

CMI Bruker Pre-clinical Molecular Imaging - praktické aplikace

Carestream
Molecular Imaging

9 Powerful Imaging Modalities

1. Fluorescence
2. Luminescence
3. Radioisotopic
4. Radiographic (X-Ray)
5. Single Photon Emission Computed Tomography (SPECT)
6. Positron Emission Tomography (PET)
7. Computed Tomography (CT)
8. MRI
9. Ultrasound



In-Vivo portfolio



ICON MRI



SkyScan CT



In Vivo FX PRO



In Vivo DXS PRO



In Vivo F PRO



In Vivo MS FX PRO



In-Vivo Xtreme
FI 16MP



In-Vivo Xtreme
BI 4MP



Albira
PET/SPECT/CT



VisualSonics- Vevo

In Vivo
"Standard"

In Vivo
"Premium"

In-Vivo Xtreme

- **Extra Sensitivity and Speed**
- **MODALITIES:**
 1. Fluorescence
 2. Luminescence
 3. Radioisotopic
 4. Radiographic (X-Ray)
 5. Reflectance
- **Camera choice:**
 - Back illuminated 4 MP camera, high sensitivity
 - Front illuminated 16 MP camera, high resolution



X-ray Source

- 45 keV energy optimized for small animal imaging
- Resolution:
 - FI 16MP: > 25 lp/mm
 - BI 4MP: > 18 lp/mm
- Max current: 500 μ A
- X-ray Spot Size < 60 μ m
- Geometric magnification stage standard

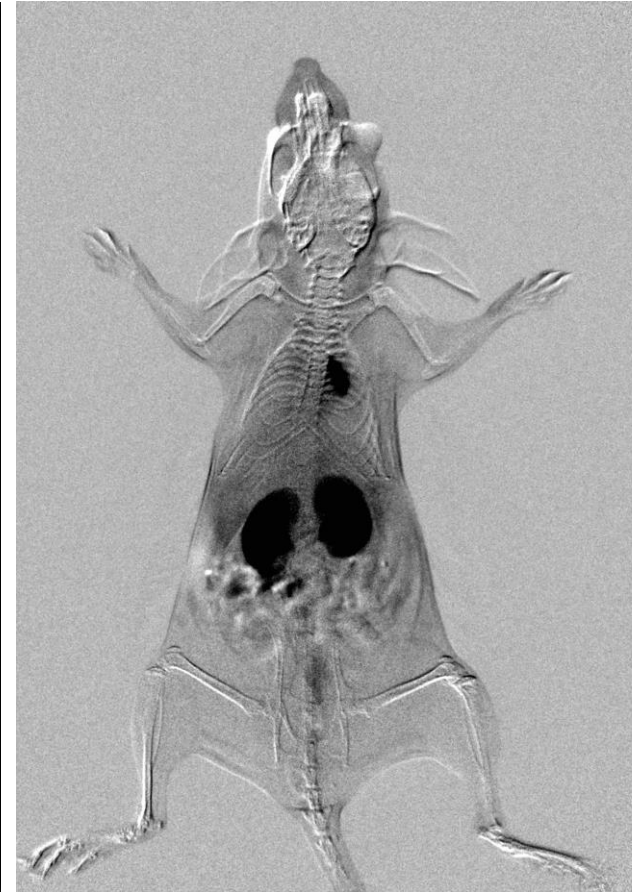




X-ray Contrast Time Lapse



X-ray Contrast- Kidneys



BRUKER X-ray Imaging of Mouse Paw



Mouse
trebecular
structure

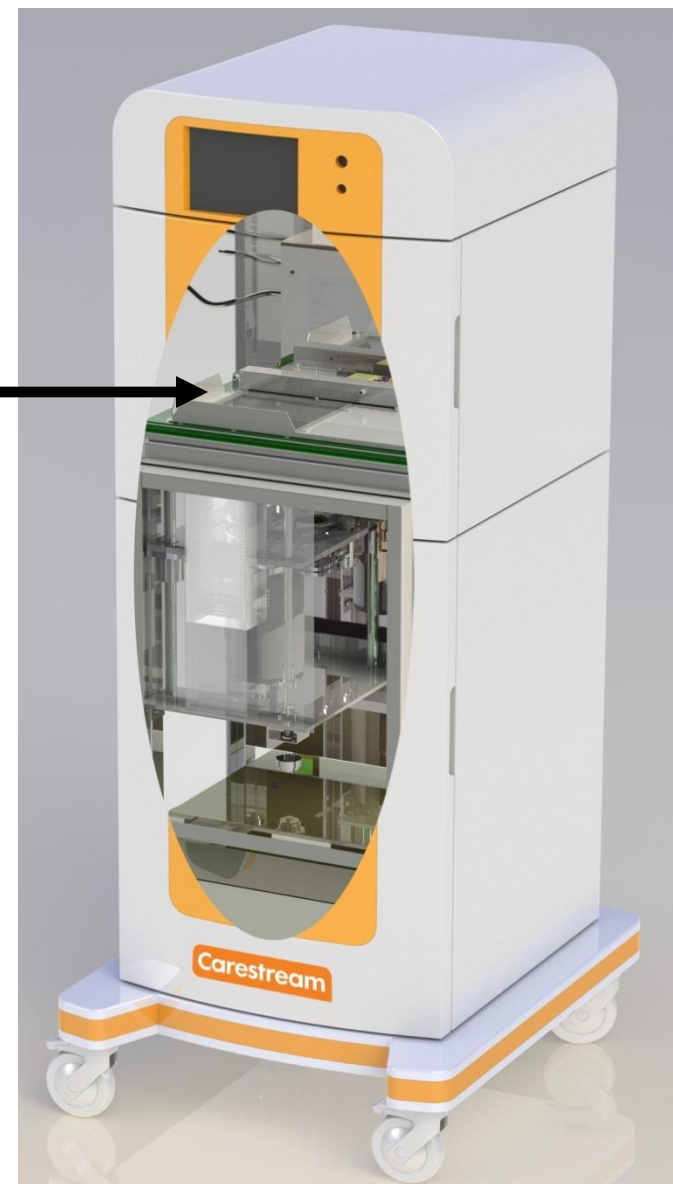
Details of each mouse
bone in paw

Animal Management Zone

- Radiographic and radioisotopic phosphor screen
- Large 20 cm x 20 cm FOV
- 5 mouse or 2 rats

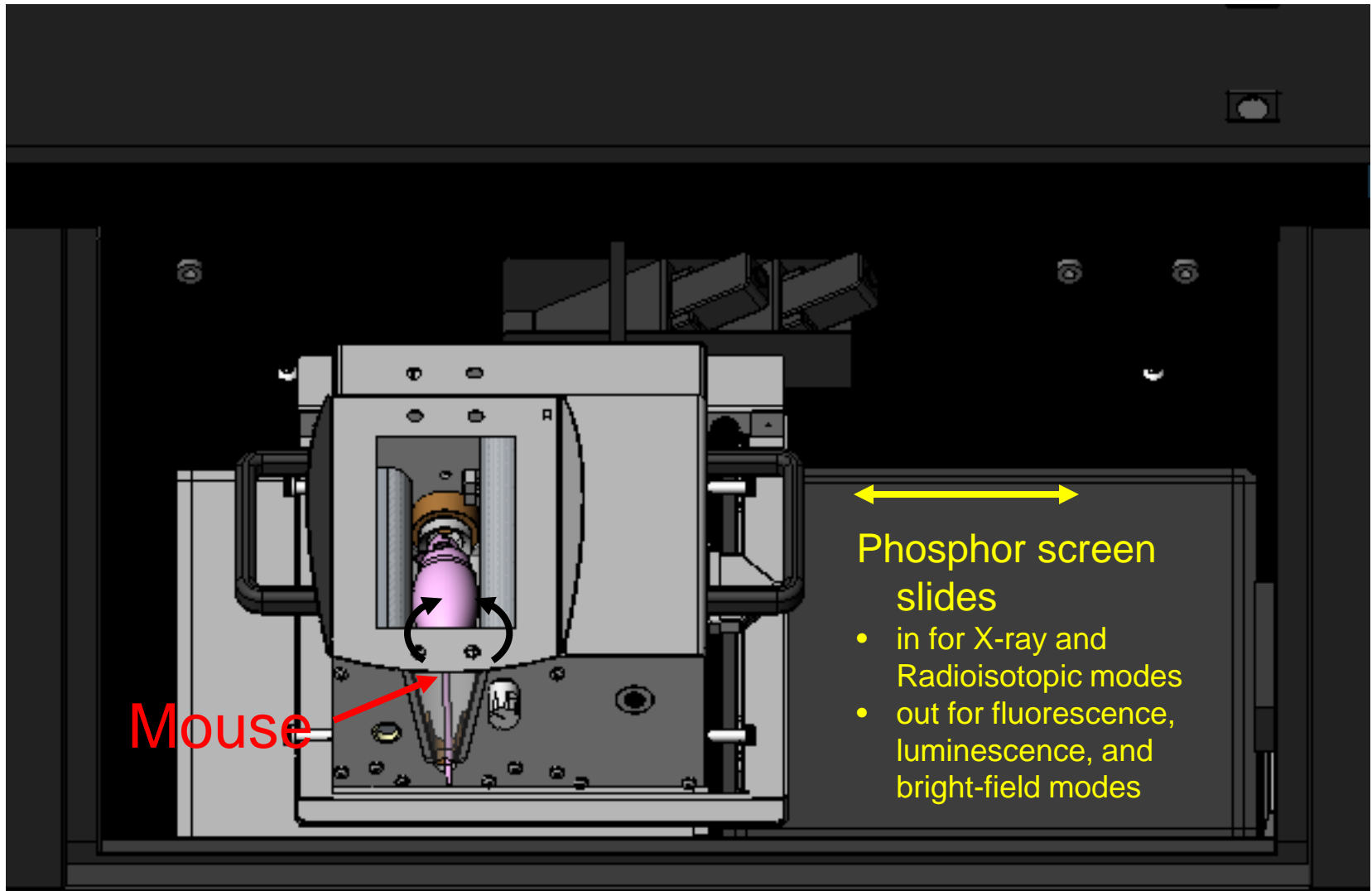
- Light tight ports
 - Catheter injection
 - Isoflurane anesthesia system
 - Animal heater

- MARS compatible
- Switching between imaging modalities = animal never moves





Multimodal Animal Rotation (MARS)

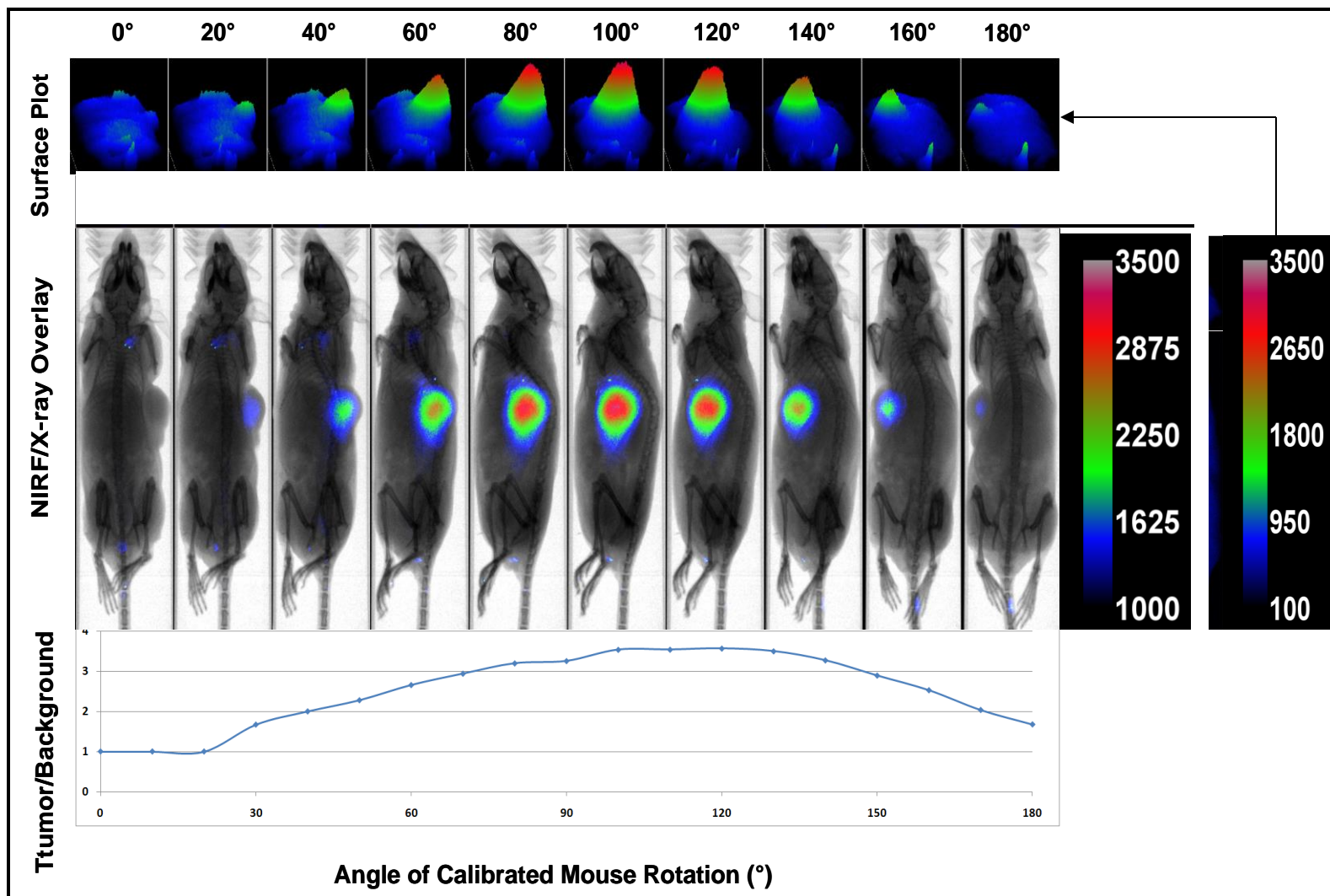


➤ MARS- Multimodal Animal Rotating System





MARS: Optimizing S/N In Vivo



Aneasthesia system



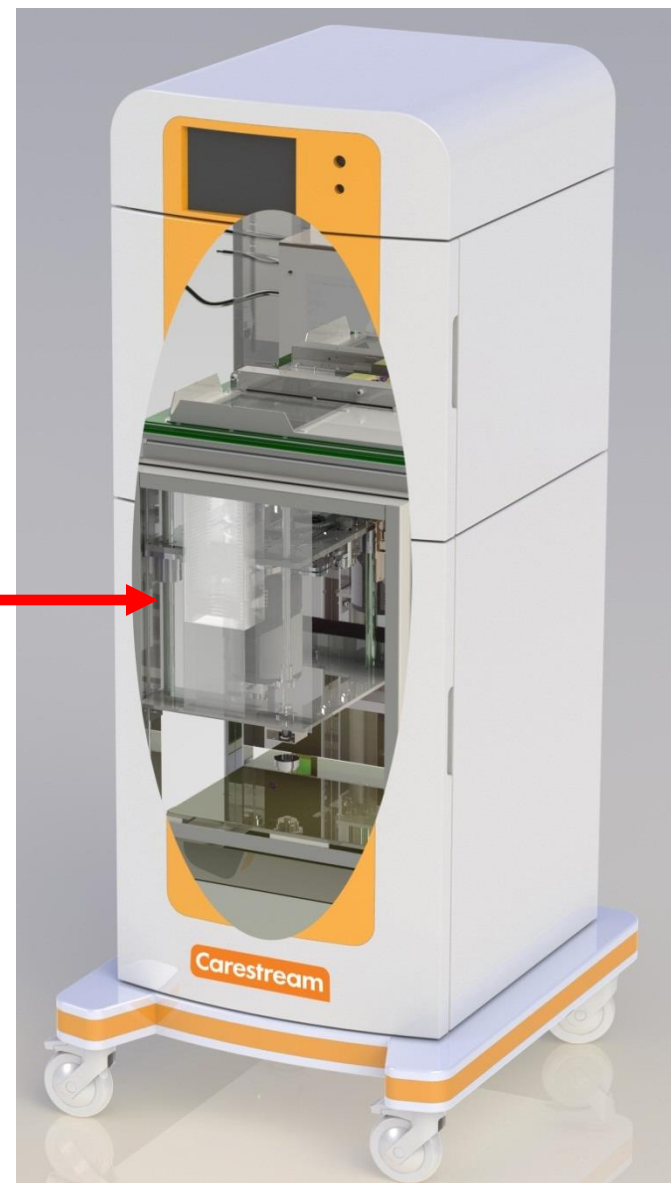
Animal heater provides negative airflow for scavenging isoflurane.



Image by Dr. Jens

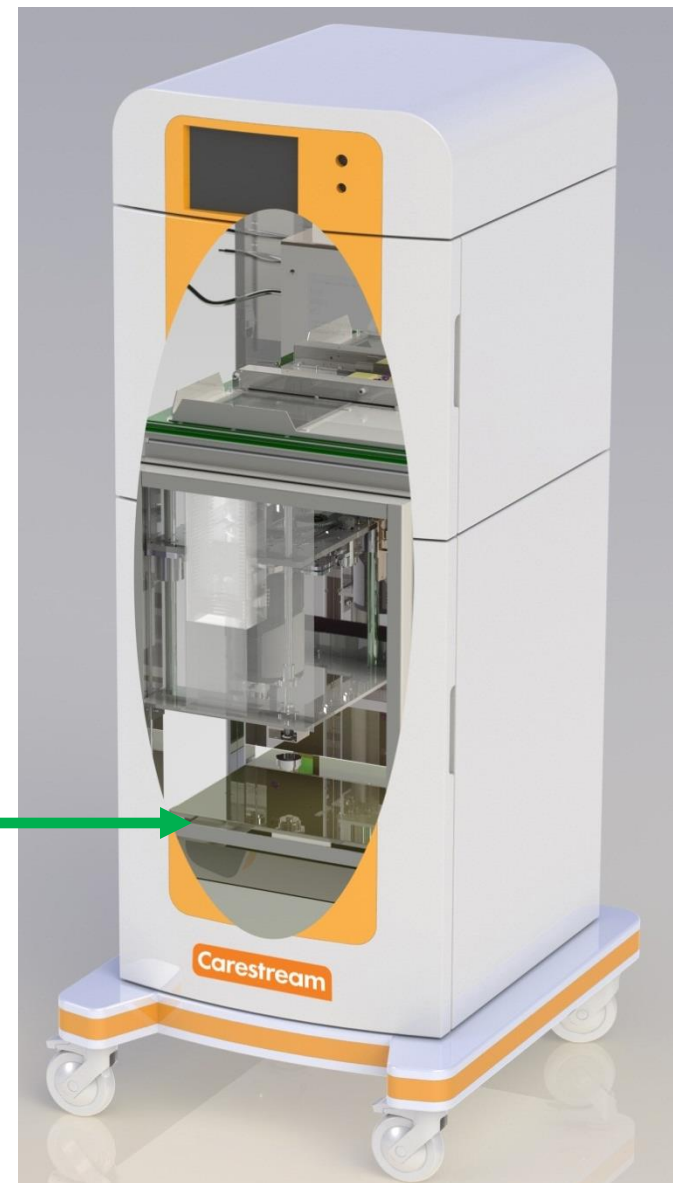
Camera and Optics

- Large fast f/1.1 lens coupled to CCD camera
- Choice of two cameras
 - High sensitivity, back-illuminated 4MP camera with cooling to -55 °C absolute
 - High resolution, front-illuminated 16MP camera with cooling to -29 °C absolute
- 6 wide angle emission filters standard
- 8 position filter wheel



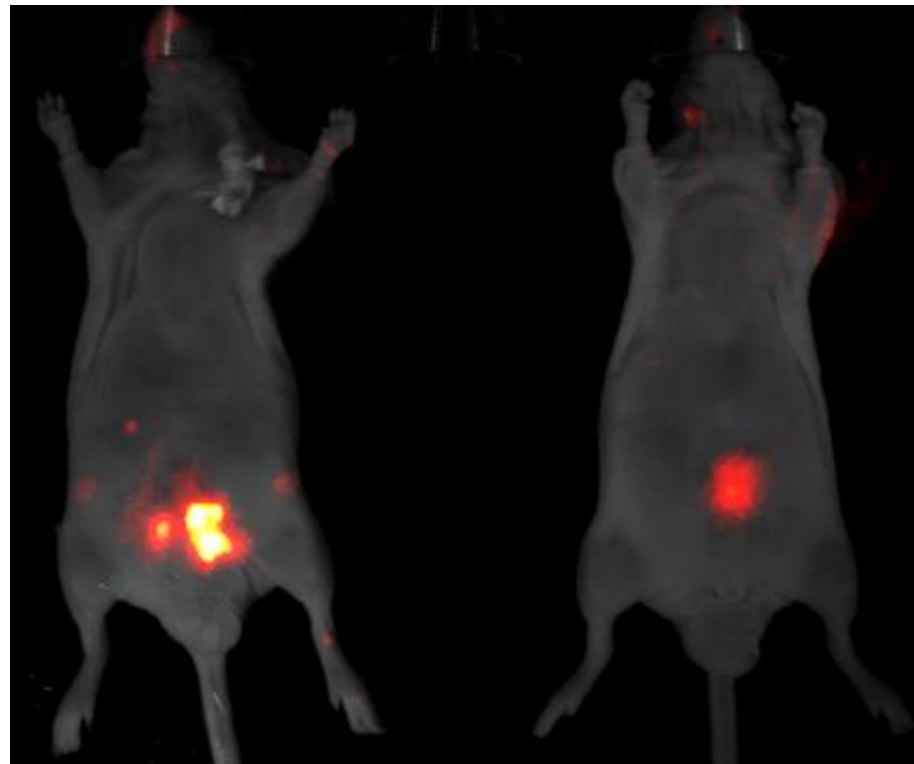
Excitation Source

- Xenon illuminator 400W
- 28 excitation filters
- Image from the visible to the NIR
- Separate fluorophores using multiplex acquisition or excitation based spectral deconvolution



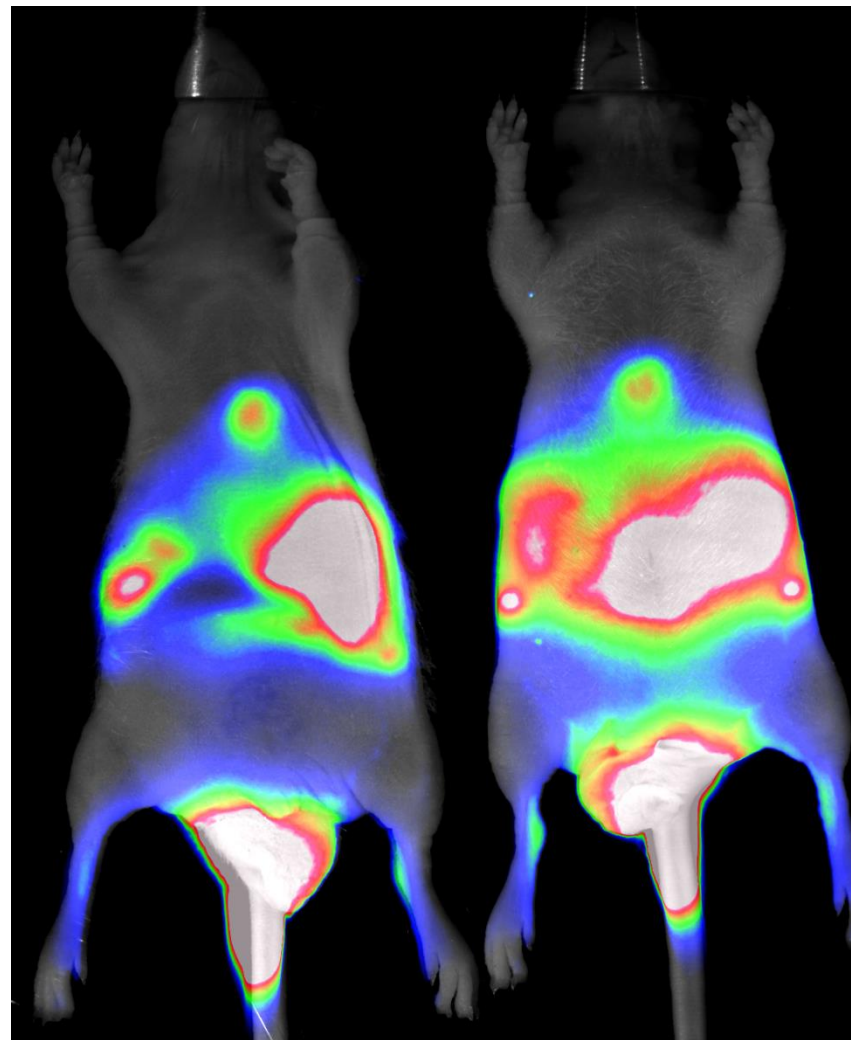
High Sensitivity Luminescence

- Oncology small or deep tumor imaging
- Stem cell tracking
- Inflammation imaging
- Immunology cell tracking



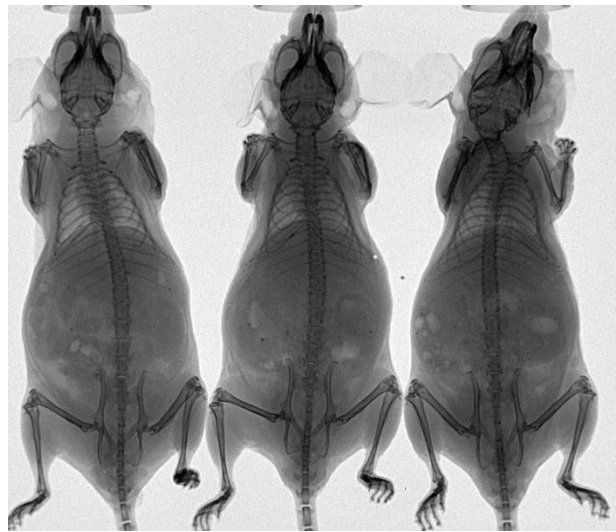
High Sensitivity Fluorescence

- Injectable probe and biomarker development
- NIR fluorescent labeled tumor cells and stem cells
- Infection imaging
- Cell death
- Activatable reporters for cell death and inflammation
- Antibody/minibody tracking



Xtreme - Brain (Frontal Cortex)

X-ray

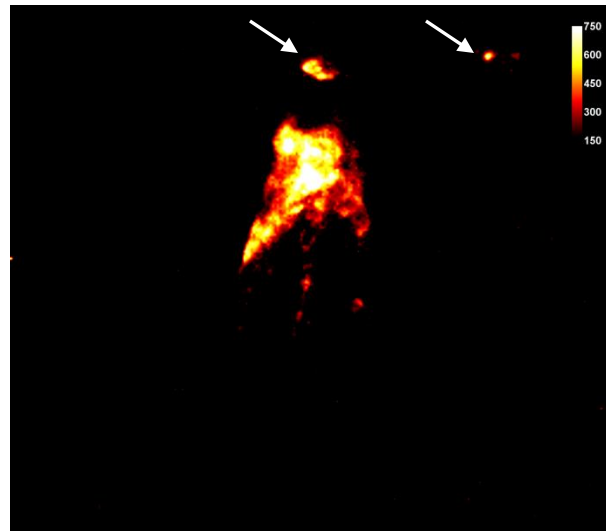


Control

Cryo 1

Cryo 2

Luminescence
(Luminol)

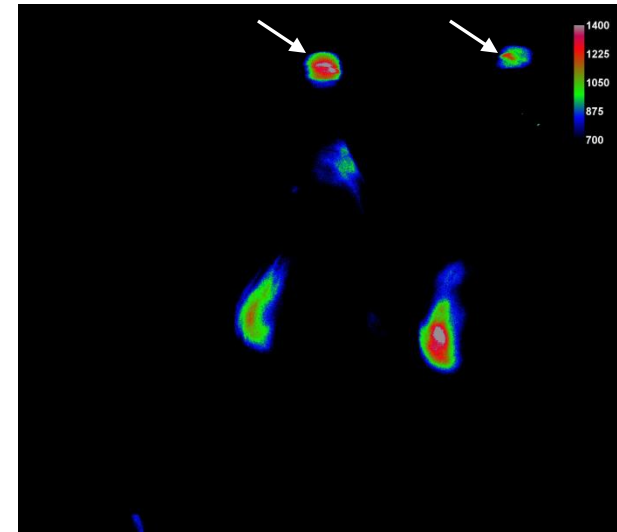


Control

Cryo 1

Cryo 2

Fluorescence
PSVue 794



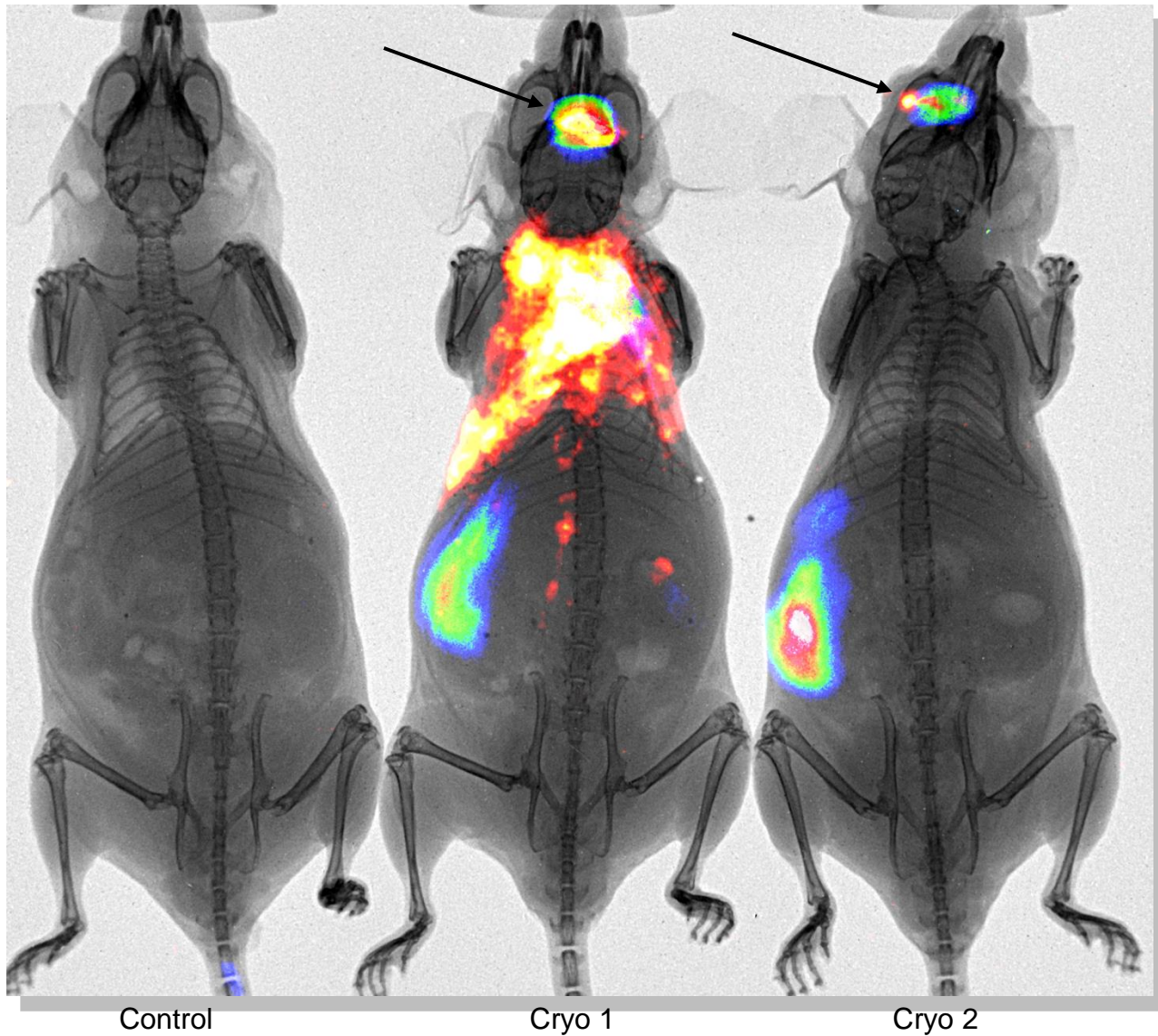
Control

Cryo 1

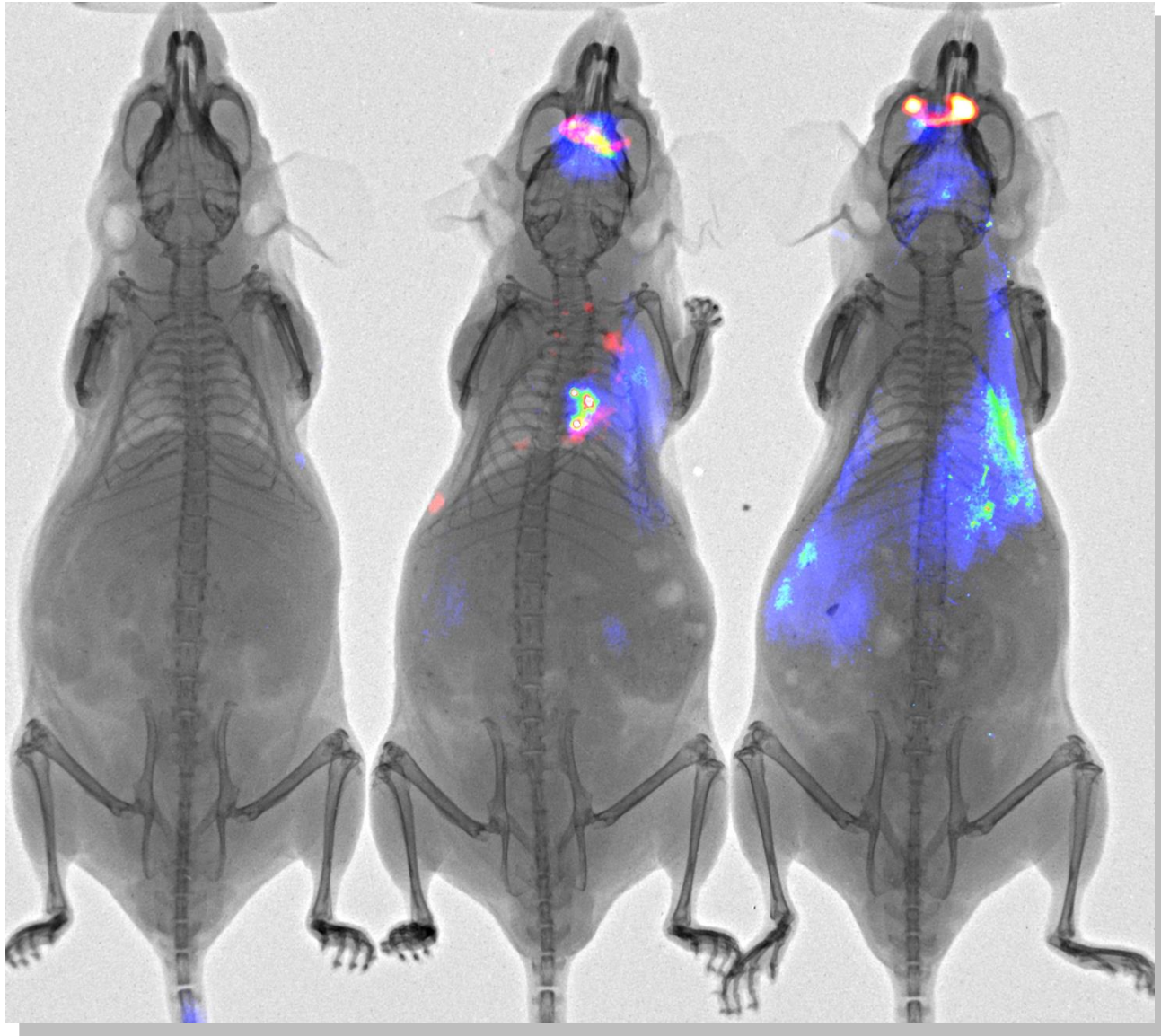
Cryo 2

5 hr post injury

Xtreme -Brain (Frontal Cortex) Cryolesion

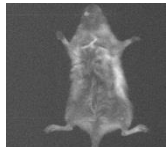


Multimodal Imaging

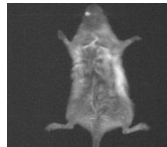


Multiple Excitation Filters

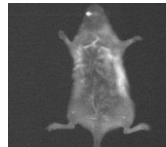
420 ex / 790 em



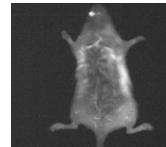
440 ex / 790 em



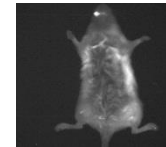
460 ex / 790 em



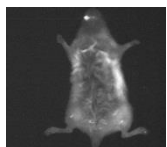
480 ex / 790 em



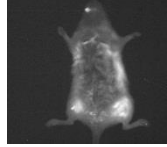
520 ex / 790 em



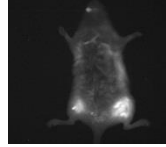
540 ex / 790 em



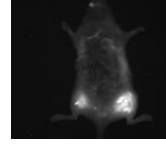
570 ex / 790 em



590 ex / 790 em



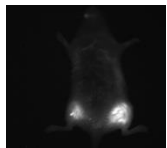
600 ex / 790 em



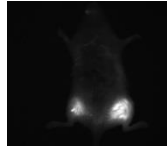
610 ex / 790 em



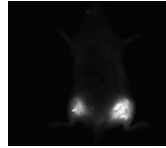
620 ex / 790 em



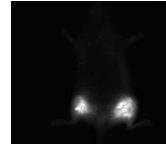
630 ex / 790 em



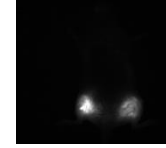
650 ex / 790 em



670 ex / 790 em



690 ex / 790 em



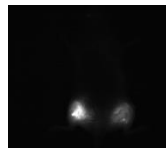
700 ex / 790 em



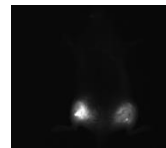
710 ex / 790 em



720 ex / 790 em

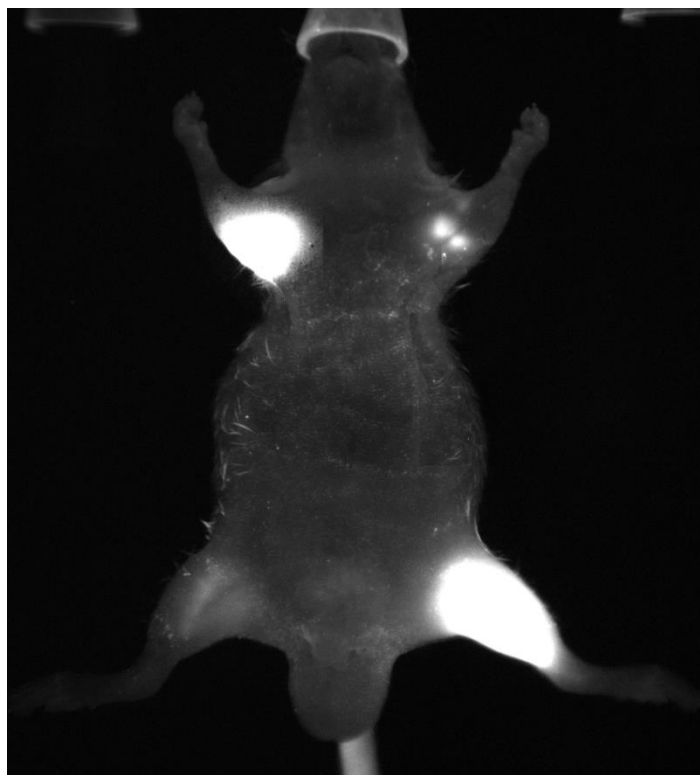


730 ex / 790 em



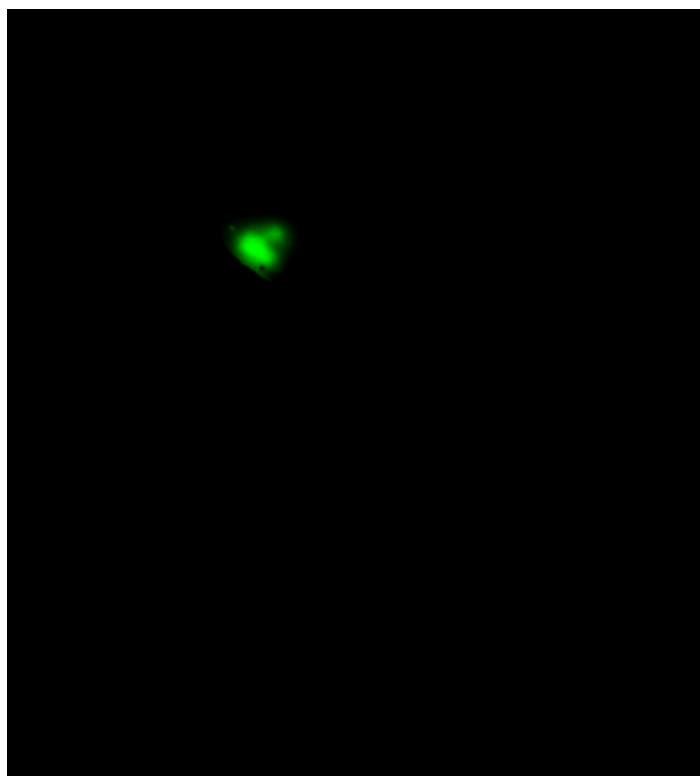
Collection of independent images that are organized as data sets for generating models and unmixing auto fluorescence and/or overlapping signals)

Spectral analysis – probes detection



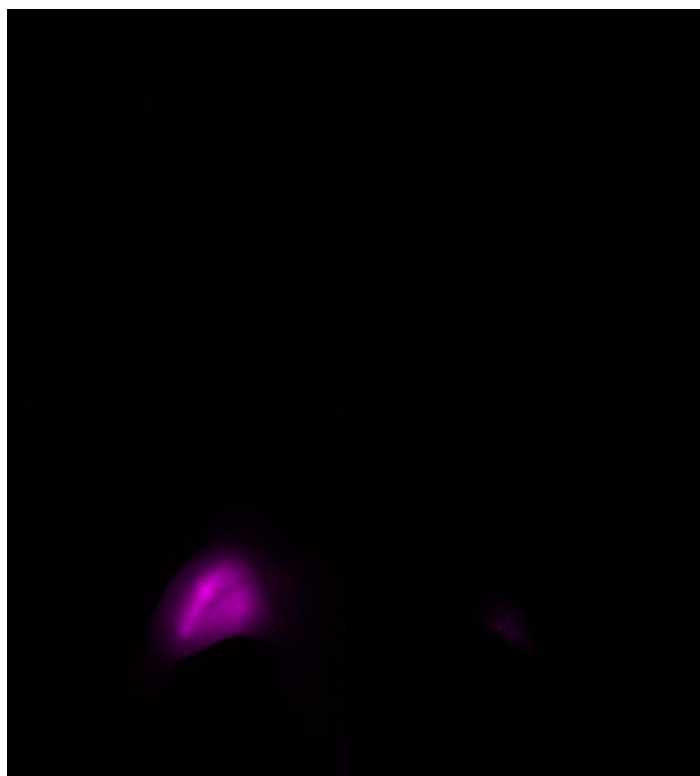
Data acquisition

Spectral analysis – probes detection



Probe identification

Spectral analysis – probes detection



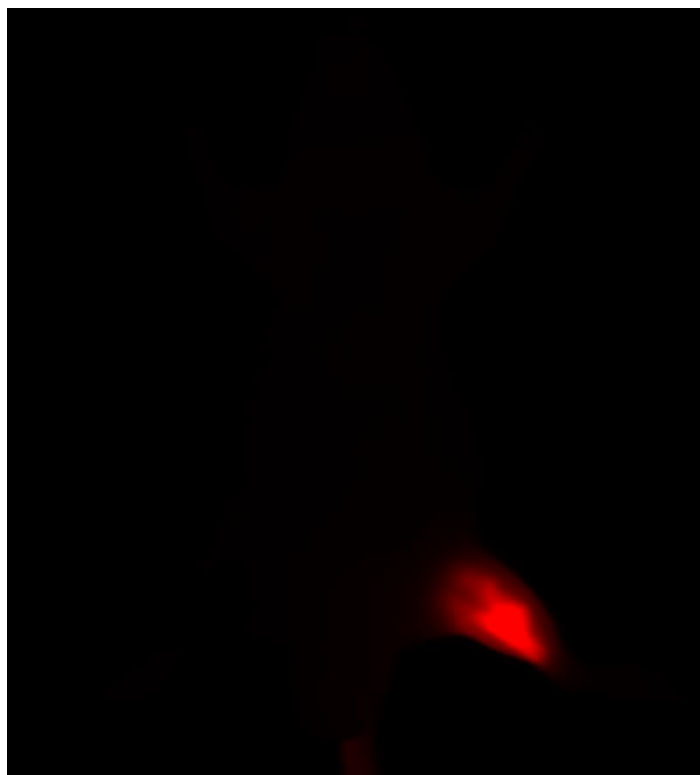
Probe identification

Spectral analysis – probes detection



Probe identification

Spectral analysis – probes detection



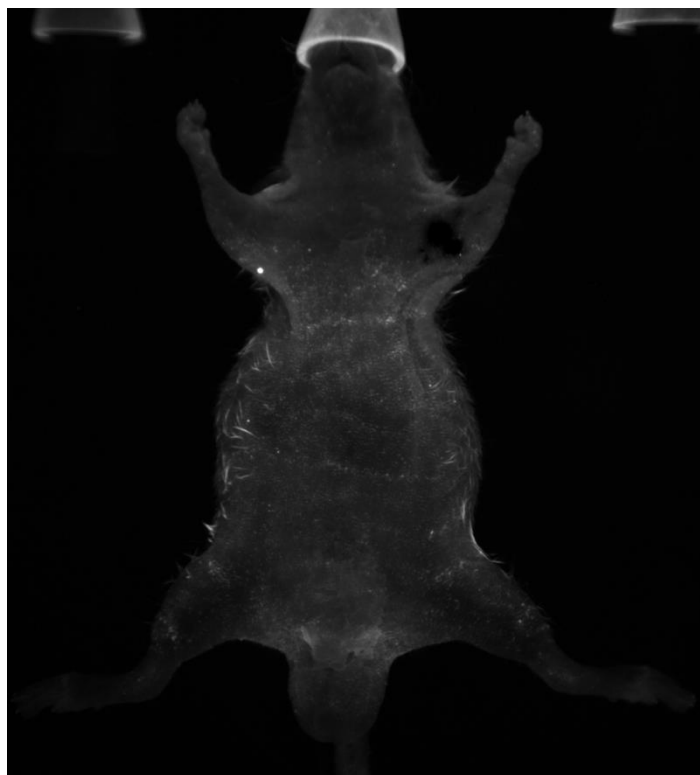
Probe identification

Spectral analysis – probes detection



Overlay

Spectral analysis – probes detection



Background image

Spectral analysis – probes detection



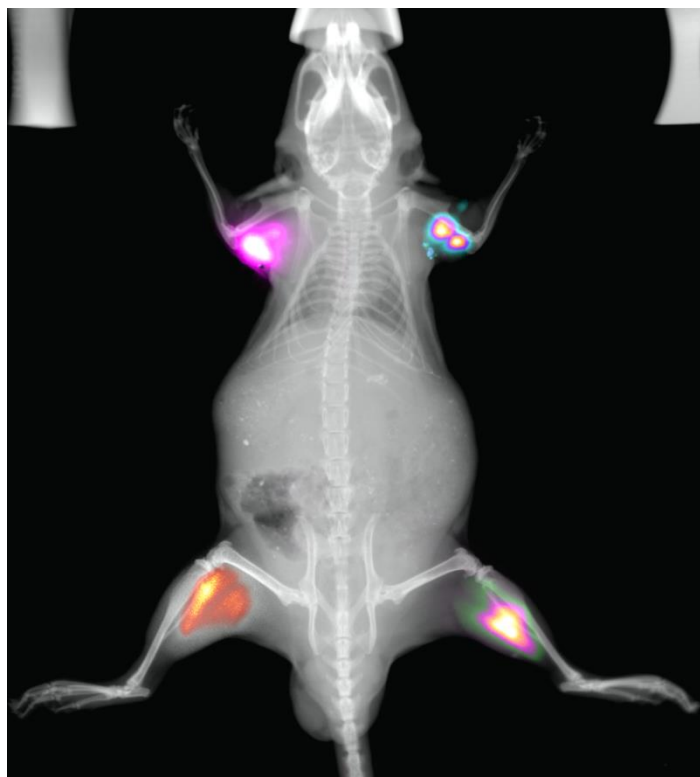
Overlay

Spectral analysis – probes detection



Co-registration

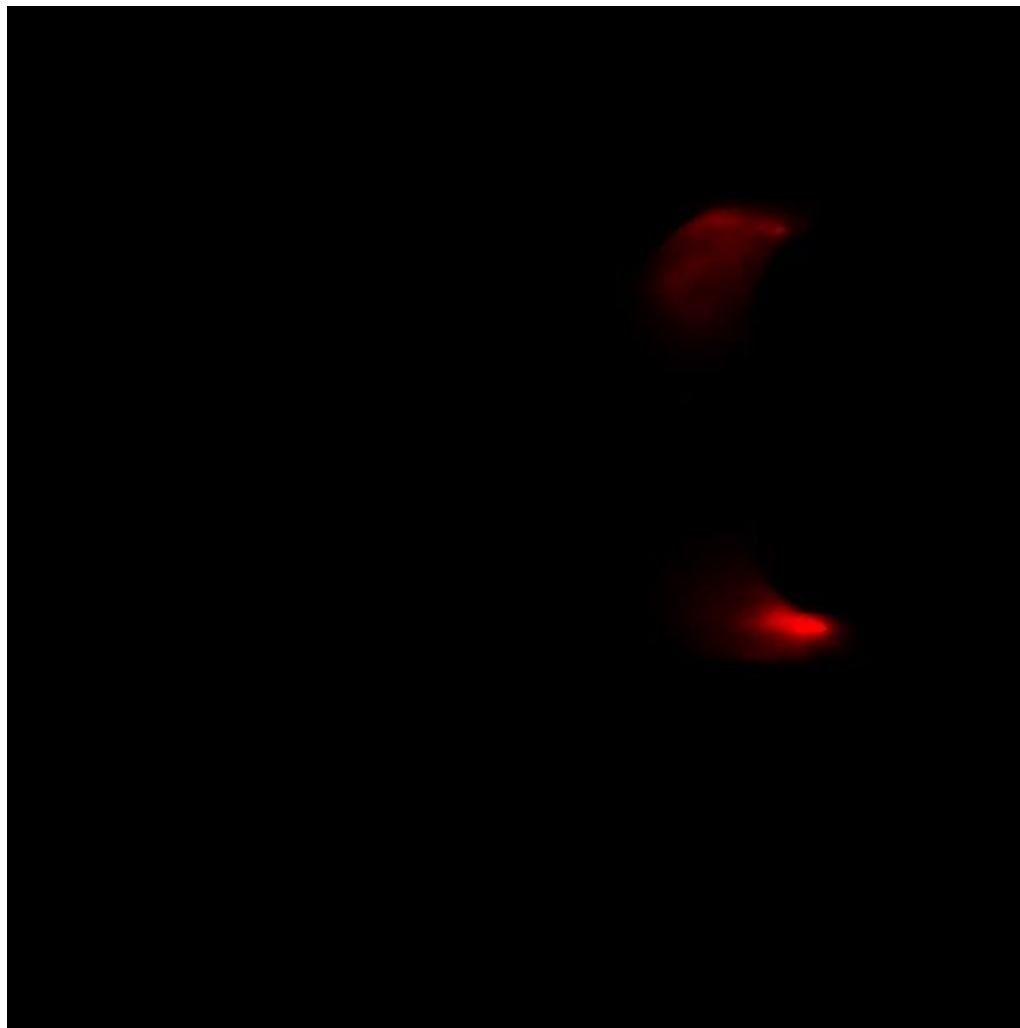
Spectral analysis – probes detection



Quantification



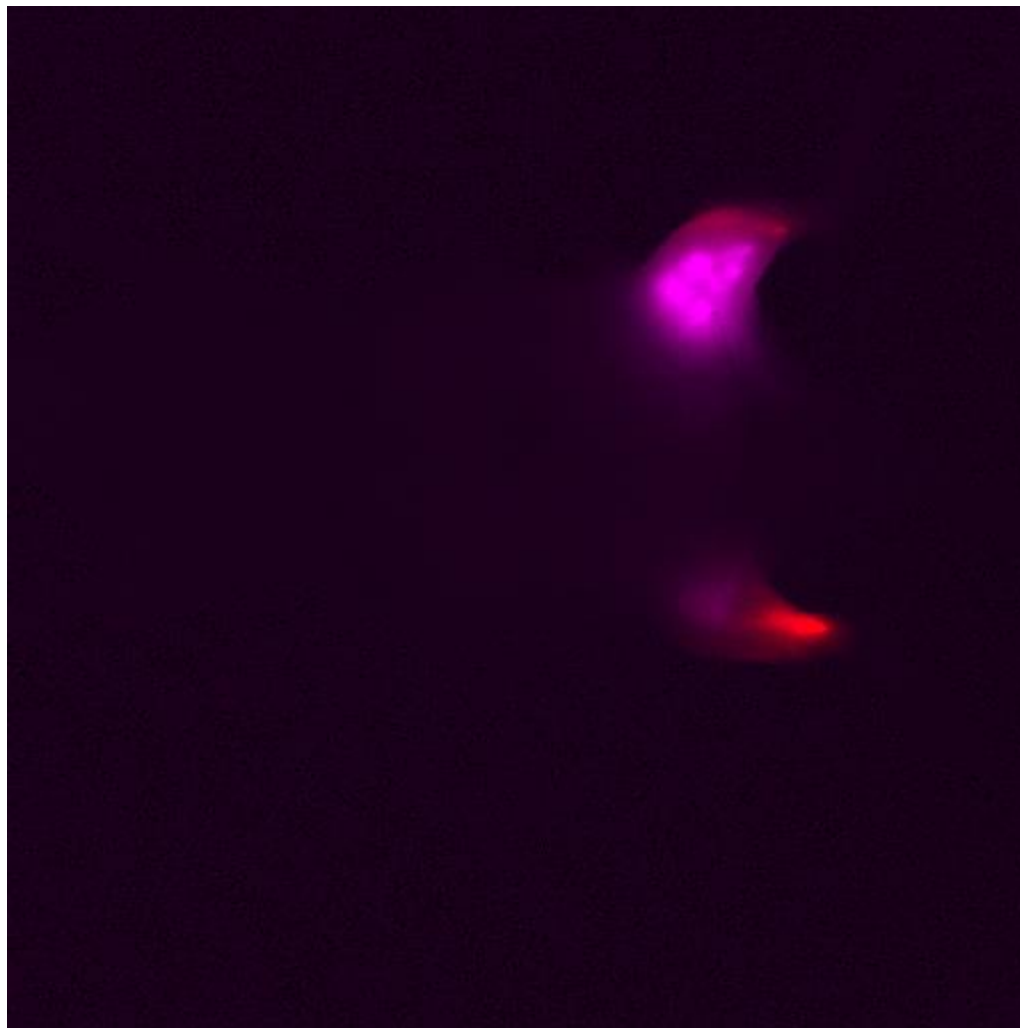
In-Vivo Multispectral Unmixing



Unmixed X-Sight 651



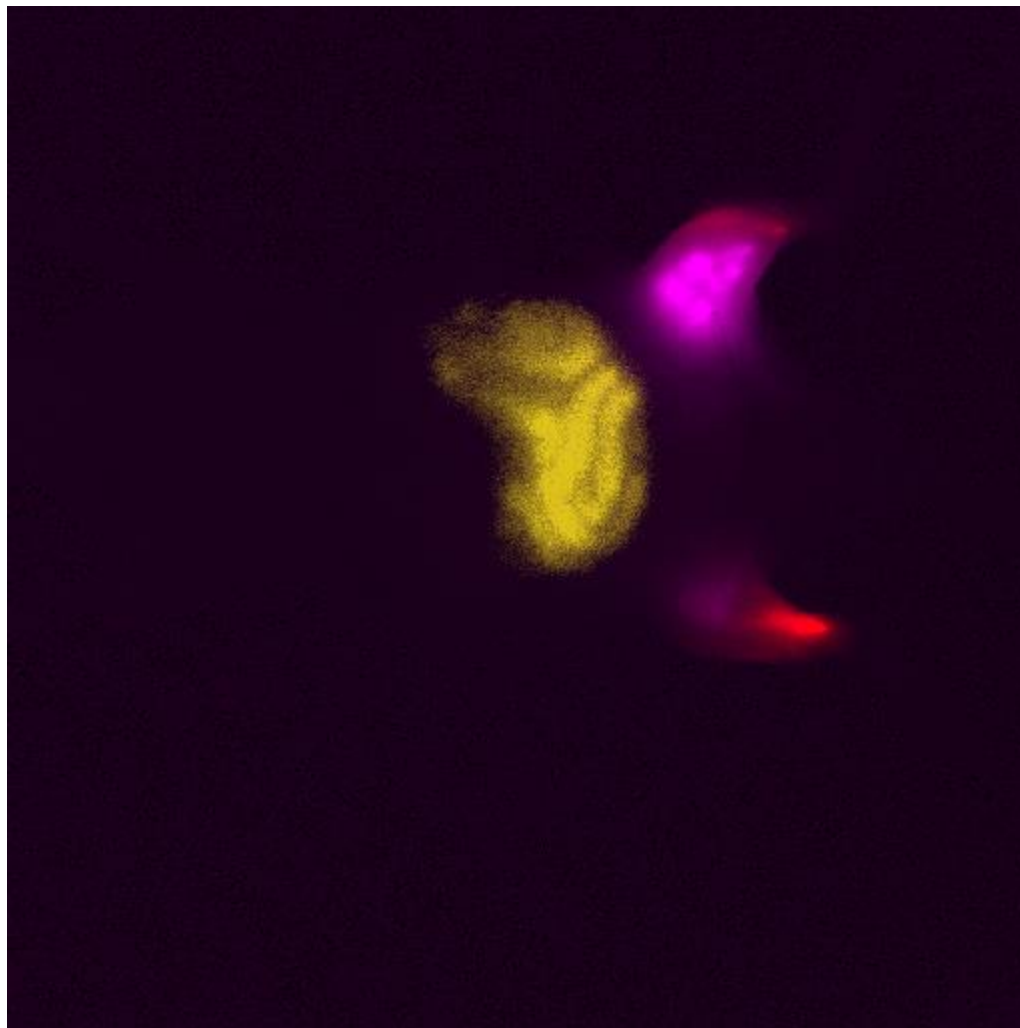
In-Vivo Multispectral Unmixing



Unmixed X-Sight 651, and 761



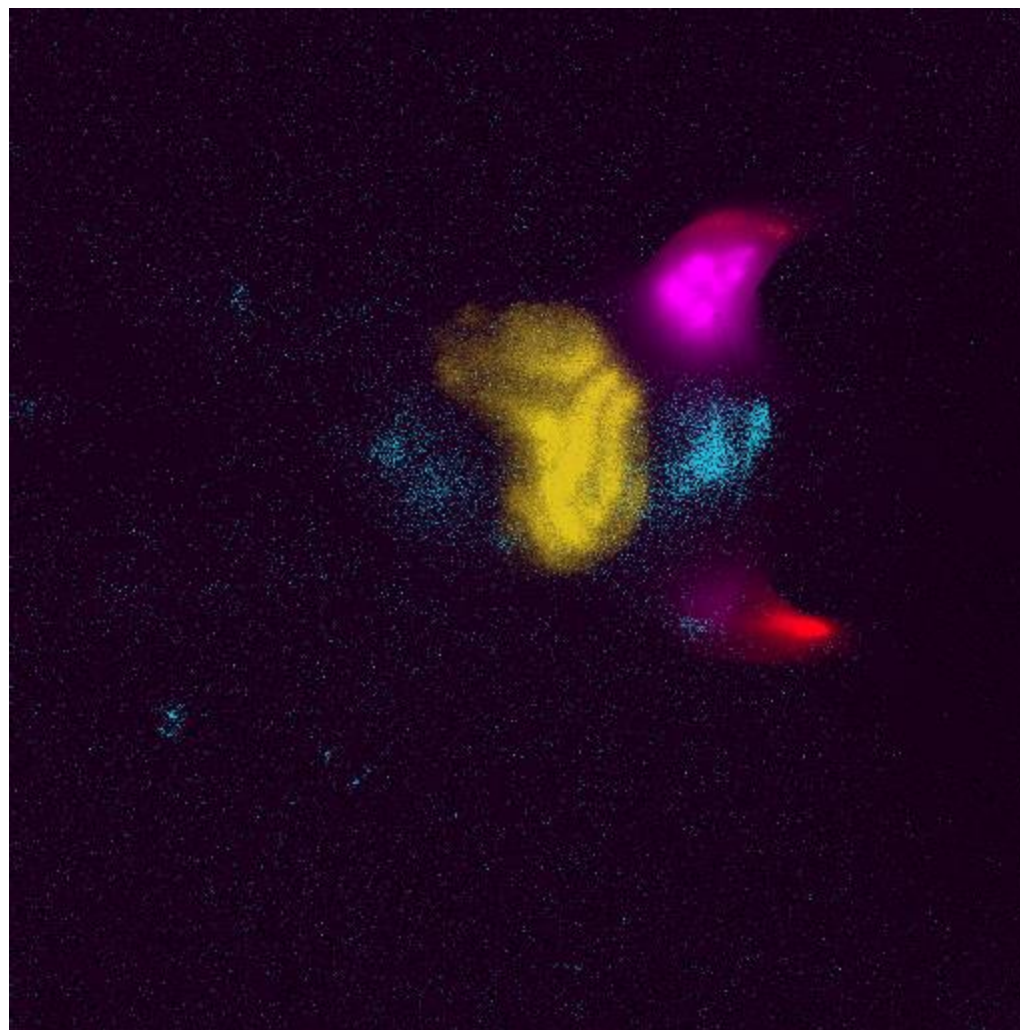
In-Vivo Multispectral Unmixing



Unmixed X-Sight 651, 761 and Food



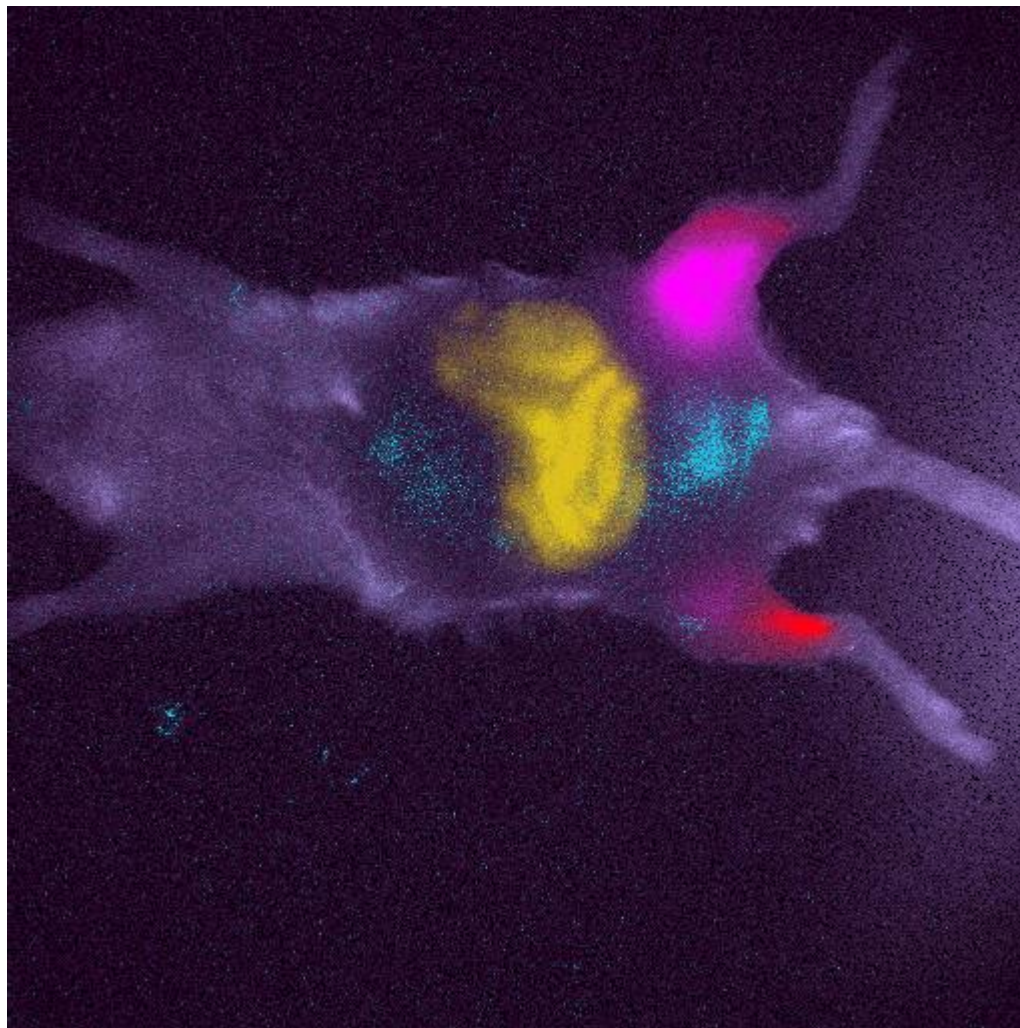
In-Vivo Multispectral Unmixing



Unmixed X-Sight 651, 761, Food and Bladder

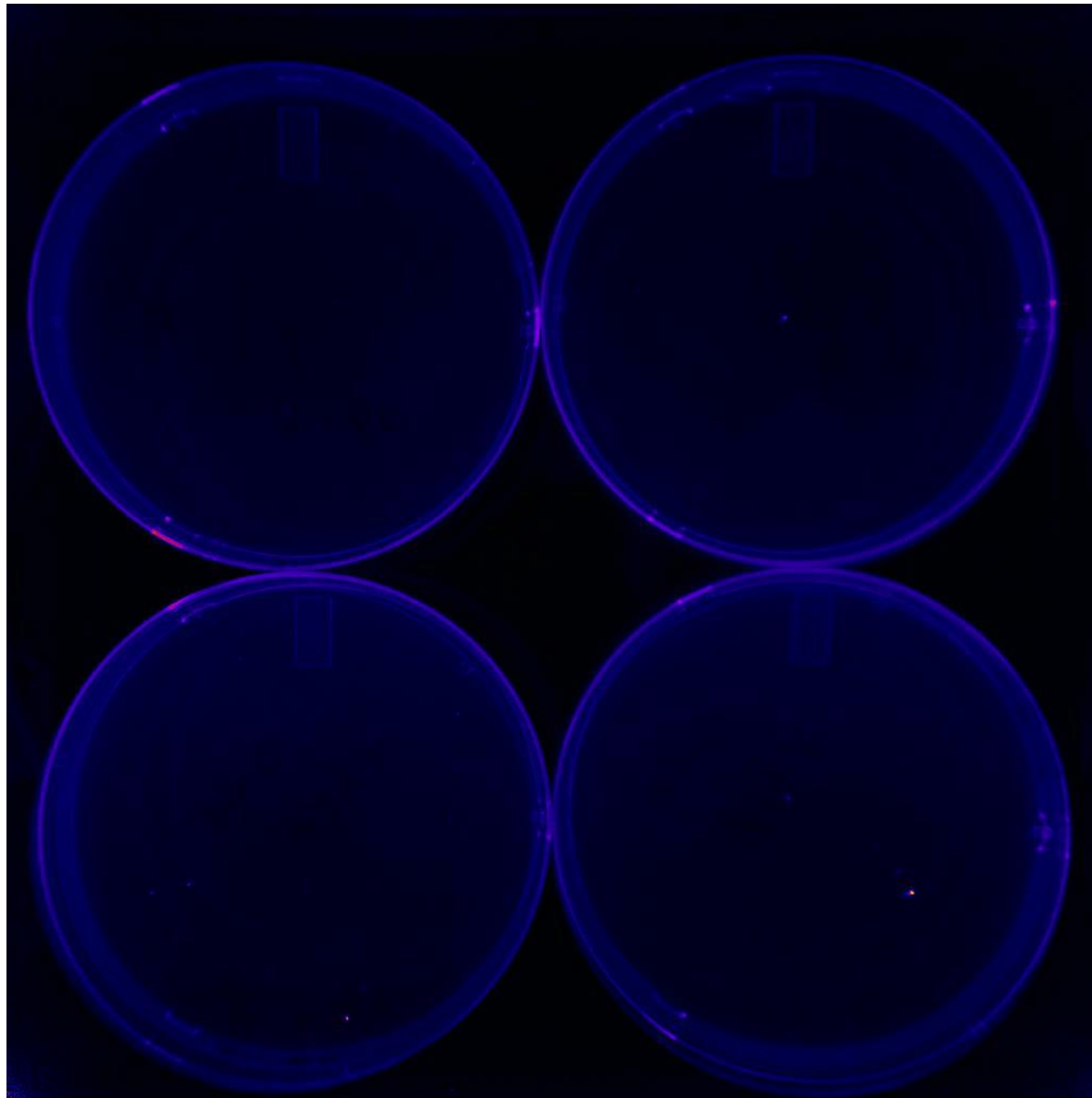


In-Vivo Multispectral Unmixing

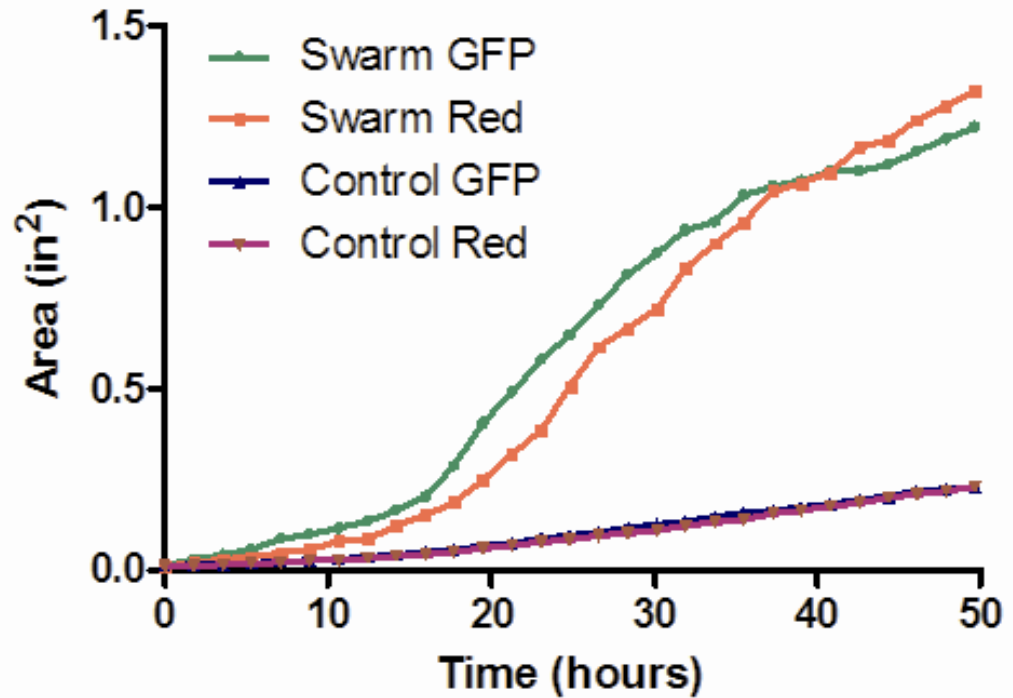
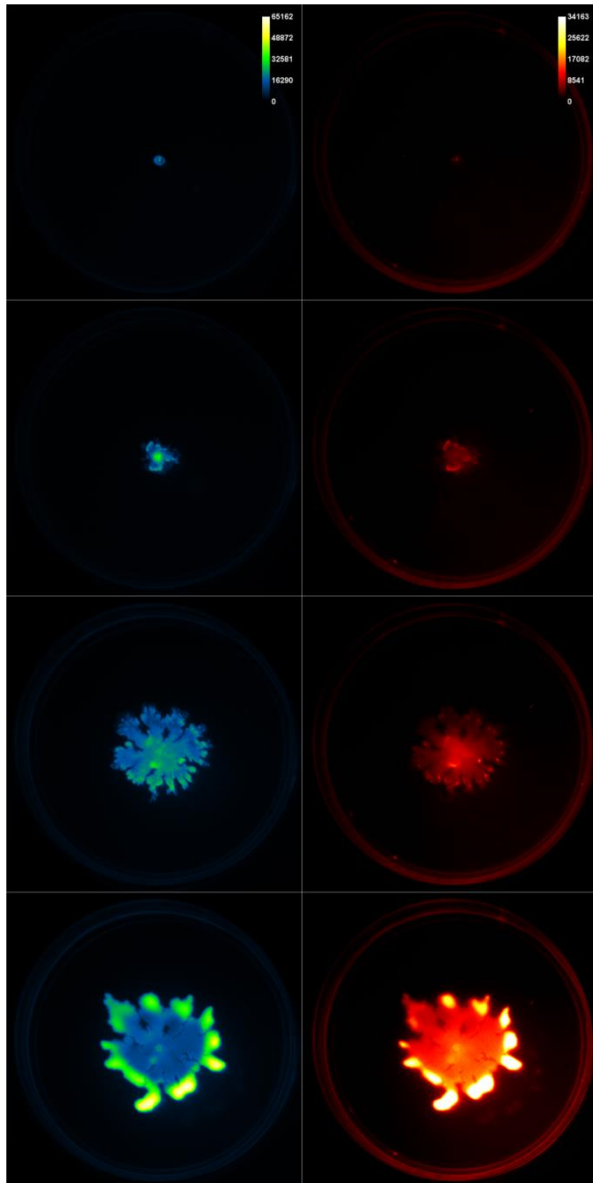


Unmixed X-Sight 651, 761, Food, Bladder, Skin and Fur

BRUKER Dynamic Imaging of Bacterial Swarm



Dynamic Imaging of Bacterial Swarm



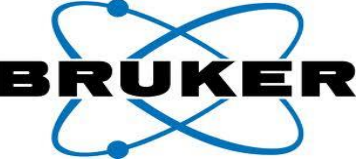


New Standard User Interface

- Single click multimodal acquisitions!
- Only the controls you need
- F-stops and binning have defaults set by modality
- Factory defined user settings and custom user settings available

The screenshot displays the 'In-Vivo Xtreme 4MP' software interface. It is divided into several sections:

- File:** Includes a 'Protocol' dropdown menu (currently 'No Saved Protocols') with an 'Execute...' button, a 'Modality' dropdown (currently 'Fluorescence'), a 'Setting' dropdown (currently 'Default Session') with 'Save' and 'Save As...' buttons, and an 'Annotation' text field.
- Camera Control:** Features 'Exposure Time' (2.000 Sec.) and 'Bin' (2x2 Pixels) dropdowns, an 'FOV (cm)' dropdown (7.2, 10, 12, 15, 18, 20), and an 'fStop' dropdown (1.1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16). It also has 'Excitation' (760) and 'Emission' (830) dropdowns, a 'Preview...' button, and a large green 'Capture...' button.
- Background Image:** A dropdown menu set to 'Standard X-Ray'.
- Status Bar:** Shows 'IP: 192.168.2.100', 'Serial No: 2501120003', and 'CCD Temp:' with a green indicator.
- Advanced...** A button at the bottom right.



Simple User Interface

Select Modality...

Settings filtered by modality

Single-Click Protocol Execution

Select Background Image

Click Capture...

Acquires functional image

Anatomical Background Image (X-ray)

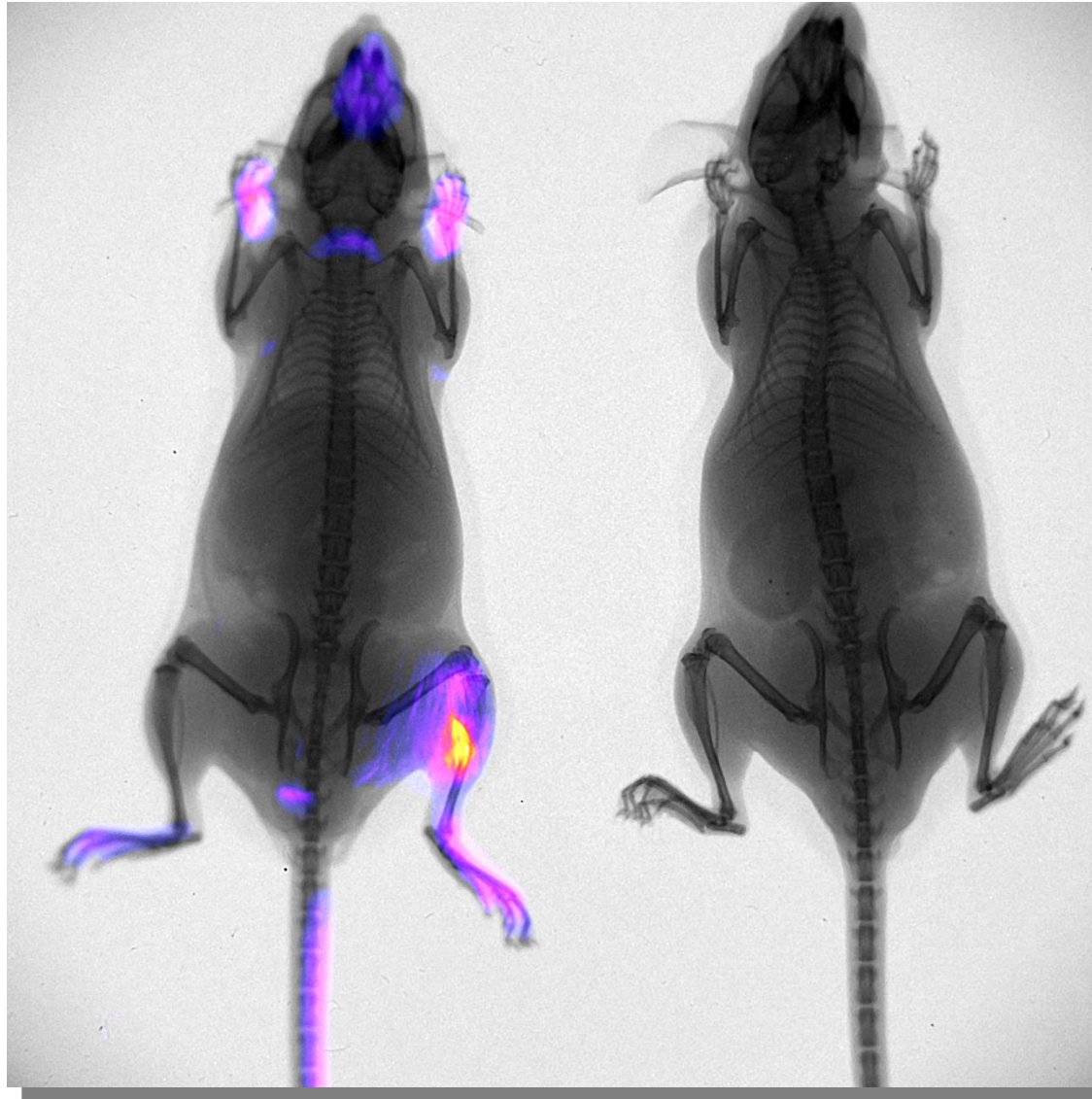
Automatic Co-registration and Overlay

The screenshot displays the 'In-Vivo Xtreme 4MP' software interface. It is divided into several sections:

- File Section:** Contains a 'Protocol' dropdown menu (currently showing 'No Saved Protocols') with an 'Execute...' button. Below it is a 'Modality' dropdown menu (showing 'Fluorescence'), a 'Setting' dropdown menu (showing 'Default Session') with 'Save' and 'Save As...' buttons, and an 'Annotation' text field.
- Background Image Section:** Features a dropdown menu for 'Background Image' (currently set to 'Standard X-Ray').
- Camera Control Section:** Includes 'Exposure Time' (2.000 Sec.) and 'Bin' (2x2 Pixels) controls. Below these are buttons for 'FOV (cm)' (7.2, 10, 12, 15, 18, 20) and 'fStop' (1.1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16). It also has 'Excitation' (760) and 'Emission' (830) dropdown menus, a 'Preview...' button, and a large green 'Capture...' button.
- Footer Section:** Displays system information: 'IP: 192.168.2.100', 'Serial No: 2501120003', and 'CCD Temp:' with a green indicator light. An 'Advanced...' button is located on the right.

Arrows from the text labels point to the corresponding UI elements: 'Select Modality...' points to the Modality dropdown; 'Settings filtered by modality' points to the Setting dropdown; 'Single-Click Protocol Execution' points to the Execute... button; 'Select Background Image' points to the Background Image dropdown; 'Click Capture...' points to the Capture... button.

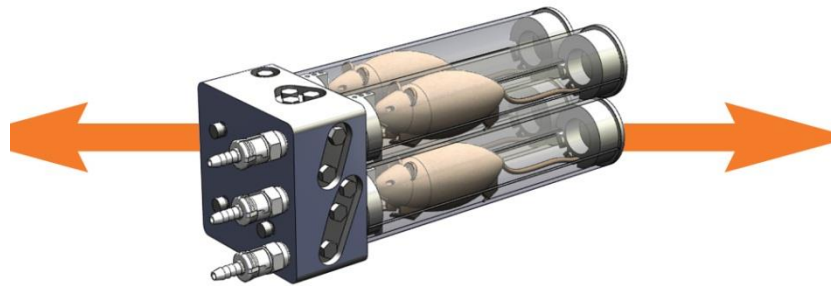
Automatic Co-registration



Fused images your way with *Multimodal Animal Transport System*



In-Vivo Xtreme



**Multimodal
Animal Transport System**

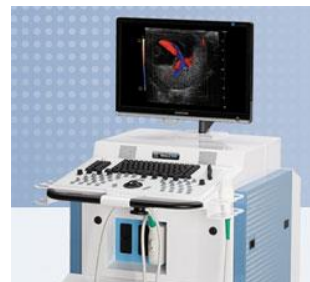


Albira

*Transport animals between
Optical, PET, SPECT, CT and MRI imaging systems*

9 Powerful Imaging Modalities

1. Fluorescence
2. Luminescence
3. Radioisotopic
4. Radiographic (X-Ray)
5. Single Photon Emission Computed Tomography (SPECT)
6. Positron Emission Tomography (PET)
7. Computed Tomography (CT)
8. MRI
9. Ultrasound



Thank you for your attention...

