

What is Albira and How Does the System Work and Why is it Differentiated Technology?

Why Albira?

Tri-modality: PET, SPECT, CT

- Modular and state-of-the-art electronics
- 6 configurations

Novel, Proprietary & Patented Detector Technology

- Revolutionary Detectors
 - Continuous crystals
 - PSMPT
 - PET/SPECT electronics
- Depth of Interaction
- Yields exceptional image quality

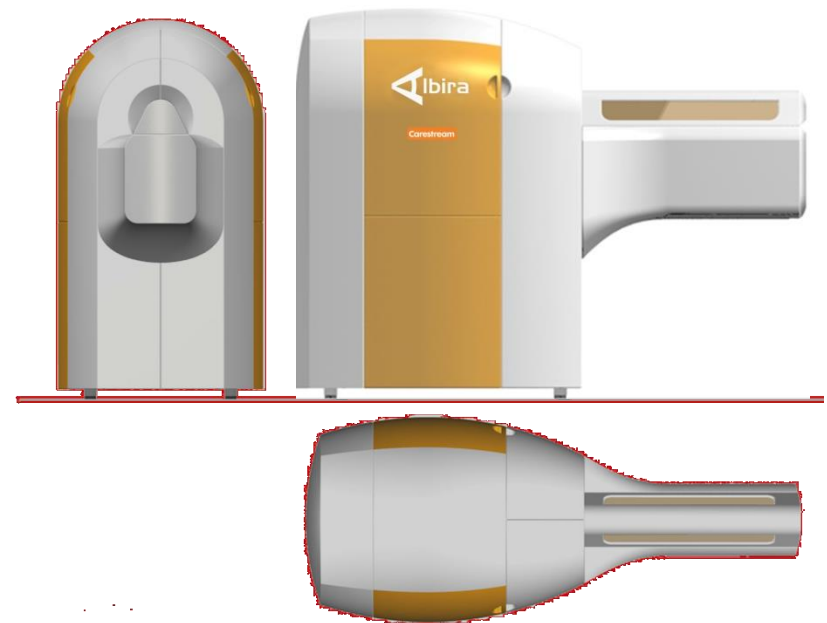
Ease of Use

- Software designed for pre-clinical research
- Preloaded acquisition and reconstruction protocols
- Automated image fusion PET/CT, SPECT/CT

Compact Size

- Space is a premium in every lab, smallest footprint

Turnkey Solution



Multimodal Modular Upgradeable Design

Choose from six configurations

- Standalone PET
- Standalone SPECT
- Standalone CT
- Bi-modal PET/CT
- Bi-modal SPECT/CT
- Tri-modal PET/SPECT/CT

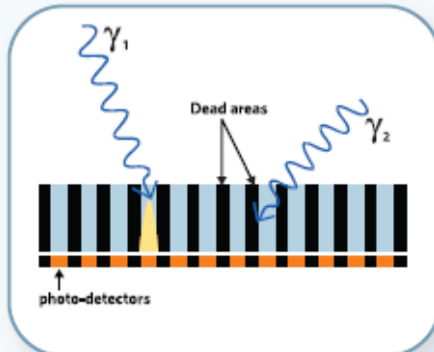


Fully upgradeable with the same footprint

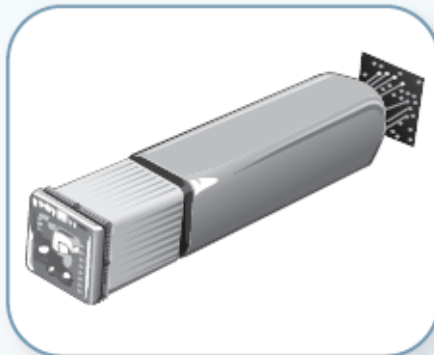
- Standalone to bi-modal or tri-modal
- Bi-modal to trimodal

The Revolution in PET Detector Technology

Conventional Technology

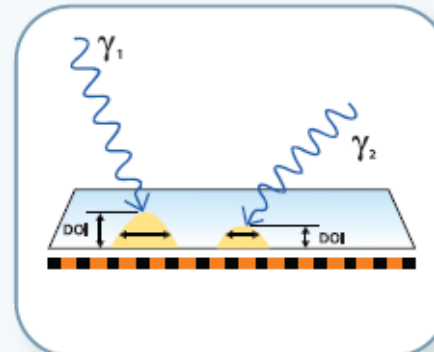


Pixelated crystal technology with dead zones.

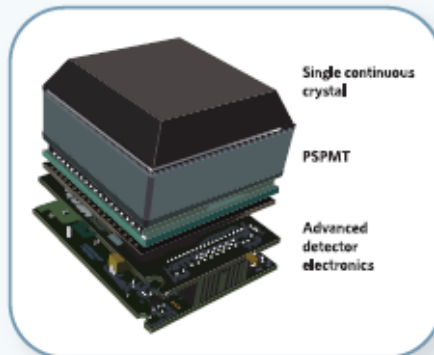


Standard PET detector technology

Albira Technology



Simultaneous detection of position and DOI measurement. No dead zones.

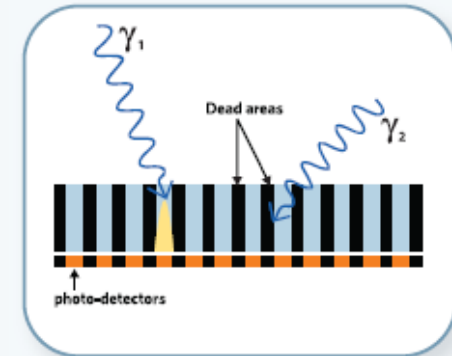


Albira's exclusive patented PET detector

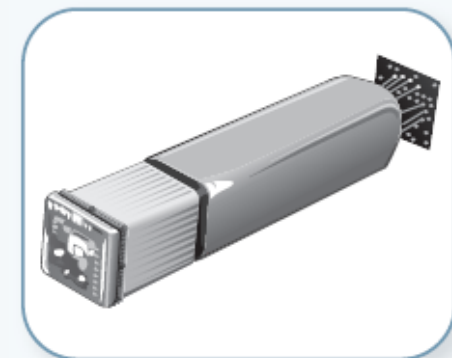
Conventional PET Detectors

- Current technology utilized packed crystals with dead zones
- Tighter packing yields more dead zone
- Susceptible to parallax error

Conventional Technology



Pixelated crystal technology
with dead zones.

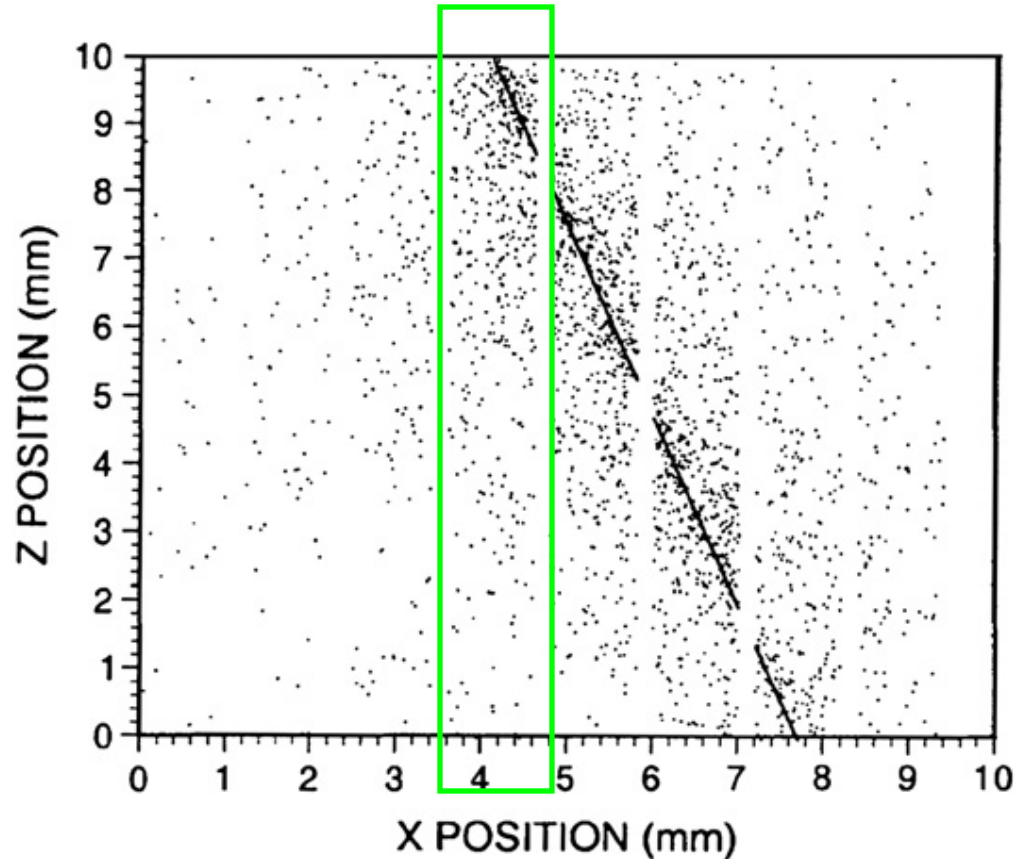


Standard PET detector technology

What is the Parallax Error?

“Another serious problem that arises in high resolution systems designed for small animal imaging is the parallax error due to penetration of the 511 keV in the detectors.”

- Monte Carlo simulation of 511 keV photon interacting at 20 angle
- 84% of interaction in the wrong crystal
- Garbage in garbage out

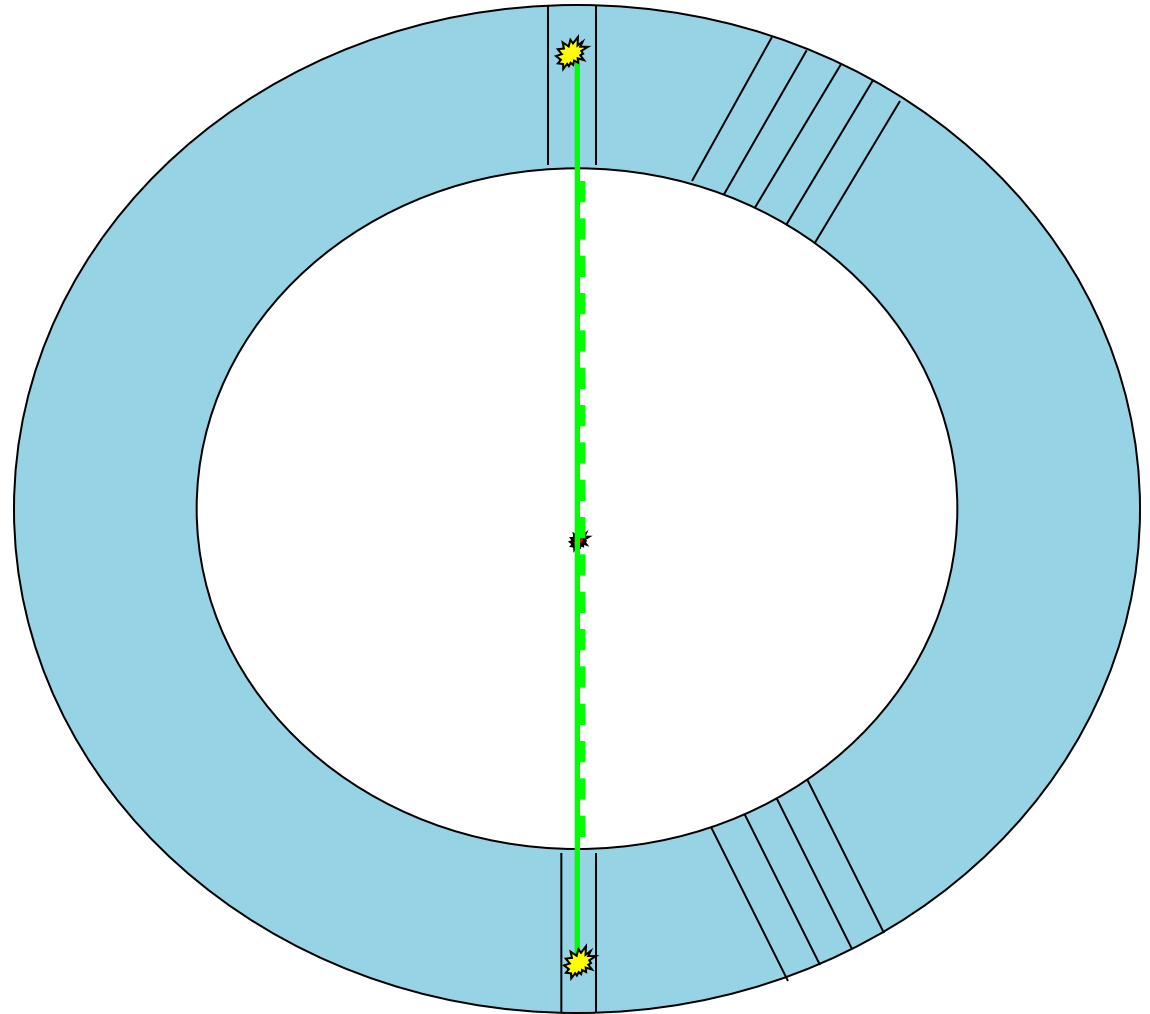


Levin CS. Design of a high-resolution and high-sensitivity scintillation crystal array for PET with nearly complete light collection. *IEEE Trans Nucl Sci* (2002);49:2241

Lecomte R. Technology challenges in small animal PET imaging. *Nuclear Instruments and Methods in Physics Research A*. 527 (2004) 157-65.

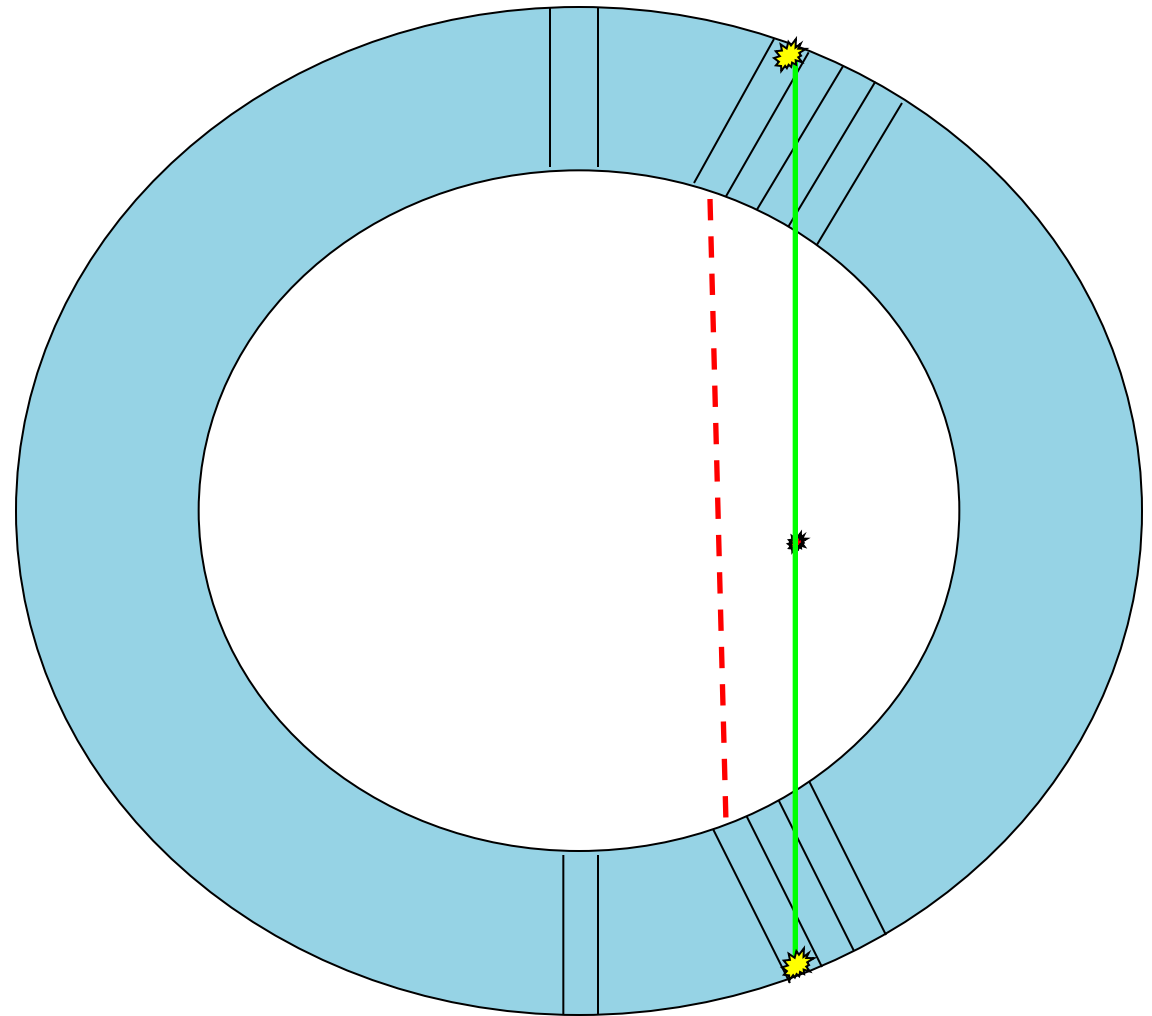
How Does the Parallax Error Affect Image Quality?

- LoR (Line of Response) create PET image
- Event creates two ~ 180 , 511 keV photons CFOV
- Correct LoR drawn by detectors (**green line**)
- Image reconstruction proceeds



How Does the Parallax Error Affect Image Quality?

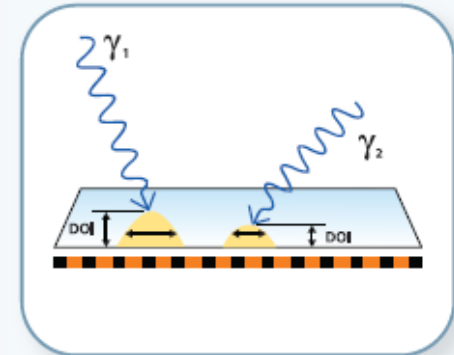
- LoR (Line of Response) create PET image
- Event creates two ~ 180 , 511 keV photons
- Incorrect LoR drawn by detectors (**red line**)
- Image reconstruction proceeds
- Image is blurred



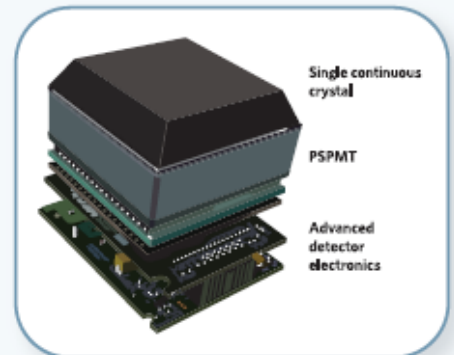
Why is Albira PET Detector Technology Different

- Albira introduces new, exclusive, and proprietary single crystals and their associated electronics
- Single LYSO crystals combined with PSPMTs and dedicated PET electronics to detect position of 511 keV photons and measure DOI
- Accurate and sensitive detection without dead zones or crystal packing variability

Albira Technology



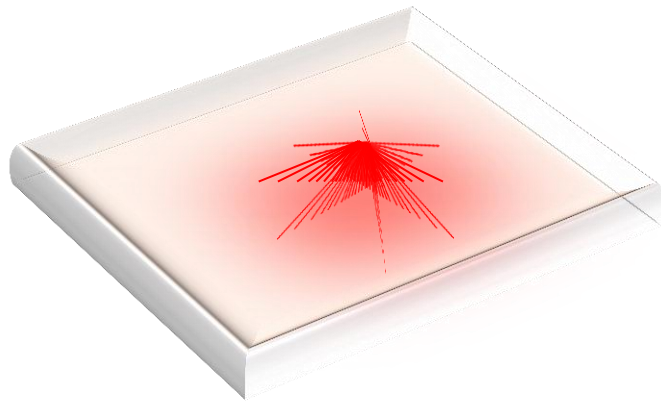
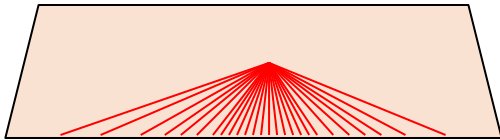
Simultaneous detection of position and DOI measurement. No dead zones.



Albira's exclusive patented PET detector

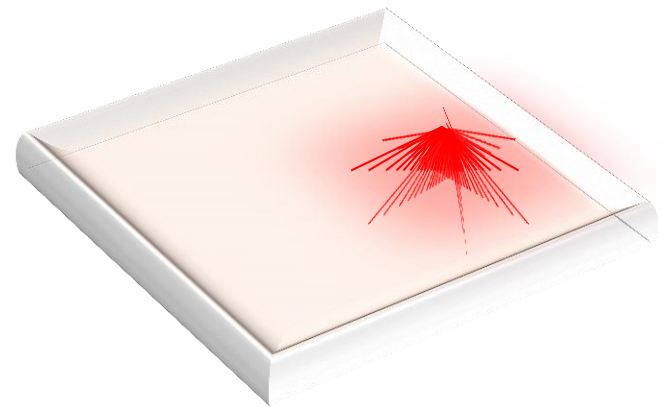
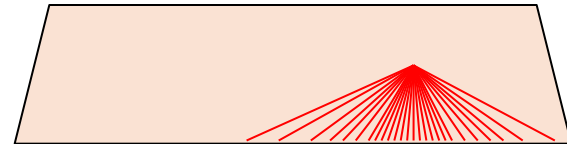
Gamma-ray Position Calculation (X,Y)

Centered gamma-ray



If interaction is produced in the center of the crystal, the energy detected is placed around the center of the PMT.

Non-centered gamma-ray

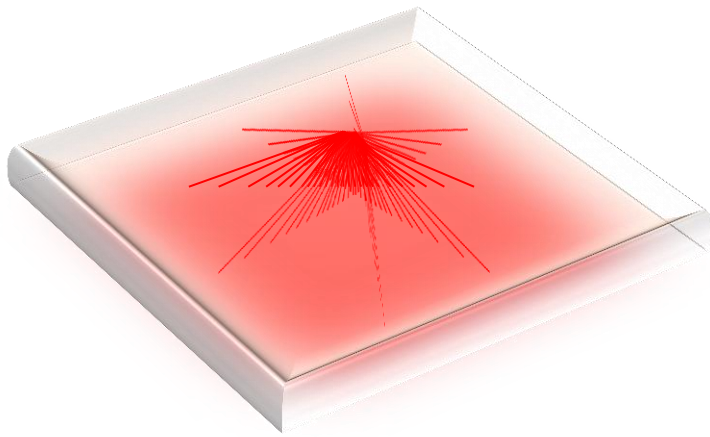
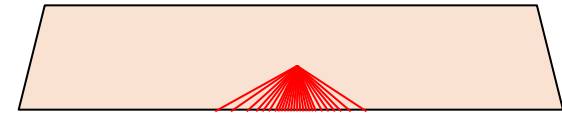
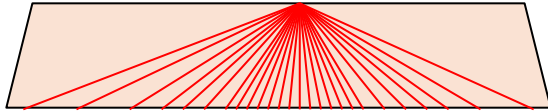


If interaction is produced closer to a crystal side, the channels corresponding to the corners closer to the interaction position will have higher energy levels.

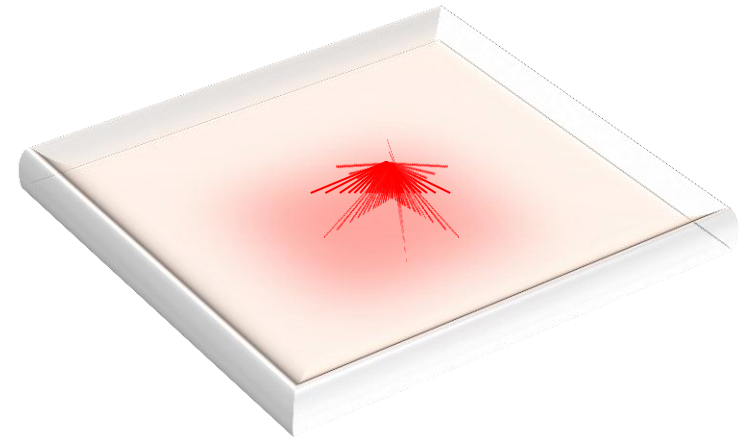
XY plane position of the interaction between the gamma-ray and the crystal is calculated estimating the centroid of the detected energy distribution.

Gamma-ray Depth Calculation (Z)

Let's compare two gamma-rays impinging in the same (X,Y) position but at a different depth.



The light spreads covering all the detector

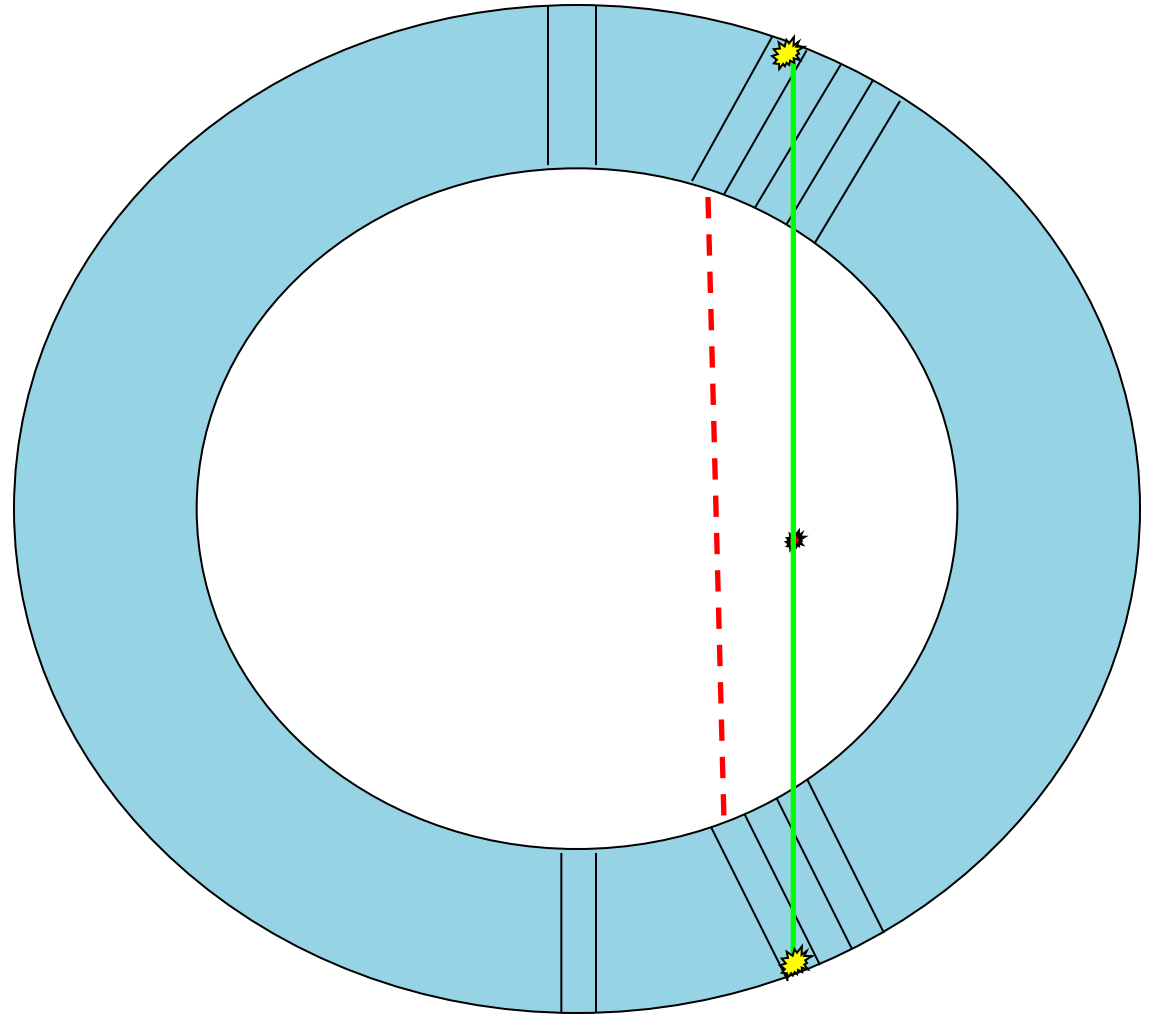


The light spreads over a fraction area of the detector

Thus, by observing at the light distribution of the impinging gamma-ray, we can calculate its Depth of Interaction (DOI).

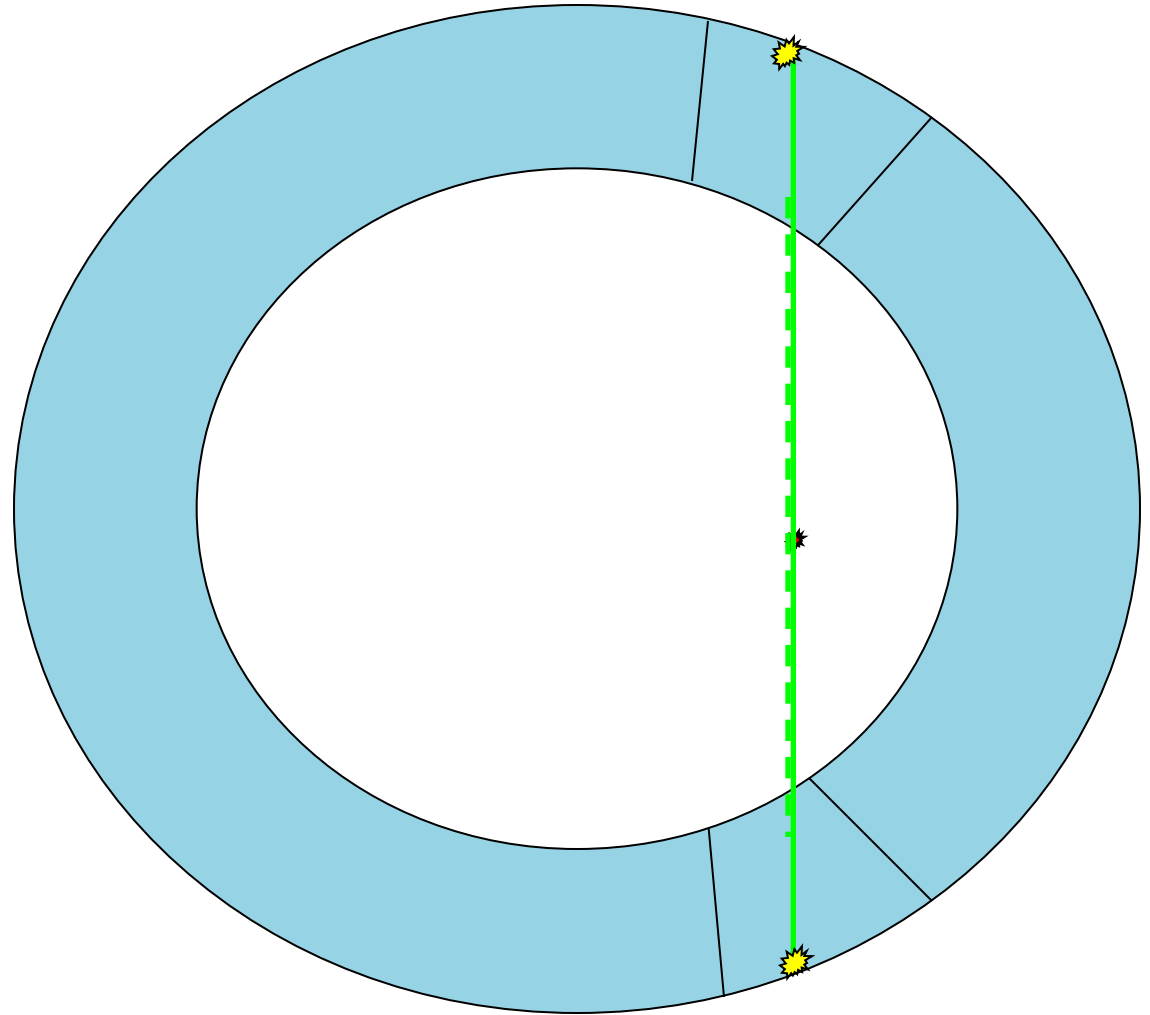
The Old Way

- LoR (Line of Response) create PET image
- Event creates two $\sim 180^\circ$, 511 keV photons
- Incorrect LoR drawn by detectors (**red line**)
- Image reconstruction proceeds

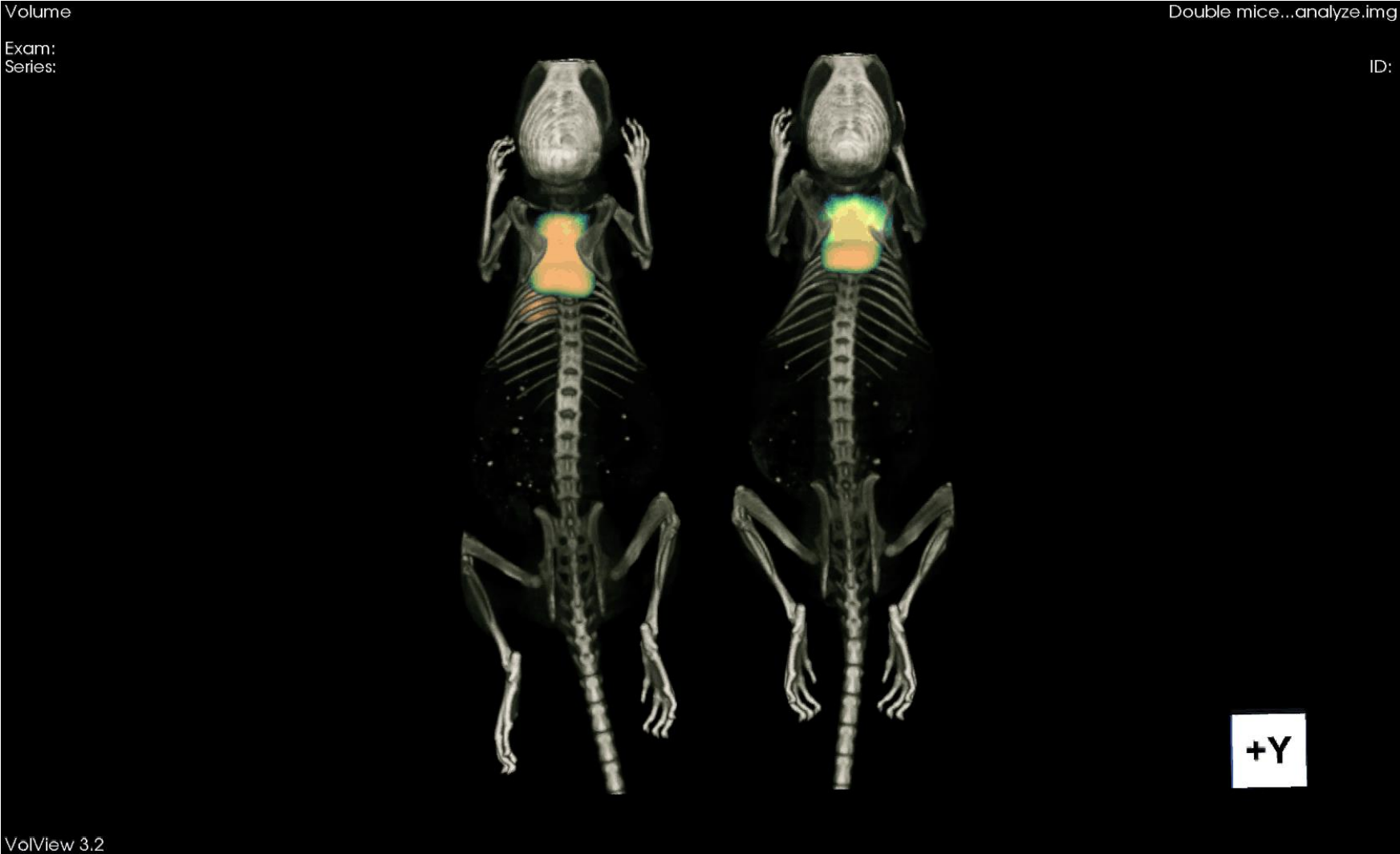


The Albira Way

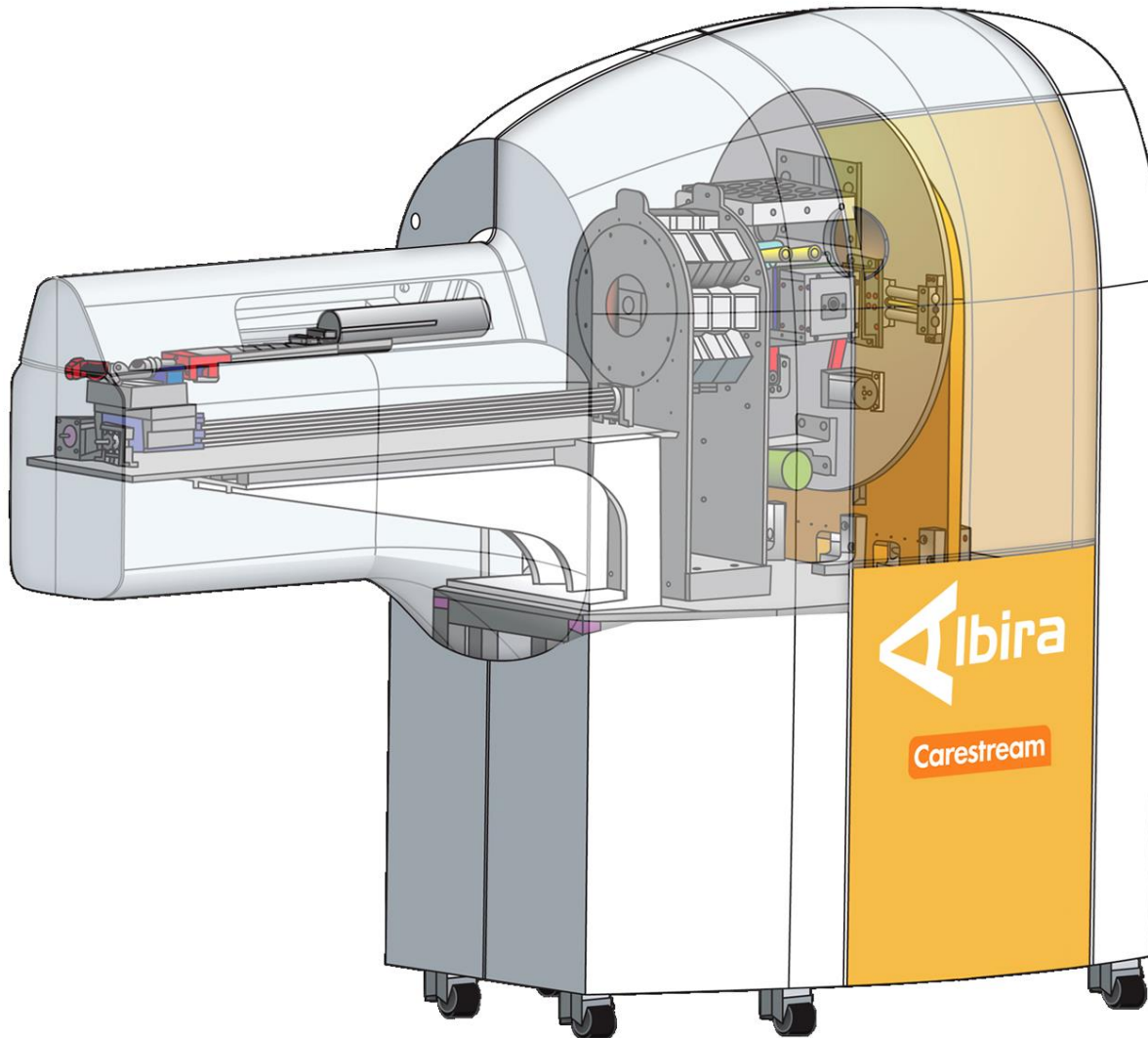
- LoR (Line of Response) create PET image
- Event creates two ~180, 511 keV photons
- Depth of interaction and position calculated
- Correct line of response drawn (green line)
- Image reconstruction proceeds



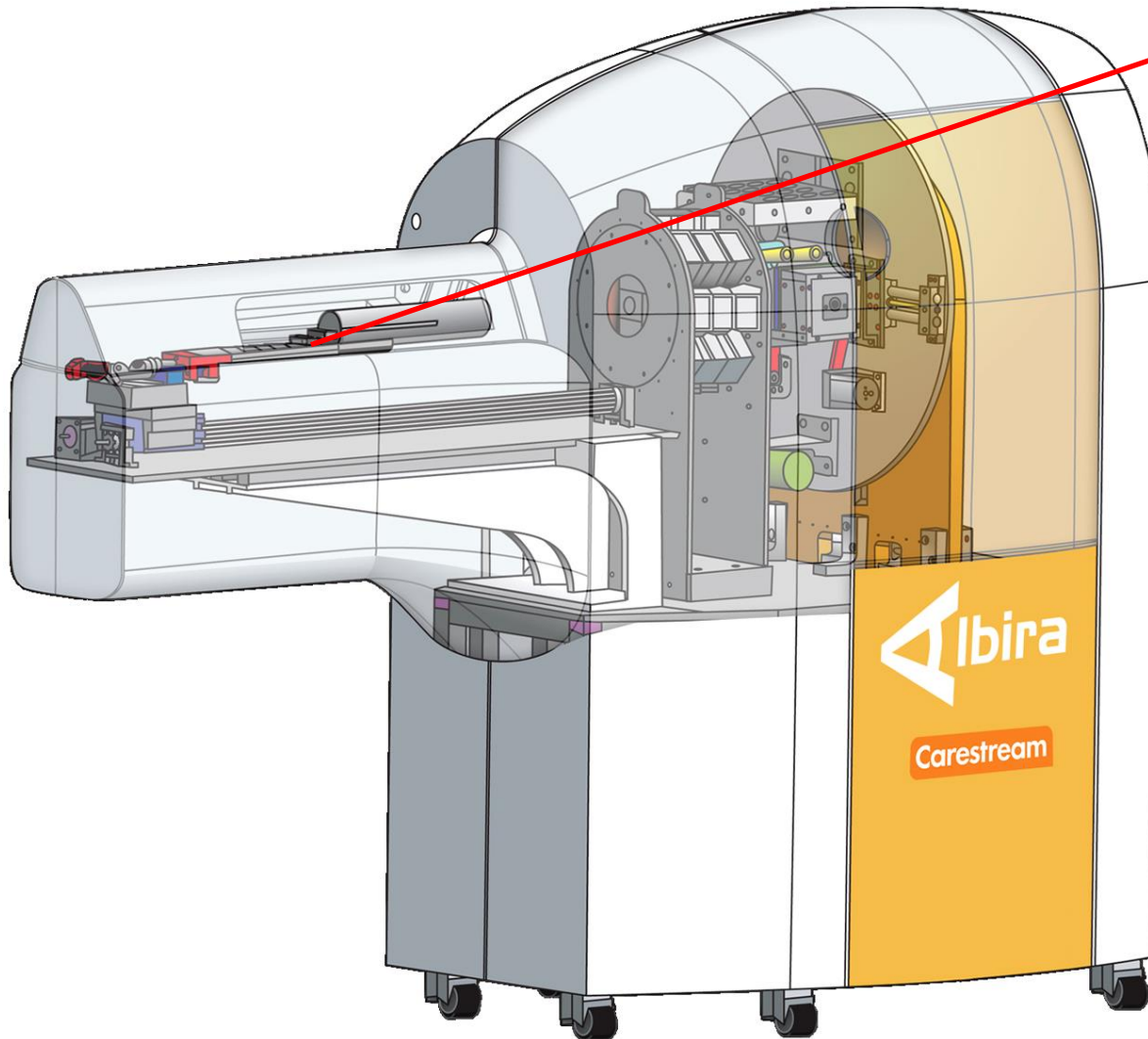
Imaging Two Mice Simultaneously



Albira – An Inside Look at the System



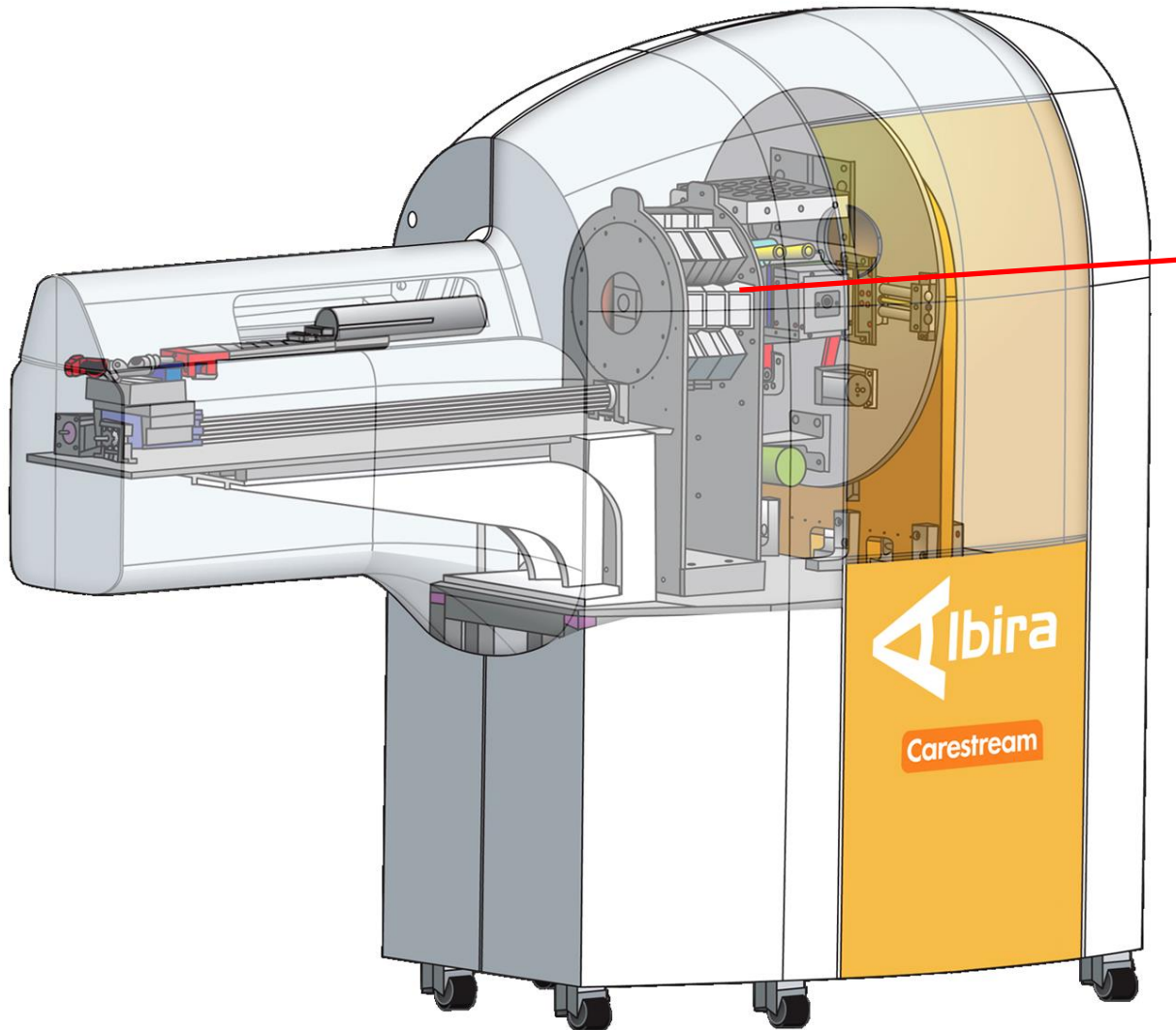
Albira – The Animal Management System



Animal Management System

- MRI compatible removable beds
- Temperature regulated environment for mice & rats
- Robust and precise motion control
- Gas ports for use with anesthesia
- Live color webcam for monitoring of animals

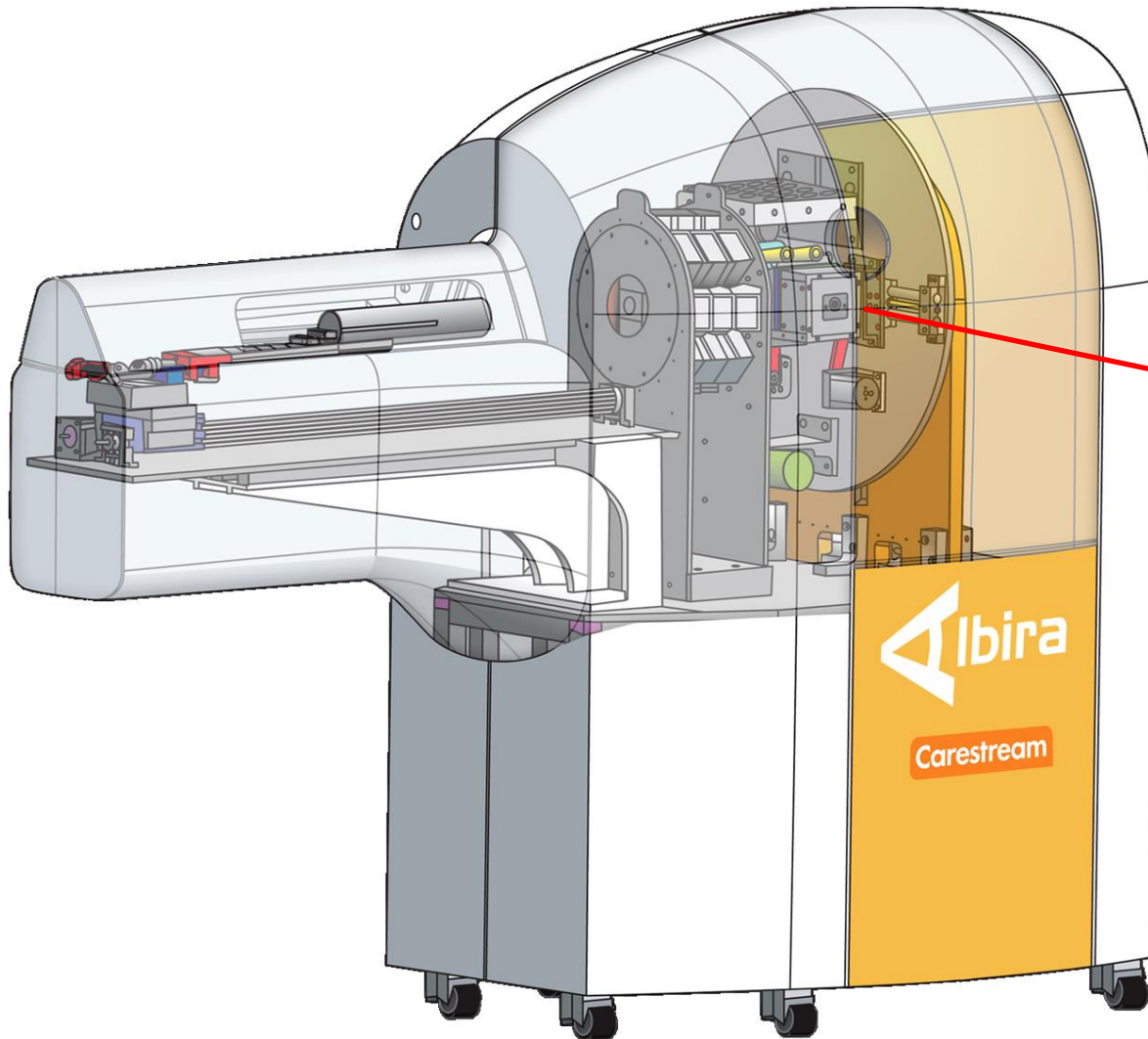
Albira – The PET Zone



PET system

- Exclusive, proprietary PET detectors
 - Single LYSO crystal
 - 64 anode PSPMT
 - Dedicated PET electronics
- High resolution < 1.1 mm using novel DOI measurement
- 8 detectors per ring, 1,2, or 3 rings configurations available
- Large FOV up to 148 mm x 80 mm

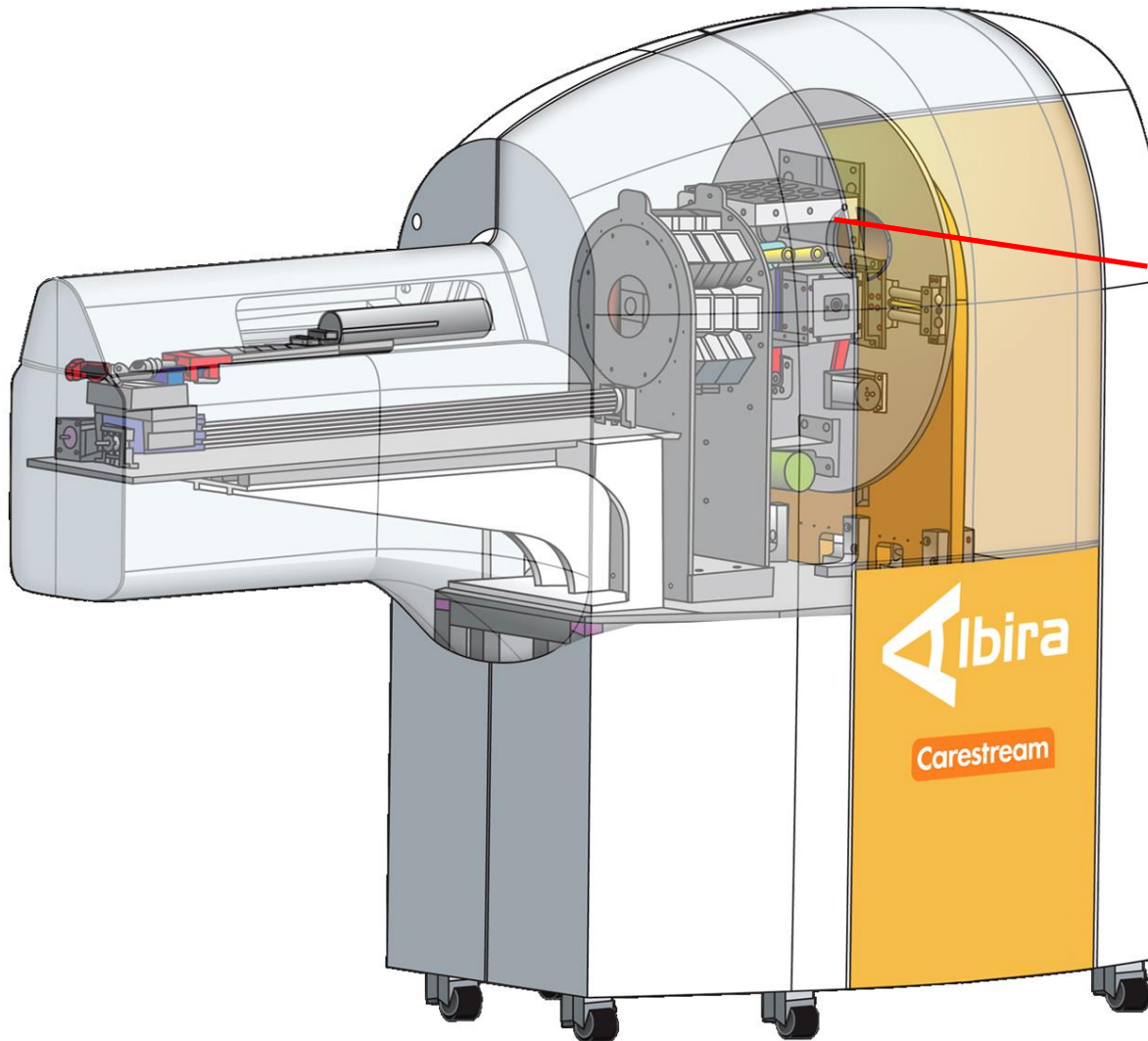
Albira – The SPECT Zone



SPECT system

- 2 gamma cameras in each system
 - CsI(Na) single crystals
 - 64 anode PSPMT
 - Dedicated SPECT electronics
- Choice of two configurations: S102 or S108
 - Increase sensitivity
 - Larger FOV
 - Broader energy range
- Single and multi-pinhole collimators included
- Fully automated FOV selection

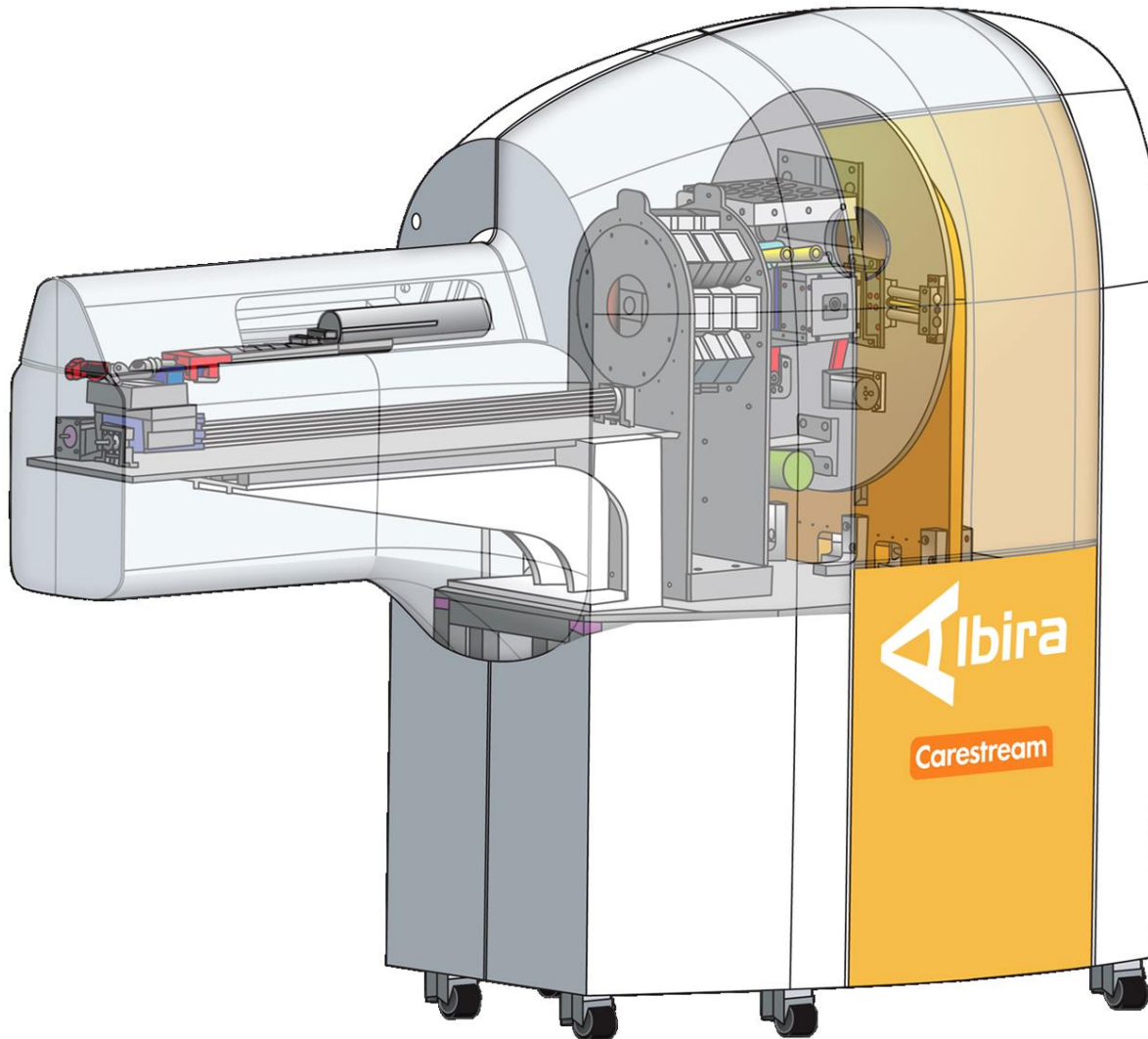
Albira – The CT Zone



CT system

- 35 μm or smaller voxel sizes
- 90 μm resolution
- X-ray source 10-50 kVp with 35 μm X-ray spot size
- Two-dimensional 12 cm x 12 cm, 2400 x 2400 pixel detector
- Rapid acquisition and reconstruction
- Safe fully shielded cabinet X-ray system with interlocks

Albira – Compact and Upgradable



Small Footprint

- Compact Size (2.2 m x 0.9 m x 1.6 m) fits in your lab
- Easy to install, fits through 92 cm doors
- Smallest footprint of any tri-modal system
- Fully upgradeable from your initial configuration AND done in your lab
 - Any standalone configuration to bi-modal or tri-modal
 - Any bi-modal configuration to tri-modal
 - Any 1 Ring PET to 2 or 3 ring PET
 - Any S102 gamma camera to S108 gamma camera

Albira Electronics Core/Additional Computers

- On board acquisition computer
 - Dual core 2.2 GHz processor
 - 2 GB of ram
 - Acquire while reconstructing
- CompactPCI form factor for improved serviceability
 - System I/O
 - Motors Interface (RS-485)
 - CT Frame Grabber
 - PET Electronics
- Reconstruction workstation
 - Dual HD color monitors
 - Dual quad core processor, 2.4 GHz
 - Windows 7, 64-bit
- Dedicated storage computer
 - Poweredge T610
 - 3 TB of hard drive space
 - Upgradeable storage capacity



Thank you!