CURRÍCULUM VÍTAE NORMALIZADO

Irene Torres Espallardo

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Summary of CV

This section describes briefly a summary of your career in science, academic and research; the main scientific and technological achievements and goals in your line of research in the medium -and long- term. It also includes other important aspects or peculiarities.

From November 2004 to June 2008 I was a PhD student at the Nuclear Medicine Department of Klinikum rechts der Isar in Munich, under the supervision of Dr. Ziegler and Dr. Rafecas. My PhD research was focused on image reconstruction for a small animal PET scanner. Prior to my PhD studies, I worked as a medical physics resident in Hospital La Fe (Valencia, Spain) for three years, completing the trainee program to become medical physicist. In August 2003 I started a position as a medical physicist in the Radiation Oncology Department at Hospital Provincial de Castellon. In both hospitals I practiced standard methods used in conventional radiotherapy.

Between July 2008 to September 2010 I was working at the University Hospital in Aachen. My research was supported by the Molecular Imaging Group of the Philips Research Laboratory in Aachen. The area in which I worked was corrections for quantitative PET images. More precisely the attenuation correction for a whole body PET/MR scanner and the lung motion correction for PET images. These corrections are applied to clinical data from the Philips Gemini TOF PET/CT scanner.

Afterwards I was hired at the IFIC (Institute of High Energy Physics, research center that depends on the University of Valencia and Spanish Research Council) for a European project called ENVISION. This project was dedicated to the improving of the quality assurance tools for hadrondtherapy. In February 2014 I started to work in Hospital Universitario y Politécnico La Fe as Medical Physicist at the Nuclear Medicine department, which is my current position.

General quality indicators of scientific research

This section describes briefly the main quality indicators of scientific production (periods of research activity, experience in supervising doctoral theses, total citations, articles in journals of the first quartile, H index...). It also includes other important aspects or peculiarities.

Web of Science Core Collection metrics
Total Articles in Publication List: 53
Sum of the Times Cited: 584
Average Citations per Article: 11,54
h-index: 12

Irene Torres Espallardo

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Name:	**Irene**
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ResearcherID:	**I-3918-2015**
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Current professional situation

Employing entity: Hospital Universitario y Politécnico La Fe **Type of entity:** Healthcare Institutions
Department: Nuclear Medicine, Clinical Area of Medical Imaging
Professional category: Medical Physics
City employing entity: Valencia, Spain
Phone: (0034) 961245640
Start date: 24/02/2014
Type of contract: Temporary **Dedication regime:** Full time
Primary (UNESCO code): 220700 - Nuclear physics
Secondary (UNESCO code): 329900 - Other medical specialities
Tertiary (UNESCO code): 331110 - Medical instruments
Identify key words: Fuentes de radiacion y detectores [eng; Nuclear medicine; physical instrumentation in biomedicine; Medical equipment

Education

University education

1st and 2nd cycle studies and pre-Bologna degrees

1 **University degree:** Formación Sanitaria Especializada
Name of qualification: Radiofisica Hospitalaria
Degree awarding entity: Hospital Universitario y Politécnico La Fe **Type of entity:** Healthcare Institutions
Date of qualification: 17/07/2003

2 **University degree:** Diplomatura / Licenciatura / Grado
Name of qualification: Licenciada
Degree awarding entity: Universitat de València
Date of qualification: 15/09/1998
Average mark: Good

Doctorates

Doctorate programme: Doctor en Física
Degree awarding entity: Universitat de València
Date of degree: 22/02/2010
Thesis title: Image Reconstruction and Correction Methods for MADPET-II based on Monte Carlo Techniques
Thesis director: Sibylle Ziegler, Magdalena Rafecas
Obtained qualification: Sobresaliente cum laude

Scientific and technological experience

Scientific or technological activities

R&D projects funded through competitive calls of public or private entities

1 **Name of the project:** Advanced Imaging DEtector for targeted Radionuclide therapy
Entity where project took place: Instituto de Investigacion Sanitaria La Fe **Type of entity:** Foundation
City of entity: Valencia,
Name principal investigator (PI, Co-PI....): Gabriela Llosa; Irene Torres Espallardo
Nº of researchers: 26
Funding entity or bodies:
EU Commision **Type of entity:** Public Research Body

Start-End date: 01/09/2025 - 30/09/2029
Total amount: 3.499.196,25 €

2 **Name of the project:** Tecnologia escalable TOF-PET usando la luz de Cherenkov en BGO
Entity where project took place: INSTITUTO DE INSTRUMENTACION PARA IMAGEN MOLECULAR **Type of entity:** R&D Centre
City of entity: Valencia, Comunitat Valenciana, Spain
Name principal investigator (PI, Co-PI....): González Martínez Antonio Javier; Gonzalez Montoro Andrea; Sánchez Martínez Filomeno; Torres Espallardo Irene
Nº of researchers: 4
Funding entity or bodies:
MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES **Type of entity:** Public Research Body

Start-End date: 2025 - 2027
Total amount: 190.500 €

3 **Name of the project:** Optimización de la dosimetría en Radioembolización
Entity where project took place: Hospital Universitario La Fe **Type of entity:** Healthcare Institutions
City of entity: Valencia, Comunitat Valenciana, Spain
Nº of researchers: 8
Funding entity or bodies:
Sociedad Española de Fisica Médica **Type of entity:** Associations and Groups

Start-End date: 01/02/2024 - 31/10/2025
Total amount: 4.000 €

4 **Name of the project:** Imagen Compton para terapia con Radionúclidos - ICOR
Entity where project took place: Instituto de Física Corpuscular **Type of entity:** State agency
City of entity: Valencia, Comunitat Valenciana, Spain
Name principal investigator (PI, Co-PI....): Gabriela Llosá Llácer; Irene Torres Espallardo
Nº of researchers: 8

Funding entity or bodies:
Conselleria de Innovacion, Universidades, Ciencia, y Sociedad Digital **Type of entity:** State agency
City funding entity: Valencia, Comunitat Valenciana, Spain

Start-End date: 12/09/2022 - 10/09/2025
Total amount: 299.920 €

5 **Name of the project:** Nuevas Tecnologías en Imágenes Médicas
Entity where project took place: Hospital Universitario y Politécnico La Fe
City of entity: Valencia, Spain
Nº of researchers: 9
Start-End date: 01/04/2021 - 31/03/2022
Total amount: 7.834 €

6 **Name of the project:** Deep Learning para diagnosis asistida por ordenador de enfermedades neurodegenerativas
Entity where project took place: Hospital Universitario y Politécnico La Fe
City of entity: Valencia, Comunitat Valenciana, Spain
Nº of researchers: 6
Start-End date: 01/12/2019 - 30/11/2020
Total amount: 4.500 €

7 **Name of the project:** DISPOSITIVO MULTI-IMAGEN CON UN DETECTOR PET PARA GUIAR LA BIOPSIA, EL TRATAMIENTO Y EL SEGUIMIENTO DEL CÁNCER DE PRÓSTATA (PROSPET)
Entity where project took place: Hospital Universitario La Fe **Type of entity:** Healthcare Institutions
City of entity: Valencia, Comunitat Valenciana, Spain
Name principal investigator (PI, Co-PI....): Cesar David Vera Donoso
Nº of researchers: 8
Funding entity or bodies:
Instituto de Salud Carlos III **Type of entity:** Public Research Body
City funding entity: Majadahonda, Madrid, Comunidad de, Spain

Start-End date: 2015 - 2017
Total amount: 99.000 €

8 **Name of the project:** ALINEAMIENTO TEMPORAL DE SONDAS Y ESCÁNERES COMERCIA- LES
Entity where project took place: Hospital Universitario La Fe **Type of entity:** Healthcare Institutions
City of entity: Valencia, Comunitat Valenciana, Spain
Name principal investigator (PI, Co-PI....): Pilar Bello Arqués; Gabriela Llosá Llácer
Nº of researchers: 9
Funding entity or bodies:
Programa VLC-BIOMED **Type of entity:** Public Research Body
City funding entity: Valencia, Comunitat Valenciana, Spain

Start-End date: 03/2015 - 03/2016
Total amount: 4.000 €

9 **Name of the project:** Estimación de la dosis de radiación por tamaño – órgano en las exploraciones de TC mediante técnicas de aprendizaje automático entrenadas con simulaciones Monte-Carlo
Entity where project took place: Hospital Universitario La Fe **Type of entity:** Healthcare Institutions
City of entity: Valencia, Comunitat Valenciana, Spain
Name principal investigator (PI, Co-PI....): Irene Torres Espallardo; Emilio Soria Olivas
Nº of researchers: 8
Funding entity or bodies:
Programa VLC-BIOMED **Type of entity:** Public Research Body
City funding entity: Valencia, Comunitat Valenciana, Spain

Start-End date: 03/2015 - 03/2016
Total amount: 4.000 €

10 **Name of the project:** Organ Size Dose Estimating in Computed Tomography using Monte Carlo simulations
Entity where project took place: Hospital Universitario La Fe **Type of entity:** Healthcare Institutions
City of entity: Valencia, Comunitat Valenciana, Spain
Name principal investigator (PI, Co-PI....): Irene Torres Espallardo; Rafael Miró Herrero
Nº of researchers: 9
Funding entity or bodies:
Proyectos Coordinados UPV-LAFE **Type of entity:** Public Research Body
City funding entity: Valencia, Comunitat Valenciana, Spain

Start-End date: 10/2014 - 10/2015
Total amount: 5.000 €

11 **Name of the project:** Calidad de imagen y cuantificación en tomografia por emisión de positrones
Entity where project took place: Universitat de València
Name principal investigator (PI, Co-PI....): Magdalena Rafecas López
Nº of researchers: 8
Funding entity or bodies:
Ministerio de Educación y Ciencia (Proyectos de I+D. Plan Nacional de Investigación Científica)

Code according to the funding entity: GV-ACOMP/2012-232
Start date: 2012
Total amount: 13.000 €

12 **Name of the project:** Telescopio Compton para monitorización de la terapia hadrónica
Entity where project took place: Universidad de Valencia y CSIC
Name principal investigator (PI, Co-PI....): Magdalena Rafecas Lopez
Nº of researchers: 8
Funding entity or bodies:
Plan Nacional de I+D+i, Acciones Complementarias (MICINN)

Code according to the funding entity: FIS2011-14585-E
Start date: 2012
Total amount: 18.000 €

13 **Name of the project:** Calidad de imagen y cuantificación en tomografia por emisión de positrones
Entity where project took place: Universitat de València
Name principal investigator (PI, Co-PI....): Magdalena Rafecas López
Nº of researchers: 8

Funding entity or bodies:
Ministerio de Educación y Ciencia (Proyectos de I+D. Plan Nacional de Investigación Científica)

Code according to the funding entity: FPA2010-14891
Start date: 2011
Total amount: 146.100 €

14 **Name of the project:** European NoVel Imaging Systems for ION therapy (ENVISION)
Entity where project took place: Comisión Europea
Name principal investigator (PI, Co-PI....): Manjit Dosanjh,
Funding entity or bodies:
Unión Europea

Code according to the funding entity: ENVISION
Start date: 2010
Total amount: 5.996.460 €

15 **Name of the project:** Improving Image Quality in Positron Emission Tomography,
Entity where project took place: Universitat de València
Name principal investigator (PI, Co-PI....): Magdalena Rafecas López
Nº of researchers: 5
Funding entity or bodies:
Ministerio de Educación y Ciencia (Proyectos de I+D. Plan Nacional de Investigación Científica)

Code according to the funding entity: TEC2007-61047
Start date: 2007
Total amount: 136.246 €

16 **Name of the project:** Medical Image in Positron Emission Tomography
Entity where project took place: Universitat de València
Name principal investigator (PI, Co-PI....): M. Rafecas
Funding entity or bodies:
Consellería de Empresa, Universidad y Ciencia- Generalitat Valenciana

Code according to the funding entity: ---
Start date: 2006

Results

Industrial and intellectual property

Title registered industrial property: Method and apparatus for compensating intra-fractional motion
Inventors/authors/obtainers: Michael Johannes Eble; Jens Christoph Georgi; Irene Torres Espallardo
Entity holder of rights: Koninklijke Philips Electronics N.V., Philips Intellectual Property & Standards Gmbh
Nº of application: PCT/IB2011/055143
Country of inscription: Germany
Date of register: 17/11/2011

Scientific and technological activities

Scientific production

Publications, scientific and technical documents

1 Carmen Salvador-Ribes; Carina Soler-Pons; Maria Jesus Sanchez-Garcia; Tobias Fechter; Consuelo Olivas; Irene Torres-Espallardo; Jose Perez-Calatayud; Dimos Baltas; Michael Mix; Luis Marti-Bonmati; Montserrat Carles. Open-source phantom with dedicated in-house software for image quality assurance in hybrid PET systems. EJNMMI PHYSICS. 12, SPRINGER, 2025. ISSN 2197-7364

DOI: 10.1186/s40658-025-00741-8

PMID: MEDLINE:40192938

Type of production: Scientific paper **Format:** Journal

Total no. authors: 11

Source of citations: WOS **Citations:** 0

2 Jorge Roser; Luis Barrientos; Pilar Bello; Marina Borja-Lloret; Jose Manuel Calatayud; Jose V. Casana; Fernando Hueso-Gonzalez; Javier Perez-Curbelo; Stefan Prado; Ana Ros; Cesar Senra; Rita Viegas; Irene Torres-Espallardo; Gabriela Llosa. Radiopharmaceutical imaging of phantoms and patients with MACACO III Compton camera. PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS. 132, ELSEVIER SCI LTD, 2025. ISSN 1120-1797

DOI: 10.1016/j.ejmp.2025.104928

PMID: MEDLINE:40068545

Type of production: Scientific paper **Format:** Journal

Total no. authors: 14

Source of citations: WOS **Citations:** 0

3 I. Torres; R. Ramos; M. L. Dominguez; J. J. Rosales; A. Roteta; E. Prieto; L. Sancho; M. de Arcocha; G. Quincoces. State of the art and future perspectives of new radinuclides in Nuclear Medicine: Part III. REVISTA ESPANOLA DE MEDICINA NUCLEAR E IMAGEN MOLECULAR. 44, ELSEVIER ESPANA SLU, 2025. ISSN 2253-654X

DOI: 10.1016/j.remn.2025.500161

PMID: MEDLINE:40311871

Type of production: Scientific paper **Format:** Journal

Total no. authors: 9

Source of citations: WOS **Citations:** 1

4 L. Sancho; A. Roteta; I. Torres; M. de Arcocha; R. Ramos; M. L. Dominguez; J. J. Rosales; E. Prieto; G. Quincoces. State of the art and future perspectives of new radionuclides in Nuclear Medicine. Part II. REVISTA ESPANOLA DE MEDICINA NUCLEAR E IMAGEN MOLECULAR. 44, ELSEVIER ESPANA SLU, 2025. ISSN 2253-654X

DOI: 10.1016/j.remn.2025.500128

PMID: MEDLINE:40147757

Type of production: Scientific paper **Format:** Journal

Total no. authors: 9

Source of citations: WOS **Citations:** 1

5 Gandia-Ferrero, Maria Teresa; Torres-Espallardo, Irene; Martinez-Sanchis, Begona; Munoz, Enrique; Morera-Ballester, Constantino; Sopena-Novales, Pablo; Alvarez-Sanchez, Lourdes; Baquero-Toledo, Miquel; Marti-Bonmati, Luis. Amyloid brain-dedicated PET images can diagnose Alzheimer's pathology with Centiloid Scale. PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS. 121, ELSEVIER SCI LTD, 2024. ISSN 1120-1797

DOI: 10.1016/j.ejmp.2024.103345

PMID: MEDLINE:38581963

Type of production: Scientific paper **Format:** Journal

Total no. authors: 9

Source of citations: WOS **Citations:** 0

6 Gandia-Ferrero MT; Adrián-Ventura J; Cháfer-Pericás C; Alvarez-Sanchez L; Ferrer-Cairols I; Martinez-Sanchis B; Torres-Espallardo I; Baquero-Toledo M; Marti-Bonmati L. Relationship between neuroimaging and emotion recognition in Mild Cognitive Impairment patients.Behavioural brain research. pp. 114844. 2024. ISSN 0166-4328

DOI: 10.1016/j.bbr.2023.114844

PMID: 38176615

Type of production: Scientific paper

7 Calatayud-Jordan, Jose; Carrasco-Vela, Nuria; Chimeno-Hernandez, Jose; Carles-Farina, Montserrat; Olivas-Arroyo, Consuelo; Bello-Arques, Pilar; Perez-Enguix, Daniel; Marti-Bonmati, Luis; Torres-Espallardo, Irene. Y-90 PET/MR imaging optimization with a Bayesian penalized likelihood reconstruction algorithm. PHYSICAL AND ENGINEERING SCIENCES IN MEDICINE. SPRINGER, 2024. ISSN 2662-4729

DOI: 10.1007/s13246-024-01452-7

PMID: MEDLINE:38884672

Type of production: Scientific paper **Format:** Journal

Total no. authors: 9

Source of citations: WOS **Citations:** 0

8 Prado-Wohlwend, Stefan; Ballesta-Moratalla, Monica; Torres-Espallardo, Irene; del Olmo-Garcia, Maria Isabel; Bello-Arques, Pilar; Olivas-Arroyo, Consuelo; Merino-Torres, Juan Francisco. Same-day comparative protocol PET/CT-PET/MRI [(68) Ga]Ga-DOTA-TOC in paragangliomas and pheochromocytomas: an approach to personalized medicine. CANCER IMAGING. 23, 2023. ISSN 1740-5025

DOI: 10.1186/s40644-023-00521-6

PMID: 36627700

Type of production: Scientific paper

9 Prats-Climent, Joan; Teresa Gandia-Ferrero, Maria; Torres-Espallardo, Irene; Alvarez-Sanchez, Lourdes; Martinez-Sanchis, Begona; Chafer-Pericas, Consuelo; Gomez-Rico, Ignacio; Cerda-Alberich, Leonor; Aparici-Robles, Fernando; Baquero-Toledo, Miquel; Jose Rodriguez-Alvarez, Maria; Marti-Bonmati, Luis. Artificial Intelligence on FDG PET Images Identifies Mild Cognitive Impairment Patients with Neurodegenerative Disease. JOURNAL OF MEDICAL SYSTEMS. 46, 2022. ISSN 0148-5598

DOI: 10.1007/s10916-022-01836-w

PMID: 35713815

Type of production: Scientific paper

10 Martinez-Movilla, Andrea; Mix, Michael; Torres-Espallardo, Irene; Teijeiro, Elena; Bello, Pilar; Baltas, Dimos; Marti-Bonmati, Luis; Carles, Montserrat. Comparison of protocols with respiratory-gated (4D) motion compensation in PET/CT: open-source package for quantification of phantom image quality. EJNMMI PHYSICS. 9, 2022. ISSN 2197-7364

DOI: 10.1186/s40658-022-00509-4

PMID: 36394640

Type of production: Scientific paper

11 Prado-Wohlwend S; Ballesta-Moratalla M; Torres-Espallardo I; Del Olmo-García MI; Sánchez-Vañó R; Bello-Arques P. Assessment of a well-differentiated pancreatic neuroendocrine tumor with ⁶⁸Ga-DOTATOC PET/CT, ⁶⁸Ga-DOTATOC PET/MRI and ^{99m}Tc-octreotide SPECT/CT. What does each scan provide?. Revista espanola de medicina nuclear e imagen molecular. 40, pp. 259 - 260. 2021.

DOI: 10.1016/j.remnie.2020.08.002

PMID: 34218892

Type of production: Scientific paper

12 Canizares, Gabriel; Gonzalez-Montoro, Andrea; Freire, Marta; Lamprou, Efthymios; Barrio, John; Sanchez, Filomeno; Benlloch, Jose M.; Hernandez, Liczandro; Moliner, Laura; Vidal, Luis F.; Torres, Irene; Sopena, Pablo; Vera-Donoso, Cesar D.; Bello, Pilar; Barbera, Julio; Gonzalez, Antonio J.. Pilot performance of a dedicated prostate PET suitable for diagnosis and biopsy guidance. EJNMMI PHYSICS. 7, 2020. ISSN 2197-7364

DOI: 10.1186/s40658-020-00305-y

PMID: 32504230

Type of production: Scientific paper **Format:** Journal

Relevant results: Background: Prostate cancer (PCa) represents one of the most common types of cancers facing the male population. Nowadays, to confirm PCa, systematic or multiparametric MRI-targeted transrectal or transperineal biopsies of the prostate are required. However, due to the lack of an accurate imaging technique capable to precisely locate cancerous cells in the prostate, ultrasound biopsies sample random parts of the prostate and, therefore, it is possible to miss regions where those cancerous cells are present. In spite of the improvement with multiparametric MRI, the low reproducibility of its reading undermines the specificity of the method. Recent development of prostate-specific radiotracers has grown the interest on using positron emission tomography (PET) scanners for this purpose, but technological improvements are still required (current scanners have resolutions in the range of 4-5 mm). Results: The main goal of this work is to improve state-of-the-art PCa imaging and diagnosis. We have focused our efforts on the design of a novel prostate-dedicated PET scanner, named ProsPET. This system has small scanner dimensions defined by a ring of just 41 cm inner diameter. In this work, we report the design, implementation, and evaluation (both through simulations and real data) of the ProsPET scanner. We have been able to achieve < 2 mm resolution in reconstructed images and high sensitivity. In addition, we have included a comparison with the Philips Gemini-TF scanner, which is used for routine imaging of PCa patients. The ProsPET exhibits better contrast, especially for rod sizes as small as 4.5 mm in diameter. Finally, we also show the first reconstructed image of a PCa patient acquired with the ProsPET. Conclusions: We have designed and built a prostate specific PET system, with a small footprint and improved spatial resolution when compared to conventional whole-body PET scanners. The gamma ray impact within each detector block includes accurate DOI determination, correcting for the parallax error. The potential role of combined organ-dedicated prostate-specific membrane antigen (PSMA) PET and ultrasound devices, as a prebiopsy diagnostic tool, could be used to guide sampling of the most aggressive sites in the prostate.

13 P Oliván-Sasot; D Pérez-Enguix; P Bello-Arqués; I Torres-Espallardo; M Falgás-Lacueva; AM Yepes-Agudelo; C Olivas-Arroyo. Radioembolization in patients with hepatocellular carcinoma: a series of 53 cases. Radiologia. 20, pp. 0033 - 8338. 2020. ISSN 2253-654X

DOI: 10.1016/j.rx.2020.09.012

PMID: 33257052

Type of production: Scientific paper **Format:** Journal

Corresponding author: No

Relevant results: Objective: To contribute our results to increase the scientific evidence about the use of radioembolization in the management of patients with hepatocellular carcinoma. Material and methods: This retrospective review included 53 patients with hepatocellular carcinoma treated with radioembolization at our center. Patients were classified according to the BCLC algorithm in detail according to their Child-Pugh functional status. We analyzed survival using the Kaplan-Meier method. We used Cox regression analysis to determine clinically significant parameters, including the doses administered in the parameters studied. Results: Patients ranged in age from 28 to 86 years (mean, 60 years). A total of 61 procedures were done. The mean activity administered was 2.8 GBq (0.7-6.4 GBq), with a mean dose of 229.9Gy (74-425.9Gy) administered in the tumor. Progression-free survival was 6.7 months and overall survival was 12.8 months. Differences in disease-free survival according to BCLC and Child-Pugh classification were not significant (p=0.848 and p=0.252, respectively). The clinical parameters that were significantly different with respect to overall survival were bilirubin levels (p<0.001), pretreatment transaminase

levels (AST) (p=0.022), Child-Pugh subclassification (p=0.003), and dose administered in the tumor (p=0.001). Only one patient had a severe adverse reaction, developing posttreatment liver failure resulting in death. Conclusions: Radioembolization is safe and efficacious in the treatment of patients with hepatocellular carcinoma. Liver function and the doses received by the tumor are key parameters for the efficacy of treatment. The increase in the scientific evidence supports the inclusion of this technique in treatment guidelines.

14 Jose Maria Chimeno; Natividad Sebastià; Irene Torres-Espallardo; Julia Balaguer; Cristian Candela-Juan; Jose Luis Loaiza; Mar Adria; Blanca Ibanez-Rosello; Adela Cañete; Luis Martí-Bonmatí; Alegría Montoro. Assessment of the dicentric chromosome assay as a biodosimetry tool for more personalized medicine in a case of a high risk neuroblastoma 131I-mIBG treatment. International Journal of Radiation Biology. 0 - 0, pp. 1 - 7. Taylor & Francis, 2019. Available on-line at: <https://doi.org/10.1080/09553002.2019.1549755>. ISSN 1362-3095

DOI: 10.1080/09553002.2019.1549755

PMID: 30496023

Type of production: Scientific paper **Format:** Journal

Relevant results: The results indicate a possible correlation between biodosimetry and standard physical dosimetry in 131I-mIBG treatment for high-risk neuroblastoma. A larger cohort and refinement of the DCA for internal irradiation are needed to define the role of biodosimetry in clinical situations.

15 Montserrat Carles Fariña; Til Bach; Irene Torres Espallardo; Dimas Baltas; Ursula Nestle; Luis Martí Bonmatí. Significance of the impact of motion compensation on the variability of PET image features. Physics in Medicine & Biology. 63, pp. 65013 - 65027. IOP Publishing, 21/03/2018. ISSN 1361-6560

DOI: 10.1088/1361-6560/aab180

PMID: 29469054

Type of production: Scientific paper **Format:** Journal

Corresponding author: No

Relevant results: n lung cancer, quantification by positron emission tomography/computed tomography (PET/CT) imaging presents challenges due to respiratory movement. Our primary aim was to study the impact of motion compensation implied by retrospectively gated (4D)-PET/CT on the variability of PET quantitative parameters. Its significance was evaluated by comparison with the variability due to (i) the voxel size in image reconstruction and (ii) the voxel size in image post-resampling. The method employed for feature extraction was chosen based on the analysis of (i) the effect of discretization of the standardized uptake value (SUV) on complementarity between texture features (TF) and conventional indices, (ii) the impact of the segmentation method on the variability of image features, and (iii) the variability of image features across the time-frame of 4D-PET. Thirty-one PET-features were involved. Three SUV discretization methods were applied: a constant width (SUV resolution) of the resampling bin (method RW), a constant number of bins (method RN) and RN on the image obtained after histogram equalization (method EqRN). The segmentation approaches evaluated were 40[Formula: see text] of SUVmax and the contrast oriented algorithm (COA). Parameters derived from 4D-PET images were compared with values derived from the PET image obtained for (i) the static protocol used in our clinical routine (3D) and (ii) the 3D image post-resampled to the voxel size of the 4D image and PET image derived after modifying the reconstruction of the 3D image to comprise the voxel size of the 4D image. Results showed that TF complementarity with conventional indices was sensitive to the SUV discretization method. In the comparison of COA and 40[Formula: see text] contours, despite the values not being interchangeable, all image features showed strong linear correlations (r > 0.91, [Formula: see text]). Across the time-frames of 4D-PET, all image features followed a normal distribution in most patients. For our patient cohort, the compensation of tumor motion did not have a significant impact on the quantitative PET parameters. The variability of PET parameters due to voxel size in image reconstruction was more significant than variability due to voxel size in image post-resampling. In conclusion, most of the parameters (apart from the contrast of neighborhood matrix) were robust to the motion compensation implied by 4D-PET/CT. The impact on parameter variability due to the voxel size in image reconstruction and in image post-resampling could not be assumed to be equivalent.

16 M. Carles; I. Torres-Espallardo; A. Alberich-Bayarri; C. Olivas; P. Bello; U. Nestle; L. Marti-Bonmati. Evaluation of PET texture features with heterogeneous phantoms: complementarity and effect of motion and segmentation method. Phys Med Biol. 62 - 2, pp. 652 - 668. 01/2017. ISSN 1361-6560

DOI: 10.1088/1361-6560/62/2/652

PMID: 28033121

Type of production: Scientific paper **Format:** Journal

Relevant results: A major source of error in quantitative PET/CT scans of lung cancer tumors is respiratory motion. Regarding the variability of PET texture features (TF), the impact of respiratory motion has not been properly studied with experimental phantoms. The primary aim of this work was to evaluate the current use of PET texture analysis for heterogeneity characterization in lesions affected by respiratory motion. Twenty-eight heterogeneous lesions were simulated by a mixture of alginate and 18 F-fluoro-2-deoxy-D-glucose (FDG). Sixteen respiratory patterns were applied. Firstly, the TF response for different heterogeneous phantoms and its robustness with respect to the segmentation method were calculated. Secondly, the variability for TF derived from PET image with (gated, G-) and without (ungated, U-) motion compensation was analyzed. Finally, TF complementarity was assessed. In the comparison of TF derived from the ideal contour with respect to TF derived from 40%-threshold and adaptive-threshold PET contours, 7/8 TF showed strong linear correlation (LC) ($p < 0.001$, $r > 0.75$), despite a significant volume underestimation. Independence of lesion movement (LC in 100% of the combined pairs of movements, $p < 0.05$) was obtained for 1/8 TF with U-image (width of the volume-activity histogram, WH) and 4/8 TF with G-image (WH and energy (ENG), local-homogeneity (LH) and entropy (ENT), derived from the co-ocurrence matrix). Their variability in terms of the coefficient of variance ([Formula: see text]) resulted in [Formula: see text](WH) = 0.18 on the U-image and [Formula: see text](WH) = 0.24, [Formula: see text](ENG) = 0.15, [Formula: see text](LH) = 0.07 and [Formula: see text](ENT) = 0.06 on the G-image. Apart from WH ($r > 0.9$, $p < 0.001$), not one of these TF has shown LC with C max. Complementarity was observed for the TF pairs: ENG-LH, CONT (contrast)-ENT and LH-ENT. In conclusion, the effect of respiratory motion should be taken into account when the heterogeneity of lung cancer is quantified on PET/CT images. Despite inaccurate volume delineation, TF derived from 40% and COA contours could be reliable for their prognostic use. The TF that exhibited simultaneous added value and independence of lesion movement were ENG and ENT computed from the G-image. Their use is therefore recommended for heterogeneity quantification of lesions affected by respiratory motion.

17 I. Torres Espallardo. PET/CT: underlying physics, instrumentation, and advances. Radiologia. 01/2017. ISSN 0033-8338

DOI: 10.1016/j.rx.2016.10.010

PMID: 28089381

Type of production: Scientific paper **Format:** Journal

Relevant results: Since it was first introduced, the main goal of PET/CT has been to provide both PET and CT images with high clinical quality and to present them to radiologists and specialists in nuclear medicine as a fused, perfectly aligned image. The use of fused PET and CT images quickly became routine in clinical practice, showing the great potential of these hybrid scanners. Thanks to this success, manufacturers have gone beyond considering CT as a mere attenuation corrector for PET, concentrating instead on design high performance PET and CT scanners with more interesting features. Since the first commercial PET/CT scanner became available in 2001, both the PET component and the CT component have improved immensely. In the case of PET, faster scintillation crystals with high stopping power such as LYSO crystals have enabled more sensitive devices to be built, making it possible to reduce the number of undesired coincidence events and to use time of flight (TOF) techniques. All these advances have improved lesion detection, especially in situations with very noisy backgrounds. Iterative reconstruction methods, together with the corrections carried out during the reconstruction and the use of the point-spread function, have improved image quality. In parallel, CT instrumentation has also improved significantly, and 64- and 128-row detectors have been incorporated into the most modern PET/CT scanners. This makes it possible to obtain high quality diagnostic anatomic images in a few seconds that both enable the correction of PET attenuation and provide information for diagnosis. Furthermore, nowadays nearly all PET/CT scanners have a system that modulates the dose of radiation that the patient is exposed to in the CT study in function of the region scanned. This article reviews the underlying physics of PET and CT imaging separately, describes the changes in the instrumentation and standard protocols in a combined PET/CT system, and finally points out the most important advances in this hybrid imaging modality.

18 P. Solevi; E. Munoz; C. Solaz; M. Trovato; P. Dendooven; J. E. Gillam; C. Lacasta; J. F. Oliver; M. Rafecas; I. Torres-Espallardo; G. Llosa. Performance of MACACO Compton telescope for ion-beam therapy monitoring: first test with proton beams. Phys Med Biol. 61 - 14, pp. 5149 - 5165. 07/2016. ISSN 1361-6560

DOI: 10.1088/0031-9155/61/14/5149

PMID: 27352107

Type of production: Scientific paper **Format:** Journal

Relevant results: In order to exploit the advantages of ion-beam therapy in a clinical setting, delivery verification techniques are necessary to detect deviations from the planned treatment. Efforts are currently oriented towards the

development of devices for real-time range monitoring. Among the different detector concepts proposed, Compton cameras are employed to detect prompt gammas and represent a valid candidate for real-time range verification. We present the first on-beam test of MACACO, a Compton telescope (multi-layer Compton camera) based on lanthanum bromide crystals and silicon photo-multipliers. The Compton telescope was first characterized through measurements and Monte Carlo simulations. The detector linearity was measured employing (22)Na and Am-Be sources, obtaining about 10% deviation from linearity at 3.44 MeV. A spectral image reconstruction algorithm was tested on synthetic data. Point-like sources emitting gamma rays with energy between 2 and 7 MeV were reconstructed with 3-5 mm resolution. The two-layer Compton telescope was employed to measure radiation emitted from a beam of 150 MeV protons impinging on a cylindrical PMMA target. Bragg-peak shifts were achieved via adjustment of the PMMA target location and the resulting measurements used during image reconstruction. Reconstructed Bragg peak profiles proved sufficient to observe peak-location differences within 10 mm demonstrating the potential of the MACACO Compton Telescope as a monitoring device for ion-beam therapy.

19 Juan Antonio Bautista Ballesteros; Irene Torres Espallardo; Pablo Borrelli; Antonio Rivas Sánchez; Pilar Bello; Luis Martí Bonmatí. Individualised dosimetry in patients with differentiated thyroid cancer based on external dose-rate. Optimisation of the number of measurements.Rev Esp Med Nucl Imagen Mol.35 - 2, pp. 107 - 114. Elsevier, 17/11/2015. ISSN 2253-654X

DOI: 10.1016/j.remn.2015.09.009

PMID: 26598429

Type of production: Scientific paper **Format:** Journal

Corresponding author: No

Relevant results: To compare the results of individual dosimetry in differentiated thyroid cancer patients treated with (131)I at our centre with the established limits and dosimetry results of published studies. Analysis of the optimal number of measurements necessary to reduce the impact of dosimetry for the comfort of the patient and, secondly, on the workload of health workers. Dosimetry was performed in the Nuclear Medicine Department of the University and Polytechnic Hospital La Fe, on 29 patients suffering from differentiated thyroid cancer and treated with activities between 1.02 and 5.51 GBq (mean 2.68 GBq) of (131)I. The Spanish Society of Medical Physics (SEFM) protocol was used, based on measurements of external dose rate adjusted to a bi-exponential curve according to a two compartment model. Different dosimetries were performed on each patient, taking different selections of the available measurements in order to find the optimal number. Results are well below the dosimetry limits, and are consistent with those obtained in other centres. The number of measurements can be reduced from 5, as proposed in the SEFM protocol, to 4 without significant loss of accuracy. Further reducing measures may be justified in individual cases. The values obtained for the dosimetry quantities are significantly below the established limits. A reduction in measurements can be assumed at the cost of a moderate increase in uncertainty, benefiting the patient.

20 I Torres-Espallardo; F Diblen; H Rohling; P Solevi; J Gillam; D Watts; S España; S Vandenberghe; F Fiedler; MRafecas. Evaluation of resistive-plate-chamber-based TOF-PET applied to in-beam particle therapy monitoring. Physics in Medicine and Biology. 60 - 9, pp. N187 - N187. 2015. Available on-line at: <http://stacks.iop.org/0031-9155/60/i=9/a=N187>. ISSN 1361-6560

DOI: 10.1088/0031-9155/60/9/N187

PMID: 25884991

Type of production: Scientific paper **Format:** Journal

Relevant results: Particle therapy is a highly conformal radiotherapy technique which reduces the dose deposited to the surrounding normal tissues. In order to fully exploit its advantages, treatment monitoring is necessary to minimize uncertainties related to the dose delivery. Up to now, the only clinically feasible technique for the monitoring of therapeutic irradiation with particle beams is Positron Emission Tomography (PET). In this work we have compared a Resistive Plate Chamber (RPC)-based PET scanner with a scintillation-crystal-based PET scanner for this application. In general, the main advantages of the RPC-PET system are its excellent timing resolution, low cost, and the possibility of building large area systems. We simulated a partial-ring scanner based on an RPC prototype under construction within the Fondazione per Adroterapia Oncologica (TERA). For comparison with the crystal-based PET scanner we have chosen the geometry of a commercially available PET scanner, the Philips Gemini TF. The coincidence time resolution used in the simulations takes into account the current achievable values as well as expected improvements of both technologies. Several scenarios (including patient data) have been simulated to evaluate the performance of different scanners. Initial results have shown that the low sensitivity of the RPC hampers its application to hadron-beam monitoring, which has an intrinsically low positron yield compared to diagnostic PET. In addition, for in-beam PET there is a further data loss due to the partial ring configuration. In order to improve the

performance of the RPC-based scanner, an improved version of the RPC detector (modifying the thickness of the gas and glass layers), providing a larger sensitivity, has been simulated and compared with an axially extended version of the crystal-based device. The improved version of the RPC shows better performance than the prototype, but the extended version of the crystal-based PET outperforms all other options.

21 P G Ortega; I Torres-Espallardo; F Cerutti; A Ferrari; J E Gillam; C Lacasta; G Llosá; J F Oliver; P RSala; P Solevi; M Rafecas. Noise evaluation of Compton camera imaging for proton therapy. Physics in Medicine and Biology. 60 - 5, pp. 1845 - 1845. 2015. Available on-line at: <http://stacks.iop.org/0031-9155/60/i=5/a=1845>. ISSN 1361-6560

DOI: 10.1088/0031-9155/60/5/1845

PMID: 25658644

Type of production: Scientific paper **Format:** Journal

Relevant results: Compton Cameras emerged as an alternative for real-time dose monitoring techniques for Particle Therapy (PT), based on the detection of prompt-gammas. As a consequence of the Compton scattering process, the gamma origin point can be restricted onto the surface of a cone (Compton cone). Through image reconstruction techniques, the distribution of the gamma emitters can be estimated, using cone-surfaces backprojections of the Compton cones through the image space, along with more sophisticated statistical methods to improve the image quality. To calculate the Compton cone required for image reconstruction, either two interactions, the last being photoelectric absorption, or three scatter interactions are needed. Because of the high energy of the photons in PT the first option might not be adequate, as the photon is not absorbed in general. However, the second option is less efficient. That is the reason to resort to spectral reconstructions, where the incoming γ energy is considered as a variable in the reconstruction inverse problem. Jointly with prompt gamma, secondary neutrons and scattered photons, not strongly correlated with the dose map, can also reach the imaging detector and produce false events. These events deteriorate the image quality. Also, high intensity beams can produce particle accumulation in the camera, which lead to an increase of random coincidences, meaning events which gather measurements from different incoming particles. The noise scenario is expected to be different if double or triple events are used, and consequently, the reconstructed images can be affected differently by spurious data. The aim of the present work is to study the effect of false events in the reconstructed image, evaluating their impact in the determination of the beam particle ranges. A simulation study that includes misidentified events (neutrons and random coincidences) in the final image of a Compton Telescope for PT monitoring is presented. The complete chain of detection, from the beam particle entering a phantom to the event classification, is simulated using FLUKA. The range determination is later estimated from the reconstructed image obtained from a two and three-event algorithm based on Maximum Likelihood Expectation Maximization. The neutron background and random coincidences due to a therapeutic-like time structure are analyzed for mono-energetic proton beams. The time structure of the beam is included in the simulations, which will affect the rate of particles entering the detector.

22 Cabello, J.; Torres-Espallardo, I.; Gillam, J.E.; Rafecas, M.. PET Reconstruction From Truncated Projections Using Total-Variation Regularization for Hadron Therapy Monitoring. 901359 - IEEE Transactions on Nuclear Science. 60 - 5, pp. 3364 - 3372. (United States of America): Institute of Electrical and Electronics Engineers (IEEE), 2013. Available on-line at: <10.1109/TNS.2013.2278121>. ISSN 0018-9499

DOI: 10.1109/TNS.2013.2278121

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 1.455

Relevant results: Hadron therapy exploits the properties of ion beams to treat tumors by maximizing the dose released to the target and sparing healthy tissue. With hadron beams, the dose distribution shows a relatively low entrance dose which rises sharply at the end of the range, providing the characteristic Bragg peak that drops quickly thereafter. It is of critical importance in order not to damage surrounding healthy tissues and/or avoid targeting underdosage to know where the delivered dose profile ends-the location of the Bragg peak. During hadron therapy, short-lived β + -emitters are produced along the beam path, their distribution being correlated with the delivered dose. Following positron annihilation, two photons are emitted, which can be detected using a positron emission tomography (PET) scanner. The low yield of emitters, their short half-life, and the wash out from the target region make the use of PET, even only a few minutes after hadron irradiation, a challenging application. In-beam PET represents a potential candidate to estimate the distribution of β + -emitters during or immediately after irradiation, at the cost of truncation effects and degraded image quality due to the partial rings required of the PET scanner. Time-of-flight (ToF) information can potentially be used to compensate for truncation effects and to enhance image contrast.

However, the highly demanding timing performance required in ToF-PET makes this option costly. Alternatively, the use of maximum-a-posteriori- expectation-maximization (MAP-EM), including total variation (TV) in the cost function, produces images with low noise, while preserving spatial resolution. In this paper, we compare data reconstructed with maximum-likelihood-expectation-maximization (ML-EM) and MAP-EM using TV as prior, and the impact of including ToF information, from data acquired with a complete and a partial-ring PET scanner, of simulated hadron beams interacting with a polymethyl methacrylate (PMMA) target. The results show that MAP-EM, in the absence of ToF information, produces lower noise images and more similar data compared to the simulated β + distributions than ML-EM with ToF information in the order of 200-600 ps. The investigation is extended to the combination of MAP-EM and ToF information to study the limit of performance using both approaches.

23 Torres-Espallardo, I.; Gillam, J.; Solevi, P.; Llosá, G.; Stankova, V.; Barrio, J.; Solaz, C.; Lacasta, C.; Rafecas, M.. Comparison of prompt-gamma and positron imaging for hadron-therapy monitoring. 902865 - Radiotherapy and Oncology. 102 - Suppl. 1, (Holland): 2012. Available on-line at: <10.1016/S0167-8140(12)70242-6>. ISSN 0167-8140

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 4.52

24 Llosá, G.; Barrio, J.; Bisogni, M.G.; Cabello, J.; Del Guerra, A.; Gillam, J.; Lacasta, C.; Oliver, J.; Rafecas, M.; Solaz, C.; Stankova, V.; Torres-Espallardo, I.. Silicon photomultipliers in pet and hadrontherapy applications. 902865 - Radiotherapy and Oncology. 102 - Suppl. 1, (Holland): 2012. Available on-line at: <10.1016/S0167-8140(12)70190-1>. ISSN 0167-8140

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 4.52

25 Gillam, J. E.; Lacasta, C.; Torres-Espallardo, I.; Candela Juan, C.; Llosá, G.; Solevi, P.; Barrio, J.; Rafecas, M.. A Compton Imaging Algorithm for On-line Monitoring in Hadron Therapy. 000346 - Proceedings of the SPIE. 7961, (United States of America): 2011. Available on-line at: <http://dx.doi.org/10.1117/12.877678>. ISSN 0277-786X

Type of production: Scientific paper **Format:** Journal

26 V. Schulz; I. Torres-Espallardo; S. Renisch; Z. Hu; N. Ojha; P. Brnert; M. Perkuhn; T. Niendorf; W. M. Schfer; H. Brockmann; T. Krohn; A. Buhl; R.W. G ?nther; F. M. Mottaghy; G.A. Krombach. Automatic, three-segment, MR-based attenuation correction for whole body PET/MR data. 911473 - European Journal of Nuclear Medicine and Molecular Imaging. 38 - 1, pp. 138 - 152. (Germany): 2010. ISSN 1619-7070

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 5.036

27 Delso G; Martinez MJ; Torres I; Ladebeck R; Michel C; Nekolla S; Ziegler SI.. Monte Carlo simulations of the count rate performance of a clinical whole-body MR/PET scanner.903598 - Medical Physics. 36 - 9, pp. 4126 - 4135. (United States of America): 2009. ISSN 0094-2405

DOI: 10.1118/1.3193676

PMID: 19810486

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 2.704

Relevant results: The combination of MR and PET scanners can provide a powerful tool for clinical diagnosis and investigation. Among the existing approaches, the most challenging is that of complete hardware integration of both scanners. Such an integrated tomograph would allow simultaneous acquisition of both modalities, which could help solve issues such as cardiac and respiratory motion. Full integration imposes restrictions on the design of the PET part, such as detector configuration and maximum ring diameter. Furthermore, MR components surrounding

the PET detector ring may cause gamma ray interactions, thus affecting PET performance. The purpose of this article is to assess the performance of a hypothetical whole-body integrated MR/PET scanner using Monte Carlo simulation techniques and compare it to state-of-the-art PET/CT devices used in clinical routine. The Monte Carlo simulation toolkit used for this study is the GEANT4 application for emission tomography. A hypothetical whole-body MR/PET tomograph fully integrated at hardware level and positioned between gradient and local coils of the MR scanner has been modeled. The NEMA 2-2001 protocol has been used to configure the simulations in order to measure sensitivity, scatter fraction, count losses, and random detections. Global sensitivity values as a function of the lower-level discriminator (LLD) energy are provided for time resolutions of 5 and 2.25 ns. In addition, the scatter fraction of the system is studied as a function of the LLD for energy resolution values of 10%, 15%, and 20%. Finally, true, scatter, random, and noise equivalent count rate curves as a function of activity concentration are given for dead-time values of 136, 432, and 1150 ns and for time resolution values of 2.25 and 5 ns. The influence on the count rate performance of the integrated PET scanner of the new geometry and interfering MR elements has been measured. The results show that the interference of the MR components has a much lower impact than the reduction in the detector ring diameter. Due to the larger solid angle coverage, the sensitivity is higher than that measured for a clinical PET/CT system (6200-10 900 cps/MBq at the center of the scanner) but not enough to compensate the degradation of the noise equivalent count rate due to increased scatter detection. The simulations prove the viability of an integrated MR/PET system and suggest that priority has to be given to either the improvement of the temporal resolution or the correction of triple coincidences if competitive performance is to be achieved.

28 Torres-Espallardo I; Rafecas M; Spanoudaki V; McElroy DP; Ziegler SI.. Effect of Inter-Crystal Scatter on Estimation Methods for Random Coincidences and subsequent correction. 906768 - Physics in Medicine and Biology. 53, pp. 2391 - 24118. (United Kingdom): Taylor and Francis, 2008. ISSN 0031-9155

DOI: 10.1088/0031-9155/53/9/012

PMID: 18421120

Type of production: Scientific paper **Format:** Journal

Corresponding author: Yes

Impact source: WOS (JCR)

Impact index in year of publication: 2.784

Relevant results: Random coincidences can contribute substantially to the background in positron emission tomography (PET). Several estimation methods are being used for correcting them. The goal of this study was to investigate the validity of techniques for random coincidence estimation, with various low-energy thresholds (LETs). Simulated singles list-mode data of the MADPET-II small animal PET scanner were used as input. The simulations have been performed using the GATE simulation toolkit. Several sources with different geometries have been employed. We evaluated the number of random events using three methods: delayed window (DW), singles rate (SR) and time histogram fitting (TH). Since the GATE simulations allow random and true coincidences to be distinguished, a comparison between the number of random coincidences estimated using the standard methods and the number obtained using GATE was performed. An overestimation in the number of random events was observed using the DW and SR methods. This overestimation decreases for LETs higher than 255 keV. It is additionally reduced when the single events which have undergone a Compton interaction in crystals before being detected are removed from the data. These two observations lead us to infer that the overestimation is due to inter-crystal scatter. The effect of this mismatch in the reconstructed images is important for quantification because it leads to an underestimation of activity. This was shown using a hot-cold-background source with 3.7 MBq total activity in the background region and a 1.59 MBq total activity in the hot region. For both 200 keV and 400 keV LET, an overestimation of random coincidences for the DW and SR methods was observed, resulting in approximately 1.5% or more (at 200 keV LET: 1.7% for DW and 7% for SR) and less than 1% (at 400 keV LET: both methods) underestimation of activity within the background region. In almost all cases, images obtained by compensating for random events in the reconstruction algorithm were better in terms of quantification than the images made with precorrected data.

29 Spanoudaki, V.C.; McElroy, D.P.; Torres-Espallardo, I.; Ziegler, S.I.. Effect of Temperature on the Performance of Proportional APD-Based Modules for Gamma Ray Detection in Positron Emission Tomography. 901359 - IEEE Transactions on Nuclear Science. 55 - 1, pp. 469 - 480. (United States of America): Institute of Electrical and Electronics Engineers (IEEE), 2008. Available on-line at: <10.1109/TNS.2007.912877>. ISSN 0018-9499

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 1.518

30 Rafecas M; Torres I; Spanoudaki V; McElroy DP; Ziegler SI.. Estimating accidental coincidences for pixelated PET detectors and singles list-mode acquisition.902704 - Nuclear Instruments & Methods in Physics Research Section A-Accelerators Spectrometers Detectors and Associated Equipment. 571, pp. 285 - 288. (Holland): 2007. ISSN 0168-9002

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 1.114

31 Virginia Spanoudaki; Irene Torres-Espallardo; Magdalena Rafecas; Sibylle Ziegler.. Performance evaluation of MADPET-II, a small animal dual layer LSO-APD PET scanner with individual detector read out and depth of interaction information. 903592 - Journal of Nuclear Medicine. 571, (United States of America): 2007. ISSN 0161-5505

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 5.915

32 V C Spanoudaki; A B Mann; A N Otte; I Konorov; I Torres-Espallardo; S Paul; S I Ziegler. Use of single photon counting detector arrays in combined PET/MR: Characterization of LYSO-SiPM detector modules and comparison with a LSO-APD detector. 914178 - Journal Of Instrumentation. 2 - 12, (United Kingdom): 2007. Available on-line at: <doi:10.1088/1748-0221/2/12/P12002>. ISSN 1748-0221

Type of production: Scientific paper **Format:** Journal

33 Ch. Lerche; J.M. Benlloch; F. Sánchez; N. Pavón; B. Escat; E.N. Giménez; M. Fernández; I. Torres; M. Giménez; A. Sebastiá; J. Martínez. Depth of ?-ray interaction within continuous crystals from the width of its scin- tillation light-distribution. 901359 - IEEE Transactions on Nuclear Science. 52 - 3, pp. 560 - 572. (United States of America): Institute of Electrical and Electronics Engineers (IEEE), 2005. Available on-line at: <10.1109/TNS.2005.851424>. ISSN 0018-9499

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 1.259

34 Torres I; Huisman M; McElroy DP; Rafecas M; Ziegler SI.. Investigating Single List Mode data acquisition for a small animal PET scanner using GATE.901238 - Biomedizinische Technik. 50 - Suppl. Vol. 1, pp. 1225 - 1226. (Germany): 2005. ISSN 0013-5585

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 0.889

35 I. Torres; J. Pérez-Calatayud; F. Lliso; J. Roselló; E. Casal; V. Carmona; V. Puchades; C.P. Lopes; E. Tomás. Dosimetría de haces pequeños de electrones mediante un método sencillo basado en la película radiográfica. 302793 - Revista de Física Médica. 5 - 2, pp. 90 - 93. (Spain): 2004. ISSN 1576-6632

Type of production: Scientific paper **Format:** Journal

36 F. Lliso Valverde; J. Pérez-Calatayud; V. Carmona Meseguer; I. Torres Espallardo; E. Tomás Miralles; V. Puchades Puchades. Un método práctico para la realización de los controles periódicos del sistema de planificación. 302793 - Revista de Física Médica. 4 - 2, pp. 87 - 91. (Spain): 2003. ISSN 1576-6632

Type of production: Scientific paper **Format:** Journal

37 I. Torres; I. Hervás; J.F. Martí; P. Bello; P. González; A. Saura; D. Flores; A. Mateo. Correlación de la actividad media regional de los segmentos cardiacos entre sí el mapa polar entre s y áreas del mapa polar entre sí en estudios de viabilidad miocárdica. 915199 - Revista Espanola de Medicina Nuclear. 21 - 3, pp. 226 - 229. (Spain): 2002. ISSN 0212-6982

Type of production: Scientific paper **Format:** Journal

38 F. Manzano; J. Pérez-Calatayud; V. Carmona; F. Lliso; I. Torres. Determinación de la Exactitud en la Reconstrucción Espacial de Implantes en Braquiterapia. 302793 - Revista de Física Médica. 3 - 2, pp. 95 - 96. (Spain): 2002. ISSN 1576-6632

Type of production: Scientific paper **Format:** Journal

39 I. Hervás; J.F. Martí; A. González; J.C. Ruiz; J. Alonso; P. Bello; F. Manzano; I. Torres; A. Mateo. Is the depth correction using the geometric mean really necessary in a 99 T cm - DMSA scan in the paediatric population?. 905568 - Nuclear Medicine Communications. 22 - 5, pp. 547 - 552. (United Kingdom): 2001. ISSN 0143-3636

Type of production: Scientific paper **Format:** Journal

Impact source: WOS (JCR)

Impact index in year of publication: 1.19

40 Gaspar Delso; Irene Torres Espallardo; Patrik Veit-Haibach. Hybrid Systems: PET/CT. Nuclear Medicine and Molecular Imaging - Reference Collection in Biomedical Science. 1, pp. 435 - 443. Elsevier, 11/09/2022.

DOI: 10.1016/B978-0-12-822960-6.00103-4

Type of production: Book chapter **Format:** Book

Position of signature: 2 **Degree of contribution:** Author or co-author of chapter in book

Total no. authors: 3 **Corresponding author:** Yes

Relevant results: After 20 years from the first prototype, hybrid PET/CT counts already with many clinical applications and many more are expected in the coming years. Due to the interest that this dual modality has arisen, there have been several advancements both in instrumentation and in image reconstruction and post-processing. Therefore, it is expected that improvements will continue to arise in detector technology, system integration and the development of advanced reconstruction algorithms.

41 Gaspar Delso; Irene Torres Espallardo; Patrik Veit-Haibach. Positron emission tomography. Nuclear Medicine and Molecular Science - Reference Collection in Biomedical Science. 1, pp. 400 - 407. Elsevier, 13/07/2022.

DOI: 10.1016/B978-0-12-822960-6.00102-2

Type of production: Book chapter **Format:** Book

Position of signature: 2 **Degree of contribution:** Author or co-author of chapter in book

Total no. authors: 3 **Corresponding author:** Yes

Relevant results: PET is a very mature technique and well-stablished imaging biomarker technology in oncology, cardiology, neuroimaging as infection/inflammation imaging and partly also musculoskeletal medicine. Nevertheless further improvements can be expected in the future i.e., from time-of-flight information, the speed of the electronics and different reconstruction techniques. It is so far unclear whether current scintillators would be replaced by other detectors. One of the most exciting developments are certainly the newly developed total-body scanners with increased axial coverage, whole-body dynamic acquisition capability and extremely low dose/high throughput scanning which open a new field of applications ready to be exploited

42 Azaiez, F.; Brasse, D.; Cerello, P.; de La Taille, C.; Del Guerra, A.; Dendooven, P.; Enghardt, W.; Fiedler, F.; Lazarus, I.; Montemont, G.; Morel, C.; Murphy, A.; Oliver, Josep F.; Parodi,K.; Priegnitz; M.; Rafecas, M.; Scheidenberger, C.; Solevi, P.; Thirolf, Peter G.; Torres-Espallardo, I. Udias, J.M.. Medical Imaging. Nuclear Physics for Medicine. Editores: Faiçal Azaiez, Angela Bracco, Jan Dobe¿, Ari Jokinen, Gabriele-Elisabeth Körner, Adam Maj, Alexander Murphy and Piet Van Duppen. Chapter II, pp. 59 - 96. (Germany): Nuclear Physics European Collaboration Committee (NuPECC), 2014. ISBN 978-2-36873-008-9

Type of production: Book chapter **Format:** Book

43 JJ Rosales; ML Domínguez; L Sancho; E Prieto; M de Arcocha; I Torres; A Roteta; R Ramos; G Quincoces. State of the art and future perspectives of new radionuclides in Nuclear Medicine.Revista espanola de medicina nuclear e imagen molecular. 44, pp. 500082. 2025.
DOI: 10.1016/j.remnie.2025.500082
PMID: 39793702
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