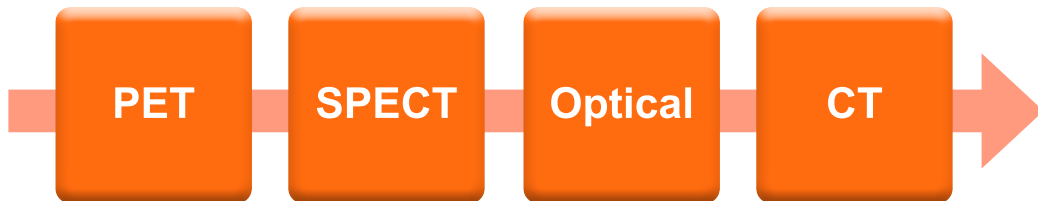




Next Generation Ultra-High Performance and Synergistic Preclinical Imaging



In any combination or stand-alone

Now you can see more with *in vivo* imaging

More Significant than the Sum of Its Parts

For the first time: Multi-modal synergy imaging

MLabs is a leading technology innovator in preclinical imaging with PET, SPECT, Optical, and X-ray CT *in vivo* imaging modalities.

These systems have received many international awards, and support the research of scores of satisfied users worldwide, as evidenced by hundreds of peer-reviewed scientific publications.

However, as we strive to meet your most demanding application needs, MLabs keeps these best-in-class imaging modalities rapidly evolving:

- Best scientifically-proven image quality with highest *in vivo* image resolution for all its modalities: PET, SPECT, Optical and CT.
- Exclusive multimodal synergy by integrating any modality combination on a single platform:
 - ✓ Simultaneous PET/PET
 - ✓ Concurrent PET/SPECT
 - ✓ Theranostic imaging of radiotherapy isotopes
 - ✓ CT-guided 3D Optical Tomography

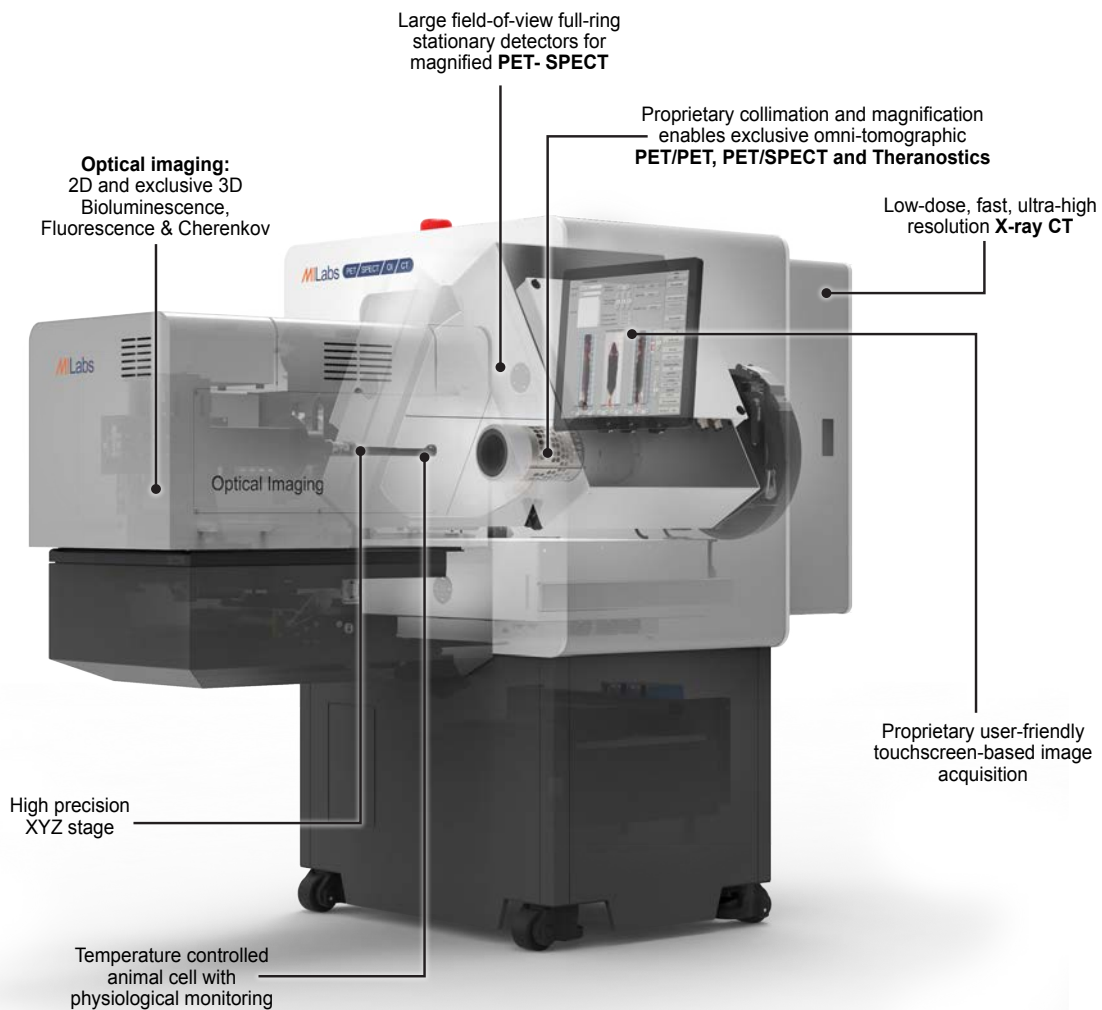
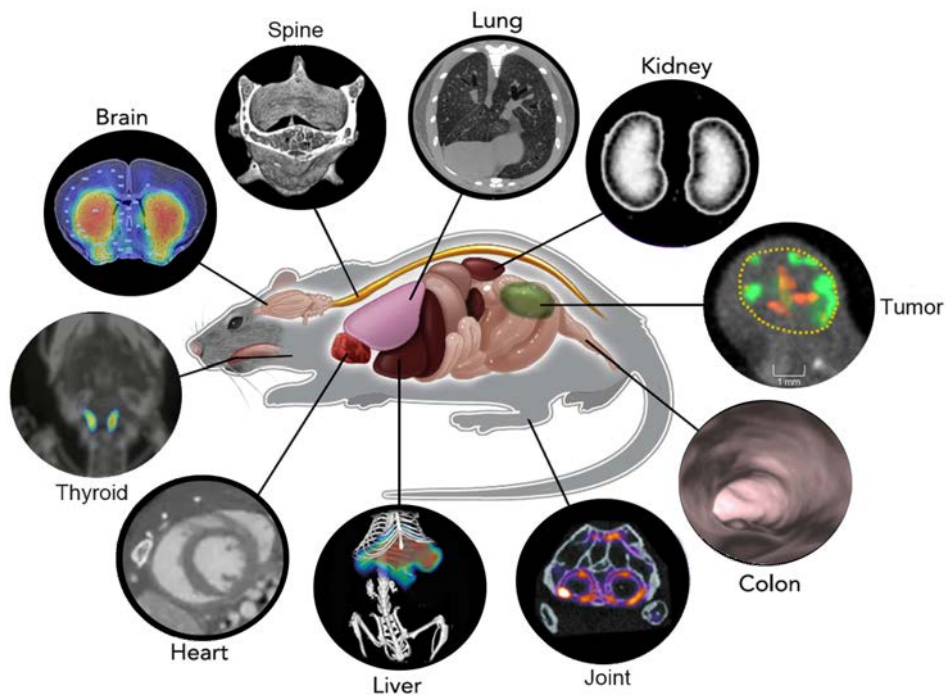


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Why seeing more matters in *in vivo* imaging

Exclusive synergistic value from integrating multiple modalities

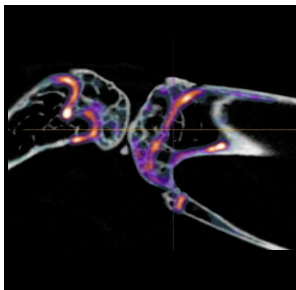
Through the combination of four modalities on a single platform, we have now achieved a higher order of multimodal imaging. By exploiting the synergistic effect of integrating modalities in any combination, we enable researchers to improve diagnostics and therapy development through the analysis of complementary, data-rich, fused images, many co-registered in both space and time. What's more, each modality by itself gives researchers image clarity beyond the capabilities of any other standalone *in vivo* imaging system.

Breakthrough translational resolution:

- ✓ SPECT resolution down to 0.12 mm
- ✓ PET resolution < 0.6 mm
- ✓ PET w/o positron range blurring for e.g. ^{89}Zr , ^{124}I , ^{82}Rb
- ✓ Theranostic SPECT at < 1 mm for all radiotherapy isotopes
- ✓ Optical tomography at 1.5 mm in deep-tissue
- ✓ *In vivo* CT with down to 2.4 micron voxel resolution

Higher sensitivity for 4D imaging:

- ✓ Dynamic SPECT: up to 30kcps/MBq sensitivity
- ✓ Dynamic PET w/o random coincidence noise
- ✓ 3D/4D tomographic optical imaging
- ✓ On-the-fly readout from fast-rotating detectors on an autonomous CT imaging gantry
- ✓ Dual-gated cardiac and respiratory acquisitions



"Now you can image mice with the same visual acuity as humans"

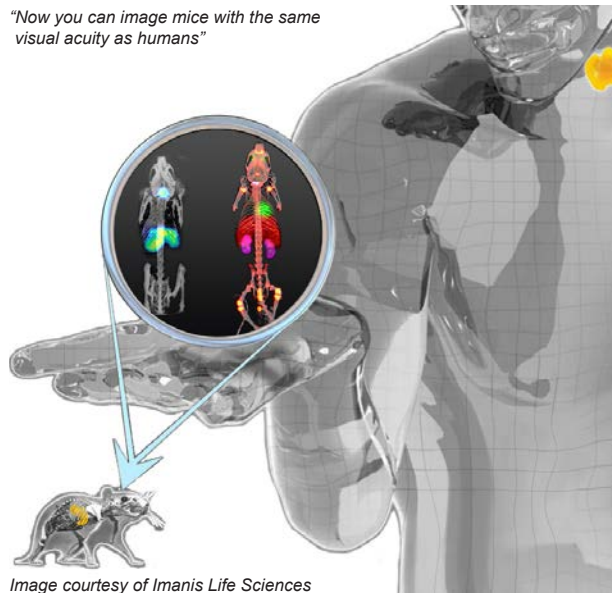
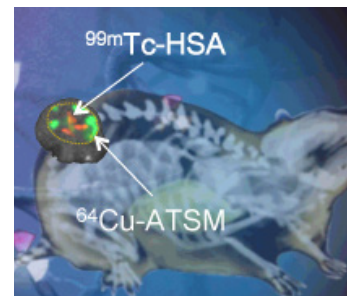
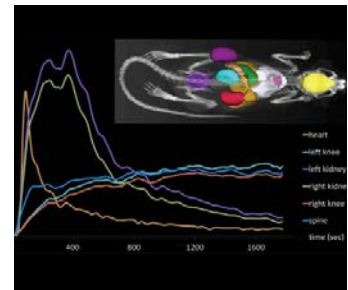


Image courtesy of Imanis Life Sciences



Unlimited theranostics research:

- ✓ All radiotherapy nuclide imaging at < 1 mm resolution
- ✓ Auger-electron emitters: e.g. ^{111}In , ^{123}I , ^{124}I
- ✓ Beta particle emitters: e.g. ^{177}Lu , ^{131}I , ^{188}Re
- ✓ Alpha particle emitters: e.g. ^{212}Pb , ^{225}Ac , ^{213}Bi , $^{209}\text{At}/^{211}\text{At}$, ^{221}Fr , ^{223}Ra
- ✓ Direct radiotherapy imaging, w/o surrogate tracers
- ✓ Quantitative dosimetry

Multiple modalities working in unison:

- ✓ One-to-one preclinical SPECT to clinical PET translation by simultaneous acquisition of co-injected tracers
- ✓ Simultaneous PET/PET and PET/SPECT with spatial and temporal co-registration.
- ✓ Single pass Optical to Nuclear PET/SPECT translation without animal shuttling.
- ✓ CT-guided 3D/4D Optical tomography

Modular Upgradable Systems



In any combination or stand-alone

Example configurations:

VECTor⁷CT: PET/SPECT/CT

- ✓ Integrated high performance PET/SPECT/CT
- ✓ Best PET resolution: ¹⁸F < 0.6 mm; ¹²⁴I at 0.75 mm
- ✓ Best SPECT resolution: 0.12 mm
- ✓ Dynamic PET & SPECT:
< 1 s organ and < 8 s total body frame rate
- ✓ Simultaneous multi-isotope PET/PET & PET-SPECT
- ✓ Radio-theranostics up to 1 MeV

U-SPECT⁷CT

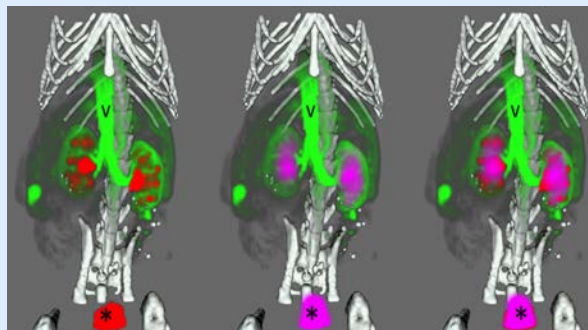
- ✓ Integrated high performance SPECT/CT
- ✓ Best SPECT resolution: 0.12 mm
- ✓ Dynamic SPECT:
< 1 s organ and < 8 s total body frame rate
- ✓ Ultra-low dose and quantitative SPECT
- ✓ Easily upgradeable with full PET capabilities
- ✓ Sub-mm High-energy SPECT

U-CT: high-performance X-Ray CT

- ✓ Ultra-high resolution stand-alone or integrated CT
- ✓ Unprecedented scanning speed: 5 s total body imaging at low dose down to < 2 mGy
- ✓ Cardiac- and respiratory-gated 4D imaging
- ✓ Dynamic contrast-enhanced CT
- ✓ True diagnostic *in vivo* CT imaging

U-OI/CT

- ✓ Exclusive integrated Optical Imaging and high performance CT
- ✓ Bioluminescence, fluorescence, Cherenkov imaging
- ✓ 3D Optical fluorescence and bioluminescence tomography
- ✓ Removable Duet Optical Module for OI and OI/CT
- ✓ Docking station for powerful stand-alone OI imaging



"By using simultaneous imaging of PET, SPECT and CT, we can have control probe and targeted imaging probe done in the same animal. The advantage for us is that we can see how the control probe behaves in relation to a specific probe in the same tumor at the same time. The resulting statistics are much better, and we use significantly fewer animals than before."

Dr. V. Kersemans, Lead Biological Scientist at University of Oxford.

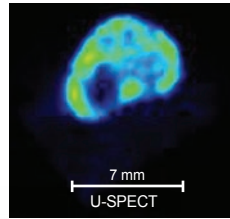
U-SPECT⁷CT

Scientifically validated ultra-high-resolution & fast dynamic SPECT imaging

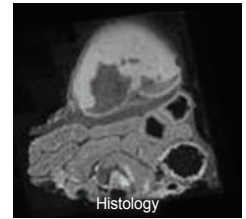
SPECT



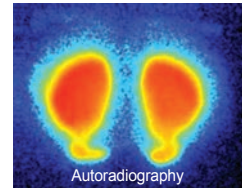
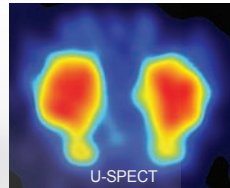
U-SPECT



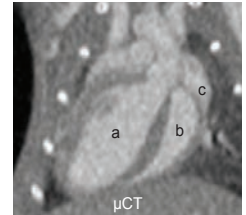
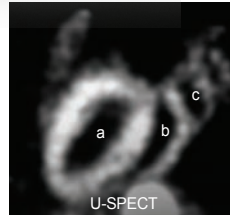
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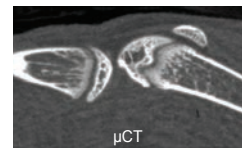
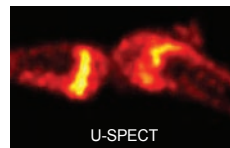
U-SPECT accurately shows heterogeneous antibody distribution within tumors [2].



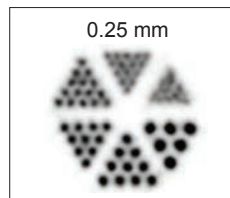
¹²³I-FP-CIT DAT SPECT of mouse brain vs. autoradiography [3].



Cardiac perfusion SPECT vs. μCT shows a) left ventricle, b) right ventricle, and c) right atrium [4].



Quarter-mm resolution *in vivo* SPECT and high-resolution μCT [1].



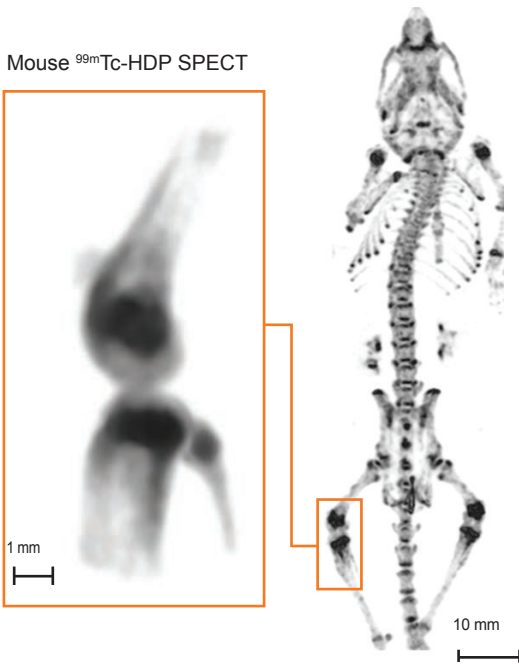
Validation of image resolution of *in vivo* U-SPECT [1].

Unmatched SPECT performance

- Spatial resolution: proven best *in vivo* SPECT resolution in the market: < 0.25 mm [1]. Enables quantifying dynamic processes in tiny sub-compartments of mouse organs and tumors *in vivo*
- 0.12 mm resolution 3D Autorad option (see p. 9)
- Temporal resolution: proven best SPECT total body and organ time resolution (< 8 s and < 1 s respectively). Perfect for assessing fast pharmacokinetics
- Sensitivity: proven best sensitivity allows for < 0.10 MBq (~3 μCi) total body SPECT and fast screening of tracers. Up to 30,000 cps/MBq sensitivity
- Reliability: patented robust stationary SPECT detector design ensures unprecedented reliability, virtually no downtime and very long system life
- Energy range: 20 keV - 1* MeV for single and multi-tracer SPECT
- Quantitation: unrivaled accuracy due to advanced correction methods for scatter, attenuation, and partial volume effects

1 Quarter-mm resolution molecular mouse imaging with U-SPECT⁷, O. Ivashchenko et al., Mol. Imaging, 2014
 2 3D histological validation of high-resolution SPECT of antibody distributions within xenografts. W. Branderhorst, et al., J. Nucl. Med. 2014
 3 Movies of dopamine transporter occupancy with ultra-high resolution focusing pinhole SPECT. B. Vastenhouw, et al., Mol. Psychiatry 2007
 4 Comparison of 4D-MicroSPECT and MicroCT for Murine Cardiac Function, N.T. Befera, et al, Mol. Imaging Biol. 2013
 * With VECTor upgrade

Ultra-high resolution SPECT



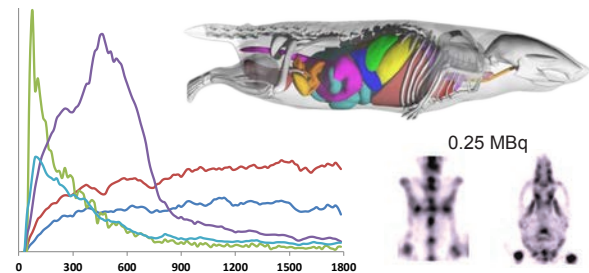
Better than a quarter-mm resolution *in vivo* SPECT imaging [1].

Stationary SPECT with proprietary Multi-Pinhole collimation



A wide range of patented collimators is available to enable ultra-high resolution (0.12 mm) or ultra-sensitive (> 30,000 cps/MBq) imaging [7].

Ultra-fast and ultra-low dose SPECT



Quarter-minute SPECT imaging combined with quarter MBq (< 7 μCi dose) enables fast 4D pharmacokinetic analysis [5] and whole-body quick and easy *in vivo* biodistribution analysis [6].

Imaging heterogeneous oncolytic virus spread in tumors at Mayo Clinic

"In order to see the viral spread inside a tumor in a treated animal, we use the U-SPECT/CT system because it provides us with extremely high-resolution SPECT images (< 0.25 mm). This enables us to track the expansion of individual infectious centers of a NIS-expressing oncolytic virus in a single tumor nodule" explains Dr. Peng. [8]



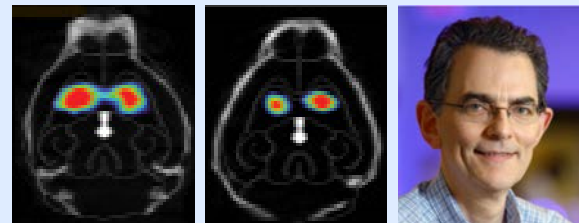
Co-founders of Imanis Life Sciences, K-W Peng, PhD. & S.J. Russel, M.D., PhD., professors at Mayo Clinic

U-SPECT images help determine that Parkinson's starts in the gut

SPECT ¹²³I-DAT-scans of the brains of mice show a reduction in dopamine in the striatum of the Parkinson's disease model that was injected with pathogenic α-synuclein.

Left: control mouse. Center: effected mouse. A general purpose collimator was used with 0.2 mm reconstruction voxel size [9].

Copyright: The Scientist.



Prof. Ted Dawson, MD, PhD, John's Hopkins Medicine, Baltimore

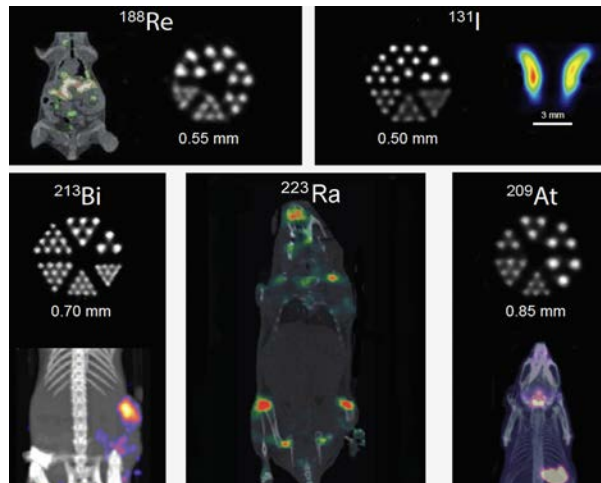
5 Whole-body sub-half-minute 4D pharmacokinetic SPECT in mice, R. Ramakers et al., J. Nucl. Med. 2013
 6 Ultra-High-Sensitivity Submillimeter Mouse SPECT, O. Ivashchenko et al., J. Nucl. Med. 2015
 7 High-resolution medium-sized animal multi-pinhole SPECT with stationary detectors, F. van der Have et al., EANM 2014, Gothenburg, Sweden
 8 Perfusion Pressure Is a Critical Determinant of the Intratumoral Extravasation of Oncolytic Viruses, A. Miller et al., Molecular Therapy, February 2016
 9 Transneuronal propagation of pathologic α-synuclein from the gut to the brain models Parkinson's disease, S. Kim et al., Neuron, 2019

Theranostics: Sub-mm Resolution Radiotherapy

Comprehensive radiotheranostics and quantitative dosimetry

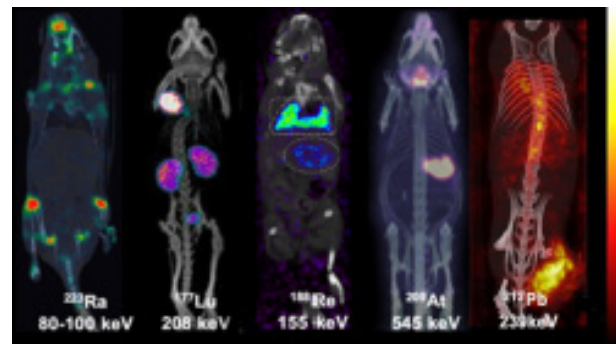
Unlike any other *in vivo* imaging system, MILabs' SPECT/CT and PET/SPECT/CT systems can image isotopes up to 1,000keV (WMIC 2018 Innovation of the Year). By virtue of its proprietary clustered multi-pinhole design, the U-SPECT and VECTor systems can image virtually any radiotherapy isotope

- ✓ Auger-electron emitters: e.g. ^{124}I , ^{111}In
- ✓ Beta particle emitters: e.g. ^{177}Lu , ^{131}I , ^{188}Re , ^{90}Y [10, 11]
- ✓ Alpha particle emitters: e.g. ^{212}Pb , ^{225}Ac , ^{213}Bi , ^{221}Fr , $^{209}\text{At}/^{211}\text{At}$, ^{223}Ra



with high sub-mm resolution. This makes direct imaging of targeted radiotherapies (theranostics) possible for a wide range of therapeutic isotopes without surrogate tracers. In addition, VECTor PET/SPECT enables comparative imaging of co-injected radiotherapy and surrogate isotopes.

Direct theranostic imaging of alpha- and beta-emitters at sub-mm resolution



Theranostics at Erasmus MC



"Erasmus MC has evaluated the promise of $^{225}\text{Ac}/^{213}\text{Bi}$ for radionuclide therapy. Being a combined alpha, gamma, and X-ray emitter with short half-life (46 min), SPECT imaging of ^{213}Bi is demanding since the majority of emitted photons has a much higher energy (440 keV) than what is common in SPECT, while dynamic pre-clinical biodistribution studies are challenging due to its short half-life. Despite these challenges, the MILabs VECTor has been successfully validated for imaging $^{225}\text{Ac}/^{213}\text{Bi}$ ". [12]

Prof. Marion de Jong, **Erasmus MC**, Rotterdam, The Netherlands

Targeted Alpha Therapy (TAT) at UBC



"We are using the MILabs VECTor PET/SPECT/CT to accelerate our theranostics research program. We are focused on imaging TAT. Attractive alpha tracers such as $^{211}\text{At}/^{209}\text{At}$ and ^{225}Ac expose *in vivo* imagers to a wide range of gamma energies up to 750keV for ^{209}At and 440.5keV for ^{213}Bi . These are impossible to image with traditional PET since all one does is detecting 511keV photons in coincidence. With traditional SPECT, one has also a lot of troubles because of resolution losses and breakthrough from high energy gamma rays. To our knowledge, VECTor is the only system that is suited to handle all targeted radiotherapy imaging and dosimetry applications" [13, 14].

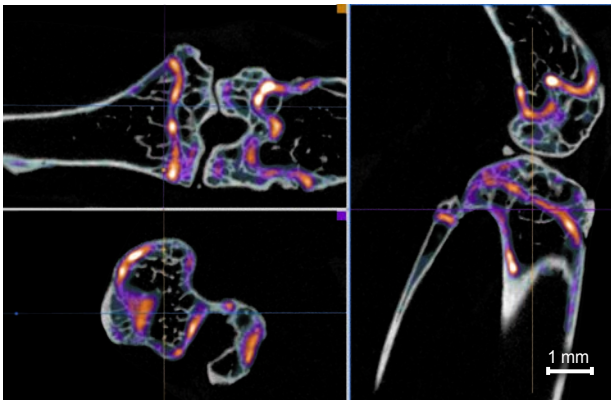
Prof. Vesna Sossi, PhD, **UBC, Vancouver**, Canada

10 High-resolution Clustered-Pinhole ^{131}I SPECT Imaging in Mice, F. van der Have et al., Nucl. Med. Biol. 2016
 11 ^{188}Re image performance assessment using small animal multi-pinhole SPECT/PET/CT system, P. L. Esquinas et al., Physica Medica, 2017.
 12 Utilizing High-Energy γ -Photons for High-Resolution ^{213}Bi SPECT in Mice, J. de Swart et al., J. Nucl. Med. 2016
 13 Multi-isotope SPECT imaging of the ^{225}Ac decay chain: feasibility studies, A. Robertson et al. Phys. Med. Biol., 2017
 14 Evaluation of ^{209}At as a theranostic isotope for the ^{211}At -radiopharmaceutical with high-energy SPECT, JR Crawford et al., Phys. Med. Biol., 2018

EXIRAD-3D: Quantitative 3D Autoradiography

Simultaneous multi-isotope PET and SPECT imaging

By scanning cryo-cooled tissue samples, such as complete organs, with a dedicated super-resolution SPECT option, researchers can finally eliminate many tedious, time-consuming, and error-prone steps from manually generated 3D autoradiography. Thanks to the excellent energy resolving capabilities of the detectors, one can scan multiple isotopes at the same time to image 3D distributions of different molecules simultaneously, with 0.12 mm resolution.



EXIRAD-3D SPECT/CT

Mouse knee imaged with super-resolution ^{99m}Tc-MDP SPECT (left) and ^{99m}Tc-MDP SPECT/CT (right) with high definition X-ray CT. These extreme resolution SPECT and CT capabilities enable studying the spatial distribution of a selected function marker and relate this one-to-one to anatomical microstructures imaged in 3D.

SPECT



EXIRAD-3D multi-isotope autoradiography is fast, saves tremendous amounts of labor and reduces costs. Best of all, results are truly quantitative. On any image analysis workstation, undistorted quantitative EXIRAD-3D images can be re-sliced in any direction over and over, and can be perfectly overlaid with automatically registered ultra-high resolution CT images obtained in the same multi-modal acquisition or with other 3D images of the specimen. With EXIRAD-3D, MILabs' U-SPECT⁷CT and VECTo^rCT systems offer a unique single-system solution to translate research results from *ex vivo* to *in vivo* analysis and vice-versa.

"This new PET/SPECT/CT instrument combined with EXIRAD-3D automated autoradiography will facilitate our research of cerebral blood flow and its glial regulation. As a result, disorders long thought neuronal in nature can now be investigated as disorders principally of glial cells, including both astrocytes and oligodendrocytes as well as their progenitors".

Prof. Maiken Nedergaard, M.D, D.M.Sci.-Center for Translational Neuroscience, Division of Glial Disease and Therapeutics. **University Rochester** Medical Center and **University of Copenhagen**.



U-PET⁷CT

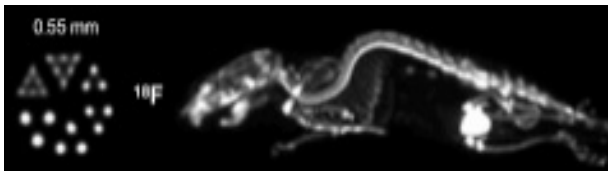
Ultra-High-Definition PET (“U-PET”): best resolution and small lesion image contrast

Unmatched PET performance

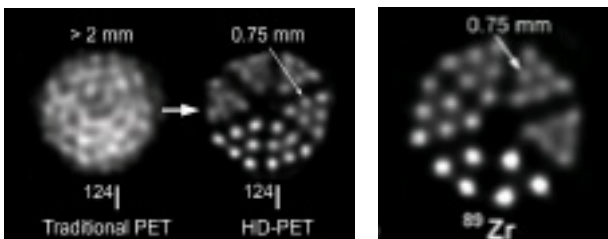
- Ultra-High-Definition: unrivaled uniform spatial resolution for conventional PET (< 0.6 mm for ¹⁸F)
- No positron range blurring for long positron range PET isotopes such as ⁸⁹Zr, ¹²⁴I, ⁸⁶Y and ⁸²Rb [15, 16]. All can be imaged with <0.75 mm resolution
- High-Definition PET (HD-PET) as a result of best spatial resolution combined with lowest image noise
- Widest linear count range up to >50MBq, translates in superior Noise-Equivalent-Count-Rate (NECR)
- Simultaneous PET/PET of two co-injected PET tracers
- High uniform sensitivity for Dynamic PET: organ and whole-body time resolutions of <1 s and < 10 s
- Low-dose whole-body imaging (e.g. [17, 18, 21])



Validated results



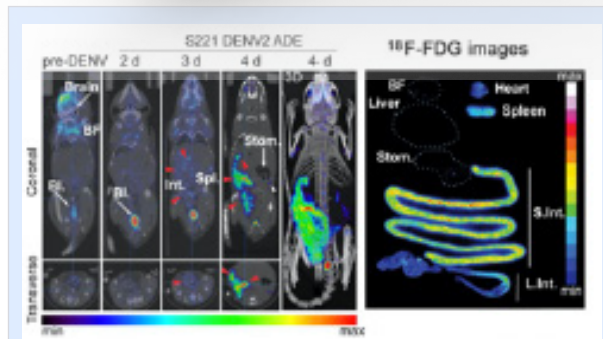
¹⁸F-NaF images of a phantom and a mouse (courtesy NIRS-Japan).



¹²⁴I resolution improvement (left) and <0.75 mm resolution ⁸⁹Zr

What is HD-PET?

To reach the visual acuity required for translating data from mouse images to those of human PET scanners, MILabs took a page out of the playbook of the microscopy evolution. Rather than trying to image a wide field without magnification and with a lot of unwanted noise contribution from surrounding random and scattered activity, MILabs took the “confocal style” approach with HD-PET. By quickly moving a focused magnified field-of-view through an animal, images can be obtained with a resolving power unattainable with conventional preclinical PET systems. Also, for the first time, many non-standard PET and virtually all radiotherapy isotopes can be imaged at sub-mm resolution with HD-PET.



“The HD-PET of our VECTorCT has significantly enhanced our ability to use non-invasive imaging to understand the inflammatory host-response in mouse models of dengue virus infection. For the very first time, we have been able to use PET for the systematical evaluation of acute viral infectious diseases. Due to the high resolution, we can visualize increased inflammation

even in the small intestines of dengue-infected mice, and we can also predict the progression and severity of dengue-mediated inflammation with FDG-PET.” [19]

Prof. Ann-Marie Chacko, PhD - DukeNUS, Singapore

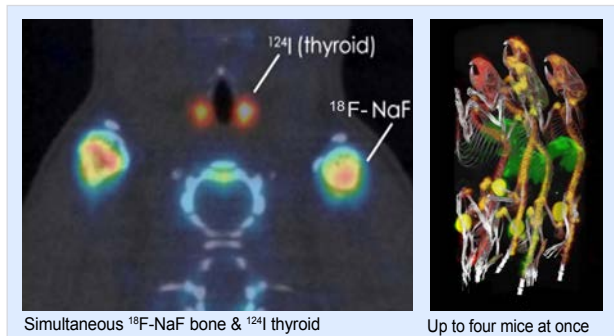
The Brilliance of HD-PET

High Definition PET: tenfold improvement in volumetric resolution as a result of physical collimation with magnification rather than electronic collimation without magnification.

High Dynamic PET: ten-fold reduction in image noise resulting in large linear dynamic activity range for up to four mice. The elimination of random and reduction of scattered coincidences extends noise-equivalent count rate (NECR)

Extended Applications:

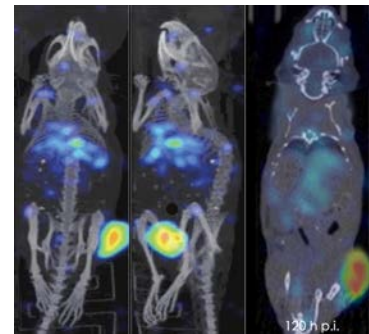
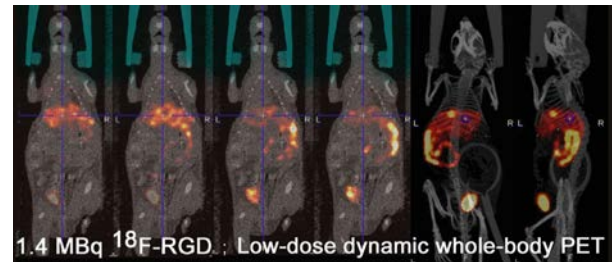
- ✓ Truthful translation: For the first time, resolution equivalence approaches the resolution of TOF-PET used in the clinic
- ✓ No positron range blurring: Important PET isotopes such as ⁸⁹Zr (e.g. immunoPET), ¹²⁴I (e.g. oncolytic virotherapy & brain PET) and ⁸²Rb (cardiac PET) can be performed without artifacts in mice models
- ✓ Two experiments at once with simultaneous PET/PET of co-injected tracers: ⁸⁹Zr ImmunoPET/FDG, ¹²⁴I NIS-PET/FDG, ⁸²Rb/FDG cardiac PET [21]
- ✓ Quantitative PET of multiple mice simultaneously owing to the wide dynamic countrate



“The resolution and sensitivity of MILabs U-PET are exquisite. For instance, we are capable of running dynamic PET at high temporal and spatial resolution with low < 5 MBq activity levels, while tumor heterogeneity can still be observed with only 0.01 MBq delivered to the tumor”

From the impact of U-PET on their research, Lead Biological Scientist at **University of Oxford**, the CRUK (Cancer Research UK) Institute

U-PET image examples including dynamic low-dose whole-body PET

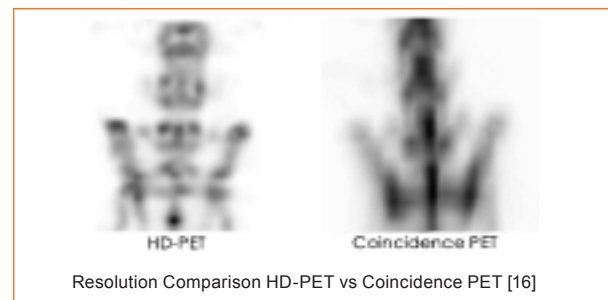


Top: Whole-body low-dose dynamic PET imaging of ¹⁸F-RGD [18]

Left: Whole-body biodistribution of ⁸⁹Zr-DFO-nimotuzumab [20]

Summary advantages of U-PET

System capabilities	MILabs	Concidence
	HD-PET	PET
Elimination of noise from randoms	YES	NO
Reduction scatter noise and bias	YES	NO
Demagnification of detector blurring	YES	NO
Photon acollinearity elimination	YES	NO
Uniform sub-mm resolution	YES	NO
Positron range elimination	YES	NO
α and β radiotheranostics imaging	YES	NO
Simultaneous PET/PET co-injected	YES	NO
Simultaneous sub-mm PET/SPECT	YES	NO



15 Zero Positron Range and Multi-Isotope Positron Emission Tomography, F.J. Beekman et al., WMIC 2018, Seattle, WA, USA.
 16 Performance Assessment of a Preclinical PET Scanner with Pinhole Collimation by Comparison to a Coincidence-Based Small-Animal PET Scanner, M.D. Walker, et al., J. Nucl. Med. 2014
 17 PET imaging of PARP expression using ¹⁸F-Olaparib, T. Wilson et al., J Nucl Med., 2018.
 18 ¹⁸F-Trifluoromethylation of Unmodified Peptides with 5-¹⁸F- (Trifluoromethyl)dibenzothiofenium Trifluoromethanesulfonate, S. Verhoog et al., J. Am. Chem. Soc. 2018
 19 ¹⁸F-FDG as an inflammation biomarker for imaging dengue virus infection and treatment response, A. Chacko et al., JCI Insight 2017
 20 ⁸⁹Zr-nimotuzumab for immunoPET imaging of epidermal growth factor receptor, R. Chekol et al., Oncotarget 2018
 21 Dual-isotope imaging allows *in vivo* immunohistochemistry using radiolabelled antibodies in tumours, J. Knight et al., Nuclear Medicine and Biology 2019

PET & SPECT: VECTor⁷CT

Simultaneous multi-isotope PET and SPECT imaging

VECTor



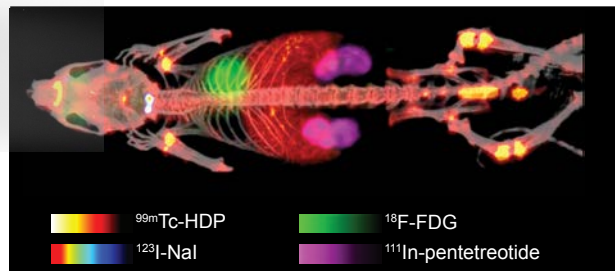
VECTor⁷CT: The system with unique tri-modality omni-imaging capabilities

- Unmatched PET/SPECT/CT performance: sub-mm PET and SPECT resolution even when imaged simultaneously in space and time. Anatomical co-registration with fast, ultra-high resolution, low-dose X-ray CT.
- Exclusive spatial and temporal co-registration of PET and SPECT images. Sub-mm imaging of co-injected PET and SPECT tracers enables exploring different physiological and molecular functions at the same time, under identical physiological and physical conditions. Allows switching between SPECT- and PET-based approaches at any time.
- Unmatched molecular sensitivity for PET and SPECT imaging enables targeting specific biological processes with low-dose PET and/or SPECT tracers.
- Dynamic PET and SPECT: excellent whole-body (< 8 s) and organ (< 1 s) time resolution.
- Advanced theranostics applications: the ability to image all high-energy isotopes at sub-mm resolution including radiotherapeutic Auger e-, α-emitters, and β-emitters such as ¹³¹I [10], ¹⁸⁸Re [11], ²¹³Bi [12], ²⁰⁹At [14], ²²⁵Ac [13], and ²²³Ra can be combined with simultaneous imaging of their therapeutic effect using almost any other PET or SPECT tracer.

Simultaneous PET/SPECT of co-injected tracers

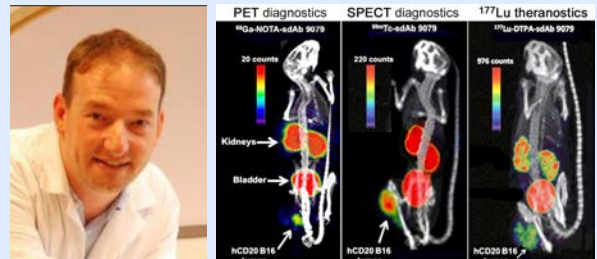


VECTor: ¹⁸F-NaF PET and ^{99m}Tc-HDP SPECT inherently co-registered in time and space, obtained in a single mouse scan.



Simultaneous SPECT and PET imaging of four tracers [22].

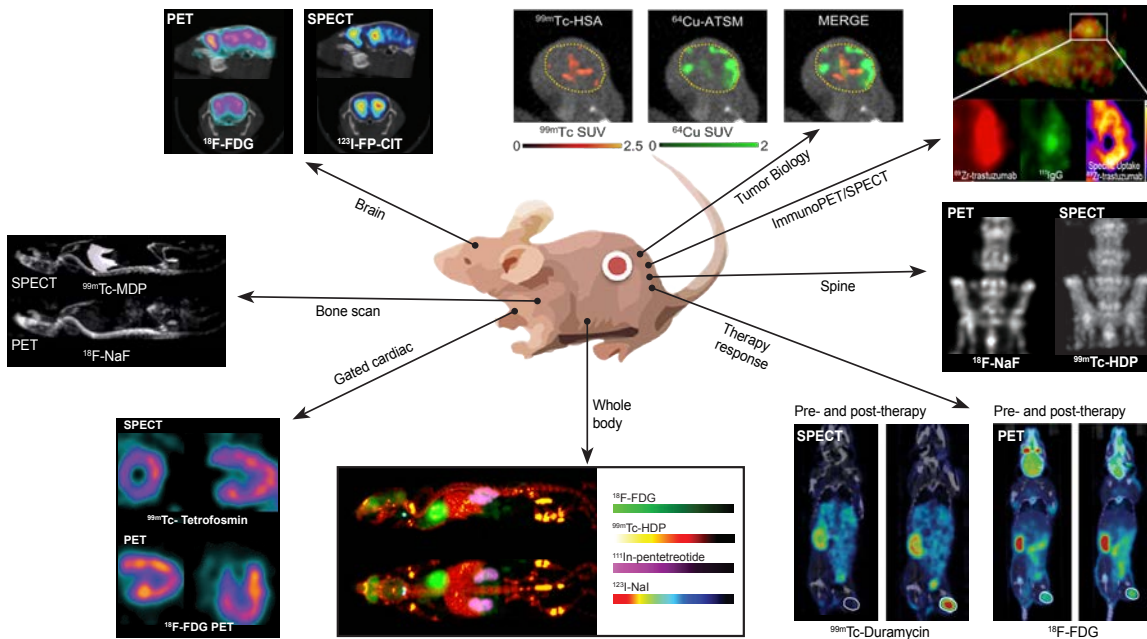
One-on-one switch from SPECT to PET, to theranostic sdAB imaging



“The ability to image simultaneous SPECT and PET tracers in the same animal at exactly the same time, gives us unique information on certain combinations while providing maximum flexibility. If we decide to change from a preclinical SPECT-labeled Nanobody to a PET-labeled nanobody for clinical trials, we can easily compare these tracers one-on-one in vivo with the VECTor simultaneous PET/SPECT imaging system”. [23]

Prof. Tony Lahoutte, MD, PhD, Head of Nuclear Medicine, UZ/VUB Brussels, Belgium

Co-injected tracers with spatial and temporal co-registration



Simultaneous PET/SPECT:

Going beyond the application capabilities of any other *in vivo* imaging system.

- Comparing immuno-PET (e.g. ^{89}Zr) and immuno-SPECT (e.g. ^{111}In) [24]
- DAT-SPECT and FDG-PET to differentiate typical from atypical parkinsonian syndromes
- Monitoring of pharmacokinetics and treatment response (e.g. $^{99\text{m}}\text{Tc}$ -Duramycin or ^{18}F -FDG) [19]
- Simultaneous ^{124}I -immuno-PET and ^{18}F -FDG scans
- Simultaneous $^{89}\text{Zr}/^{111}\text{In}$ tumor heterogeneity imaging
- ^{82}Rb -PET versus $^{99\text{m}}\text{Tc}$ -sestamibi SPECT
- Alzheimer imaging: SPECT (e.g. $^{99\text{m}}\text{Tc}$ -HMPAO) with PET (e.g. ^{18}F -flortaucipir)
- Simultaneous vascularity ($^{99\text{m}}\text{Tc}$ -HSA) and hypoxia (^{64}Cu -ATSM) imaging in tumors [25]
- Single scan comparisons of “identical” SPECT and PET tracers: e.g. labeled with ^{67}Ga vs ^{68}Ga , $^{125}\text{I}/^{123}\text{I}/^{131}\text{I}$ vs ^{124}I , ^{111}In vs ^{64}Cu
- Direct radiotherapy imaging (theranostics) versus indirect radiotherapy imaging with surrogate PET or SPECT



“We have demonstrated that the use of dual-isotope VECTor PET/SPECT/CT Imaging of $^{89}\text{Zr}/^{111}\text{In}$ overcomes the issue of non-specific antibody in tumors. It enables true quantification of epitope expression levels, and allows non-invasive *in vivo* immunohistochemistry.” [24]

Prof. B. Cornelissen, PhD, Oncology, **University of Oxford**, UK



“We have developed a method to simultaneously visualize hypoxia and vascularity within HT-29 tumors using *in vivo* dual-isotope high-resolution PET/SPECT in tumor micro-environments. This has enhanced our studies on cancer biology and develop more effective treatment strategies”. [25]

Y. Fujibayashi, PhD, Director **Molecular Imaging NIRS**, Japan

22 VECTor: A Pre-clinical Imaging System for Simultaneous Sub-mm SPECT-PET, M C. Goorden, et al., J. Nucl. Med., 2013

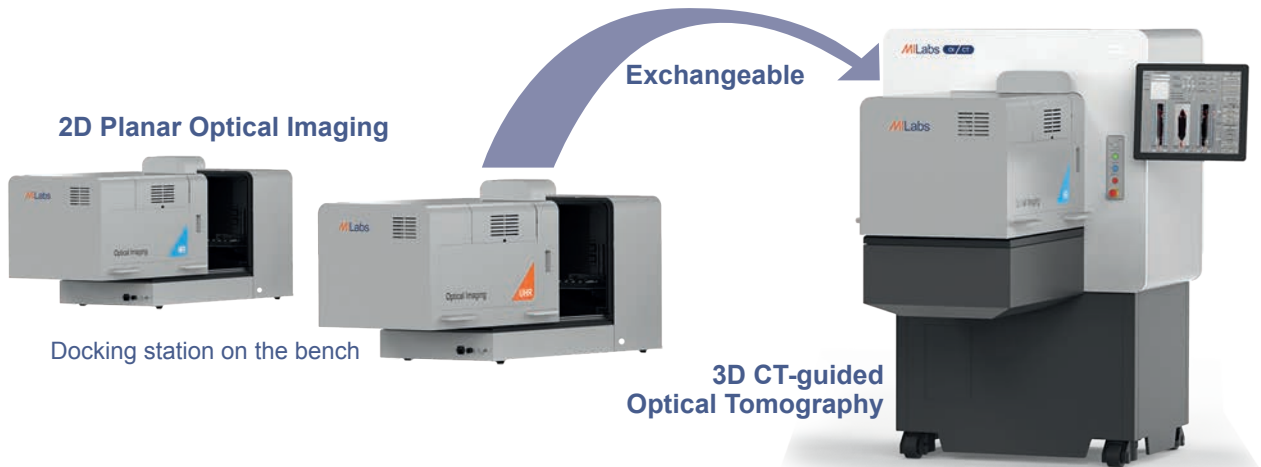
23 Theranostic Radiolabeled Anti-CD20 sdAb for Targeted Radionuclide Therapy of Non-Hodgkin Lymphoma, Molecular Cancer Therapeutics, December 2017

24 Dual-isotope imaging allows *in vivo* immunohistochemistry using radiolabelled antibodies in tumours, B. Cornelissen et al., Nuclear Medicine and Biology, March 2019

25 *In vivo* Simultaneous Imaging of Vascular Pool and Hypoxia with a HT-29 Tumor Model: the Application of Dual-Isotope SPECT/PET/CT, N. Adachi et al., IJBAR 2016

U-OI: 2D Optical Imaging & 3D Optical Tomography

Exclusive dual-use: Duet Optical Imaging module



Start with customizable high-throughput benchtop 2D Optical Imaging

The new optical modules can be tailored with large-area ultra-sensitive 1 Mpx ("HR") or 4 Mpx ("UHR") cameras. Moreover, the systems can be equipped with 6, 12, 24, 36, or even 48 emission filters!

Make switching between qualitative 2D Optical and quantitative 3D Optical/CT a snap

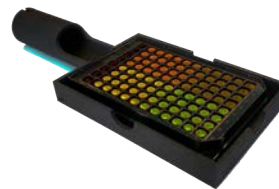
By simply transferring the optical module from the docking station to MILabs' CT scanner, seamless integration of Optical and CT hardware & software occurs. One can now perform Optical and CT imaging in parallel for dedicated applications. Or one can elect to perform Optical Tomography, where segmented CT images are used to guide the quantitative reconstruction of 3D/4D tomographic bioluminescence or fluorescence images ("BLT" or "FLT").

From stand-alone benchtop to in-line translation of Optical to Nuclear Tomography

Want to translate your Optical Imaging results to clinically compatible PET or SPECT data? Just add the desired modality to your Optical/CT platform. MILabs can deliver any combination of in-line PET, SPECT, Optical, and CT on a single platform, or you can add any of these modalities to suit your application demands. Eliminates animal shuttling and avoids inconsistent anesthesia.

Use your Optical Imaging System as never before:

- ✓ On a bench, with a docking station for high throughput 2D imaging of up to ten mice at a time
- ✓ On an automated X-ray CT platform for automated 2D planar, or for CT-guided deep-tissue quantitative 3D Tomographic Optical imaging
- ✓ Upgrade at any time with in-line PET & SPECT

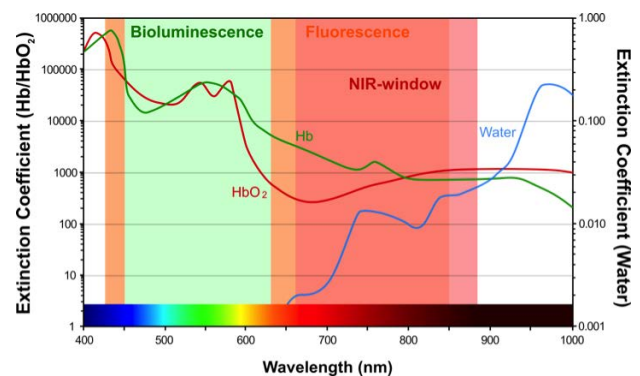


96-well plate



5-mouse holder

Bioluminescence, Fluorescence and Cherenkov imaging



Since the Duet Optical module's wavelength range covers Cherenkov Luminescence (CL) or Secondary Cherenkov-induced Fluorescence Imaging (SCIFI), the system can be used to image radionuclides that emit charged particles such as β^- . This ability further complements the theranostic applications of VECTor[®] by enabling e.g. ⁹⁰Y radiotherapy imaging [26].

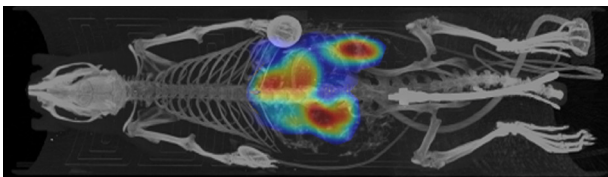
A scalable & highly flexible optical imaging platform

Spectral Unmixing

By acquiring images with multiple narrow-band excitation & emission filters, the acquired spectra of multiple probes can be unmixed using the spectral unmixing feature of MILabs' optional Imalytics Software. [27]

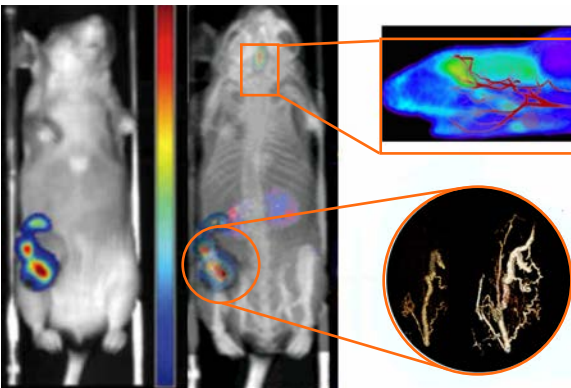
Enhancing OI with Diagnostic CT

As the only optical imaging system with an integrated CT with diagnostic capabilities, VECTor7 enables to: Use Perspective MIP imaging to fuse 2D optical images with 3D X-ray CT anatomical images (e.g. optical bioluminescence from liver tumors).



Anatomical co-registration of 2D optical and 3D CT using Perspective MIP (Maximum Intensity Projections)

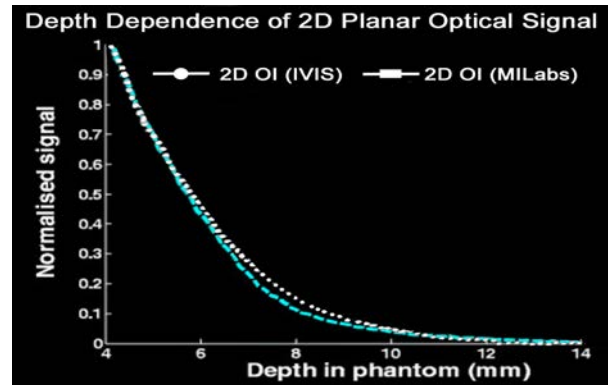
- Use Dynamic Contrast Enhanced CT to determine whether light intensity changes in tumors are actually due to treatment effects or caused by acute hypoxia due to rapid growth or inadequate blood supply



Beyond Optical/CT co-registration: the in-line Diagnostic CT enables to look at tumor vascularity to validate optical signal response to treatment.

Sensitivity of 2D Optical Imaging

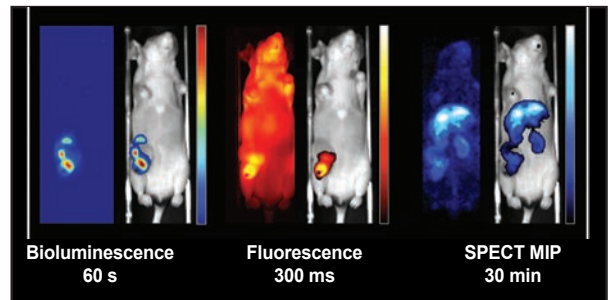
Because of the depth dependence of planar optical signals for *in vivo* imaging, it is difficult and not always relevant to compare the optical sensitivities of different systems. The following graph illustrates that no matter what system used, imaging of deep tissue with 3D tomography is required for true quantitation.



Exponential decline of measured 2D OI signal in homogeneous tissue phantom. Relative intensities normalized to one at 4 mm depth [27]

Enhancing OI with Nuclear Images

In a single scanning session and with a single dose of anesthesia, VECTor7 OI/CT enables complementary registration of bioluminescent, fluorescent, CT, PET, and SPECT images.



Example of complementary registered bioluminescent, fluorescent, and nuclear images in one scanning session with a single dose of anesthesia [28].

Seeing better and going deeper at Columbia University with Optical Tomography



"Our long-term goal is to develop novel therapies for lung diseases such as acute respiratory distress syndrome (ARDS). Since anatomic changes do not quantitate the underlying disease, we perform quantitative molecular imaging with mouse models of ARDS using tomographic PET and 3D Optical/CT imaging. ⁶⁸Ga-albumin can be utilized as a translational radiotracer for quantifying the abnormal epithelial permeability that is the underlying cause of various lung pathologies, including ARDS. From our experiments, we validated that MILabs 3D Optical/CT imaging with Cy7-albumin can be used as a preclinical translational surrogate for ⁶⁸Ga-albumin while it offers a high throughput means for rapidly screening potential therapeutics that aim to reverse the underlying disease process." [28]

Akiva Mintz, MD, PhD, Director, Nuclear Medicine & Molecular Imaging, **Columbia University**, New York

26 New Strategies for Fluorescent Probe Design in Medical Diagnostic Imaging, H. Kobayashi et al., Chemical Reviews 2010

27 U-SPECT-BioFluo: An Integrated Radionuclide, Bioluminescence, and Fluorescence Imaging Platform. M.N. van Oosterom, et al, EJNMMI Research, 2014

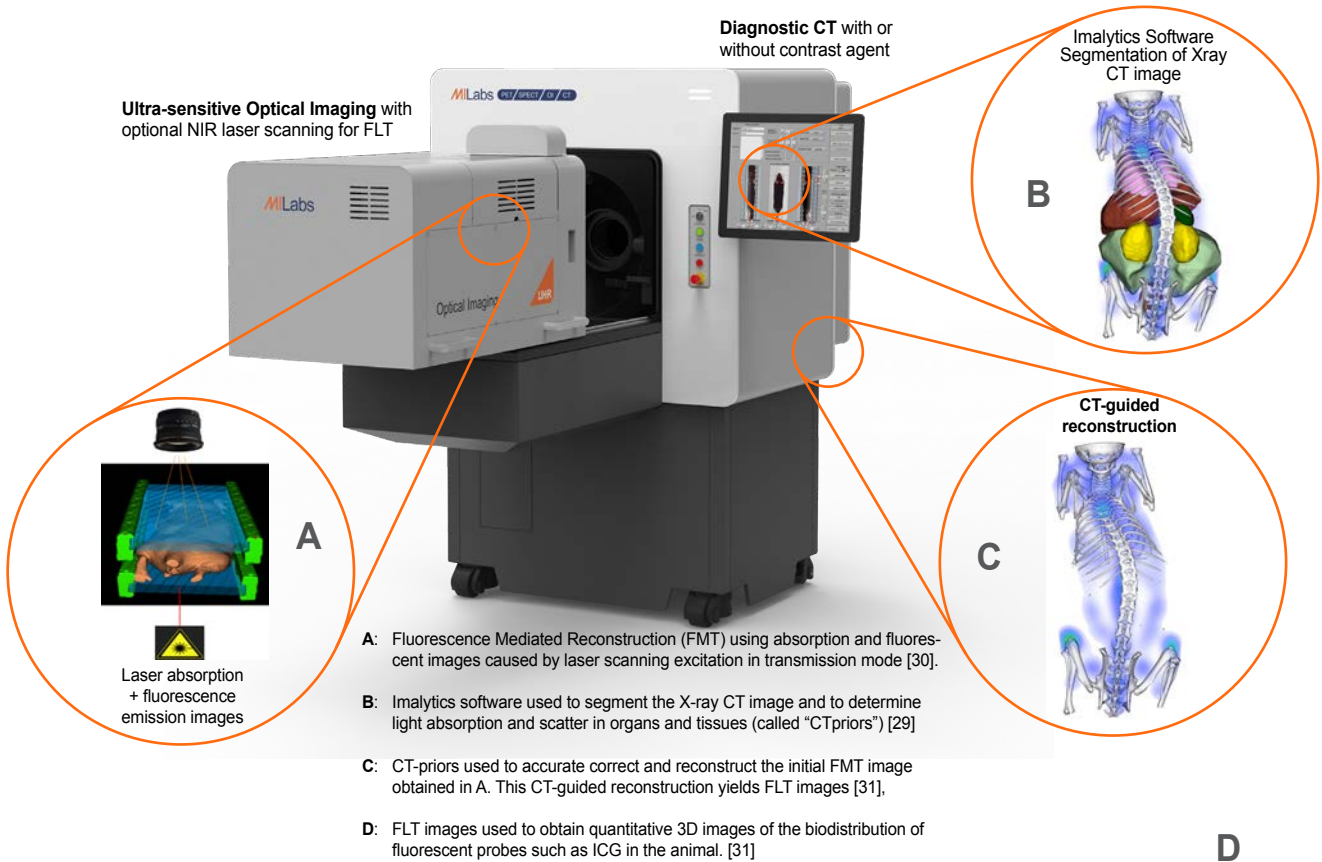
28 Multimodality Molecular Imaging of Lung Disease Using PET, CT and Optical Imaging, SSG07-09 Oral Presentation, RSNA 2019

Optical tomography: Fluorescence (FLT/CT) and Bioluminescence (BLT/CT) in 3D/4D

A breakthrough in hybrid Optical/CT tomography

The powerful combination of two industry-leading modalities with the best image analysis and segmentation software (Imalytics Preclinical [29]) enables quantitative optical tomography imaging with fluorescence and bioluminescence.

Optical

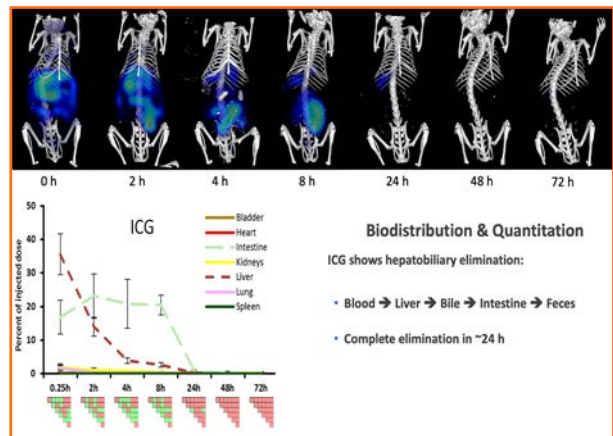


Hybrid FLT/CT

Hybrid FLT/CT goes beyond the capabilities of stand-alone FLT (also called Fluorescence Molecular Tomography, FMT) by using the heterogeneous optical absorption and scattering maps of the animal for improved fluorescence reconstruction.

Hybrid BLT/CT

Hybrid BLT/CT uses the same 3D bioluminescent light correction approach as FLT by using segmented CT priors, but reconstructs the initial 3D BLT image by imaging bioluminescence at multiple wavelengths. [32]

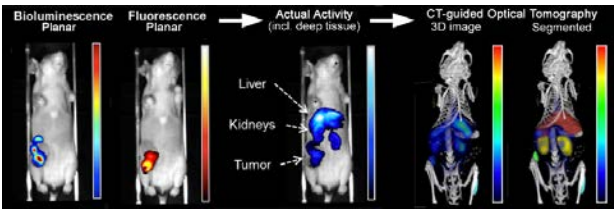


29 Imalytics Preclinical: Interactive Analysis of Biomedical Volume Data, F. Gremse et al., Theranostics 2016
 30 Method for reconstructing the image of an object scanned with a laser imaging apparatus, Rohler et al., US patent 6,130,958; 2000
 31 Hybrid μ CT-FLT imaging and image analysis, F. Gremse et al., J Vis Exp. 2015
 32 Spectrally resolved bioluminescence optical tomography, H. Dehghani et al., Optics Letters, 2006

Quantitative Optical Tomography

Why hybrid FLT/CT is superior?

Light scattering and absorption are heterogeneous in the body of an animal, and depend on the “darkness” of the organ/tissue. As illustrated below, accurate optical imaging is not possible without 3D tomographic imaging of deep tissues [33].



Hybrid FLT/CT at RWTH-Aachen

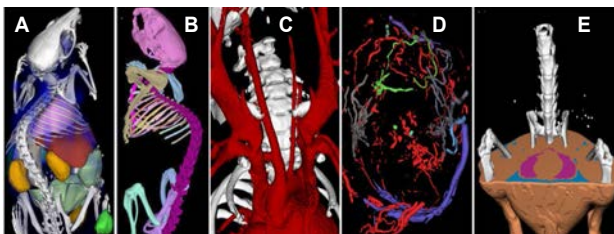
“MLabs’ hybrid FLT/CT is the only system that can obtain accurate *in vivo* biodistributions of fluorescence activity in deep tissue. Because of its in-line diagnostic CT, the system can determine the highly heterogeneous scattering and absorption in tissues, including those in dark organs such as the heart, liver & kidneys.” [33]



Dr. Felix Gremse, RWTH University Aachen, Germany

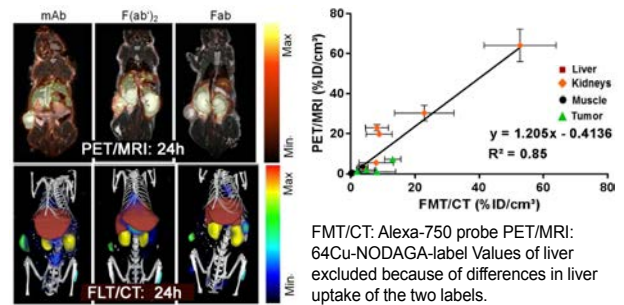
Imalytics Preclinical software

- Imalytics is critical for CT-guided reconstructions using CT priors. Additional functionality includes:
- Organ segmentation for biodistribution studies (A)
- Bone segmentation and labeling (B)
- Segmentation of blood vessels and vascularity (C,D)
- Fat segmentation, visceral and sub-cutaneous (E)



Hybrid FLT/CT versus PET/MRI

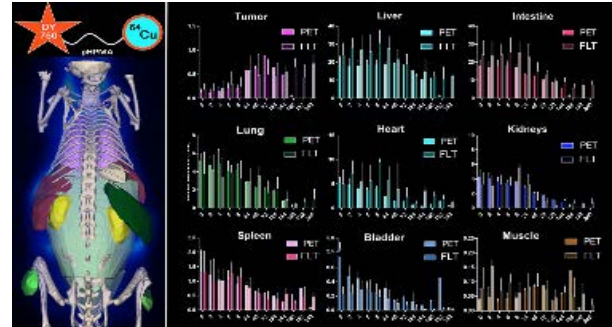
In this multi-institutional FLT/CT versus PET/MRI study, the biodistribution in separate cohorts of nude mice with subcutaneous tumors, twenty-four hours post injection of anti-EGFR, were studied. *In vivo* analyses correlated with *ex vivo* quantitation for both modalities [34].



FMT/CT: Alexa-750 probe PET/MRI: ⁶⁴Cu-NODAGA-label Values of liver excluded because of differences in liver uptake of the two labels.

Hybrid FLT/CT versus PET/CT

Pharmacokinetics of bimodal PET/Optical probes is critical for surgical guidance applications. As illustrated, biodistributions of Dy-750 FLT/CT correlates with ⁶⁴Cu-PET/CT using a bimodal NIR-PET probe [35].



MLabs U-OI features	OI	Hybrid OI/CT
2D bioluminescence, fluorescence, and Cherenkov imaging	✓	✓
Maximum number of animals	10	3
96-well plate imaging	✓	✓
Spectral unmixing	Optional*	Optional*
In-line X-ray CT	Optional	✓
3D FLT/CT and BLT/CT	N/A	Optional
Imalytics Preclinical	Optional	Optional

33 Absorption reconstruction improves biodistribution of fluorescent nanoprobes using hybrid fluorescence tomography, F. Gremse et al., Theranostics 2014.

34 Comparison of the accuracy of FMT/CT and PET/MRI for the assessment of antibody biodistribution in squamous cell carcinoma xenografts, C. Hage et al., J. Nucl. Med., 2017

35 Validation of fluorescence-mediated tomography combined with microCT: a longitudinal *in vivo* comparison to PET-imaging, S. Rosenhain et al., EMIM 2019, PW-23

U-CT: stand-alone or integrated X-ray CT

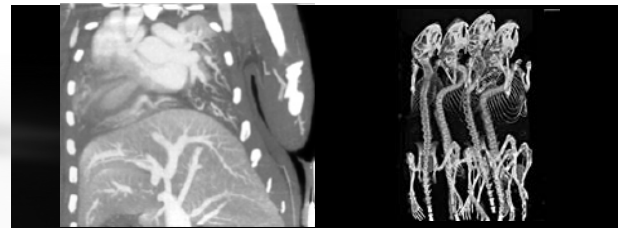
The only CT system that will fit your needs - Today, tomorrow and beyond...

CT



Cardiac- and respiratory-gated CT

Accurate CT reconstruction in cardiac and respiratory research requires motion elimination from the heart and diaphragm. U-CT uses dual-gated acquisitions and freeze-frame to avoid image blurring.



Respiratory- and cardiac-gated "freeze-frame" image on left, and sensor-free respiratory-gated multi-mouse imaging on the right.

Industry-leading 3D/4D adaptive X-ray CT

MILabs' U-CT is extremely fast and offers ultra-high resolution at low X-ray doses enabling demanding multispecies 3D/4D *in vivo* applications, including dynamic contrast-enhanced (DCE) CT imaging.

Many steps ahead in *in vivo* X-ray CT:

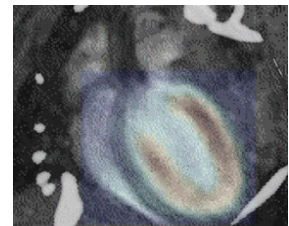
- Stand-alone or integrated CT, field-upgradable with SPECT, PET, and 2D/3D Optical imaging
- With variable isotropic voxel resolution down to 2.4 μm , the system is also suited for *ex vivo* applications
- Ultra-fast whole-body scanning down to 5s per mouse
- Ultra-low dose, down to < 2 mGy whole-body mouse
- Simultaneous scanning of up to 4 mice with sensor-free respiratory gating

Unique DCE-CT & PET/SPECT/CT

With fast, high-resolution, and optional dual-energy acquisitions, U-CT is uniquely suited for diagnostic DCE-CT applications. Moreover, MILabs' unique attenuation correction enables hybrid PET/SPECT/CT imaging, even for gated acquisitions [36].

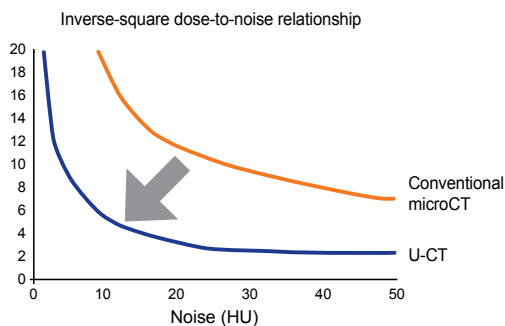


DCE-CT* of tumor vasculature [37].



U-PET/CT ^{18}F -FDG and Exitron

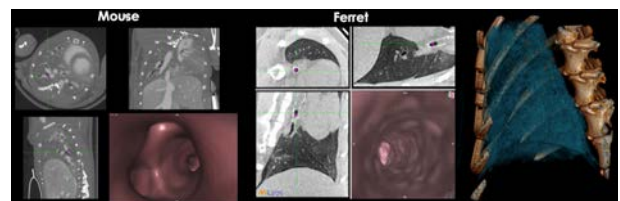
Unrivaled *in vivo* dose efficiency



By combining cutting-edge CMOS technology with a thick scintillation layer and on-the-fly readout with a totally autonomous gantry, U-CT sets new low-dose benchmarks without compromising image quality.

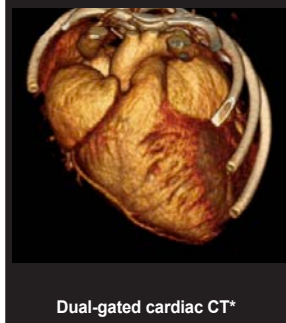
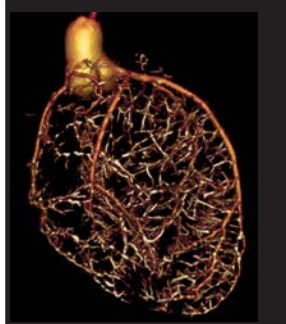
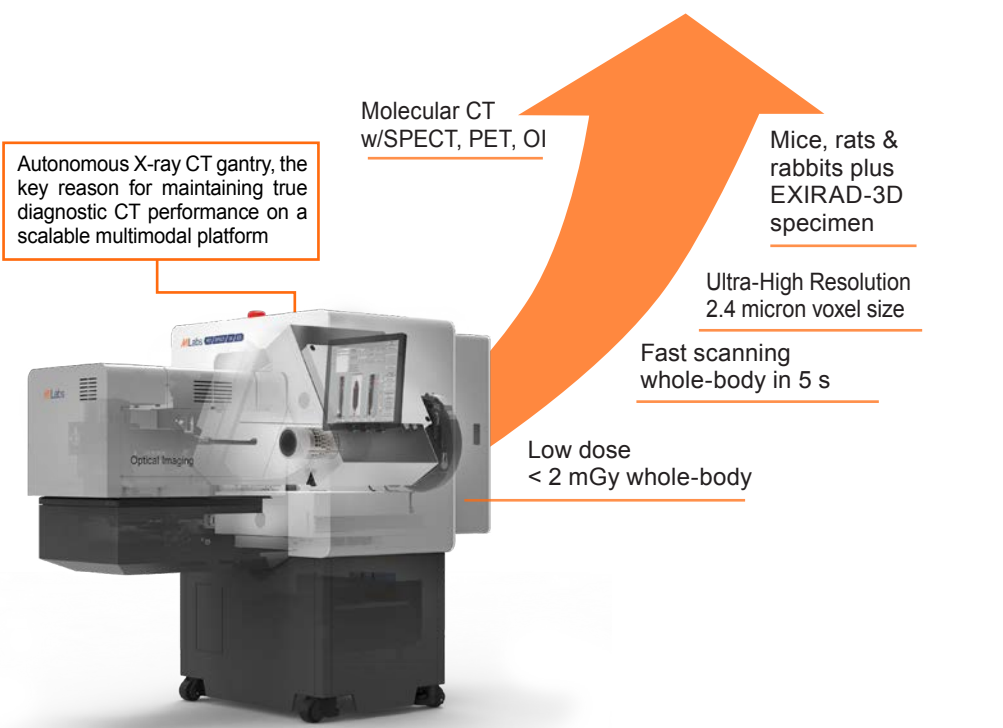
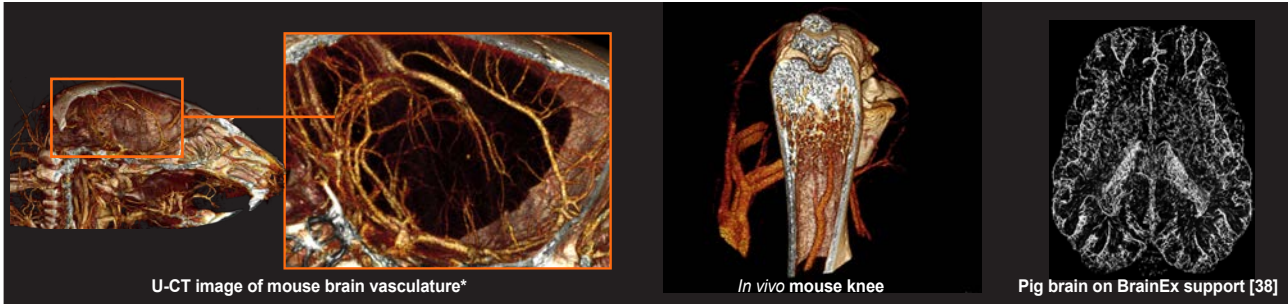
From specimen to larger animals

MILab's U-CT is a true multispecies microCT system capable of imaging *ex vivo* specimen as well as a range of *in vivo* animals. The FOV is large enough to image entire mice, rats and optionally, ferrets and rabbits.



Virtual lung endoscopy from mouse to ferret.

MILabs' U-CT system will adapt to your applications so you don't have to adapt your research. Why invest in multiple systems for speed and resolution, for *in vivo* and *ex vivo* applications, or for molecular CT with SPECT, PET or OI, if you can start your research with a single U-CT today and expand by adding modalities over time?



"MILabs new ultra-high resolution *in vivo* Molecular CT system enables our laboratory to advance our effort on targeted molecular imaging and the development of non-invasive nuclear imaging strategies to study the biological processes (i.e. inflammation, angiogenesis, arteriogenesis) associated with atherosclerosis, peripheral artery disease, ischemic heart disease, and post-infarct remodeling." [40]

Prof. Albert Sinusas, MD, Director Cardiovascular Imaging and Director of the Translational Research Imaging Center at Yale University, New Haven, USA

36 Oral contrast enhances the SPECT/CT resolution of in-life NIS reporter gene imaging, L. Suksanpaisan et al, Cancer Gene Therapy, 2013
 37 Courtesy of Dr. Sean Smart and Dr. Veerle Kersemans, CRUK/MRC Oxford Institute for Radiation Oncology, University of Oxford
 38 Restoration of brain circulation and cellular functions hours post-mortem, Z. Vrselja et al., Nature, April 2019
 39 Samples courtesy of Prof. A.J. Sinusas, MD and Zhenwu Zhuang, MD, MS, Yale School of Medicine, USA
 40 Yale imaging Center: <https://www.milabs.com/yale-translational-research-imaging-center-acquires-milabs-integrated-spectct-system/>

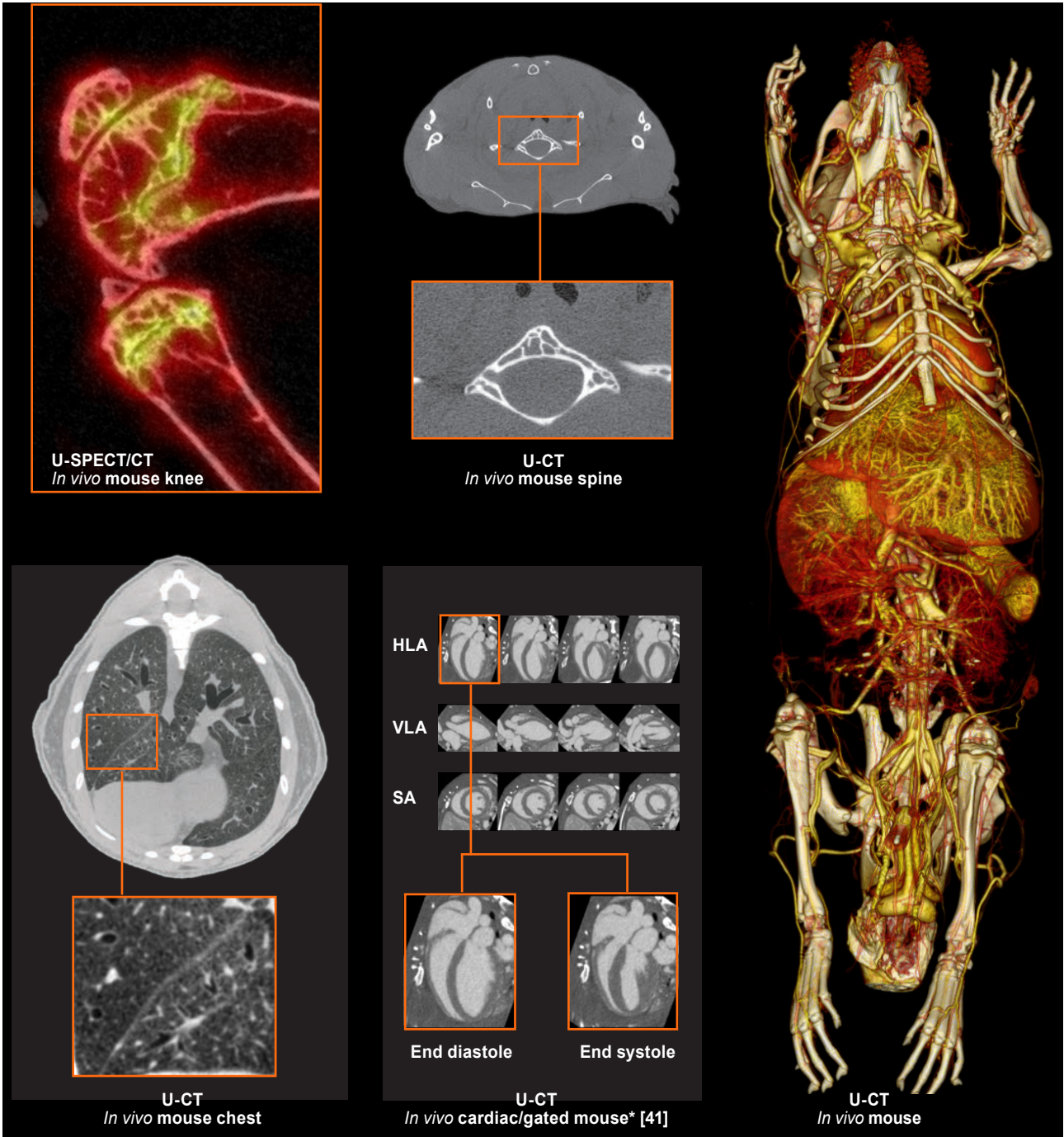
CT

U-CT: X-ray CT Beyond the Application Capabilities of Other Preclinical CT Systems

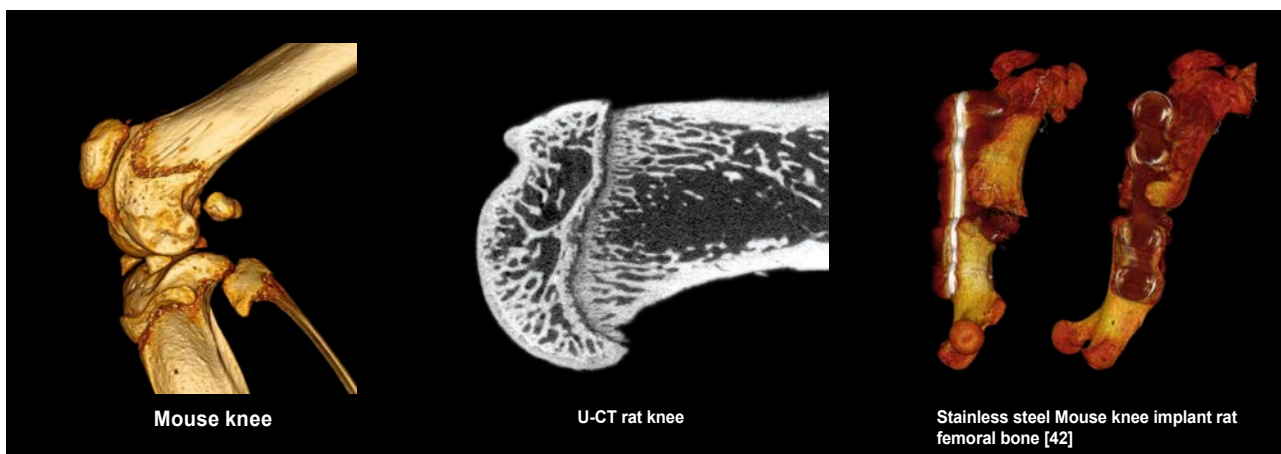
Best resolution, highest speed, and lowest dose for *in vivo* imaging, plus scaleable to image small specimen as well as larger animals including rabbits. In addition, upgradable with in-line OI and/or PET and SPECT plus the unique ability to handle DCE-CT and attenuation-corrected PET/CT and SPECT/CT, including gated multi-modality acquisitions.

The system allows for dual-gated cardiac- and respiratory imaging for freeze-frame acquisitions and features sensor-free respiratory gating for imaging up to four mice simultaneously. An on-screen radiation dose estimator and dual-energy acquisitions add to U-CT's flexibility so that you can fully tailor its capabilities to your research needs.


CT



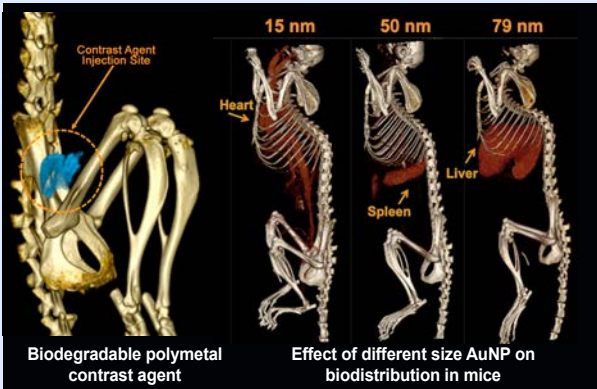
MILabs' images are fully compatible with existing image processing software based on international image format standards and work seamlessly with post-processing image analysis software packages such as PMOD, ImaLytics Pre-clinical, VivoQuant, Amira, ImageJ, and OsiriX. *In vivo* images acquired by U-CT can be analyzed and quantified in high detail using the user's favored software.



CT



"By encapsulating small core nanoparticles made of three different elements (gold, cerium and tantalum) in PCPP polymer, we developed biodegradable nanoparticles that can generate high CT contrast at various tube voltage settings used in the MILabs microCT [43]. Moreover, we were able to investigate the effect of AuNP with sizes from 4 to 152 nm on in vivo CT contrast at several timepoints via imaging mice and study biodistributions" [44].



Biodegradable polymetal contrast agent

Effect of different size AuNP on biodistribution in mice

Prof. David Cormode, PhD, Department of Radiology, Hospital of the **University of Pennsylvania**, Philadelphia, USA

X-Ray CT system/module	Standard	HR	UHR	XUHR
Smallest isotropic voxel size	30 μm	10 μm	4 μm	2.4 μm
Focal spot size	25 μm	25 μm	7 μm	7 μm
Total body mouse scanning time	5 s	5 s	5 s	5 s
Total body mouse dose	< 5 mGy	< 5 mGy	< 2 mGy	< 2 mGy
Maximum field of view (FOV)	\varnothing 75 mm	\varnothing 75 mm	\varnothing 75 mm	\varnothing 75 mm
Focused scanning		✓	✓	✓
Focused scanning in <i>ex vivo</i> specimen holder				✓
Circular and helical scanning	✓	✓	✓	✓
Mouse	✓	✓	✓	✓
Rat	✓	✓	✓	✓
Medium sized animal (FOV \varnothing 130 mm)	Optional	Optional	Optional	Optional
Dual-energy CT	Optional	Optional	Optional	Optional
Dynamic (multi-frame) imaging	Optional	Optional	Optional	Optional
Respiratory and cardiac gating	Optional	Optional	Optional	Optional

41 Sample courtesy of Prof. A.J. Sinusas, MD and Zhenwu Zhuang, MD, MS, Yale School of Medicine, USA
 42 Samples courtesy of Prof. R. Jayakumar, Amrita Center for Nanosciences and Molecular Medicine, India
 43 Radioprotective garment-inspired biodegradable polymetal nanoparticles for enhanced CT contrast production, D. Cormode et al., Chemistry of Materials, December 2019
 44 Effect of Gold Nanoparticle Size on Their Properties as Contrast Agents for Computed Tomography, D. Cormode et al., Nature Research Scientific Reports, October 2019

E-Class Entry Level Systems

Nuclear detectors designed for cost-efficiency without multi-modal compromises



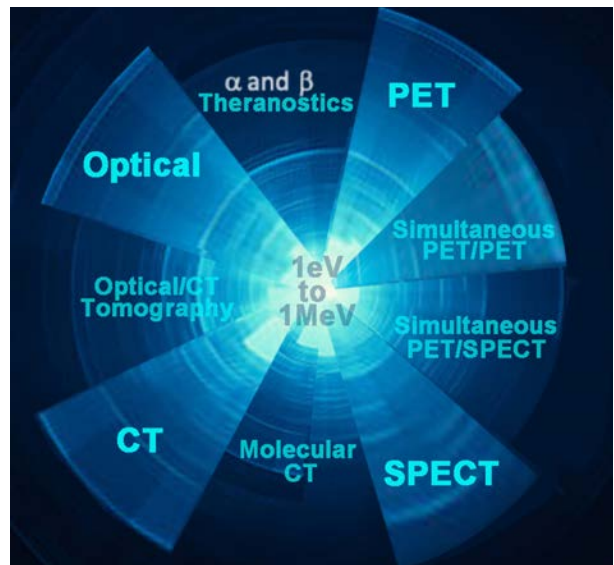
Economic stand-alone or integrated systems

No matter what modality, PET, SPECT, Optical or CT, your MILabs E-Class imaging system will keep entry and operating costs low and image quality high.



By reducing the detector surface area by approx. 30%, MILabs has succeeded in developing preclinical nuclear imaging systems at much reduced cost, with little performance compromises [45]. The slightly reduced PET and SPECT sensitivity compared to the standard U-SPECT or VECTor systems can easily be compensated for by a somewhat longer acquisition time or/and little more activity. The resolution remains unchanged.

Based on the only technology that exploits multimodality synergies



True translational image resolutions

"If we expect to see structures in a mouse that we are used to see in human imaging, we need to achieve comparable anatomical and functional resolution. Today, this resolution can only be achieved with a MILabs E-Class U-SPECT/CT system".



Prof. M. Inubushi, PhD, **Kawasaki Medical University**, Okayama, Japan

Using its award-winning 1eV to 1MeV broadband photon detection technology (WMIC 2018 Commercial Innovation of the Year), MILabs' E-Class can also exploit multimodality synergies:

- Simultaneous PET/PET of two co-injected PET tracers
- Simultaneous PET/SPECT of co-injected tracers
- Alpha and beta emission theranostics
- CT-guided fluorescence and bioluminescence tomography
- Molecular CT imaging with nuclear and optical probes

45 Performance evaluation of U-SPECT E-Class: multi-pinhole imaging with 2 stationary detectors, J. Hoffmann et al., Poster #805 European Molecular Imaging Meeting 2020

Animal Handling

Dedicated animal cells and monitoring systems

Animal beds and cells

MILabs' transparent animal imaging beds can be easily converted to closed imaging U-cells for pathogen-free imaging. They are equipped with anesthesia cones and heater pads for optimal animal comfort. The beds can easily be mounted onto, and removed from, MILabs' systems and also facilitate smooth transfer to other modalities such as MRI. The beds allow for open access to the animal during acquisition or can be closed. There is continuous visual monitoring of the animal by optical cameras. Custom beds are available upon request.

Anesthesia

Animals can be anesthetized with an optional gas anesthesia system with built-in vaporizer and flow meter. Precise automatic control of anesthetic and air minimizes anesthetic consumption.

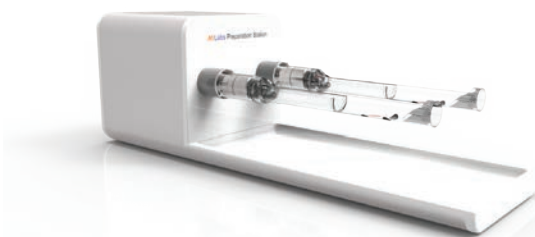


Gating, heating and monitoring

An integrated system is available for animal monitoring, automatic animal temperature regulation, and multiple physiological event triggering. This enables flexible triggering, e.g. combined respiratory and cardiac gating.



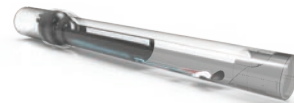
Docking station



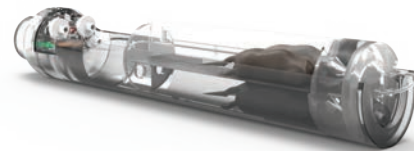
Animals can easily be positioned, injected and prepared using movable docking stations. These can be used either on the bench or inside a fume-hood.



Mouse bed optimized for comfort, reproducibility, and reliability.



U-cell providing closed environment, suited for immuno-compromised or contagious mice.



Multi-mouse bed, for scanning 2, 3 or 4 animals simultaneously.



Rat bed with anesthesia nose cone, heating and gating connections.



Ferret bed with anesthesia nose cone, heating and gating connections.



Medium size animal bed for animals up to 5 kg.

Plate/slide holder

Multi-mouse holders



Holder for stand-alone OI and hybrid OI/CT.



Animal holders for hybrid FLT/CT and BLT/CT imaging.

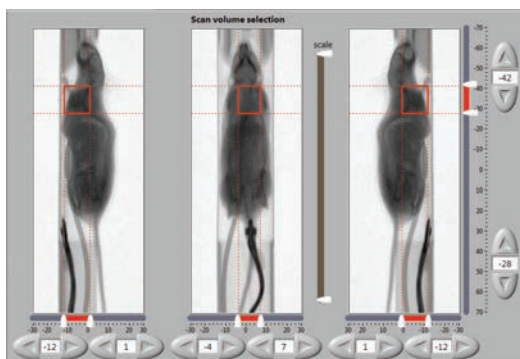
Fully Integrated Software Platform

Image acquisition and reconstruction

MILabs' systems are provided with advanced proprietary acquisition, reconstruction, fusion, and analysis software. The software is intuitive and extremely user-friendly, so imaging with MILabs's systems can typically be mastered by a technician or a student in a single day.

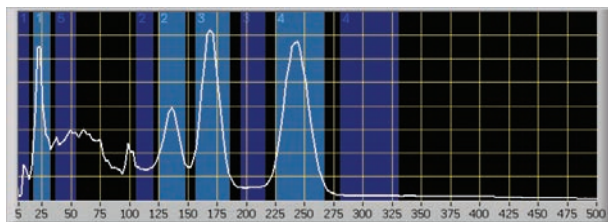
GUI-based acquisition set-up

The patented acquisition graphical user interface (GUI) is displayed on a touch screen. Unique interactive sliders enable easy and accurate selection of the field-of-view in three orthogonal directions. The scan volume is selected from either three X-ray or optical camera views and helps improve signal strength from the tissues of interest [46].



Field-of-view selection from total body and organs using optical and/or X-ray CT images exploits MILabs' fast-focused 3D acquisition [47].

True List Mode image acquisitions

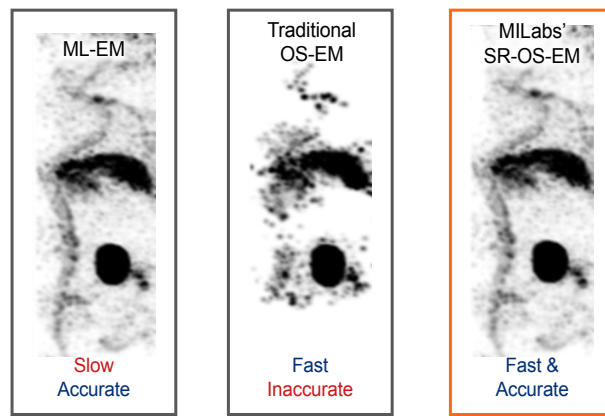


True List Mode (TLM) acquisitions facilitate quantitative multi-isotope imaging with a virtually unlimited number of energy windows. With the VECTor²CT, a PET isotope can easily be imaged simultaneously with a combination of several different SPECT isotopes. Furthermore, with TLM, background windows can be defined retrospectively to accurately correct for scatter and spill-over effects, and stored accumulated counts can be fractionated to study the effect on image quality, thus enabling dose planning without rescanning.



Reconstruction software

Novel reconstruction algorithms such as model based MLEM, OS-EM, Pixel-based OS-EM (P-OS-EM) [47] or statistically regulated OS-EM (SR-OS-EM) are used for SPECT and PET reconstruction. These reconstruction algorithms are up to 30 times faster than traditional OS-EM while accuracy is improved [48].



MILabs' SR-OS-EM [39] provides fast high-fidelity image reconstructions

46 Targeted Multi-pinhole SPECT. W. Branderhorst, B., et al., Eur. J. Nucl. Med. Mol. Imaging, 2011
47 Pixel-based Subsets for Rapid Multi-pinhole SPECT Reconstruction. W. Branderhorst, et al., Phys. Med. Biol., 2010
48 Similarity-regulation of OS-EM for accelerated SPECT reconstruction P. Vaissier, et al., Phys. Med. Biol. 2016

Visualization, analysis and storage

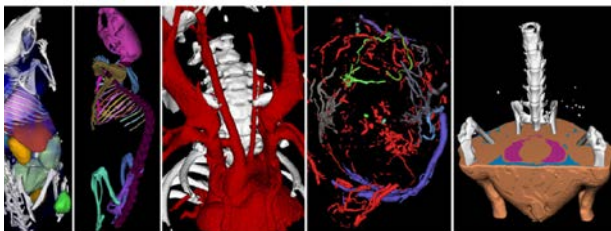


An enterprise-wide license for the visualization and analysis software platform comes with every system installation. Image data storage and handling are in full accordance with the latest DICOM standard. Other data formats include BMP, TIFF, JPG, AVI, and NIfTI which facilitates import into image analysis software packages.

Examples of compatible analysis and post-processing software

MILabs multi-modal preclinical systems are compatible with a wide variety of image visualization, analysis and post-processing software packages, such as Imalytics Preclinical, PMOD, InviCRO-VivoQuant, Amira, OsiriX, ImageJ and BoneJ. These image processing software packages combine fundamental viewing functionality with power analysis tools for the different modalities.

Imalytics Preclinical



An illustration of the image segmentation and power analysis tools of Imalytics Preclinical [49]. From left to right: biodistribution, bone segmentation, vessel segmentation, tumor vascularity, and fat segmentation.

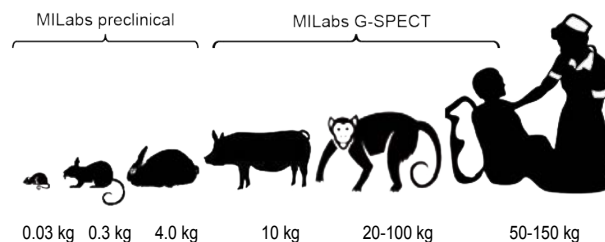


Clinical G-SPECT* for Large Animals

Gyro-free SPECT; from mouse to man



MILabs offers gyro-free SPECT for any size animal

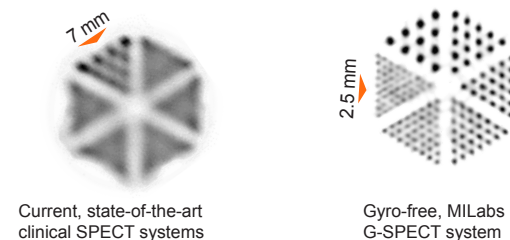


The award-winning large animal G-SPECT's design is based on the same proven gyro-free technology used in U-SPECT⁷. The result is a robust, fast, and cost-effective solution with unprecedented image quality for scanning large animals and humans.

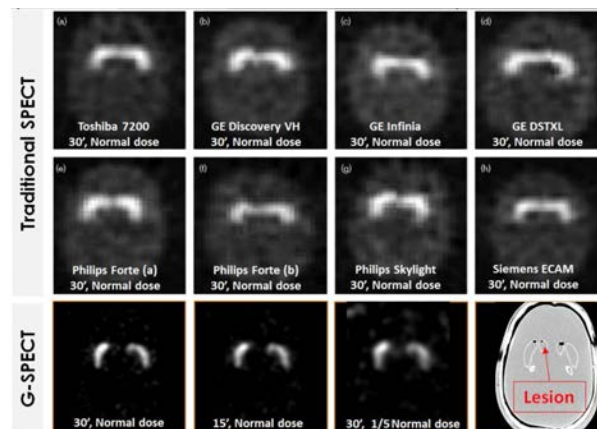
Unmatched SPECT performance

- Stunning image quality: with a ten-fold volumetric resolution improvement over current state-of-the-art large animal and clinical SPECT [50], G-SPECT outperforms dedicated PET systems for organ-specific imaging
- Adaptive SPECT: user-exchangeable collimators allow for adaptation of resolution to any animal size to facilitate translation from mouse to large animal to humans without any information loss
- Slash costs: thanks to the breakthrough full-ring, gyro-free, detector technology, G-SPECT can cut down tracer dose with a factor of ten without affecting image quality
- Extra insight with dynamic SPECT: the high sensitivity of G-SPECT and the absence of detector rotation, enables a truly dynamic determination of tracer uptake
- Reliable and stable: no wear-and-tear from rotating detectors and no instability or calibration problems caused by positioning inaccuracies
- List-mode acquisitions: eliminate rescans caused by movement by retrospectively deleting the list data portion subject to motion

Clearer images at reduced doses



Comparison G-SPECT w/ Traditional SPECT (Alderson Brain Phantom)



G-SPECT's image quality improvement with the Alderson brain phantom for DaTScans from different cameras [51]

50 G-SPECT: a full ring high sensitivity and ultra-fast clinical molecular imaging system with < 3 mm resolution. F. Beekman et al. Eur J Nucl Med Mol Imaging 2015

51 Adapted from "Variation of DaTSCAN Quantification Between Different Gamma Camera Types", R.J. Morton et al. Nucl. Med. Commun. 2005

* Clinical availability depends on final local registrations, including FDA and CE clearance.

Selected Global Installations



Customer Care and Applications Training Worldwide

MILabs is privileged to have a fast-growing base of premier research institutions and companies among its customer base. Manufactured in an ISO-certified facility, its preclinical imaging products are installed and maintained globally by a dedicated service and support organization. Devoid of heavy rotating gantries, its PET, SPECT, Optical and CT systems benefit from the longest time-between-failures and require minimal recalibration.

Adaptability to our clients preclinical imaging needs and customer service are at the core of our culture.

This starts by maximizing the potential of your MILabs' device with our Basic and Advanced User Training. Our Application Scientists will show the new and experienced members of your research group how to produce sharper images, obtain enhanced quantitative results and take advantage of the latest imaging methods and technologies.

Advanced User Trainings can be personalized and include objectives such as optimizing image resolution, increase reproducibility, perform dynamic imaging, improve scan planning and software upgrade guidance.

We Appreciate Industry and Scientific Awards...

MILabs' groundbreaking imaging platforms have received several international industrial innovation and scientific awards, e.g. from Frost & Sullivan, the Society of Nuclear Medicine and the World Molecular Imaging Society. Each year MILabs significantly invests in new technologies such as software and hardware upgrades to ensure that MILabs' customers can continuously expand their cutting edge research.



Frost & Sullivan: Medical Innovation Product Award



Dutch Science Foundation: Physics Valorization Prize 2013



Society of Nuclear Medicine: Animal Image of the Year



World Molecular Imaging Society



Soc. Nucl. Med. & Mol. Im.: Hoffman Memorial Award 2017



World Molecular Imaging Society

... but Value Customer Partnerships Most

MILabs is committed to supporting the scientific and medical community by providing the best possible imaging solutions on the market. MILabs is proud that world-leading academic partners have chosen MILabs' systems. MILabs collaborates with many institutes worldwide through joint grant applications, sharing of expertise, organizing workshops and developing customized imaging solutions with a single goal in mind: to facilitate and perform the best research in diagnostics and theranostics.