


The Current Status and Future Horizon of NM/PET Instrumentation Development in Iran

The 25th International Iranian Congress of Nuclear Medicine

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Head of Research Center for Molecular and Cellular Imaging
Institute for Advanced Medical Technologies

Senior Researcher, Division of Nuclear Medicine, Geneva University Hospital, Geneva, Switzerland

Director of TUMS Preclinical Imaging Core Facility (TPCF)




MISG Laboratories in 2005:

Prof. Habib Zaidi

Division of Nuclear Medicine,
Geneva University Hospital

Prof. Arman Rahmim

Department of Radiology,
John Hopkins University

Prof. Hamid Sabet

Center for Advanced Medical Imaging Sciences,
Harvard Medical School,

- **Image Correction and Quantification Lab**
- **Simulation and Modelling Lab**
- **Molecular Imaging Instrumentation Lab**

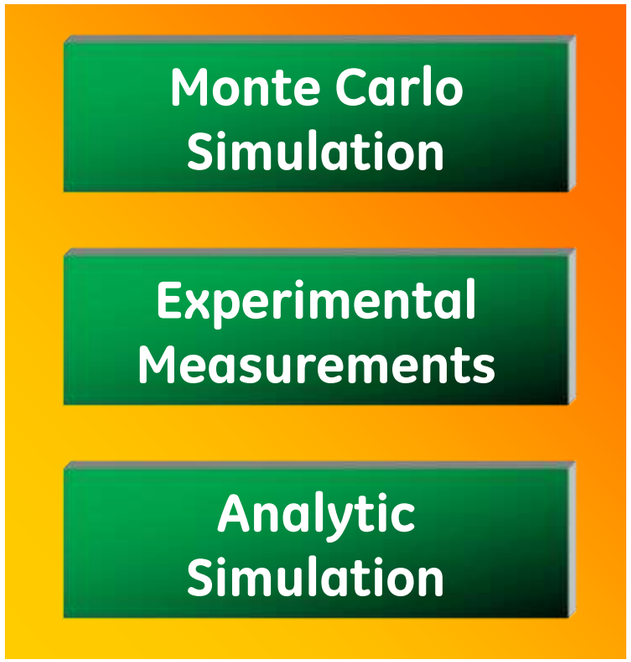
Research Area

Hybrid Imaging: PET/CT, PET/MRI, SPECT/CT
Artifact Reduction, Reconstruction, Quantification, Optimization, Modeling

Preclinical Imaging: PET, CT, SPECT
Design, Modeling, Optimization, Reconstruction, Artifact Reduction

Design and Development of Imaging Systems
Electronic Design, Software Development, Calibration

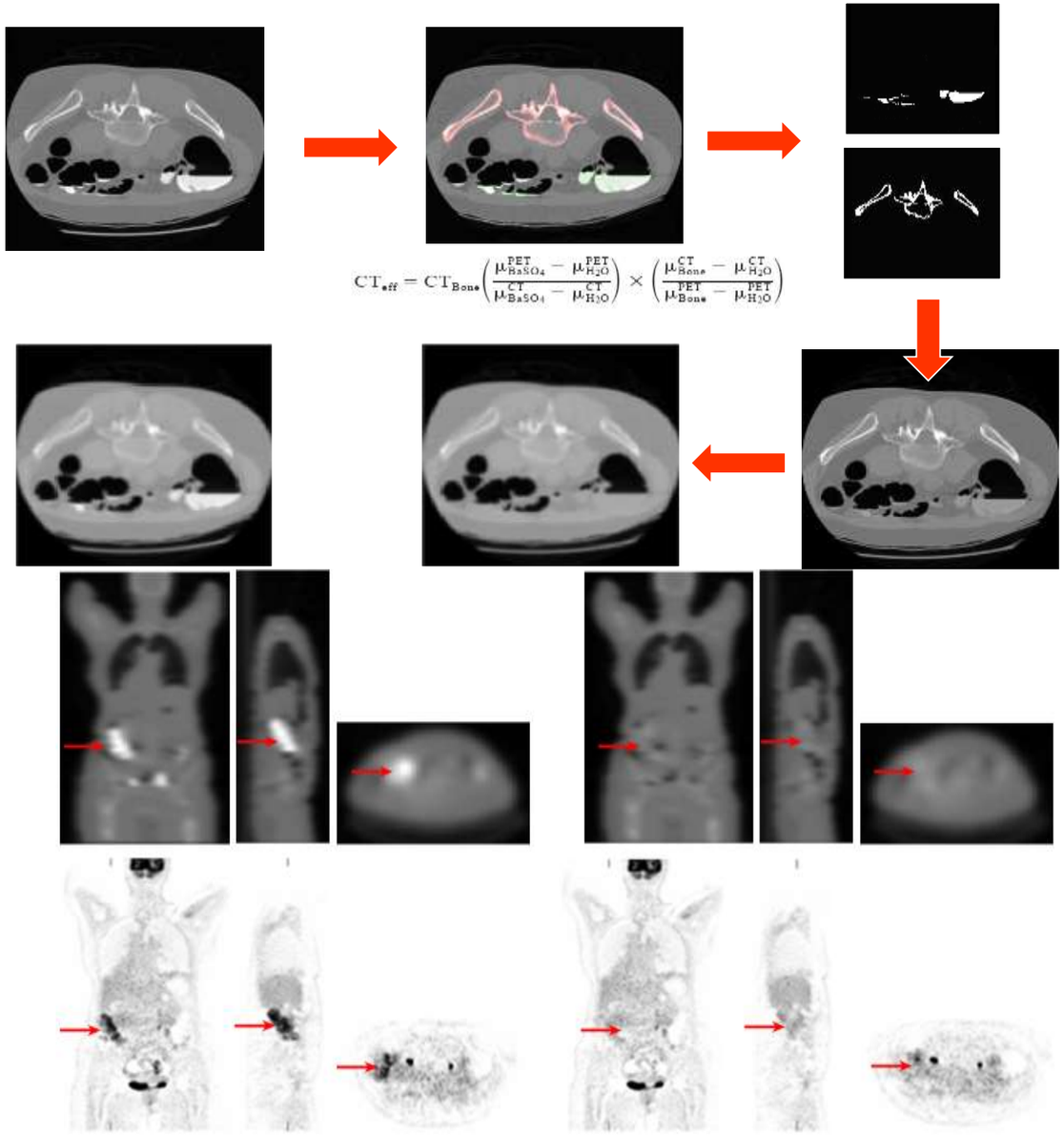
Method



Projects

Design and Implementation of a GUI for Automatic Segmentation of oral Contrast Agent in CT Images: Application in Correction of Oral Contrast Artifacts in CT-Based Attenuation Correction in PET

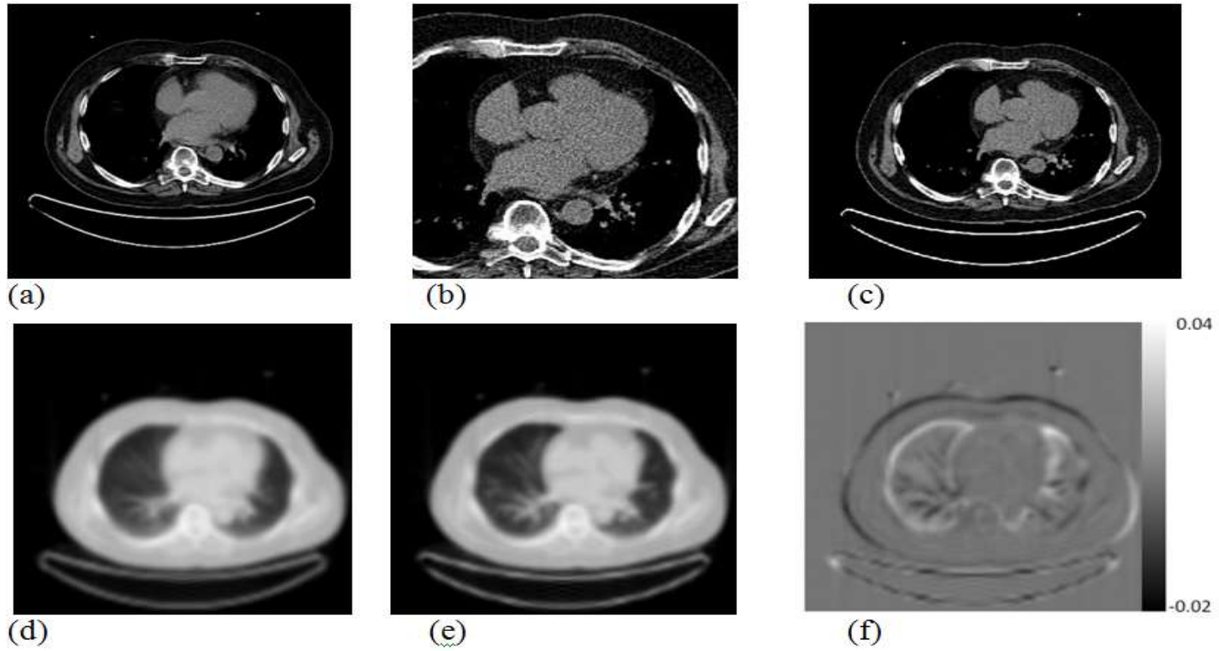
In this study, we developed an automated segmentation algorithm for classification of regions containing oral contrast medium in order to correct for artefacts in CT attenuation-corrected PET images using the segmented contrast correction (SCC) algorithm

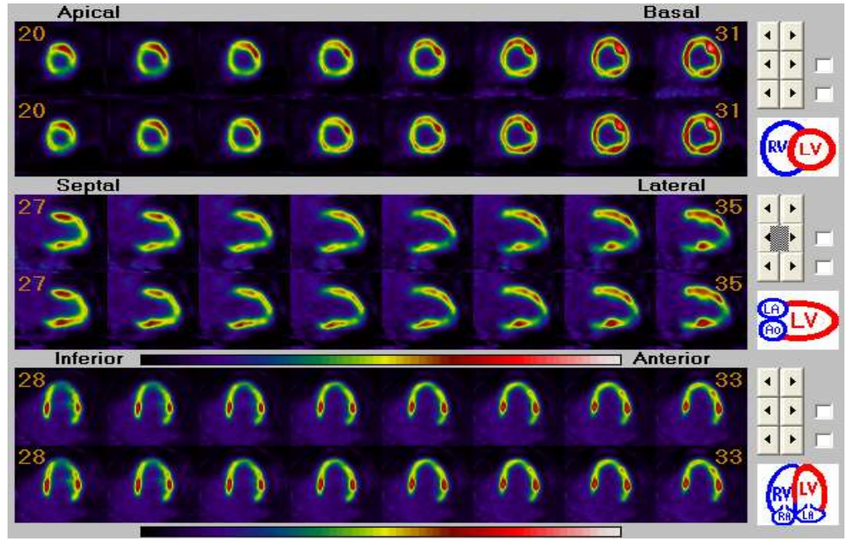


Projects

Coronary Calcium Score Scan-Based Attenuation Correction in Cardiovascular PET Imaging

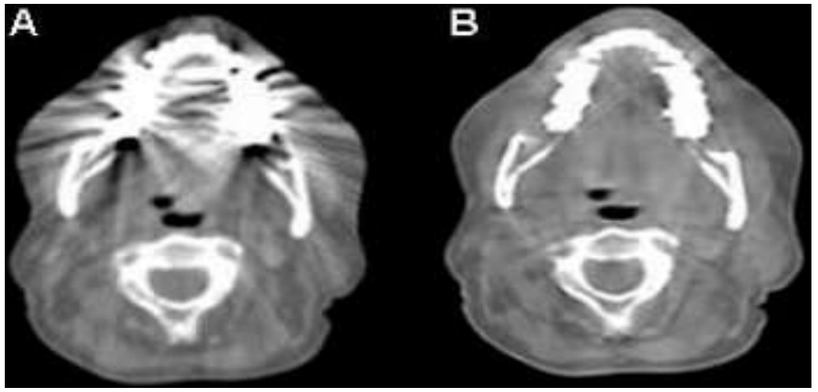
The aim of this study is to evaluate the possibility of using CaScCT images for AC of myocardial rest/stress/viability PET data with the aim of reducing patient dose. Our preliminary results seem to suggest that the calcium score study could be used for attenuation correction of cardiac PET images, thus allowing the elimination of CTAC in viability and stress perfusion studies and as such reduce patient dose.



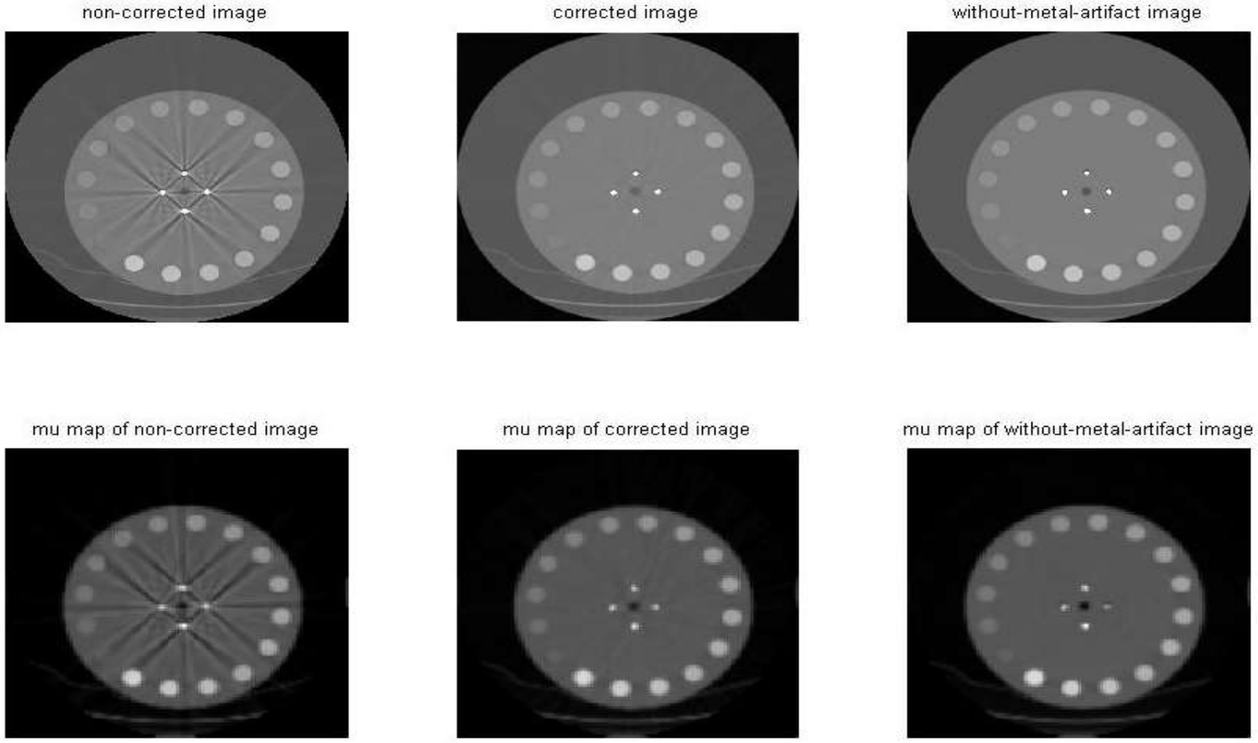


Projects

Reduction of Dental Filling Artifact in CT-Based Attenuation Correction in Hybrid PET/CT Imaging

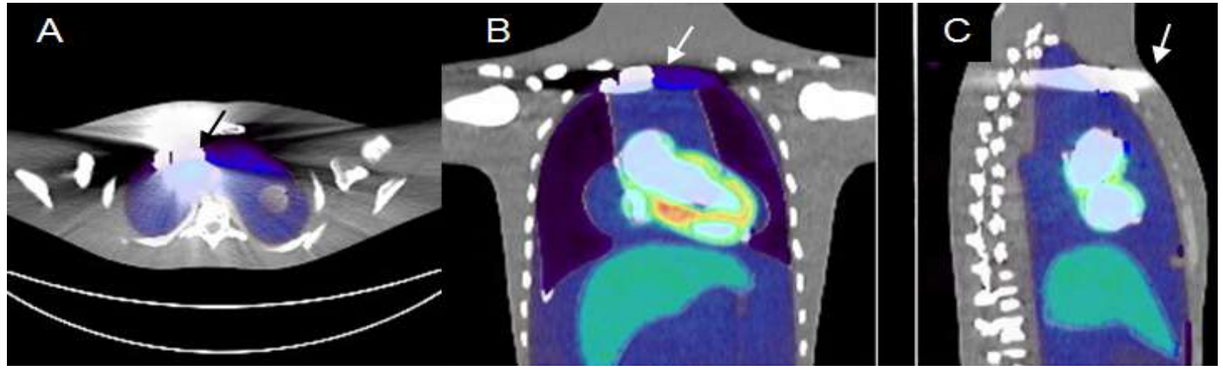


The purpose of this work is to develop a fast approach for reduction of dental filling artefacts in the generated μmap. Currently available metal artefact reduction (MAR) algorithms are based on correction of raw data sinograms which are huge files usually stored in proprietary format not generally disclosed by manufacturers and thus are not straightforward to handle and manipulate.



Projects

Quantification of Metallic Artefacts Arising from Implantable Cardiac Pacing Devices in Oncological PET/CT Studies: A Phantom Study

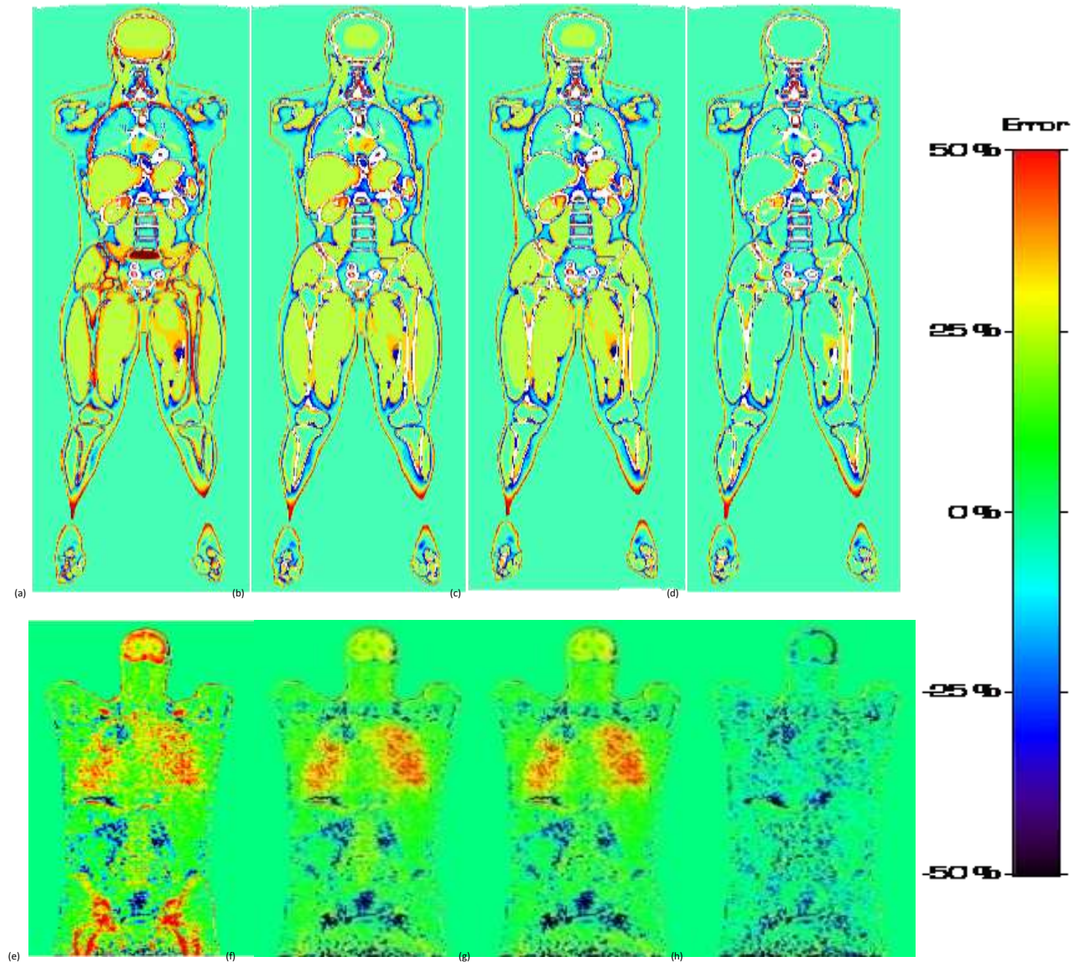


In this study, we evaluated the magnitude of metallic artefacts caused by various implantable cardiac pacing devices (without leads) on both attenuation maps (*μ*-maps) and PET images using experimental phantom studies. We also assessed the efficacy of a metal artefact reduction (MAR) algorithm along with the severity of artefacts in the presence of misalignment between *μ*-maps and PET images. Our study demonstrated that as the battery composition of pacemakers and defibrillators moves toward low atomic-number elements, particularly in newly introduced batteries, the severity of the induced artefacts is reduced. It was found that the MAR algorithm is not successful in reducing metallic artefacts arising from cardiac pacing devices in underestimated regions whereas misalignments between PET and CT images result in more severe metal-related pseudo-uptake.

Projects

Impact of Tissue Classification on The Accuracy of MR-based Attenuation Correction in PET/MRI

In this study, we investigate the effect of using various classification schemes on the accuracy of MRI-based attenuation correction in PET/MRI.
PET/MR and PET/CT are two bywords of multimodality imaging systems [1, 2]. The main challenge of quantitative PET imaging is photon attenuation. The mere solution is to find the attenuation map of the subject under study for the purpose of attenuation correction.
One of the well known strategies for generation of attenuation map at 511 keV from MR images is to use image segmentation to identify the organs, and then to assign attenuation coefficients to each individual organ [3]. This method is more general and not only is employed in MRI based attenuation correction techniques since some CT-based attenuation correction methods also take the advantage of tissue classification [4].



Company Profile (2009)

Parto Negar Persia Co.

Scope of Activities Based of ISO 13485:

Design, Manufacturing, Installation, Sales and After Sales Service of Nuclear Medicine and Imaging Instrumentation Including:

- Gamma Camera and SPECT
- PET
- Gamma Probe
- Intra Operation Gamma Camera
- Preclinical Imaging
- UBT
- Automatic Injection System

ISO 9001 CERTIFIED

ISO 13485 CERTIFIED

17 Years of Innovation Leadership in NM with PNP

Patents

US Patents

1. US Patent US 8,503,748 B2, 2013, "Non Linear Recursive Filter for Medical Image Processing"

2. US Patent, 2015, Application No. 62164584 " Cardiac SPECT Imaging Using Robotic ARM Movements",

3. US Patent, 2015, Application No. 62146350 "Desktop Open-Gantry SPECT Imaging System Using Tilted Detector",

4. US Patent, 2016, "A Miniature Cardiac SPECT Scanner with Rotating Slat Collimator",

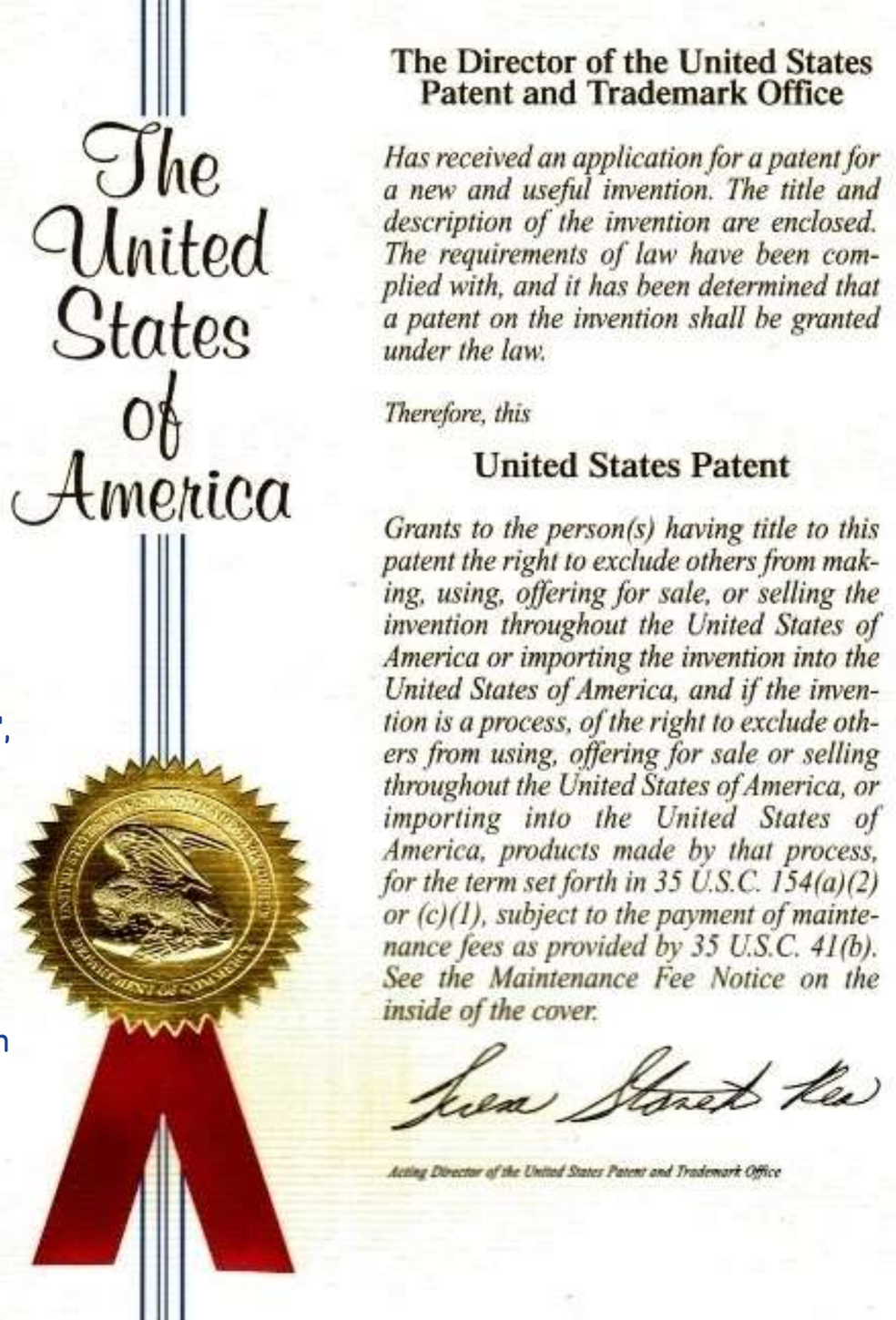
5. US Patent, 2016, "Positron-Freezing: An Application to Ultra-High Resolution PET Imaging",

6. US Patent, 2016, "Automatic 2D Peak Detection Algorithm for Positioning Calibration of Detector Block Images of PET System", Pending

7. US Patent, 2017, No. US 62/435,877 " A Novel Method for Reduction of Positron Range in High-Resolution PET Imaginer“

8. US Patent, 2018, No. US NA97034 " A Novel Approach for Component Based Normalization Model in PET Scanner with Partial Geometry “

9. US Patent, 2021, No. US 63/141988 " Novel Approach for Scan Time Reduction in medical Imaging by Reducing the Number of Projections“



Production Certificates from MOH

We got Several Production Licenses from medical equipment department of Iran MOH:

In order to get this license the flowing test should be done and also almost it takes 12 months:

1. IEC 60601-1-1:2005
2. IEC 60601-1-2:2005
3. IEC 60601-1-4:2005
4. EMC Compliance
5. Clinical Evaluation
6. NEMA Test

جمهوری اسلامی ایران
وزارت بهداشت، درمان و آموزش پزشکی

سازمان غذا و دارو
IFDA
اداره کل تجهیزات پزشکی

شماره پروانه : ۹۸۸۲۸۸۷۸
تاریخ صدور : ۱۳۹۶/۰۴/۲۱
تاریخ آخرین تغییر : ۱۴۰۳/۰۳/۰۶
تاریخ اعتبار : ۱۴۰۶/۰۳/۰۶
پیوست : ندارد

پروانه تولید وسیله پزشکی (سه ساله)

تولید کننده : توسعه صنایع تصویر برداری پرتو نگار پرشیا
شناسه ملی : ۱۰۳۲۰۲۶۵۳۵۱
نشانی : استان تهران - شهر قدس - کیلومتر ۱۹ جاده مخصوص، سه راه کاروانسرا سنگی، کوچه درخشان، پلاک ۱۵

نام وسیله : گاما پروب
گروه تخصصی : دستگاه‌های پزشکی هسته‌ای
مدل : SURGEOGUIDE II
نام تجاری : PNP
حیطه کاربرد : اسکن غدد لنفاوی حین عمل جراحی

سابقه مجوز : دارد

تعهدات و زمان اجرا : ارائه نتایج گزارش آزمون اختصاصیNEMA NU3در صورت معرفی آزمایشگاه همکار

تعهدات اجرا نشده :

تاییدیه CE :

در اجرای بند ۱۲ ماده ۱ قانون تشکیلات و وظایف وزارت بهداشت، درمان و آموزش پزشکی مصوب ۱۳۶۷/۰۳/۰۳ و تبصره ۲ ماده ۱۴ از قانون مربوط به مقررات امور پزشکی و دارویی و مواد خوردنی و آشامیدنی با اصلاحات والحاقات بعدی مصوب ۱۳۳۴/۰۳/۲۹ ، این پروانه صرفا برای وسیله ذکر شده و با موارد قید شده در پیوست آن(در صورت داشتن پیوست) صادر گردیده است.استفاده از وسیله مذکور با توجه به حیطه کاربرد آن و شرایط مندرج در این پروانه مجاز است.در صورت عدم انجام تعهدات به جهت حفظ سلامت جامعه، پروانه تمدید نخواهد شد

دکتر سعیدرضا شاهمرادی
مدیرکل تجهیزات پزشکی

IFDA

Parto Negar Persia Co.

SURGEOGUIDE II

Gamma Probe

The most common and most favorite device for surgeons providing an easy to use small hand held device for detecting and localizing sentinel lymph nodes

ISO 9001 CERTIFIED

ISO 13485 CERTIFIED

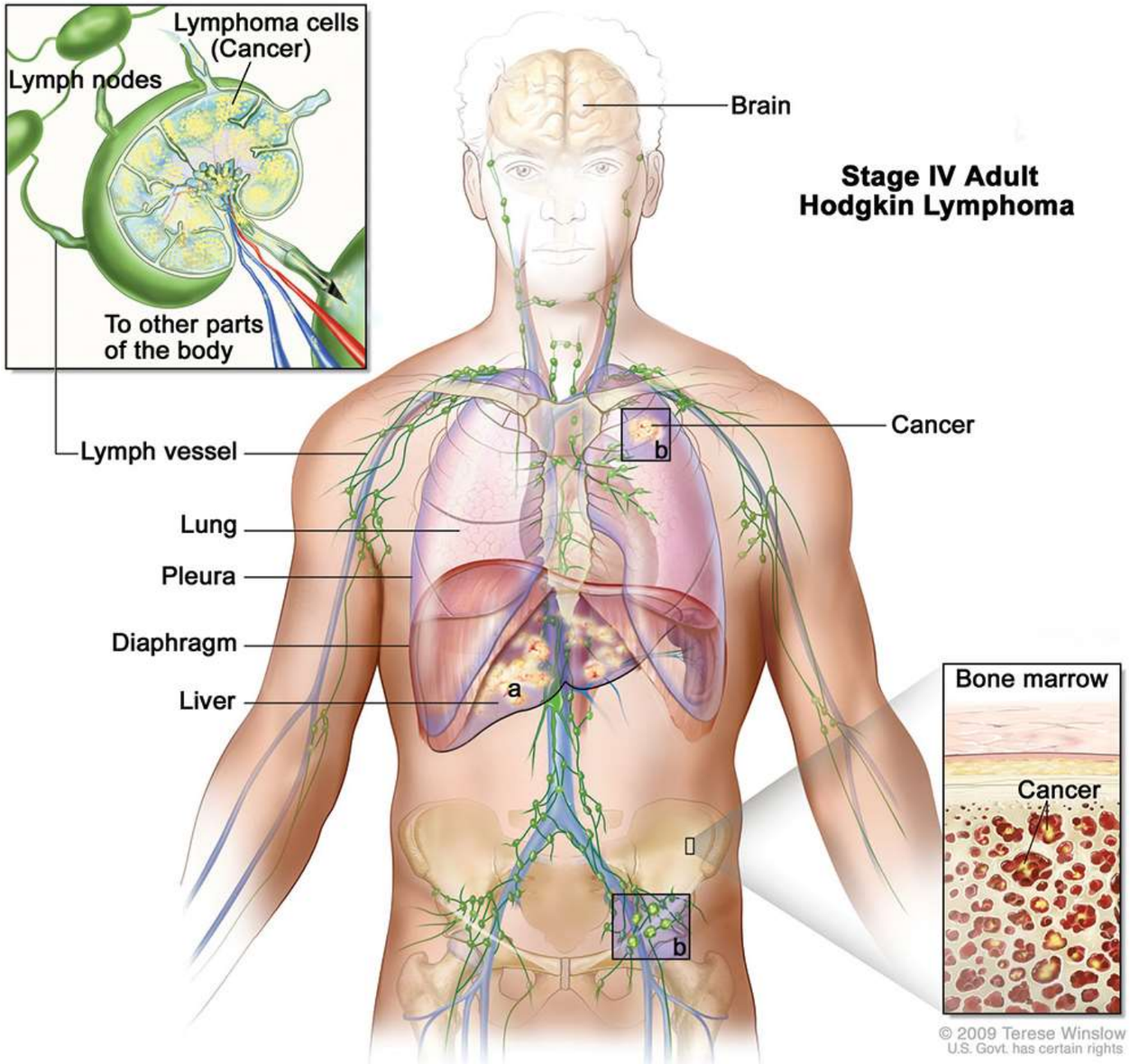
IEC 60601-1: 2005
IEC 60601-1-2: 2007

SurgeoGuide Applications

Parto Negar Persia Co.

Clinical Applications:

- Breast cancer
- Gynecological cancers (cervical, ovarian, uterine, vaginal and vulvar)
- Melanoma and other types of skin tumors
- Head & Neck
- Endocrine cancers (thyroid, parathyroid)
- Urology cancers (prostate, bladder, testicular, kidney and penile)
- Nuclear Medicine (localization of gamma labeled areas)



SurgeoGuide Specifications

Parto Negar Persia Co.

Specifications:

- Sensitivity: ~2 cps/MBq @ 3 cm
- Shielding Efficiency: 99.6 % for Tc-99m
- Energy Resolution: <11% FWHM for Tc-99m
- Three types of Probes: Large Tip, Small Tip, Endoscopic
- Length: 21 cm
- Tip Diameter: 16 mm(Large),11 mm (Small),10 mm (Endoscopic)
- Stainless Steel Body , Tungsten Collimator
- Angular Resolution: 30˚, 45˚, 95˚ (optional)
- Local Resolution: <40 mm FWHM at 5 cm distance(For Large Probe)
- User- Friendly Console
- Bright Display
- FM/Beep Sound
- Two Probes Simultaneously
- Light Weight Console
- Battery-powered (optional)

M. R. Ay, N. Zeraatkar, N. Gorjizadeh, S. Sajedi, H. Arabi, M. H. Farahani, B. Teimourian "SURGEOGUIDE: a Gamma Probe for Localization of Sentinel Lymph Nodes" ***European Association of Nuclear Medicine Annual Congress***, 19-23 October 2013, Lyon, France. Eur J Nucl Med Mol, Vol 20, Issue 2

Probe Technology

Ultra-low dark count rates of <100kHz/mm^2 typical
Exceptional breakdown voltage uniformity at ±250mV
>40% PDE at 420nm and extended sensitivity to 300nm for improved UV sensitivity
250ps coincidence resolving time (FWHM) for LYSO scintillators
Ultra-fast rise times of 300ps with 600ps pulse width for improved multi-photon resolution capability
Temperature stability of 20mV/°C, negating the need for active voltage control

Parto Negar Persia Co.

GAMMAPEN

All in One Gamma Probe

User Friendly Pocket Gamma Probe

ISO 9001 CERTIFIED

ISO 13485 CERTIFIED

Gamma Pen

Parto Negar Persia Co.

GammaPen Specifications:

- Length: 22cm
- Two type of tips: Small and large
- Tip Diameter: 14 mm (Large), 11 mm (Small)
- Tungsten Collimator
- Crystal: CsI (Tl)
- Weight: 170 gr
- Adequate dimension
- No disturbing cables
- Rechargeable battery
- Bluetooth connection support
- User- Friendly
- Digital display.
- Beep sound modulated with count rate
- Vibration alarm

Clinical applications:

- Breast cancer
- Gynecological cancers (cervical, ovarian, uterine, vaginal and vulvar)
- Melanoma and other types of skin tumors
- Head & Neck
- Endocrine cancers (thyroid, parathyroid)
- Urology cancers (prostate, bladder, testicular, kidney and penile)
- Nuclear Medicine (localization of gamma labeled areas)

NEMA-NU3 standard test results:

- Sensitivity: ~2000 cps/MBq at 3 cm
- Shielding Efficiency: >99 % for Tc-99m
- Energy Resolution: <11% FWHM for Tc-99m
- Angular Resolution: between 65° to 85°
- Local Resolution: <55 mm FWHM at 3 cm distance

Dr. Ramin Sadeghi
Nuclear Medicine Specialist

Over the years, I have conducted extensive research on the application of radiosurgery techniques and the SURGEOGUIDE II device for sentinel lymph nodes in various cancers such as pancreas, prostate, ovary, bladder, and more. My work has resulted in numerous publications in this area.

Dr. Azam Salati
Breast Surgeon

I have been using the GammaProbe manufactured by Parto Negar Persia for breast surgeries for 4 to 5 years, and I am satisfied with its performance.

Dr. Hengameh Saravani
General Surgeon

I have been using the GammaProbe manufactured by Parto Negar Persia for three years. The device is extremely user-friendly and significantly enhances the quality of treatment.

Dr. Baharak Shahin
Breast Surgery Fellowship

I use the GammaProbe devices from Parto Negar Company at least 6-7 times a week for surgeries in the breast and axilla areas in hospitals in Ahvaz. The diagnostic accuracy of the device, especially within a short time after injection, is outstanding.

Dr. Reza Shojaeian
Specialist in Pediatric Surgery

For several years, I have used the GammaProbe device (SURGEOGUIDE II) with small probes to perform sentinel node biopsies in pediatric solid tumors. The device has consistently performed accurately and appropriately, and I have encountered no issues with its use. I am very pleased with the quality of this domestically produced device.

Dr. Leila Shekargozar
General Surgeon

I have been using the GammaProbe device made by Parto Negar Persia Company in Rasht for about a year. The device is excellent for sentinel lymph node detection and has high quality.

Dr. Nahid Nafisi
Breast Surgery Specialist

Every surgeon knows the indispensable role of a GammaProbe device in breast cancer surgery. Operating without it would be a disservice to women nationwide, and it is both an ethical and professional imperative for hospitals to have this equipment readily available.

Dr. Alireza Negahi
Cancer Surgeon

The SURGEOGUIDE II device is very easy to use, and its detection is accurate and reliable. Using this device in practical areas greatly aids in better diagnosis and more effective treatment. I am grateful to the designers and manufacturers.

Dr. Alireza Nemati
General Surgeon

I have utilized the GammaProbe device manufactured by Parto Negar Persia Company for surgical procedures in women's breast, abdominal, and genital areas for an extended period. The device's quality and precision are outstanding. Specifically, for women's surgeries, I suggest using the GammaPen model, which boasts an elegant design that enhances usability.

Dr. Marzieh Nouri Delui
General Surgeon

I have been using the GammaProbe manufactured by Parto Negar Persia for 8 to 9 years at Qaem Hospital in Mashhad. The diagnostic quality of this device, especially in breast surgeries, is excellent.

Dr. Bahram Pourseyedi
Specialist in General Surgery

A key advancement of the GammaProbe device (SURGEOGUIDE II) is its heightened sensitivity in detecting sentinel lymph nodes, particularly in cases of breast cancer and skin melanoma. This helps many patients avoid extensive regional lymph node dissection and its associated complications. I have used this device for many years and am very satisfied with its performance and the quality of service provided.

Dr. Homan Riazi
Breast Surgery Specialist

The GammaProbe device developed by Parto Negar Persia company is outstanding. During surgical procedures, it is difficult to distinguish its performance from that of internationally recognized devices. The GammaPen model, a new design iteration of this device, is tailored specifically for surgeons, making surgical tasks significantly easier by removing the need for consoles and tangled wires.

Dr. Kamran Mamaghani
Thoracic Surgeon

My colleagues and I have been using the GammaProbe device from Parto Negar Persia Company for sentinel node detection in the axillary area and other relevant regions since 2019. The diagnostic accuracy and performance of the device are entirely satisfactory and acceptable.

Dr. Azita Mazinani
General Surgeon

I have been using the GammaProbe at the Cancer Research Center for several years. I am thoroughly satisfied with its performance and extend my gratitude to the manufacturers.

Dr. Mostafa Mehrabi Bahar
General Surgeon

I have been using the GammaProbe manufactured by Parto Negar Persia in hospitals such as Arya, Omid, and Imam Reza in Mashhad for years to identify cancerous lymph nodes in the axillary region. I would like to express my gratitude to the manufacturers for the device's remarkable precision and excellent performance.

Dr. Marijeh Mirshahi
Breast Surgeon

I have been using the GammaProbe for the axillary region at Bint Al-Huda Hospital in Mashhad for about 5 years. I am completely satisfied with the device's accuracy and quality.

Dr. Hassan Moayeri
Cancer Surgery Fellowship

I have been using the GammaProbe device made by Parto Negar Persia Company for breast areas, melanoma, and lower limb melanoma for 6-7 years. The device is excellent and significantly aids in effective treatment.

Dr. Masoud Mohajer
General Surgeon

I have been using this device for about 2 years, particularly for breast surgery. The quality of the device is excellent, and it is extremely helpful for improved diagnosis.

Dr. Ali Jangjou
Specialist in Laparoscopic Surgery

Under my supervision at Imam Reza Hospital in Mashhad, both the SURGEOGUIDE II and GammaPen devices were clinically evaluated, demonstrating technical performance comparable to international standards.

Dr. Seyed Mohammad Reza-Javadi
Specialist in Breast Surgery

Having performed over two hundred sentinel lymph node surgeries with various brands, I can confidently assert that this device meets international quality standards. I hope that this innovative and advanced technique will soon be accessible to our dear compatriots across Iran.

Dr. Alireza Kabiri
General Surgeon

I have been using the SURGEOGUIDE II device at Golestan Hospital in Ahvaz for many years. The main use is for breast surgery, and on average, I perform 6-7 surgeries per week with this device. I am satisfied with its good performance and diagnostic capability.

Dr. Mohammad Hamid Karbasian
Surgeon and Specialist in Breast Diseases

The GammaProbe device (SURGEOGUIDE II), developed through domestic production and the advancement of local expertise, operates efficiently and reliably. Since acquiring it at Salamat Farda Hospital, we have encountered no issues. I extend my best wishes for health and success to all the engineering team and members of Parto Negar Persia Company.

Dr. Ahmed Kaviani
Specialist in Breast Surgery

I have utilized the GammaProbe device (SURGEOGUIDE II) made by Parto Negar Persia Company for sentinel lymph node surgery, and I am pleased with its performance.

Dr. Hamidreza Khorshidi
Specialist in Thoracic Surgery

The GammaProbe device from Parto Negar Persia company offers a precise view of the surgical site and is extremely valuable for both educational and therapeutic purposes. In the short time since its acquisition, I have performed four surgeries with it and am very satisfied with the results.

Dr. Saba Ebrahimian
Breast Surgery Fellowship

Since 2019, I have been using the GammaProbe device from Parto Negar Persia Company in all my surgeries and am fully satisfied with its performance and accuracy.

Dr. Mahdi Ghoncheh
Aesthetic, Plastic and Reconstructive surgeon

In collaboration with Dr. Forghani, I have been using the GammaProbe for surgeries in the groin and axillary regions in Mashhad for years. During all these years of use, we have encountered no issues and are completely satisfied with its performance.

Dr. Esmaeil Haj Nasrollah
General Surgeon

For years, I have been using the SURGEOGUIDE II device for breast surgery. The problem is that in public hospitals, patients come for treatment late, but in the early stages of the disease, using this device greatly helps in effective treatment.

Dr. Solmaz Hashemi
Specialist in Breast Surgery

Using a GammaProbe device during surgery is now widely recognized as essential. I have employed this device for detecting sentinel nodes in the axillary area for an extensive period, and the GammaProbe manufactured by Parto Negar Persia Company stands competitive with international standards.

Dr. Esmat al-Sadat Hashemi
Specialist in General Surgery

I find that the GammaProbe device from Parto Negar Persia company is as user-friendly as its foreign counterparts and excels in both accuracy and speed when identifying sentinel lymph nodes.

Dr. Hassan Hassan Zadeh-Baradaran
General Surgeon

For several years, I have been using the GammaProbe manufactured by Parto Negar Persia at Razavi and Nazaran Hospitals in Mashhad for sentinel lymph node and breast cancer surgeries. Throughout all these years, the device has never encountered any issues, and I am completely satisfied with its performance.

Dr. Mohammad Ismail Akbari
Specialist in Cancer Surgery

As an expert and instructor in cancer surgery, I have been engaged with the GammaProbe device (SURGEOGUIDE II) from Parto Negar Persia Company since day one. Having used it for over ten years now, I am fully satisfied with its performance.

Dr. Majid Akrami
Specialist in Cancer Surgery

The GammaProbe device (SURGEOGUIDE II) offers dependable efficiency and accuracy, marking a significant advancement in the use of nuclear medicine for breast cancer surgery in Iran. Over the past years, I have treated over a hundred patients with the GammaProbe from Parto Negar Persia company and have been thoroughly satisfied with its performance.

Dr. Nasrin Al-Sadat Alavi
General Surgeon

I used the device for 6 months at the Breast Cancer Surgery Center in Tehran, specifically for breast cancer procedures. Currently, due to migration, I am no longer using the device, but it was an excellent device.

Dr. Parisa Aziminejadan
Breast Surgery Fellowship

My colleagues and I at Asia Hospital have been using the SURGEOGUIDE II device for years. We perform many breast surgeries weekly and have never encountered any issues with the device. It is excellent.

Dr. Naser Basirnia
General Surgeon

I have been using the device for about two years. The quality of the device is very good and better compared to similar samples that I have been worked before.

Dr. Mania Beiranvand
Breast Surgeon

I primarily use the SURGEOGUIDE II device for breast surgery and occasionally for melanoma. The device is exceptionally excellent, and I plan to acquire the GammaPen device made by Parto Negar Persia Company. I am grateful to the company's engineers for creating such a high-quality device.

Parto Negar Persia Co.

HeliGuide

Urea Breath Test System

reliable, easy to use, painless,
non invasive, high speed and cost
effective test for detecting H.pylori

ISO 9001 CERTIFIED

ISO 13485 CERTIFIED

IEC 61010-1:2013
IEC 61326-1:2013

Parto Negar Persia Co.

Urea Breath Test

HELIGUIDE is a C14-Urea breath test system perfectly suited for primary diagnosis and for post treatment follow up of helicobacter pylori infection

CE

HeliGuide
Urea Breath Test System

Advantages of HeliGuide system

- Convenience – Easy to use, near patient testing no need to send sample for analysis
- Comfort – Painless, non-invasive gastroscopic tubing
- Speed – Samples are ready for analysis in only 10 minutes with test result available in 5 minutes

1. Swallow the capsule

2. After a 10-minute wait, breath into Breathcard

3. Insert Breathcard into HeliGuide analyzer

4. Result is available in a few minutes

Parto Negar Persia Co.

ProSPECT

Dual Head Dedicated Cardiac SPECT

A Professional Solution for Cardiac Imaging

IEC 60601-1-1:2005
IEC 60601-1-2:2007
IEC 60601-1-4:2000

Institute of Global Certification IIGC ISO 9001 CERTIFIED IAS ACCREDITED Management Systems Certification Body MSCB 105

Institute of Global Certification IIGC ISO 13485 CERTIFIED IAS ACCREDITED Management Systems Certification Body MSCB 105

Parto Negar Persia Co.

Handling patients of all sizes

Design for easy access of patient with any size (150 kg, 210 cm)

Providing a wide variety of SPECT scans

Possibility of SPECT scans in different modes including supine, prone, dextro-cardia, 180 degrees and 360 degrees arc.

Optimal Field of View

Optimizing FOV to minimize inappropriate activity uptake of other organs

Portable acquisition console

User-Friendly acquisition software with predefined acquisition protocols

Hand controller

Easy to control gantry operations and body contour learnings

ProSPECT

Optimal detector design for cardiology

Dual-detectors with fixed 90° angels and minimum dead zone

Designed with patient comfort in mind

Patient-friendly design specially patients with claustrophobia disorders

Light-weight collimators

Easy to change collimators manually.

Detector Technology:

The United States of America

US 20120027274A1

(19) **United States**

(12) **Patent Application Publication**

FARAHANI et al.

(10) **Pub. No.: US 2012/0027274 A1**

(43) **Pub. Date: Feb. 2, 2012**

(54) **NONLINEAR RECURSIVE FILTER FOR MEDICAL IMAGE PROCESSING**

(76) Inventors: **MOHAMMAD HOSSEIN FARAHANI**, Tehran (IR); **SALAR SAJEDI TOIGHOUN**, Tabriz (IR); **MOHAMMAD REZA AY**, Tehran (IR); **SAEED SARKAR**, Tehran (IR)

(21) Appl. No.: **13/196,664**

(22) Filed: **Aug. 2, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/369,840, filed on Aug. 2, 2010.

Publication Classification

(51) **Int. Cl.**
G06K 9/00 (2006.01)

(52) **U.S. Cl.** **382/128**

(57) **ABSTRACT**

A new system and method for medical image processing using a nonlinear recursive filter are disclosed. An input signal including two or more pulses received from a medical imaging system is sampled at a predetermined sampling rate. The maximum magnitude, i.e., peak, and/or the occurrence time of the maximum magnitude of the first pulse of the input signal is/are determined using a nonlinear recursive filter. Predicted magnitude values of the tail of the first pulse can be determined and subtracted from the input signal to correct for pileup before determining the maximum magnitude and/or occurrence time of the next pulses. A medical image can be reconstructed using the determined maximum magnitudes and/or the occurrence times of the maximum magnitudes of the pulses of the input signal. The nonlinear recursive filter can be implemented using one or more look-up tables.

Comparison Cardiac Scanner

Parto Negar Persia Co.

NEMA SPECSIFICATIONS	ProSPECT	C-Cam, Siemens	Cardio-C, Mediso	CardioMD, Philips	Ventri, GE
Intrinsic Spatial Resolution (FWHM in UFOV)	≤3.7mm	≤ 3.7 mm	2.9 mm	≤ 3.7 mm	3.7
Intrinsic Energy Resolution FWHM	≤ 9.3%	9.40%	9.70%	9.40%	≤ 10%
Intrinsic Flood Field Uniformity_Differential in UFOV	≤1.3%	≤ 1.5 %	≤ 2.4 %	≤ 1.5 %	≤ 1.5 %
Intrinsic Flood Field Uniformity_Integral in UFOV	≤2.4%	≤ 2.5 %	≤ 2.9 %	≤ 2.5 %	≤ 2.5 %
Intrinsic Spatial Linearity_Differential in UFOV	≤ 0.2mm	≤ 0.2 mm	≤ 0.2 mm	≤ 0.2 mm	≤ 0.2 mm
System Spatial Resolution at 10 cm (LEHR)	7.6 mm	7.6 mm	≤ 7.7 mm	≤ 7.7 mm	7.6 mm
System Spatial Resolution at 10 cm (LEAP)	9.8mm	9.6 mm	9.7 mm	9.4 mm	9.6 mm
System Planar Sensitivity at 10 cm (LEHR)	192 cpm/µci	170 cpm/µci	145 cpm/µci	191 cpm/µci	191 cpm/µci

ProSPECT II...

Designed to... Fullfill your Nuclear Cardiology needs

Parto Negar Persia Co.

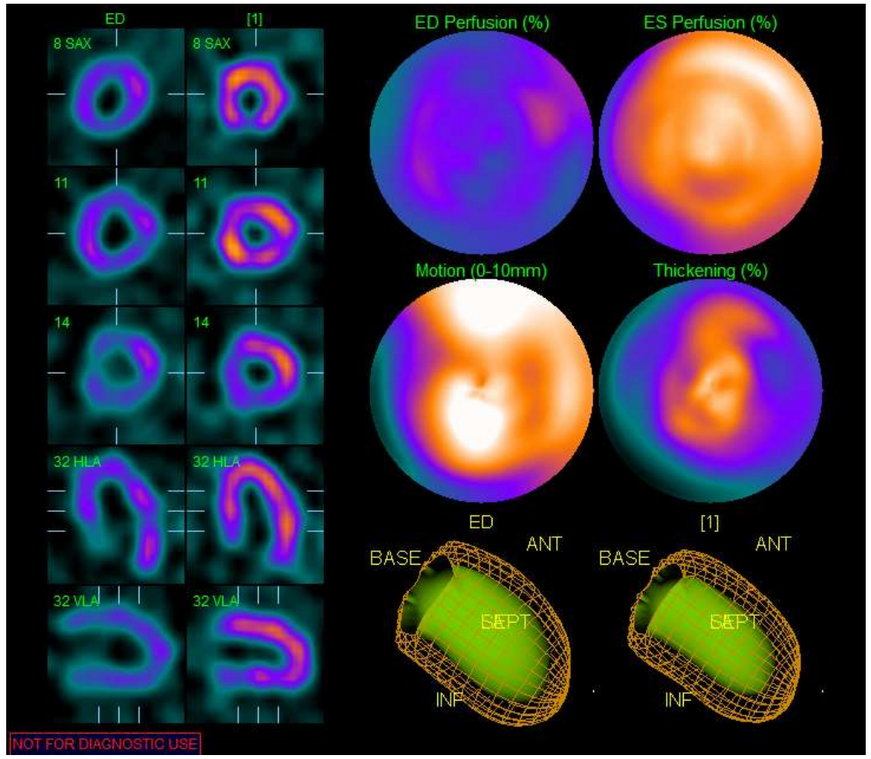
ProSPECT at a glance...

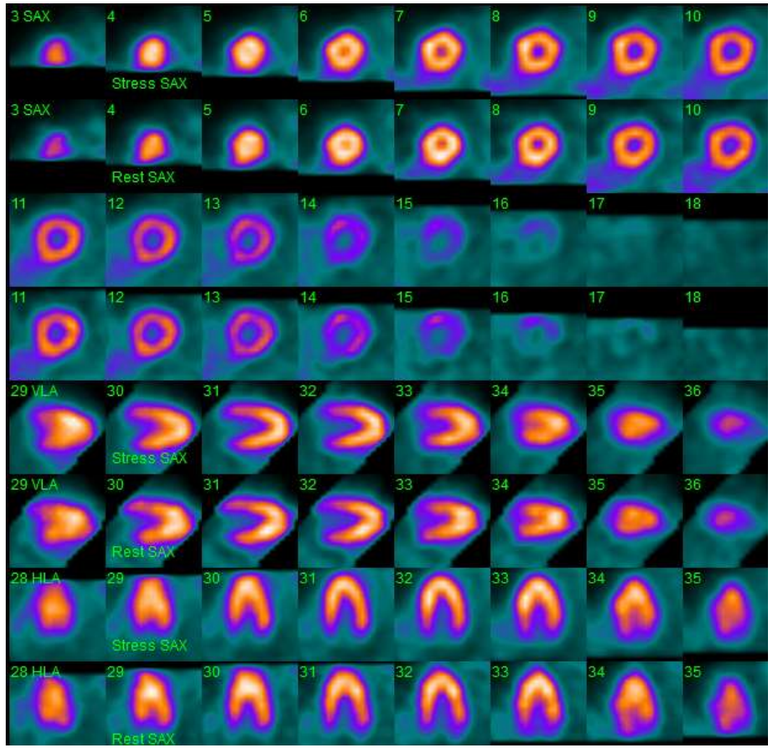
- Optimized for patient comfort
- Accommodates 99% of your patients
- Full range of cardiac scans
- Smooth workflow and throughput

Image Gallery

Parto Negar Persia Co.

A 21 y.o woman participated in the ProSPECT research project. She had no cardiac risk factors nor symptoms. She underwent two-day, stress-rest study using 20 mCi 99mTc-Sestamibi on each day. Imaging was performed 30 minutes after tracer injection in the stress study and 90 minutes later in the rest study. She exercised on a standard Bruce protocol achieving maximal predicted workload.





ProSPECT II

Dedicated Dual Head Cardiac SPECT Scanner

A Professional Solution for Cardiac Imaging

تجربه‌ی متخصصان پزشکی هسته‌ای از کار با دستگاه اسپکت قلب

دکتر سعید فرزانه فر

بیمارستان امام خمینی (ره) تهران

ریاست بخش پزشکی هسته‌ای

از دستگاه، سهولت کاربری و کیفیت تصاویر آن راضی هستم. دستگاه تاکنون مشکلی نداشته و از عملکرد آن کاملا رضایت داریم.

دکتر رامین صادقی

بیمارستان جواد الائمه (ع) مشهد

متخصص پزشکی هسته‌ای

دستگاه هم از نظر کیفیت و هم قدرت تشخیصی بسیار عالی است و با نمونه‌های مشابه خارجی هیچ تفاوتی ندارد. تولید چنین دستگاهی توسط متخصصان ایرانی خودمان مایه افتخار است و از نصب این دستگاه در بیمارستان جواد الائمه مشهد بسیار خرسندیم.

دکتر سمیه قهرمانی

بیمارستان جواد الائمه (ع) مشهد

مسئول بخش پزشکی هسته‌ای

دستگاه اسپکت قلبی ProSPECT شرکت پرتونگار پرشیا از آبان ۱۳۹۹ در این مرکز فعال بوده و تاکنون بیش از ۱۵۶۰۰ بیمار با آن اسکن شده‌اند. کیفیت تصاویر قابل قبول و هم‌تراز با نمونه‌های خارجی است و خدمات پس از فروش شرکت نیز مورد تأیید مسئول فنی و مدیریت مرکز قرار دارد.

دکتر مریم تاجیک رستمی

بیمارستان مرکز قلب تهران

مسئول بخش پزشکی هسته‌ای

دستگاه اسپکت قلبی با مدل ProSPECT، ساخت شرکت پرتونگار پرشیا، که از مهرماه ۱۴۰۱ در این مرکز نصب گردیده است، تاکنون بیش از ۵۰۰۰ بیمار را اسکن کرده است و کیفیت تصاویر این دستگاه مورد قبول بوده و قابل رقابت با تصاویر سیستم‌های خارجی می‌باشد.

دکتر علیرضا امامی اردکانی

بیمارستان دکتر شریعتی

متخصص پزشکی هسته‌ای

مرکز پزشکی هسته‌ای بیمارستان شریعتی از کیفیت تصاویر اسپکت قلبی با مدل ProSPECT ساخت شرکت پرتونگار پرشیا بسیار رضایت دارد. همچنین خدمات پس از فروش شرکت پرتونگار پرشیا مورد تائید اینجانب می‌باشد.

خانم دکتر زینب فرضی زاده

مرکز خصوصی المهدی اردبیل

متخصص پزشکی هسته‌ای

دستگاه اسپکت قلبی مدل ProSPECT تولید شده توسط شرکت پرتونگار پرشیا کیفیت مطلوبی دارد. همچنین کاربری محصول و تصاویری که به دست می‌دهد مورد تائید و قبول اینجانب است.

دکتر پیمان شیخ زاده

بیمارستان امام خمینی (ره)

فیزیست بالینی و مسئول فیزیک بهداشت

دستگاه تصویربرداری اسپکت قلبی مدل ProSPECT ساخت شرکت پرتونگار پرشیا از مهر ۱۳۹۶ در این مرکز راه‌اندازی شده و تاکنون حدود ۸۰۰۰ بیمار با آن اسکن شده‌اند. این دستگاه با کیفیت تصویری قابل رقابت با نمونه‌های خارجی و نرم‌افزار کاربرپسند، عملکرد بسیار مطلوبی داشته است.

آقای اصغر اجاقلو

بیمارستان رجایی کرج

سوپروایزر بخش پزشکی هسته‌ای

دستگاه عالی است و خداراشکر هم از کارکرد و هم از کیفیت تصویر و هم از کاربری راضی هستیم. همچنین شرکت پرتونگار پرشیا پشتیبانی خوبی دارد و به راحتی در دسترس هستند.

Parto Negar Persia Co.

WHOLE BODY SPECT IMAGING

Dual Head Variable Angle General SPECT System

High Performance Digital Detector Based on Square PMT

Whole Body SPECT

Parto Negar Persia Co.

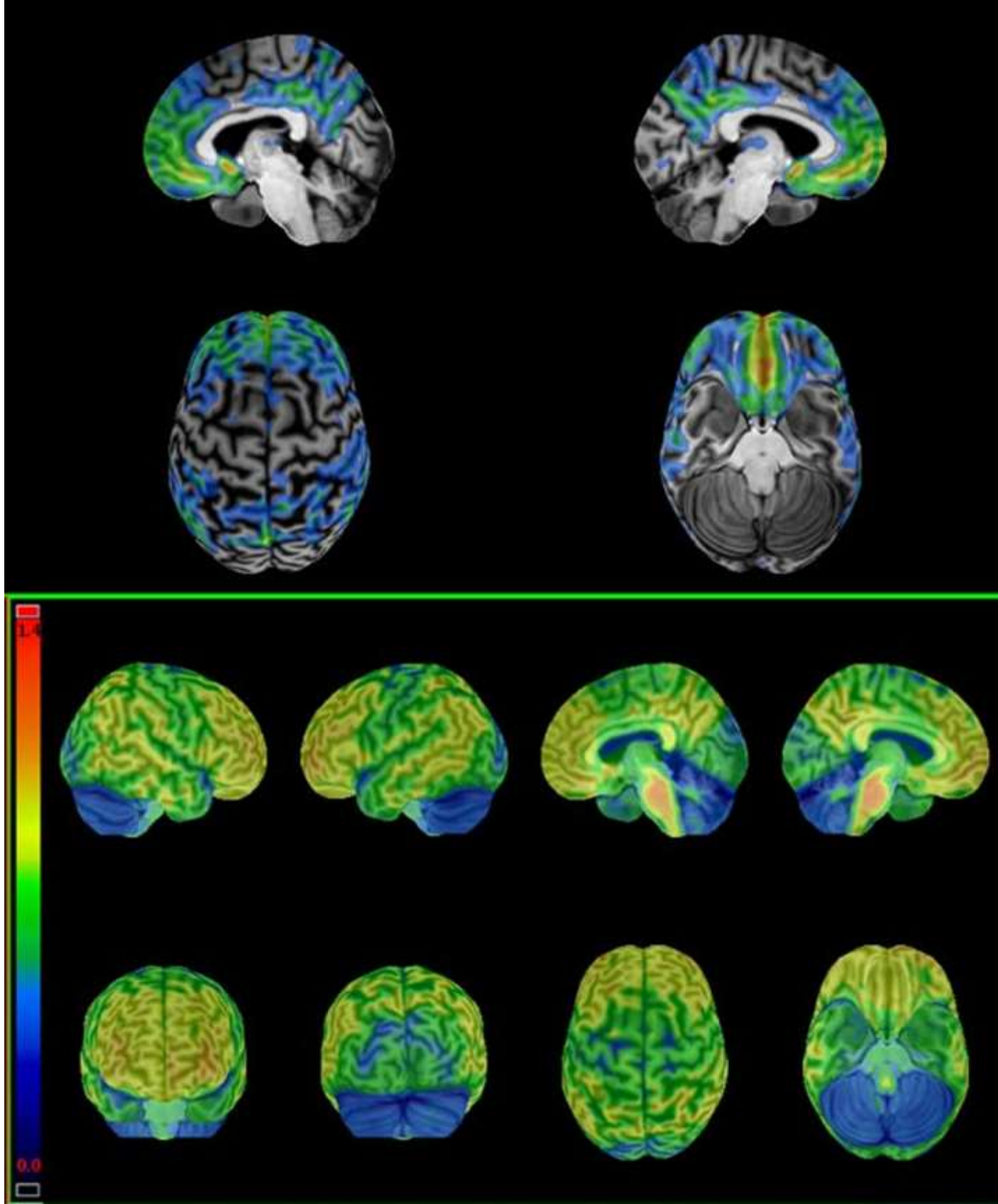

PHEDCO
SIGHT
PROSPECT II
PROSPECT II

Whole Body SPECT (Insight II)

Parto Negar Persia Co.

Dedicated Brain PET

- Movement disorders
- Epilepsy
- Brain tumors
- Dementia
- Stroke and neuronal plasticity
- Neuropharmacology
- Autonomic failure
- Cerebellar ataxia
- Pyramidal signs in any combination
- Cerebrovascular Disease
- Schizophrenia
- Addiction
- Depression and Anxiety



Dedicated Brain PET

Parto Negar Persia Co.

US 20180101936A1

(19) **United States**

(12) **Patent Application Publication**

Zeraatkar et al.

(10) **Pub. No.: US 2018/0101936 A1**

(43) **Pub. Date: Apr. 12, 2018**

(54) **PEAK DETECTION IN A TWO DIMENSIONAL IMAGE**

(71) Applicants: **Navid Zeraatkar**, Tehran (IR); **Salar Sajedi Toighoun**, Tehran (IR); **Mohsen Taheri Parkoohi**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(72) Inventors: **Navid Zeraatkar**, Tehran (IR); **Salar Sajedi Toighoun**, Tehran (IR); **Mohsen Taheri Parkoohi**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(73) Assignee: **Tose'e Sanaye Tasvirbardari Parto Negar Persia Company Ltd.**, Tehran (IR)

(21) Appl. No.: **15/829,808**

(22) Filed: **Dec. 1, 2017**

Related U.S. Application Data

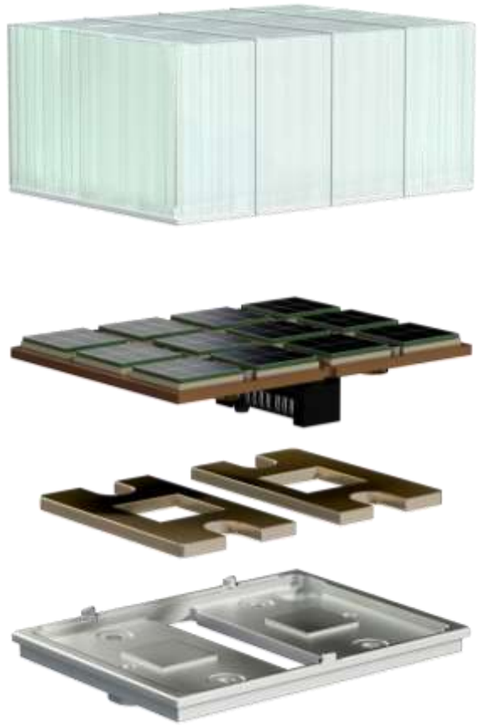
(60) Provisional application No. 62/429,763, filed on Dec.

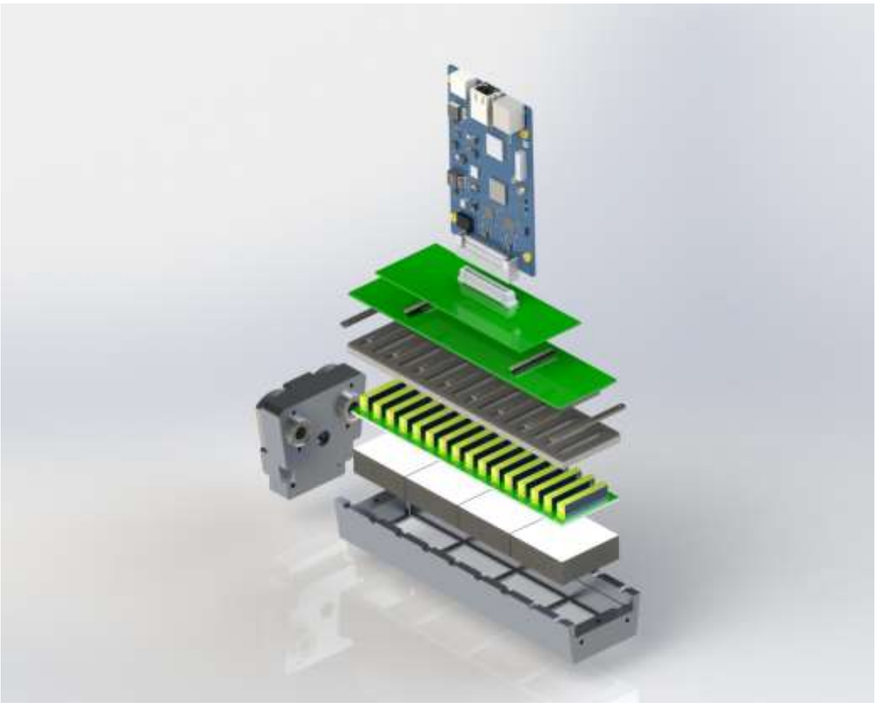
A61B 6/03 (2006.01)
A61B 6/00 (2006.01)
C09K 11/77 (2006.01)

(52) **U.S. Cl.**
CPC ***G06T 5/002*** (2013.01); ***G06T 5/20*** (2013.01); ***G06T 11/005*** (2013.01); ***A61B 6/037*** (2013.01); *G06T 2210/41* (2013.01); ***C09K 11/7774*** (2013.01); *G06T 2207/10104* (2013.01); *G06T 2207/10108* (2013.01); ***A61B 6/582*** (2013.01)

(57) **ABSTRACT**

An improved method for peak detection in a two-dimensional image is disclosed. In one implementation, the method includes one or more of the following steps: generating a smooth image from the two-dimensional image, detecting a plurality of local peaks in the smooth image, detecting a plurality of true peaks among the plurality of local peaks, and generating a peak-detected image from the smooth image. The smooth image includes a plurality of pixels, where each pixel of the plurality of pixels has an intensity level and an address. The address includes a row





US011150360B2

(12) **United States Patent**

Sanaat et al.

(10) **Patent No.: US 11,150,360 B2**

(45) **Date of Patent: Oct. 19, 2021**

(54) **ALTERING PATHS OF OPTICAL PHOTONS PASSING THROUGH A SCINTILLATOR**

(71) Applicants: **Amirhossein Sanaat**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(72) Inventors: **Amirhossein Sanaat**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(73) Assignee: **PARTO NEGAR PERSIA (PNP) COMPANY**, Tehran (IR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 162 days.

(52) **U.S. Cl.**
CPC ***G01T 1/2002*** (2013.01); ***G01T 1/161*** (2013.01)

(58) **Field of Classification Search**
CPC G01T 1/2002; G01T 1/161; G01T 1/2018
See application file for complete search history.

(56) **References Cited**

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* cited by examiner

Primary Examiner — David P Porta

We Developed Digital PET Technology

Dedicated Brain PET

Parto Negar Persia Co.

US 20200146649A1

(19) **United States**

(12) **Patent Application Publication**

Amirrashedi et al.

(10) **Pub. No.: US 2020/0146649 A1**

(43) **Pub. Date: May 14, 2020**

(54) **NORMALIZATION OF A POSITRON EMISSION TOMOGRAPHY SCANNER**

(71) Applicants: **Mahsa Amirrashedi**, Tehran (IR); **Mohammad reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR)

(72) Inventors: **Mahsa Amirrashedi**, Tehran (IR); **Mohammad reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR)

(73) Assignee: **Parto Negar Persia (PNP) Company**, Tehran (IR)

(21) Appl. No.: **16/746,447**

(22) Filed: **Jan. 17, 2020**

Related U.S. Application Data

(60) Provisional application No. 62/793,895, filed on Jan. 18, 2019.

G01N 23/22 (2018.01)

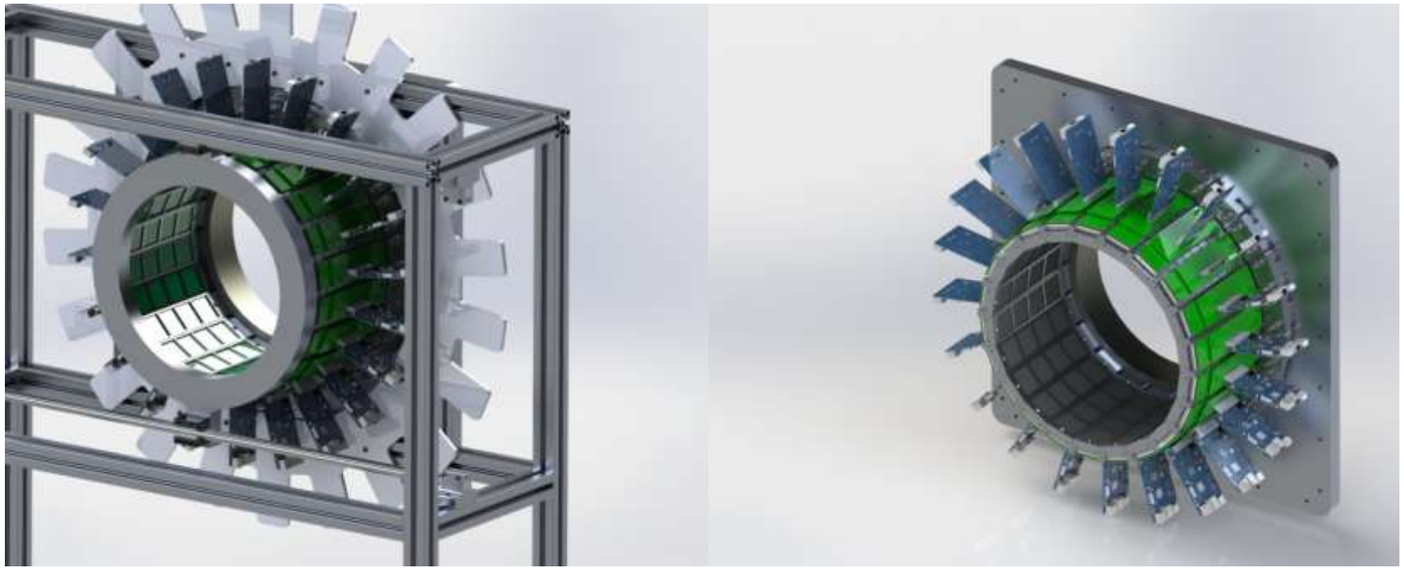
A61B 6/03 (2006.01)

(52) **U.S. Cl.**

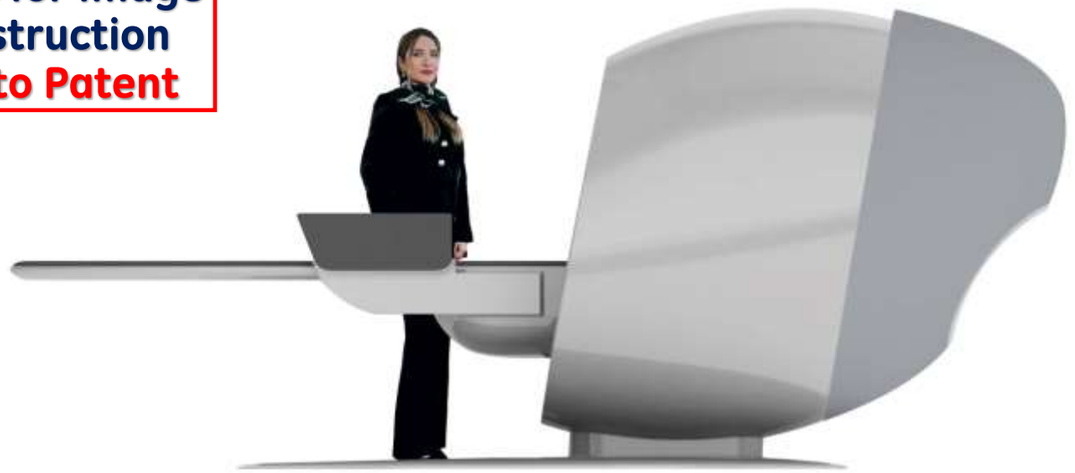
CPC ***A61B 6/583*** (2013.01); ***G06T 11/005*** (2013.01); ***G01N 23/22*** (2013.01); *G01N 2223/108* (2013.01); *G01N 2223/419* (2013.01); *G06T 2210/41* (2013.01); ***A61B 6/037*** (2013.01)

(57) **ABSTRACT**

A method for normalization of a positron emission tomography (PET) scanner. The PET scanner includes a plurality of blocks. Each of the plurality of blocks includes a plurality of rows. Each of the plurality of rows includes a plurality of actual detectors and an unused area. The method includes acquiring a plurality of lines of response (LORs) by scanning a normalization phantom, obtaining a plurality of actual counts by extracting a plurality of LORs subsets from the plurality of LORs and counting a number of elements in each LORs subset, generating a plurality of virtual detectors



We have new concept for Image reconstruction ready to Patent



US010295680B2

(12) **United States Patent**

Mahani et al.

(10) **Patent No.: US 10,295,680 B2**

(45) **Date of Patent: May 21, 2019**

(54) **POSITRON RANGE REDUCTION IN POSITRON EMISSION TOMOGRAPHY IMAGING**

(71) Applicants: **Hojjat Mahani**, Esfahan (IR); **Mustafa Abbasi**, Shiraz (IR); **Mohammad Reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR)

(72) Inventors: **Hojjat Mahani**, Esfahan (IR); **Mustafa Abbasi**, Shiraz (IR); **Mohammad Reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR)

(73) Assignee: **PARTO NEGAR PERSIA CO.**, Tehran (IR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(58) **Field of Classification Search**

CPC A61B 6/037; G01T 1/2985

See application file for complete search history.

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2014/0228673 A1 * 8/2014 Watson A61B 6/5247 600/411

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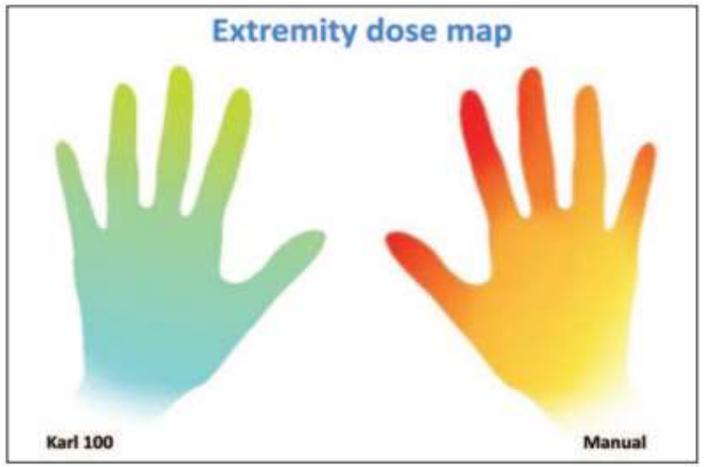
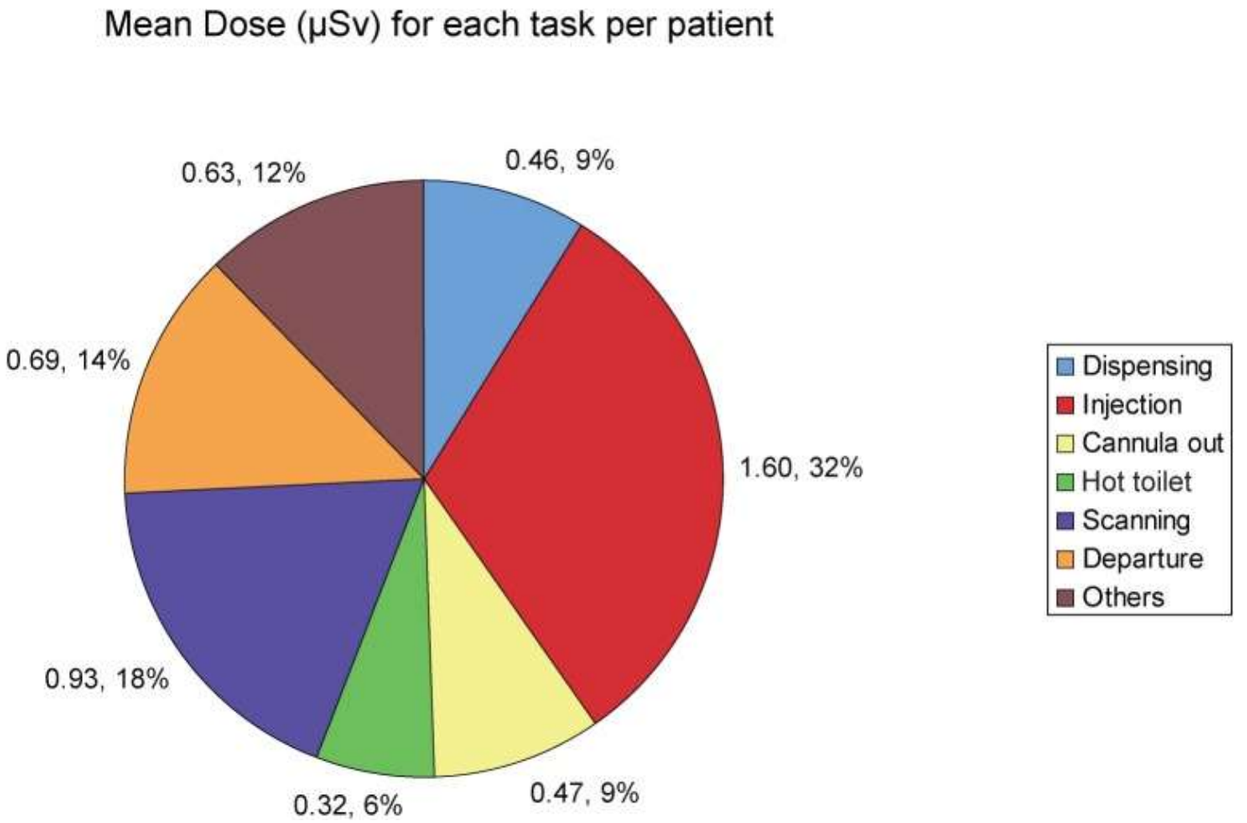
Huang et al. "The effect of magnetic field on positron range and spatial resolution in an integrated whole-body time-of-flight PET/MRI system." Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), 2014 IEEE. IEEE, 2014, pp. 1-4.

(Continued)

Automatic Injector for FDG

Parto Negar Persia Co.





Automatic Injector for FDG

Parto Negar Persia Co.

LEMER PAX

MEDRAD

TEMA

COMECER

Disadvantages:

- High cost for system (140- 190 KEuro)
- High cost for consumables (20- 30 Euro per patient)
- Minimum Maintenance Support

Automatic Injector for FDG

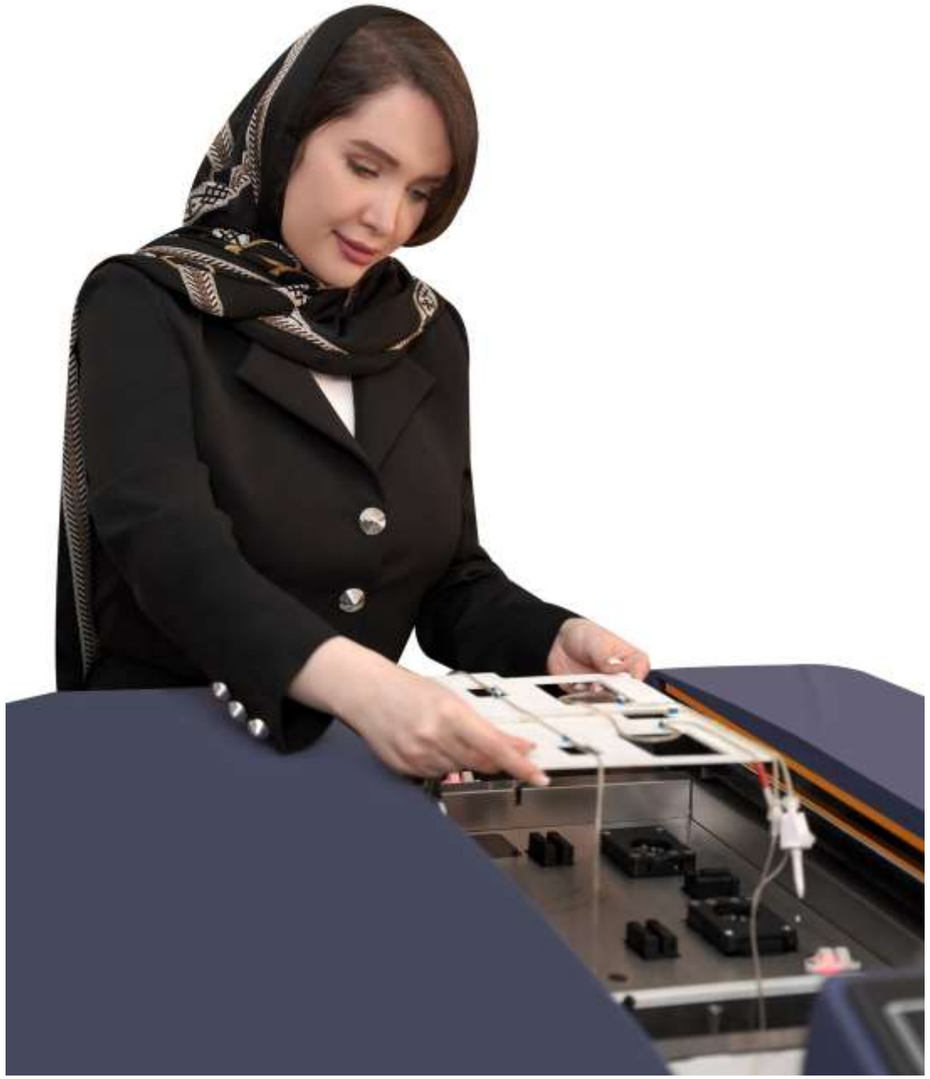
Parto Negar Persia Co.

Advantages of AUTOMATIC INJECTOR

- Smart Injection System
- Automated Consumables Tracking
- Low Consumables Cost
- Easy and Safe Handling of Radioactive Vials
- High Level of Accuracy in Injection
- Fully Motorized Movement
- Predictive Maintenance
- Safe Shielding with Low Radiation Leakage
- Fully Automatic Injection Process
- Reliable Operation with Low Maintenance Cost
- Easy Connect with Service

Automatic Injector for FDG

Parto Negar Persia Co.



Wireless ECG Trigger

Parto Negar Persia Co.

The ECG Trigger or R-wave detector is an instrument that detects the bioelectric signal resulting from activation of the heart's ventricles. Such detectors are used in intensive-care wards to monitor heartbeats of patients and to alert the medical staff to abnormal rhythms.

Features

- Wireless ECG Trigger
- Automatic R Wave Detection
- Digital ECG waveform output
- Synchronized ECG trigger output
- 3 Selectable ECG Leads
- Controllable ECG Output
- Trigger Pulse LED
- Patient Isolation
- External ECG Interface
- Universal Voltage
- Easy to Handle
- Patient Comfort

Cardium AiRo

A new concept for small foot print and dedicated cardiac SPECT scanner empowered by Artificial Intelligence and Robotic Motion

US 20160116604A1

(19) **United States**

(12) **Patent Application Publication**
Zeraatkar et al.

(10) **Pub. No.: US 2016/0116604 A1**

(43) **Pub. Date: Apr. 28, 2016**

(54) **DESKTOP OPEN-GANTRY SPECT IMAGING SYSTEM**

(71) Applicants: **Navid Zeraatkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(72) Inventors: **Navid Zeraatkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(21) Appl. No.: **14/975,772**

(22) Filed: **Dec. 19, 2015**

Related U.S. Application Data

(60) Provisional application No. 62/146,350, filed on Apr. 12, 2015.

Publication Classification

(51) **Int. Cl.**

G01T 1/166	(2006.01)
G01T 1/20	(2006.01)
G01T 1/202	(2006.01)
G21K 1/02	(2006.01)

(52) **U.S. Cl.**

CPC ***G01T 1/1663*** (2013.01); ***G21K 1/02*** (2013.01); ***G01T 1/2006*** (2013.01); ***G01T 1/202*** (2013.01)

(57) **ABSTRACT**

An open-gantry structure of SPECT imaging system for scanning human small organs or small animals and method for preparing the system is disclosed. The system contains an imaging desk that one or multiple detector heads are rotated around the object to be scanned while tilted under the imaging desk and dedicated image reconstruction algorithm was developed for the system in case of applying single pinhole collimator.

US 20180259656A1

(19) **United States**

(12) **Patent Application Publication**
Mahani et al.

(10) **Pub. No.: US 2018/0259656 A1**

(43) **Pub. Date: Sep. 13, 2018**

(54) **SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY IMAGING WITH A SPINNING PARALLEL-SLAT COLLIMATOR**

(71) Applicants: **Hojjat Mahani**, Isfahan (IR); **Mohammad Reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR)

(72) Inventors: **Hojjat Mahani**, Isfahan (IR); **Mohammad Reza Ay**, Tehran (IR); **Saeed Sarkar**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR)

(73) Assignee: **Parto Negar Persia Co.**, Tehran (IR)

(21) Appl. No.: **15/920,426**

(22) Filed: **Mar. 13, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/470,363, filed on Mar. 13, 2017.

Publication Classification

(51) **Int. Cl.**

G01T 1/208	(2006.01)
G01T 1/164	(2006.01)
G06T 11/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G01T 1/208*** (2013.01); ***G01T 1/1642*** (2013.01); *G06T 2211/424* (2013.01); ***G06T 11/006*** (2013.01); ***G06T 11/008*** (2013.01); ***G06T 11/005*** (2013.01)

(57) **ABSTRACT**

A method and a system for single photon emission computed tomography (SPECT) imaging capable of performing a rapid acquisition of imaging data. The SPECT imaging system, placed at a fixed radial distance from the center of an object being imaged, includes a gamma detector and a collimator. The collimator, mounted on the gamma detector, includes a plurality of parallel slats, each perpendicular to the surface of the gamma detector. The method implemented by this system rapidly reconstructs a high-resolution and high-sensitivity image.

Cardium AiRo

The system will be ready for NEMA test and clinical evaluation in Q3 2025

Deep Learning Application in NM/PET

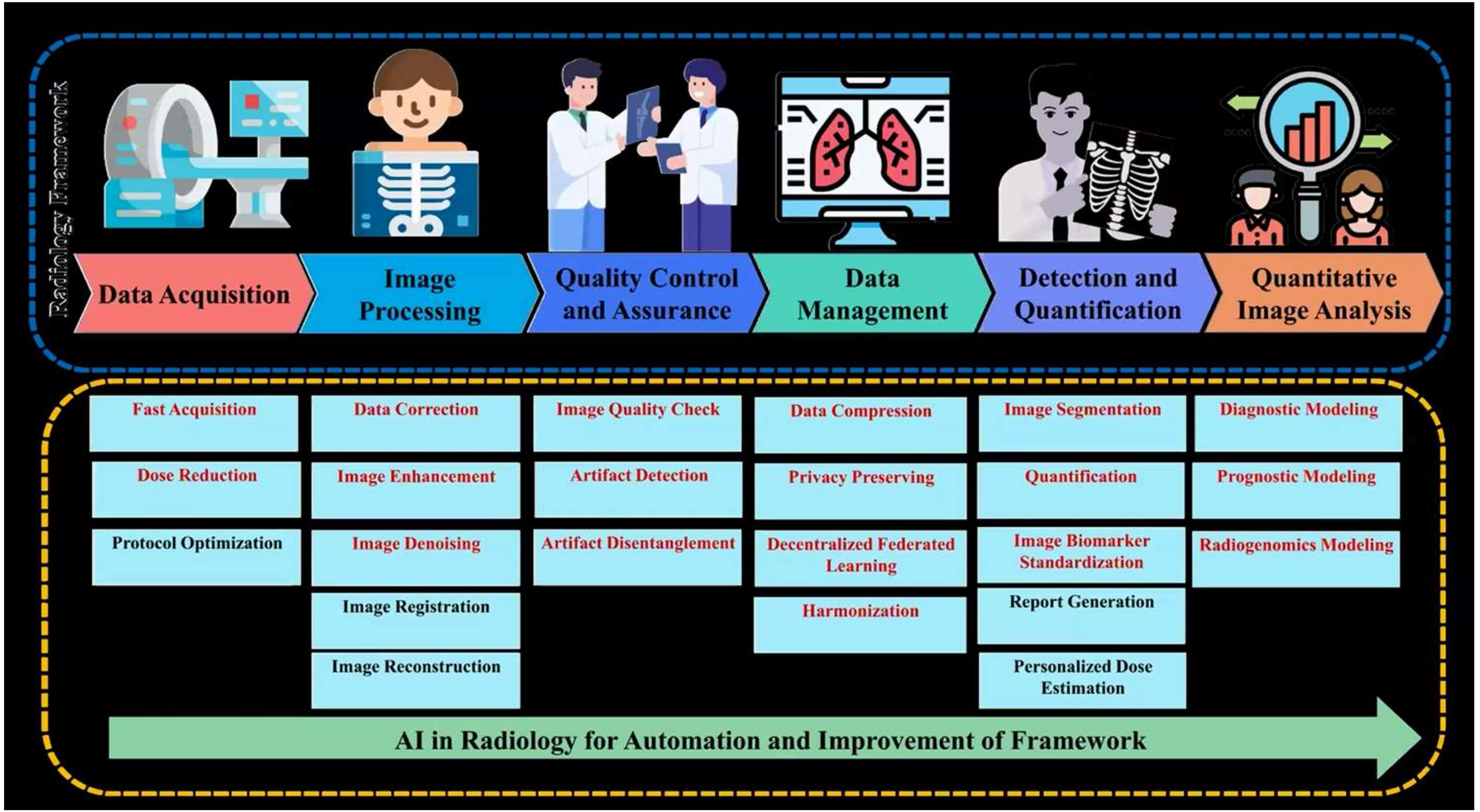


Image reconstruction and low-dose/fast image acquisition

Ways to leverage DL in reconstruction

- Direct mapping
  (FastPET, deepPET)

- DL-based image reconstruction
  (UI's DPR, FBSEM-Net, ClarifyDL,)

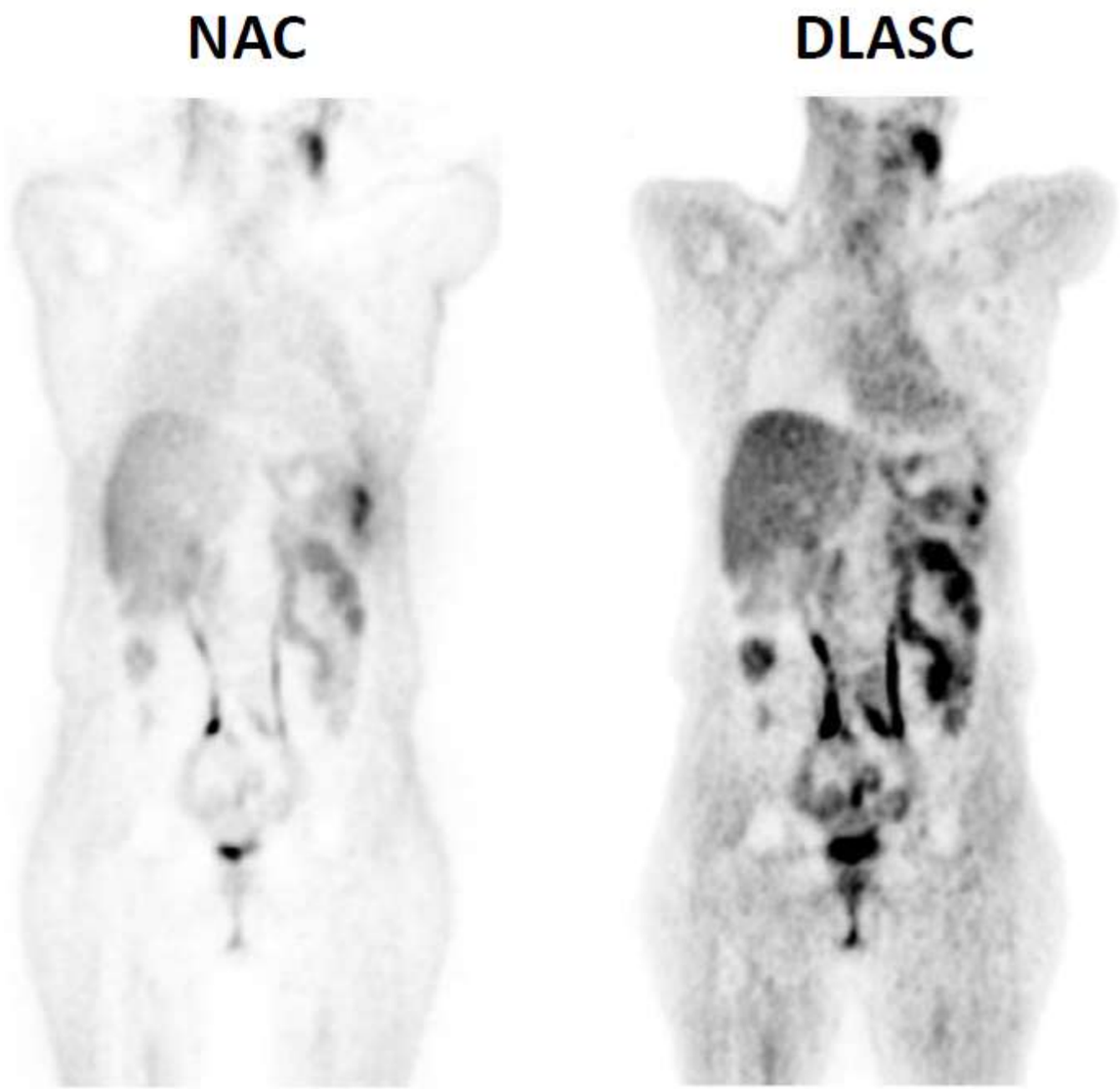
- DL-based image enhancement
  (Subtle PET, Air Recon DL, TrueFidelity, Precision DL)

Quantitative imaging

- A significant number of emitted photons undergo attenuation and Compton scatter interactions before they reach PET and SPECT detectors. Scatter and attenuation lead to over- and under-estimation of activity concentration, consequently resulting in large quantification errors.

- The main challenge for ASC arises in SPECT-only, PET-only, as well as PET/MR and SPECT/MR imaging since MR images are not directly correlated to electron density, and as such, do not provide information about attenuation coefficients of biological tissues

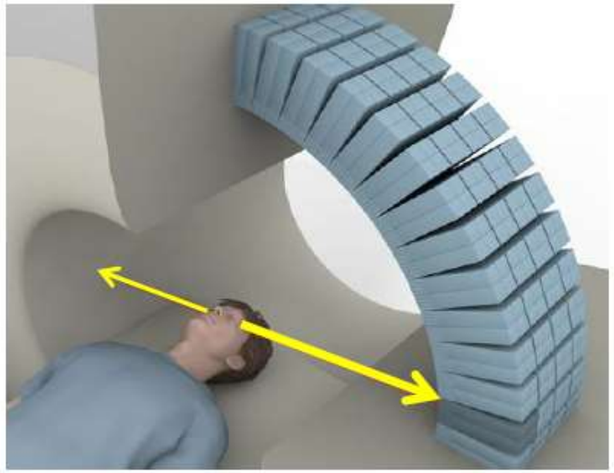
- Deep learning-based algorithms were proposed to address the challenges of conventional ASC approaches in PET and SPECT imaging



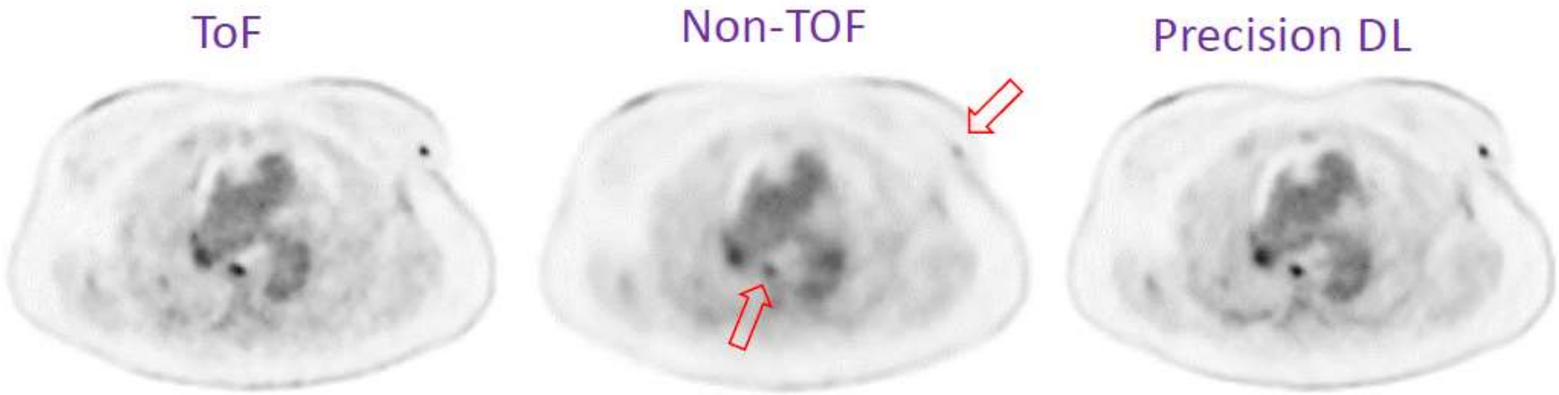
Wang T, Lei Y, Fu Y, Curran WJ, Liu T, Nye JA, et al. Machine learning in quantitative PET: a review of attenuation correction and low-count image reconstruction methods. Phys Med 2020;76:294–306.

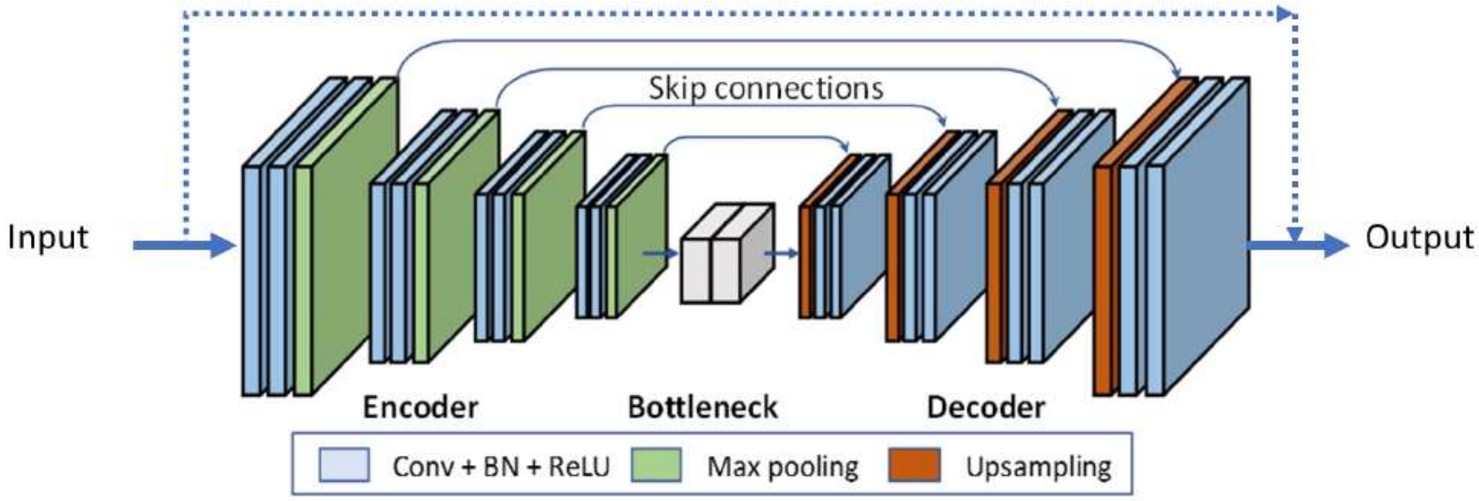
Deep learning time-of-flight (ToF) image enhancement

DL post-reconstruction



- Fast TOF detectors measure the arrival time of the two photons
- Based on $\Delta x = c/2 * \Delta t$, their origin along the two detectors can be estimated

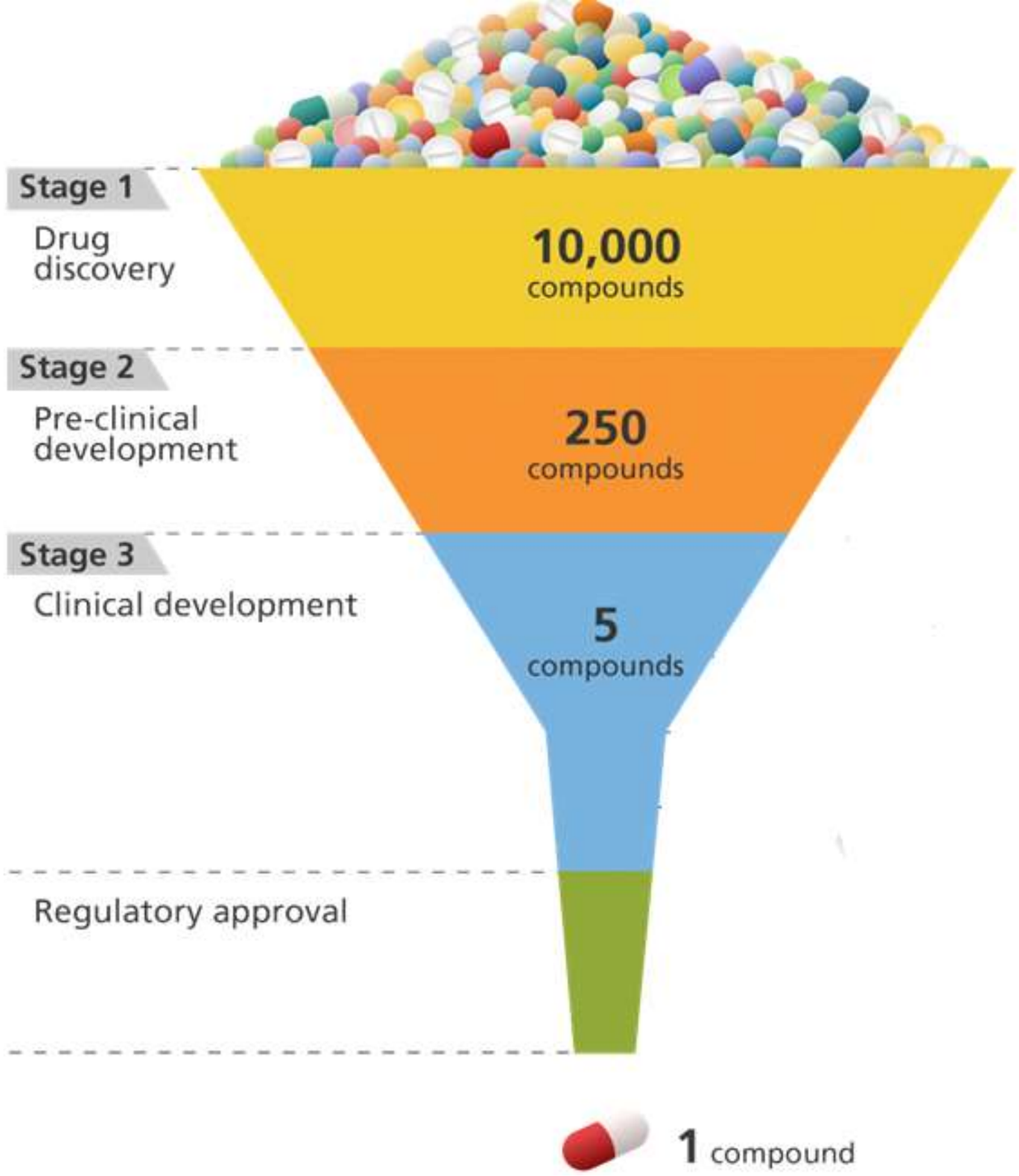




Precision DL™ is FDA approved for OMNI PET/CT scanners

Deep learning–based time-of-flight (ToF) image enhancement of non-ToF PET scans, A Mehranian et al.
European Journal of Nuclear Medicine and Molecular Imaging 49 (11), 3740-3749

Why Preclinical Imaging



Parto Negar Persia Co.

Preclinical Imaging

Xtrim

Animal PET Imaging System

High Performance and Versatility for Your Preclinical Imaging Research Needs

Institute of Global Certification IGC CERTIFIED ISO 13485

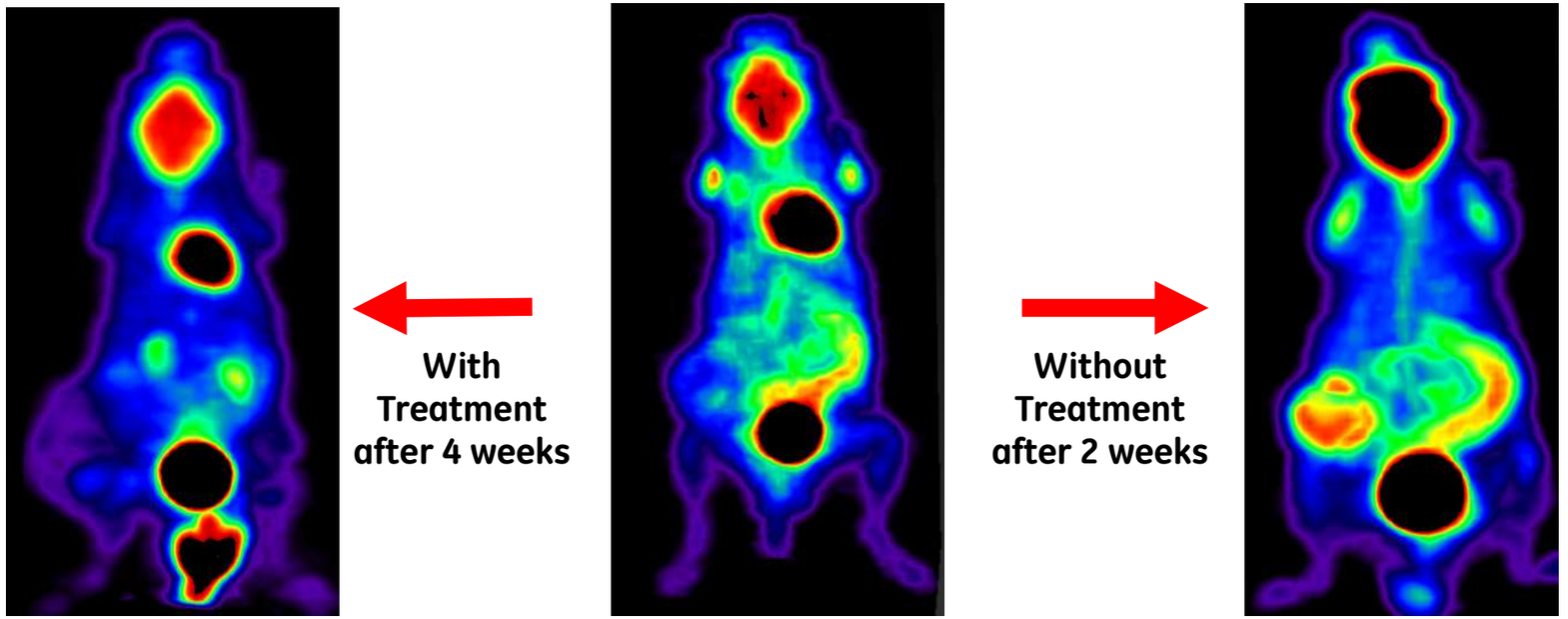
Institute of Global Certification IGC CERTIFIED ISO 9001

TPCF Image Gallery (PET)

Study: The effect of synthetic drug on breast cancer inhibition and activation of apoptotic pathways in tumor-bearing mice

Imaging Parameters:

- Subject: Tumor
- Injection: IV
- Radiotracer: FDG
- Uptake time: 60 min
- Acq time: 8 min



Finding:

tumor detection and treatment investigation is available.

Courtesy of Dr. Ghafouri, Gilan University

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Xtrim PET High Performance and Versatility for Your Preclinical Imaging Research Needs

Over the past two decades, growing interest in using animal models of human disease has led to great advances in translational sciences. In line with this trend, non-invasive preclinical PET imaging systems are well-known for their superior capabilities in adopting molecular and cellular researches.

PNP preclinical solutions are removing the limits on driving medical research from the laboratory to the clinic. Xtrim provides the high performance and versatility available to address your preclinical imaging research needs. From basic science and disease progression, to drug discovery and development, Xtrim offers an unrivaled solution for optimizing your research outcomes.

First PET Image with NaF

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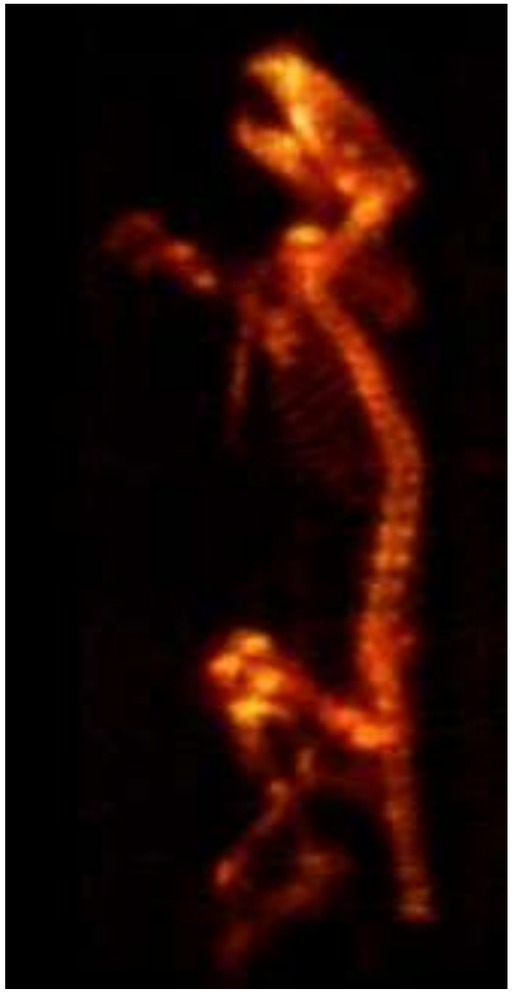
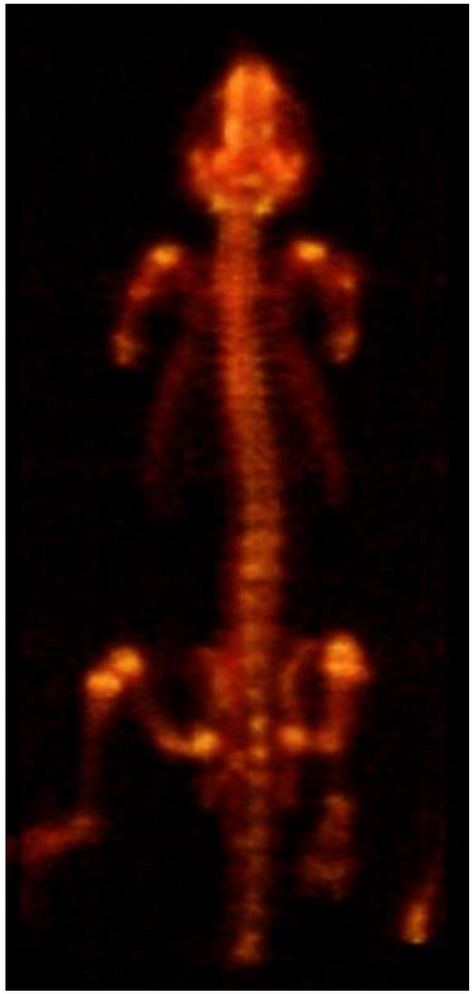
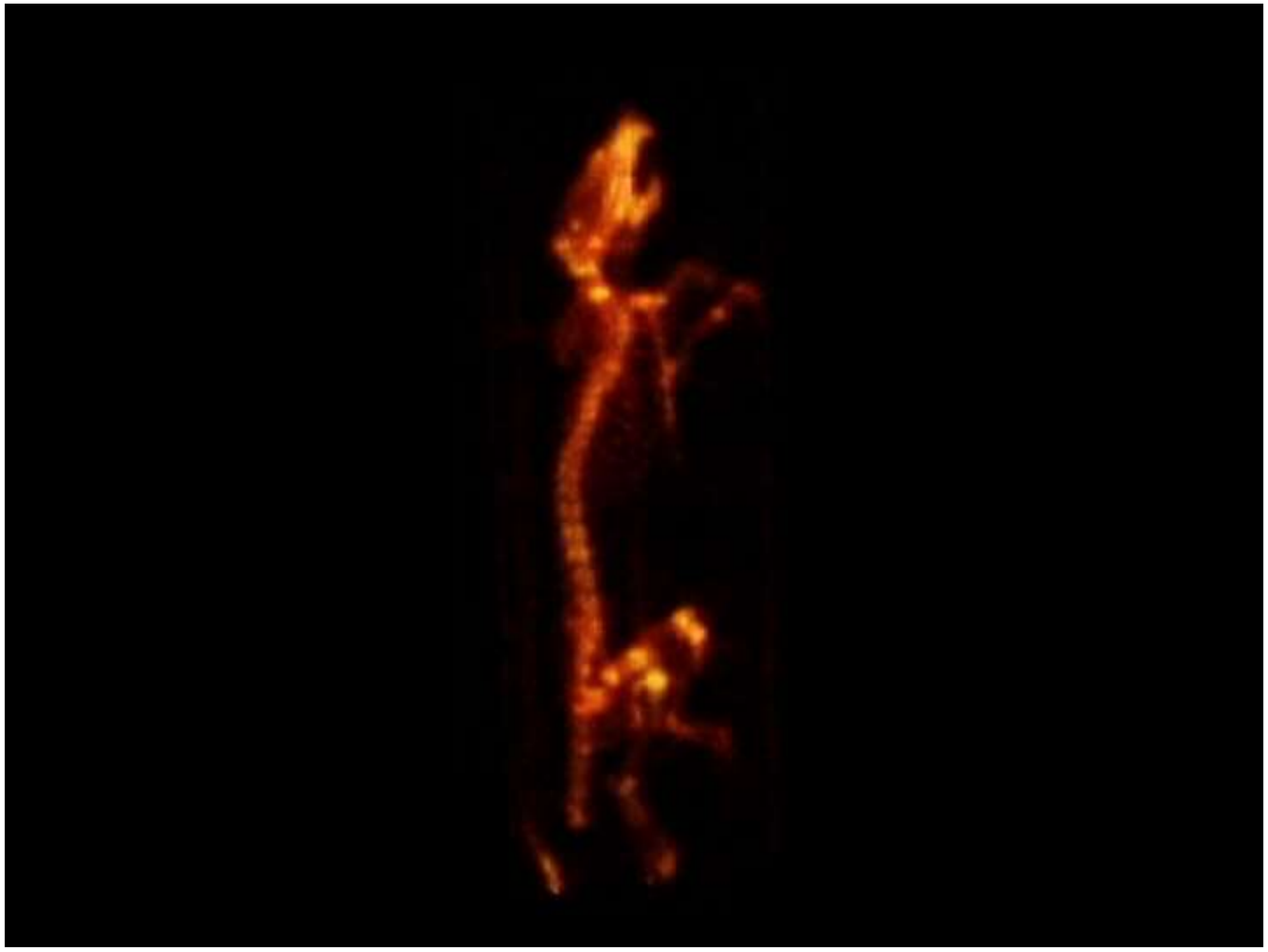
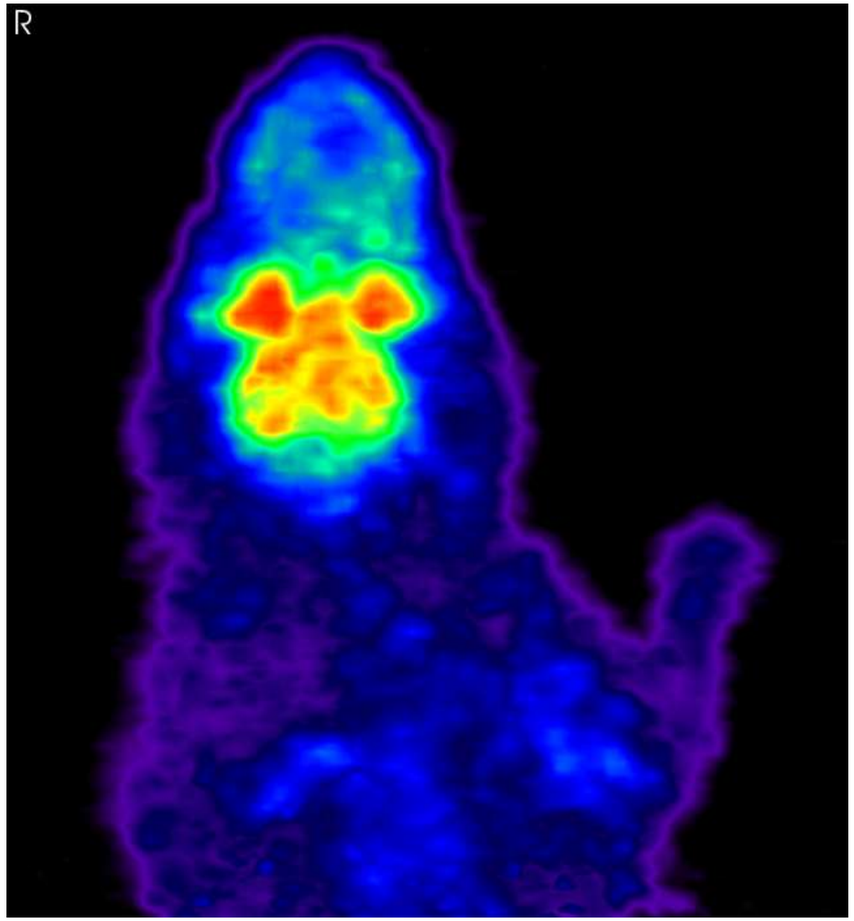


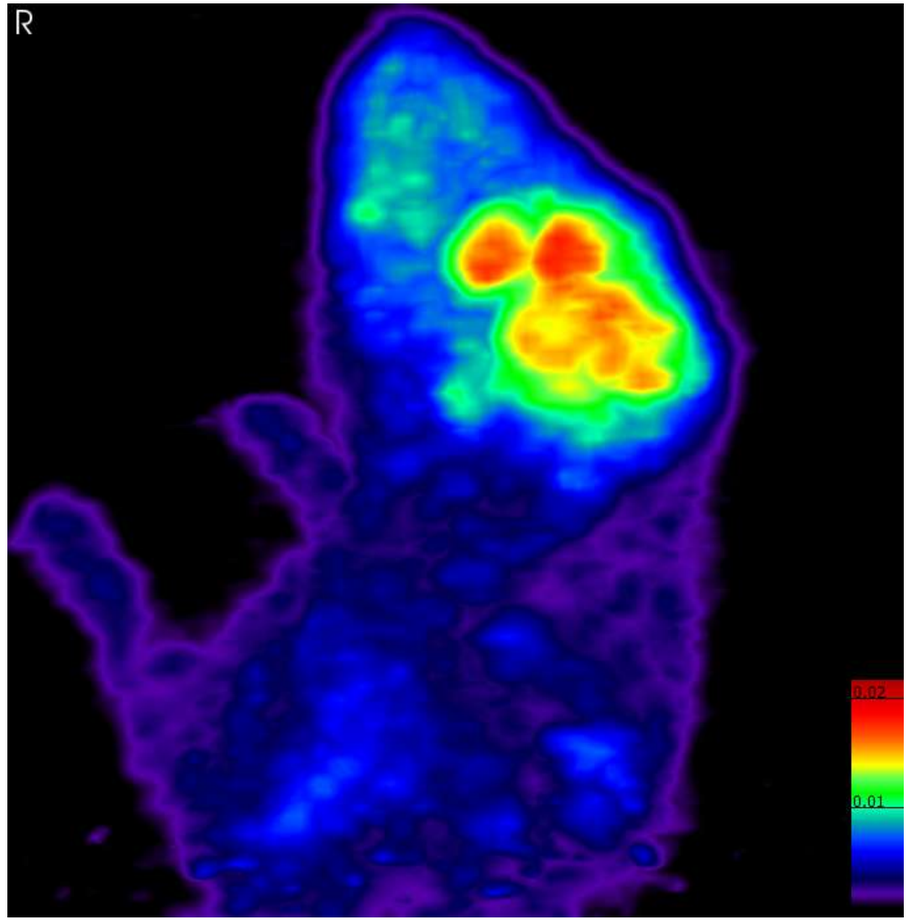




Images from our Studies in TPCF

Parto Negar Persia Co.





PET scan of rat with Glioblastoma (GBM) tumor using ^{18}FDG.

Parto Negar Persia Co.

Proprietary Tech

Our developed technology is based on our three published US Patents

The United States of America

The Director of the United States Patent and Trademark Office

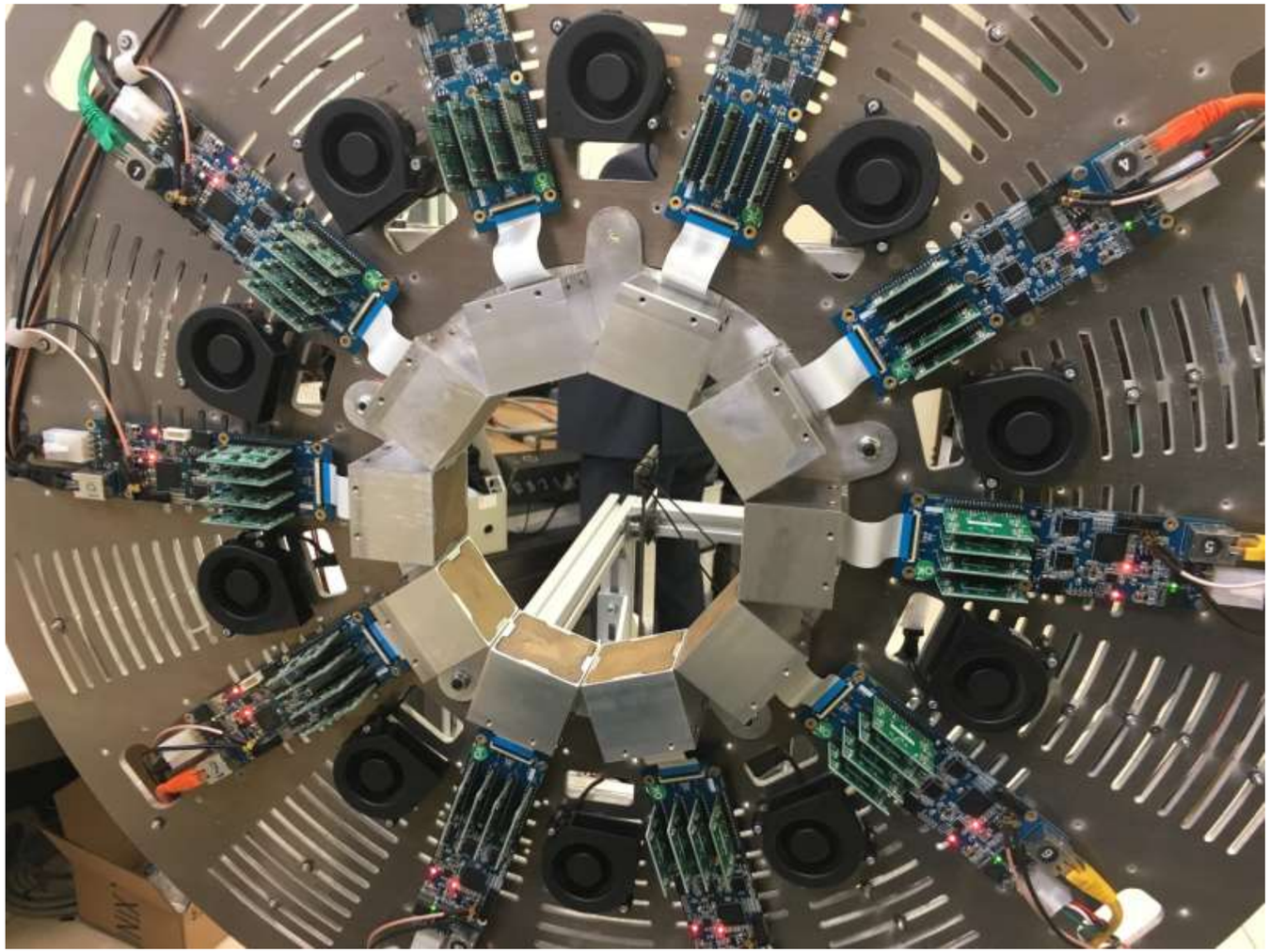
Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Acting Director of the United States Patent and Trademark Office



Parto Negar Persia Co.

HiReSPECT

Dual head small animal SPECT

High Resolution Animal SPECT Imaging System

ISO 9001 CERTIFIED

ISO 13485 CERTIFIED

Parto Negar Persia Co.

HiReSPECT

High Resolution Animal SPECT Imaging System

HiReSPECT provides the highest performance and versatility available to address your preclinical imaging research needs from academic and translational research, to drug discovery and development.

The HiReSPECT is a Dual Head Small Animal SPECT imaging system that provides in vivo high resolution three-dimensional (3D) images of physiological functions in small laboratory animals.

Application:

Small animal imaging is an emerging field which has an impact on various biomedical research areas such as neurology, oncology, cardiology, immunology and infection biology.

The pharmaceutical industries and research centers will profit from SPECT system as they accelerate drug and biomarker development by yielding more reliable in vivo results and cost effective study design.

First Experimental Study

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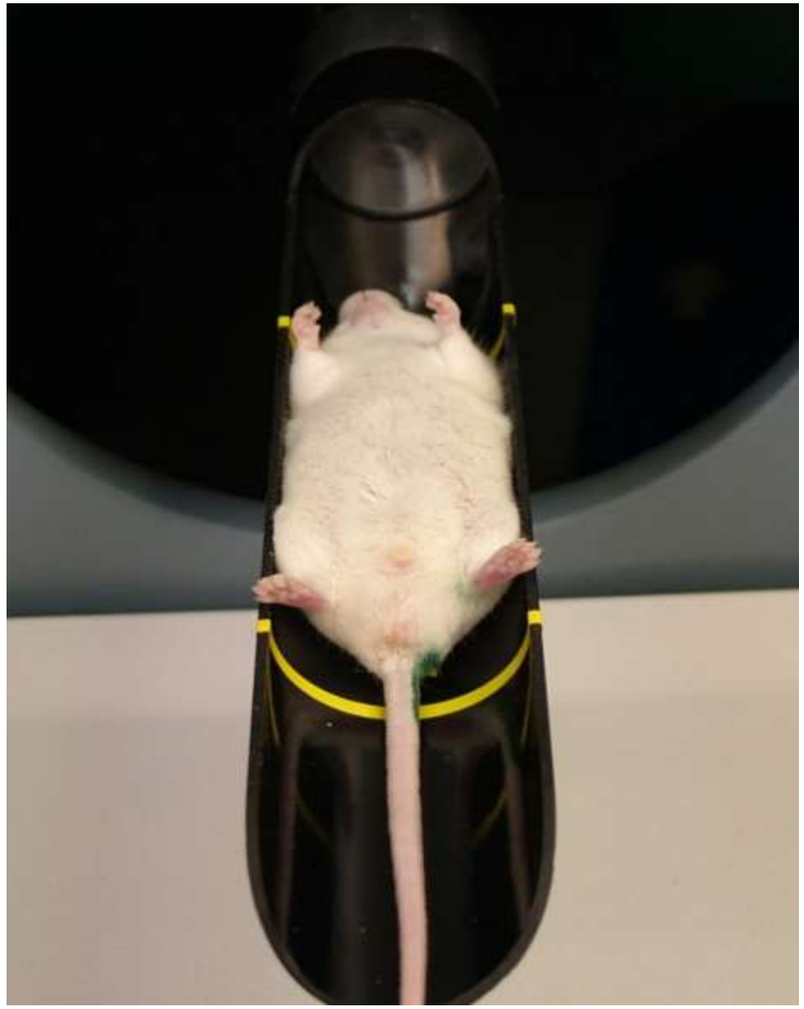
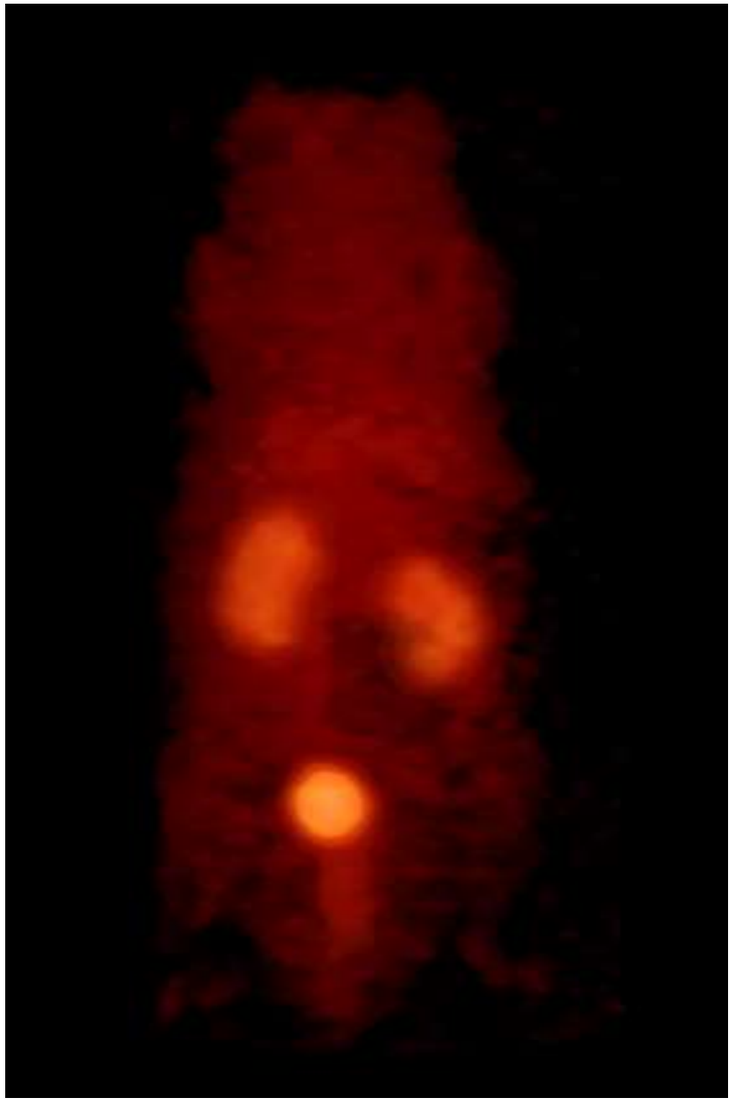
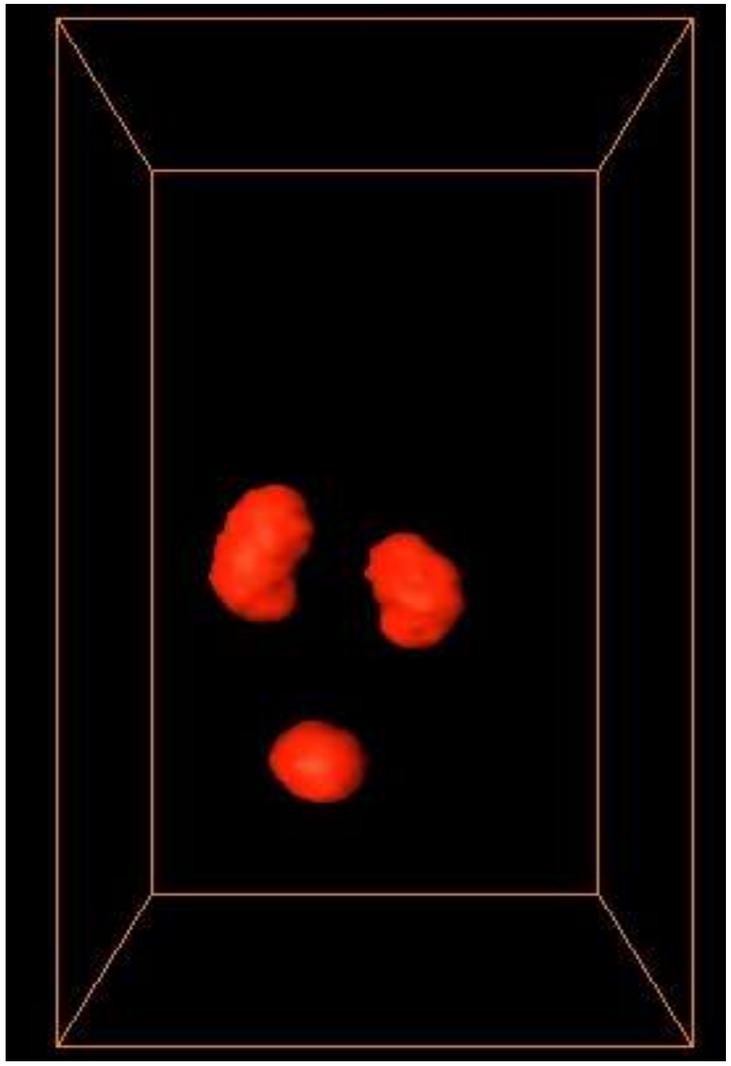
TC-DMSA Renal Scan







Some Studies by our Customers

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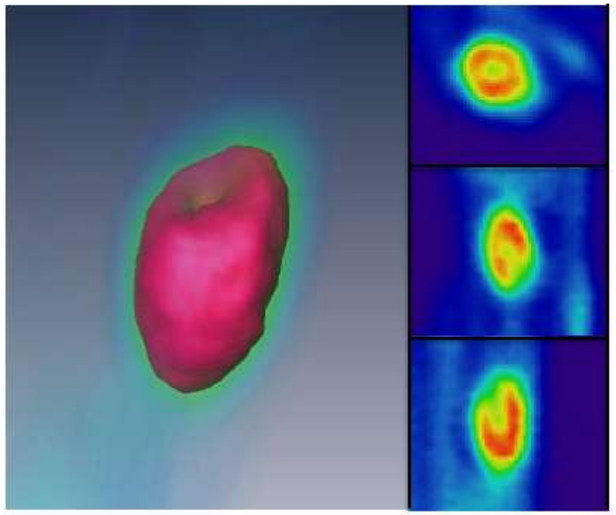
CARDIAC SPECT



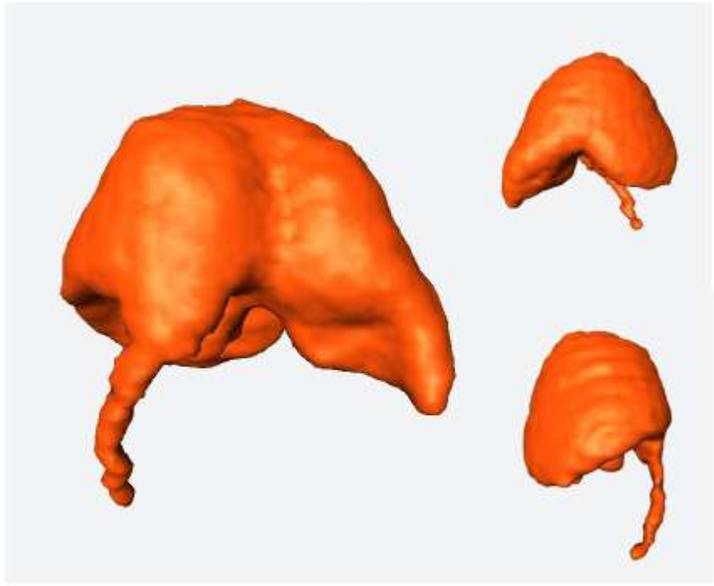
Rat Study

Persian Gulf Nuclear Medicine Research Center

This document is a report on Rat-Cardiac SPECT scan using HiReSPECT animal SPECT imaging system.

November 10, 2013

Liver imaging

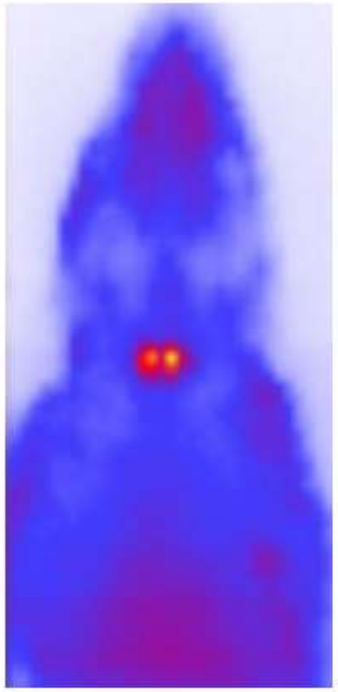


Mice Study

Atomic Energy Organization of Iran

This document is a report on Mice-Liver SPECT scan using HiReSPECT animal SPECT imaging system

Desember 15, 2013



THYROID SPECT SCAN

Rat Study

REPORT

This document contains the results of Rat-Thyroid SPECT scan using HiReSPECT animal SPECT Imaging system

Persian Gulf Nuclear Medicine Research Center

November 12, 2013

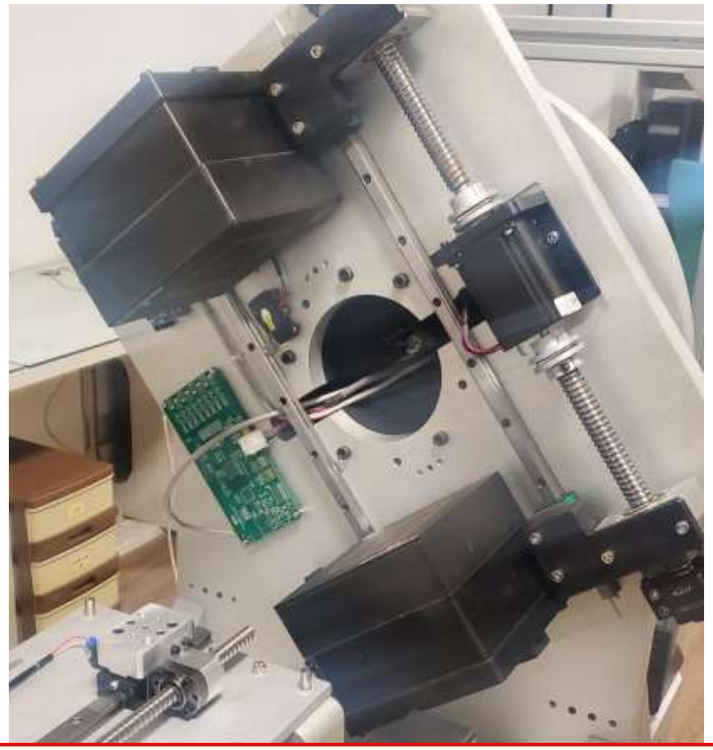
Parto Negar Persia Co.

HiReSPECT II

High Resolution Preclinica SPECT Imaging System

CERTIFIED ISO 13485

CERTIFIED ISO 9001



US 20180101936A1

(19) **United States**

(12) **Patent Application Publication**

Zeraatkar et al.

(10) **Pub. No.: US 2018/0101936 A1**

(43) **Pub. Date: Apr. 12, 2018**

(54) **PEAK DETECTION IN A TWO DIMENSIONAL IMAGE**

(71) Applicants: **Navid Zeraatkar**, Tehran (IR); **Salar Sajedi Toighoun**, Tehran (IR); **Mohsen Taheri Parkoohi**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(72) Inventors: **Navid Zeraatkar**, Tehran (IR); **Salar Sajedi Toighoun**, Tehran (IR); **Mohsen Taheri Parkoohi**, Tehran (IR); **Mohammad Reza Ay**, Tehran (IR); **Mohammad Hossein Farahani**, Tehran (IR); **Saeed Sarkar**, Tehran (IR)

(73) Assignee: **Tose'e Sanaye Tasvirbardari Parto Negar Persia Company Ltd.**, Tehran (IR)

(21) Appl. No.: **15/829,808**

(22) Filed: **Dec. 1, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/429,763, filed on Dec.

A61B 6/03 (2006.01)
A61B 6/00 (2006.01)
C09K 11/77 (2006.01)

(52) **U.S. Cl.**
CPC ***G06T 5/002*** (2013.01); ***G06T 5/20*** (2013.01); ***G06T 11/005*** (2013.01); ***A61B 6/037*** (2013.01); *G06T 2210/41* (2013.01); ***C09K 11/7774*** (2013.01); *G06T 2207/10104* (2013.01); *G06T 2207/10108* (2013.01); ***A61B 6/582*** (2013.01)

(57) **ABSTRACT**

An improved method for peak detection in a two-dimensional image is disclosed. In one implementation, the method includes one or more of the following steps: generating a smooth image from the two-dimensional image, detecting a plurality of local peaks in the smooth image, detecting a plurality of true peaks among the plurality of local peaks, and generating a peak-detected image from the smooth image. The smooth image includes a plurality of pixels, where each pixel of the plurality of pixels has an intensity level and an address. The address includes a row

HiReSPECT II

High Resolution Preclinical SPECT Imaging System

Detectors

- Pixelated CsI(Na): 95×95 cm^2
- SiPM: 12×12 array of 3mm SMT sensors
- Number of SiPM per detector: 4 pcs
- Bore opening: 100 mm

Animal handeling

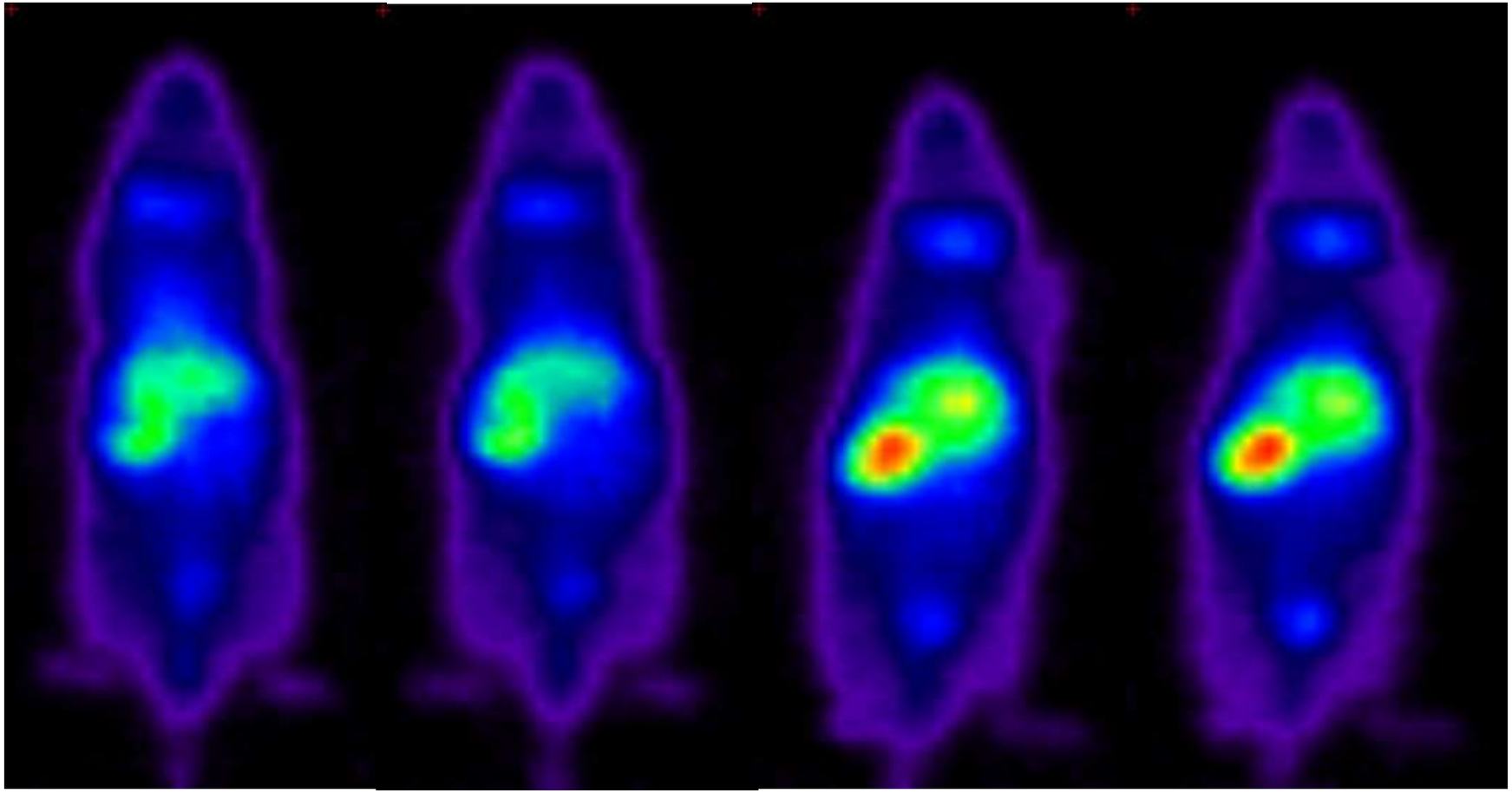
- Automated bed positioning
- Low attenuation carbon fiber material
- Easy bed attach/detach
- Capability of scanning of mice and rat
- Equipped with inside video camera for precise positioning

Room requirement

- Minimum room size: 8 m^2
- System dimension (W×D×H): 103×127×180 cm^3
- Total system weight: 250 kg
- Standard air condition (20-25°C)

TPCF Image Gallery (SPECT)

Imaging of marked drugs and evaluating their distribution



Immediately after injection

5 minutes after injection

15 minutes after injection

Half an hour after injection

Our team is open to receive your comments and suggestions in order to improve the quality of products

Thanks to our Team work