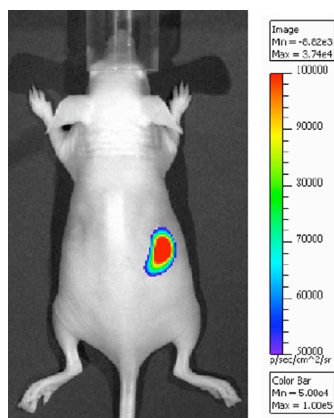
Living Image Software

Multimodal Imaging

IVIS Lumina XR offers the most sensitive and flexible small animal optical imaging system in both bioluminescence, fluorescence and now X-ray. Precise optical and X-ray overlay brings your optical signal into anatomical context. Caliper Life Science's Living Image software automates all controls and settings required for seamless image acquisition and processing. The IVIS Lumina XR is calibrated to NIST standards assuring you consistent and reproducible results independent of magnification or filter selection from one instrument to any other IVIS instrument around the world.



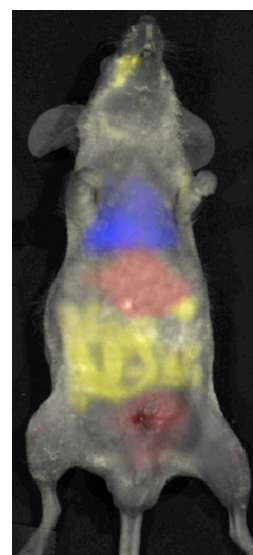
A Nu/Nu mouse with a subcutaneous HT1080 tumor was i.v. injected with Aurovist nanogold particles (10 μ L/g body weight, 270 mg/mL) and Avastin-750 probe.



A Nu/Nu mouse with a subcutaneous tumor containing 100 cells expressing luciferase.

Superior Optical Imaging

IVIS Lumina XR is capable of imaging both fluorescent and bioluminescent reporters or dyes. The system is equipped with up to 21 emission filter sets that can be used to image reporters that emit from green to near-infrared. Superior spectral unmixing is achieved by optional high resolution sharp cut off filters that are interchangeable to achieve the highest performance, sensitivity and spectral unmixing. IVIS Lumina XR can also accommodate petri dishes or micro-titer plates for in vitro imaging. The system incorporates premium animal handling features such as a heated stage, gas anesthesia connections and a syringe injection system for simultaneous compound administration.



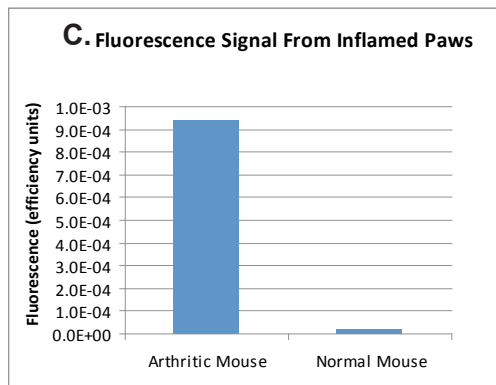
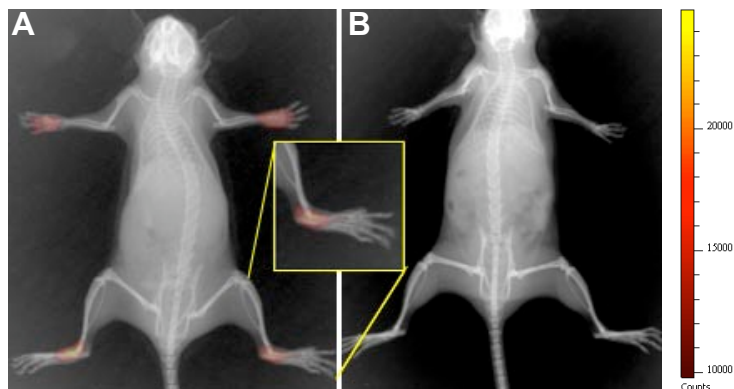
Spectrally unmixed Nu/Nu mouse with DyLight 800 in the lungs, CF750 in the liver and bladder and chlorophyll within the gastrointestinal tract.

Living Image Software

The Living Image software yields high-quality, reproducible, quantitative results incorporating instrument calibration, background subtraction and the image algorithms. Living image also provides simple, user guided spectral unmixing that automatically performs algorithms that allow detection and separation of multiple reporters, greatly reduce the effects of tissue autofluorescence and effectively reduce cross talk between reporters.

Applications: Optical In Context

Rheumatoid Arthritis

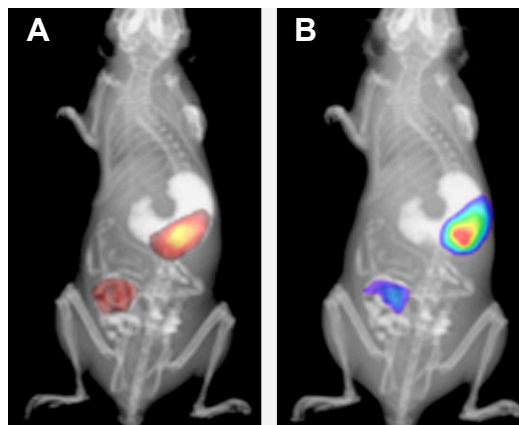
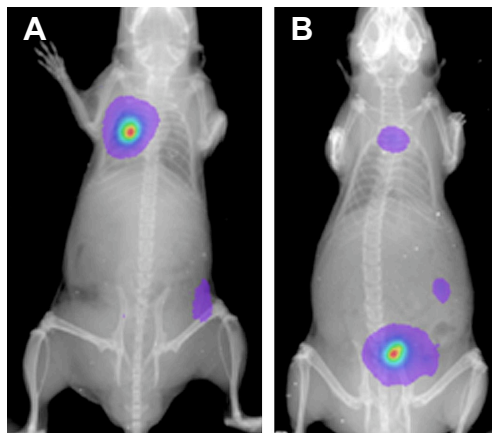


(A) A DBA1 mouse was induced to develop rheumatoid arthritis (RA) with arthrogen CIA antibody. At day15, the mouse was i.v. injected with 200 μ L of Glycolipo-K1-Cy5.5 and imaged on a ventral view with Lumina XR. (B) No binding of probe to the non-induced control mouse. (C) Quantification of the fluorescence signal from the extremities was shown. The numbers represent total signal of the extremities.

Infectious Diseases

Contextual resolution of bones and contrast agents gives a clearer picture, localizing and determining the disease state of an animal.

Nu/Nu mouse was fed with peanut butter/150mg barium sulfate mixture, containing 3×10^8 cfu of dually labeled *Salmonella typhimurium* Xen26-lux-cherry. (A) Fluorescent (Ex605/Em660 nm) and (B) bioluminescent images were taken at 5 hours at an exposure time of 5 minutes separately.



Oncology: Metastatic Cancer

Exquisite sensitivity is required to define small metastases. IVIS Lumina XR is the only multimodal optical imaging system that can reach a minimal detection radiance of 100 photons/s/sr/cm² allowing you to detect a small number of cells.

Nu/Nu mice were i.c. injected with 1×10^5 PC3M-luc2 cells and tumor metastases were detected through bioluminescence imaging. Metastases were detected in the rib cage, lymph node (A), spinal cord and prostate (B), which was confirmed by necropsy analysis.

Inside the IVIS Lumina XR

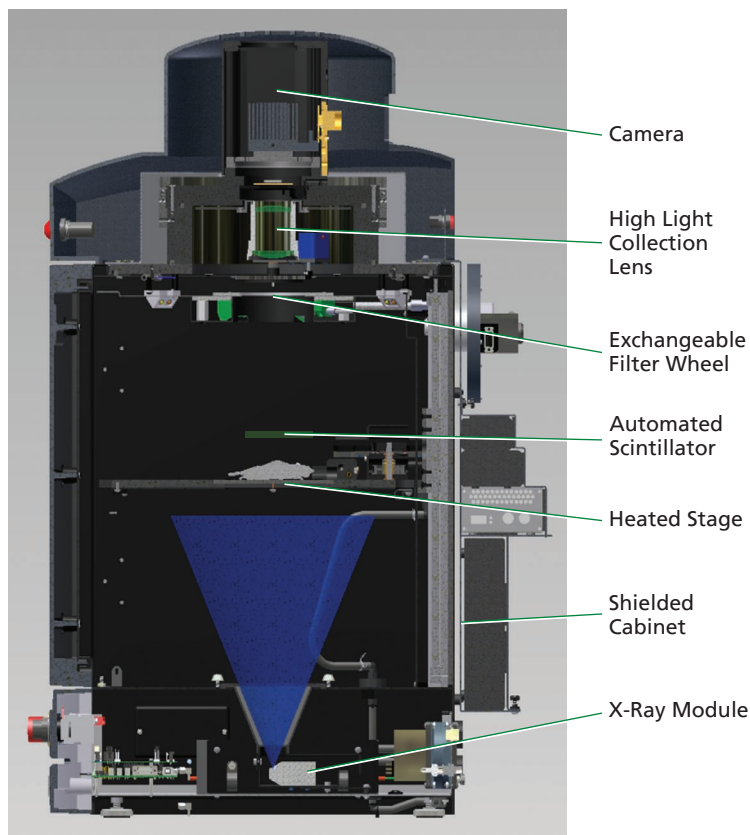
- Back-thinned, back-illuminated grade 1 CCD provides high quantum efficiency over the entire visible to near-infrared spectrum
- Light-tight imaging chamber
- 8 position emission filter wheels
- 10 position excitation filter wheels
- 5 filter wheel choices for a broad range of fluorescence applications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

X-Ray Module

- 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 US 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 allow 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





High Magnification Zoom Lens Attachment
(available winter 2010)



Magnified Mouse Paw



Magnified Hip Ball and Socket



Anesthesia System
Cat No. 118918 XGI-8 (120V)
Cat No. 118919 XGI-8 (230V)
Cat No. 118957 XGI-8 (100V)



High Spectral Resolution Filters
Cat No. 123324 (Standard Filters)
Cat No. 123325 (500 Series)
Cat No. 123326 (600 Series)
Cat No. 123327 (700 Series)
Cat No. 126138 (Mid-High Range)

Fluorophores	Standard High Resolution Excitation Filter Set (Built-In)**	Emission Filter Options
GFP, YFP and PKH26	430, 465, 500, 535, 570, 605, 640, 675, 710, 745	*500 Series (Low Range) 500, 520, 540, 560, 580, 600 and 620 nm
DsRed and Tomato		*600 Series (Mid Range) 580, 600, 620, 640, 660, 680 and 700 nm
Cy5.5, XenoLight 680, Katushka and Cherry FP		*Mid-High Range 640,660,680,700,720,740 and 760nm
Indocyanine Green and XenoFluor 750, 770		*700 Series (High Range) 720, 740, 760, 780, 800, 820, and 840 nm
Multiple Fluorophores Spanning 500-900 nm Broad Imaging Solution		Standard Emission Filter Set 515-575, 575-650, 695-770, 810-875 nm

*20 nm bandpass emission filter

**35 nm bandpass excitation filters

IMAGING SYSTEM COMPONENTS	SPECIFICATIONS
Camera Sensor	Back-thinned, back-illuminated, cooled Grade 1 CCD, frame transfer
CCD Size	13 x 13 mm
CCD Operating Temp	minus 90 °C
Imaging Pixels	1024 x 1024
Quantum Efficiency	>85% at 500 – 700 nm, >30% at 400 – 900 nm
Pixel Size	13 microns
Min. Detectable Radiance	100 photons/s/sr/cm ²
Optical Field of View (FOV) cm	5x5, 7x7, 10x10, 12.5x,12.5 (Optional zoom 2.4x2.4)
X-ray Field of View (FOV) cm	5x5, 7x7, 10x10 (Optional zoom 2.4x2.4)
Lens	f/.95 – f/16, 50 mm
Min. Image Pixel Resolution	50 microns
Min Read Noise (e-)	Better than 5
Dark Current (Typical)	<3 x 10 ⁻⁴ e-/pixel/s
Excitation Fluorescence Filters	10
Emission Fluorescence Filters	4 standard (Optional 4 sets of 7 high resolution filters)
Radiation shielded Cabinet	Exceeds standards set by the US 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	10-40kV
Tube Current Range	1-100uA
Anode Material	Tungsten
Typical X-Ray Image Acquisition Time	10s
Average mouse dosage	1-3 mGy
X-ray Tube Window	0.127mm beryllium
Animal height (cm)	0-2.6 (average mouse is 2cm)
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)	2.8 GHz, 2 GB RAM, RW CD/DVD, 2x250 GB HD, 20" flat screen monitor
Living Image Software	1 acquisition copy and 1 analysis copy of Living Image software 4.0 and higher