



The InSyTe™ Series

The first benchtop small animal
multi-modality imaging system
with in-line X-ray CT



The All-Digital **InSyTe** Series
Small Animal Tomography Systems

Single-modality configurations: PET, SPECT, FLECT or CT
Dual-modality configurations: PET/CT, SPECT/CT or FLECT/CT
Field-upgradeable

SYSTEM CONCEPT and DESCRIPTION

The InSyTe (Integrated System Technologies) systems offer researchers new flexibility in choosing an imaging modality, or combination of imaging modalities, in a compact and cost-effective design. All systems incorporate TriFoil's state-of-the-art digital detection technologies for PET, SPECT, Optical (FLECT) and CT in-vivo imaging of mice and small rats, plus exclusive features such as MMP-SPECT and CBM-PET.

No matter what configuration – PET, SPECT or FLECT, with or without CT – the InSyTe Series excels by offering the best image-contrast at the lowest price. You can purchase a system with a single modality at the start and upgrade later to incorporate X-ray CT, or you can start with a X-ray CT-only version. All InSyTe systems have a simple, consistent user-friendly interface for image reconstruction and co-registration across all modalities, and a powerful image post-processing workstation.

In creating these smaller benchtop systems, we aim to give labs the ability to expand technology without having to build an area to house it. The InSyTe series provides laboratories the ability to purchase an imaging system at a lower price but still capable of producing high-contrast, clinical-grade images, thus maximizing non-invasive imaging throughput while minimizing cost.

Platform tailored to meet your needs

InSyTe is a common system platform designed to accommodate multiple tomographic imaging modalities in single–or dual-modality configurations: PET or SPECT or FLECT, with or without X-ray CT. A single-axis animal bed track enables automated image co-registration between modalities.

By implementing TriFoil's cutting-edge but proven digital detection technologies, all InSyTe systems offer excellent performance. Supplemented by a wide range of integrated and common features, the InSyTe platform can be adapted to meet all your nuclear optical molecular imaging needs.

- Accommodates the following choices of modalities: FLECT™ (360° Optical Imaging), PET (APD detection with continuous motion PET acquisitions) or SPECT (MMP-SPECT™ with CZT detection) with or without CT, as well as a standalone CT.
- Field upgradeable: X-ray CT can be added at a later stage to any single modality PET, SPECT or FLECT system.

Great technology in a small package

The InSyTe systems save premium laboratory space with its truly benchtop design. The secret? State-of-the-art digital detection for all modalities.

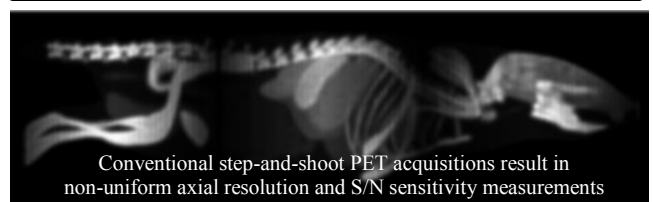
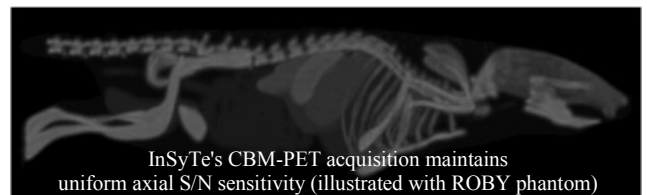


- Easy-to-use but very powerful: sub-mm PET, dynamic SPECT, 3D Optical FLECT tomography and X-ray CT with high soft-tissue contrast.
- Fully shielded in compliance with the FDA cabinet X-ray system design requirements Title 21 CFR 1020.40

LabPET®: APD-based continuous-motion PET

The LabPET sub-system offers visualization and quantitation of biological processes over a wide range of PET activity levels at a spatial resolution of $<1.0\mu\text{l}$ ($<1\text{mm}$).

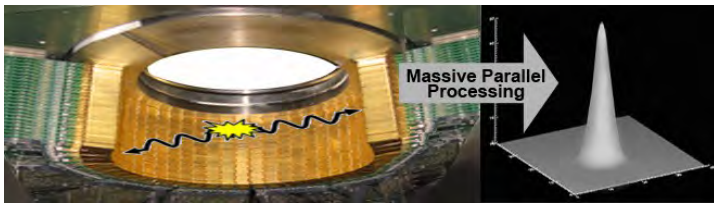
The InSyTe LabPET system is the first preclinical PET with continuous-bed-motion PET detection. This so-called "CBM-PET" maintains uniform signal-to-noise sensitivity across the entire scan range. This capability combined with TriFoil's digital APD-based PET, expands its already proven in-plane quantitative accuracy to precise quantifiable results in all three dimensions.



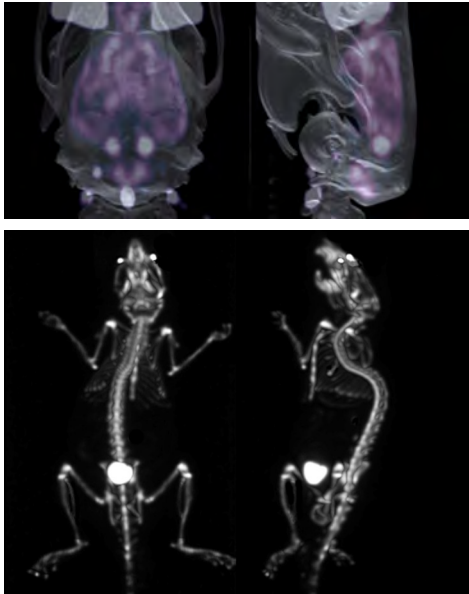
Other features include:

- Field-of View (FOV): 11cm bore size with selectable transverse FOV of 25mm to 65mm, all with CBM-PET providing a user-selectable axial FOV from 19mm to 150mm.
- Continuous-motion PET with list-mode acquisitions for high post-processing and reconstruction flexibility, including decay, scatter and CT-based attenuation corrections.
- Reconstruction algorithms include FBP, 2D-MLEM, 3D-MLEM and fast, patent-protected 3D AMPs-OSEM algorithm

The digital PET advantage: Through direct one-to-one coupling of scintillators to APD detectors, light sharing between crystal pixels and detectors can be avoided, leading to improved spatial contrast resolution. In addition, since the system employs parallel processing of the detector signals, saturation of detection and counting electronics can be eliminated which results in a largely expanded quantitation range and the ability to acquire images with continuous bed motion (CBM-PET)



The Digital PET Advantage illustrated: over 500 individual APD detectors, one-to-one coupled to phoswich scintillator pairs, followed by massive parallel processing result in sharp image contrast ratios



*Top: PET/CT: Small Wistar rat, injected with FDG to generate general distribution in the brain including harderian glands.
Bottom: PET-only scan of a mouse: Tracer NaF-18 in window 350-650 keV (Bergeron et al., Sherbrooke Molecular Imaging Center, Sherbrooke, Canada)*

FLECT™: 360° Fluorescence Tomography

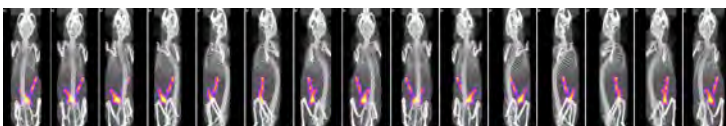
FLECT is the first and only 3D tomographic optical imager. The system uses proprietary orbiting laser scanning with surround fluorescence detection digital detection to deliver 3D images with unmatched performance characteristics:

- Uniform femtomole/mm³ sensitivity and ~1mm resolution throughout the subject
- Quantitation linearity (R2 = 0.9985) across a wide range of concentrations due to the very wide dynamic range of >10¹¹
- Accurate quantification of deep tissue

FLECT uses the actual morphology of each subject for 3D reconstruction and animals are scanned in the prone or supine position, using imaging cells compatible with all other modalities.

This InSyTe 3D fluorescence system is user-configurable with up to 12 lasers and up to 16 filters.

The in-line FLECT/CT system provides one-pass fused functional and optical images. The CT priors are used to further enhance the quality of the optical images.



The Digital 3D FLECT advantage: FLECT can detect optical probes in deep tissue and eliminates the contribution of signals from underlying and overlaying activity, making quantitative optical imaging a reality. Images are of similar quality as can be obtained with preclinical PET/CT and SPECT/CT systems (see images to the right)

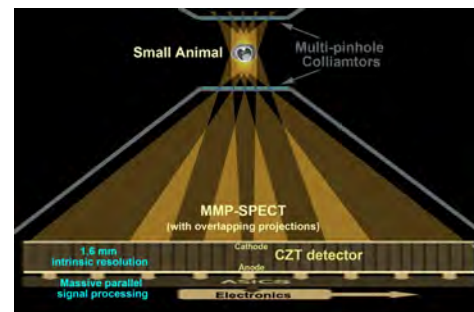
MMP-SPECT™: CZT based SPECT system

The MMP-SPECT sub-system exploits the proven performance of Multiplexed Multi-Pinhole SPECT (MMP-SPECT) and the high intrinsic spatial and energy resolutions of the solid-state Cadmium Zinc Telluride (CZT) detector technology. Direct CZT detection eliminates scintillator light-spreading and PMT light-sharing. This enables simultaneous pinhole projection of up to 16 images on a single detector.

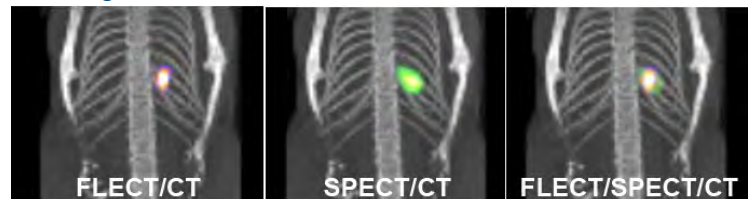
The InSyTe SPECT sub-system is designed to perform both focused and whole-body SPECT imaging, as well as static and dynamic SPECT acquisitions.

Other features include:

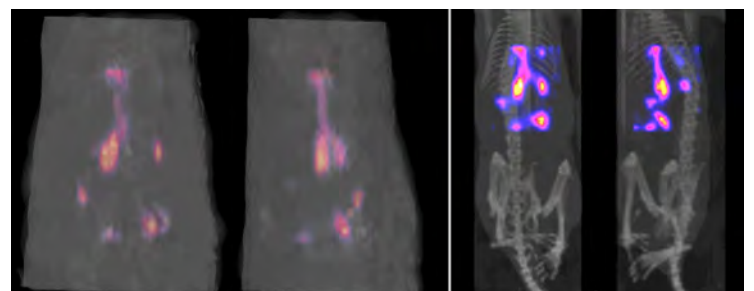
- Is configured with two CZT digital gamma cameras of high intrinsic 1.6 mm resolution.
- Multi-pinhole collimators with up to 16 pinholes per detector for mice and small rats.
- High energy resolution (better than 4.5 % at 140 keV) generates clear images by reducing radiation scatter, and is uniquely suited for simultaneous multi-isotope imaging.
- Single- and multi-isotope detection of all common SPECT isotopes: I-125, 99mTc, I-123, In-111, Lu-177, Re-188, etc.
- Patent-protected HiSPECT 3D-OSEM image reconstruction with RAYguide contrast enhancement for low-dose images



The Digital SPECT Advantage illustrated: Overlapping projections are enabling InSyTe's SPECT system to cover the entire diameter of the animal with one single acquisition, thus avoiding numerous step-and-shoot system operations for whole-body scanning.

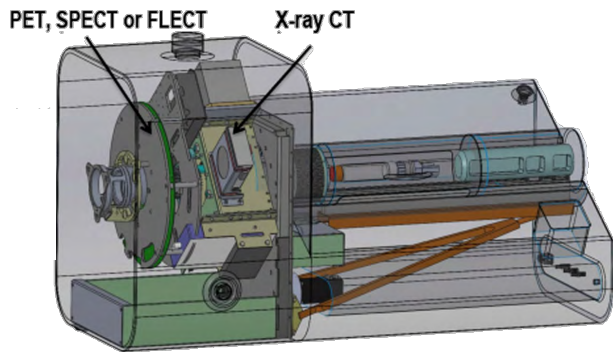


*Lung carcinoma (A549 luc cells): small tumor imaged with FLECT (RGD-Cy5.5 probe) and SPECT (RGD-99mTc tracer)
(Drs. S. Pesnel, M. Vandamme & A. LePape, CNRS Orleans, France)*



*Illustration of FLECT deep-tissue imaging: Left: FLECT-only; Right: FLECT/CT Animal model: Apo-E Fatty diet mice; Probe: Prosense 750
(Courtesy of Xiaoyou Ying, Ph.D, Preclinical Biosciences, Sanofi R&D, MA, USA)*

XO-CT: Fast, Low-Dose X-ray CT system



The InSyTE X-Ray Only (XO) Computed Tomography (CT) system provides high-quality CT images. Its co-axial design with PET, SPECT or FLECT enables one-pass imaging with automatic co-registration of functional and anatomical images. When used for standalone CT imaging, the images can be fused with tomographic images from other systems imported through DICOM.

The CT system features a large-area 1.3 mega pixel CMOS detector and 50W X-ray source, optimized for soft-tissue contrast imaging by using user-selectable X-ray energy filtering. It has the flexibility to perform a wide range of acquisition protocols, with whole-body imaging in less than 90 seconds.

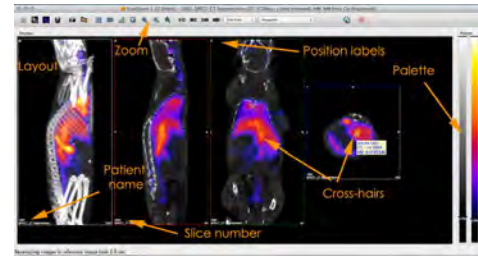
As a stand-alone X-ray CT system, upgradable to PET/CT, SPECT/CT or FLECT/CT at any time, the InSyTe XO-CT offers the best price/performance ratio in the industry.

Excellent quality CT images with and without contrast agents



Image Post-Processing Workstation

The VivoQuant image post-processing workstation offers a wide range of fusion, visualization and data analysis capabilities. VivoQuant is seamlessly integrated with the data acquisition and reconstruction software of the InSyTe systems enabling users to visualize and analyze FLECT/PET/SPECT data fused with CT.



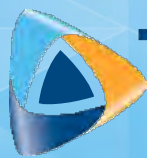
Courtesy of Invivo

Regulatory and Compliance

This product is a CE compliant device that satisfies the requirements regarding Electromagnetic Compatibility (EMC), Electro-Magnetic Interference (EMI) pursuant to IEC 61010. This product is also designed to comply with applicable standards under the Radiation Control for Health and Safety Act of 1968

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