

XVI MEXICAN SYMPOSIUM ON MEDICAL PHYSICS

Physics in Precision Medicine -
Advances in Imaging and Therapy

SCIENTIFIC PROGRAM



XVI Mexican Symposium On Medical Physics

Physics in Precision Medicine: Advances in Imaging and Therapy



The Medical Physics Division of the Mexican Physics Society and the School of Engineering of Universidad Autónoma de Yucatán are pleased to host the XVI Mexican Symposium on Medical Physics to be held at the Holiday Inn Merida Hotel in Mérida, Yucatán, México from April 1st to 3rd, 2020. The Symposium is sponsored by the International Organization for Medical Physics (IOMP), the American Association of Physicists in Medicine (AAPM), and the Centro Latinoamericano de Física (CLAF).

In its XVI iteration, the Symposium's goal is to provide a space of collegiate discussion on the scientific and technological advances, perspectives, and challenges of Medical Physics in dawn of the era of precision medicine. The theme of the symposium is:

Physics in precision medicine: advances in diagnostic and therapy

Following the tradition of previous symposium, the Symposium will be preceded by a Pre-Symposium School on March 30th and 31st to provide continuing education on basic topics such as quality control and dosimetry. At the same time, we seek to offer attendants a deep view about the state of the art of our field. We are very thankful with the plenary and invited speakers, as well as with the faculty of the pre-symposium school for sharing with us their research and expertise.

And, of course, no better place to meet than Merida, the capital of the state of Yucatan. It is a place where present fuses with past and future, a city grounded in peace and hospitality and adorned by beautiful architecture. Mérida is an embracing city full of history and natural beauty. Yucatán, with the crystal-clear water of its cenotes (underground rivers) and majestic Mayan cities such as Chichen-Itzá and Uxmal, is a cultural melting pot that has given birth to artists, scientists, and one of the best cuisines in the world.

In representation of the Organizing and Scientific Committees, we thank you for your contribution to the Symposium and hope that you enjoy it.

Orlando Soberanis-Domínguez, M.Sc. and Ivan M. Rosado-Méndez, Ph.D.

Chairs of Organizing and Scientific Committees
XVI Mexican Symposium on Medical Physics



XVI Mexican Symposium On Medical Physics

Physics in Precision Medicine: Advances in Imaging and Therapy



Invited speakers and faculty of pre-symposium school



Dr. Thomas R. Mackie

Board of Visitors Vice Chair
Emeritus Professor, Medical Physics and Human Oncology
Director, Medical Devices Focus Area, Morgridge Institute for Research
University of Wisconsin-Madison
Faculty and plenary speaker

Dr. Mackie's career focuses on planning and delivery of radiation therapy to cancer patients. His group developed the 3-D treatment planning system that became the Philips Pinnacle treatment planning system, the most widely used radiation therapy treatment planning system in the world. His group was also the developer of tomotherapy, that combines technology from linear accelerators and computed tomography. More recently, Dr. Mackie has been working on developing a compact proton therapy machine for treating cancer. He has over 150 peer-reviewed publications, over 15 patents, and has trained many Ph.D. students. Dr. Mackie is a Fellow of the American Association of Physicists in Medicine and President of the John R. Cameron Medical Physics Foundation, a non-profit organization that supports the UW Medical Physics Department, medical physics in the developing world and high school science scholarships. In 2002, Dr. Mackie received the Ernst & Young Entrepreneur of the Year award.

https://directory.engr.wisc.edu/bme/Faculty/Mackie_Thomas/ https://en.wikipedia.org/wiki/Thomas_Rockwell_Mackie



Dr. Timothy J. Hall

Interim Chair and Professor Department of Medical Physics
Director, Graduate Medical Physics Program
Program Director, UW Radiological Sciences Training Program
Vice-Chair of the Quantitative Imaging Biomarker Alliance
Radiological Society of North America
Faculty and plenary speaker

Dr. Hall's work focuses on developing quantitative methods in medical ultrasound. This entails developing experimental methods for estimating specific physical properties of tissue (such as the acoustic backscatter coefficient (to quantify acoustic scattering on an absolute scale), the effective scatterer size (to describe the tissue microstructure), and the nonlinear elastic modulus (to describe the tissue stiffness on an absolute scale). Also, within that effort are developments of test objects with known material properties (phantoms) that can be used to evaluate performance of these quantitative techniques, and performance descriptors that provide metrics to compare performance. The effort also involves integration of these methods into clinical imaging systems and tests in animal models, clinical trials in human subjects, and observer performance studies to test efficacy. Dr. Hall is funded by the NIH to investigate breast tissue properties with ultrasound and to develop uterine cervix assessments associated with pre-term birth and predicting successful post-date inductions.

<https://www.medphysics.wisc.edu/blog/staff/hall-timothy/>



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Dr. Guillermina Ferro Flores

Gerencia de Aplicaciones Nucleares en la Salud
Instituto Nacional de Investigaciones Nucleares
Plenary speaker

Dr. Guillermina Ferro has a doctoral degree in science with a specialty in Medical Physics from the Universidad Autónoma del Estado de México. Her research focuses on applications of ionizing radiation to industry, medicine and agriculture. She specializes in Medical Physics focused on radiopharmacy and nuclear medicine. She is a member of Mexico's National Scientist Network (SNI II) and the Mexican Academy of Sciences.

<http://www.inin.gob.mx/plantillas/investigacion.cfm?clave=5&campo=4260>



Dr. Daniel Razansky

Faculty of Medicine and Institute of Pharmacology and Toxicology
University of Zurich, Switzerland
Institute for Biomedical Engineering and Department of Information
Technology and Electrical Engineering, ETH Zurich, Switzerland
Plenary speaker

Professor Razansky's research lies at the forefront of the rapidly evolving area of molecular imaging sciences. As opposed to traditional anatomical imaging approaches, this multidisciplinary field aims at early diagnosis and improved classification of tissue function and stage of disease with highly potent applications in areas such as neuroscience, cancer research, and cardiovascular diagnostics. The particular focus is on the development of novel biomedical imaging tools based on optoacoustics, diffuse optics, ultrasound, and multi-modality approaches in order to enable imaging with high spatial and temporal resolution on different scales, from organ to cell. He has been awarded the Human Frontier Science Program Award, ERC Consolidator Award, German Innovation Prize, Top 40 scientists under 40 list of the Capital Magazine (2011 and 2012), and the ERC Starting Independent Researcher Award (StG 2010)

<https://www.professoren.tum.de/en/razansky-daniel/>



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Physics in Precision Medicine: Advances in Imaging and Therapy



Dr. María-Ester Brandan

Investigadora Titular C, T. C.

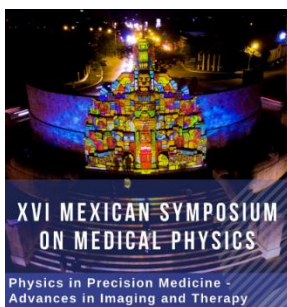
Coordinadora de grupo de Dosimetría y Física Médica

Instituto de Física

Universidad Nacional Autónoma de México

Dr. Brandan's present and past research include a broad spectrum of subjects in experimental nuclear physics, radiation dosimetry and medical physics. She was the creator and coordinator for 20 years of the UNAM M.Sc. (Medical Physics) program aimed at specializing physicists into medical applications. She is a member of the Mexican Academy of Sciences, Fellow of the American Physical Society and the American Association of Physicists in Medicine and a Fellow (member) of TWAS, the Academy of Sciences for the Developing World. She has been awarded the Mexican Physics Society Medal for the Development of Physics in Mexico and received the UNAM 2013 Premio Universidad Nacional in the area of Research in Exact Sciences. She is a current commissioner of ICRU, the International Commission on Radiation Units & Measurements.

<https://www.fisica.unam.mx/~brandan/>



Dr. Héctor Garnica

Investigador Cinvestav 3C

Centro de Investigación y Estudios Avanzados

Monterrey, Nuevo León

Dr. Garnica-Garza heads the X-ray Imaging Laboratory at the Center for Research and Advanced Studies of the National Polytechnic Institute. His research interests center on the use of Monte Carlo simulation, as applied to the transport of radiation, to model radiotherapy treatment devices, irradiation techniques and imaging modalities. He holds a Ph.D. in Medical Physics from Wayne State University.



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Dr. José Ramos-Méndez

Assistant Researcher
Radiation Oncology, School of Medicine
University of California – San Francisco

Dr. José Ramos-Méndez's research includes the development and validation of Monte Carlo (MC) simulations for the interaction of ionizing radiation for radiotherapy, radiochemistry and radiobiology. In particular, he is focused in studying the correlation between ionization and excitation details to biological damage assisted by MC track-structure; the aspects of particle's intertrack interactions and oxygen depletion distributions for FLASH radiotherapy; and the enhancement of radiochemistry modeling for the indirect DNA damage from boron-neutron capture therapy. He is the main developer at UCSF of TOPAS and TOPAS-nBio, two Monte Carlo tools developed in collaboration with researchers of SLAC National Laboratory and the Massachusetts General Hospital. Dr. Ramos-Méndez is an active member of the Geant4 Collaboration and the steering committee of the Geant4-DNA Collaboration.



Dr. Ana Leonor Rivera López

Investigadora de Carrera Titular B
Departamento de Estructura de la Materia
Instituto de Ciencias Nucleares

Dr. Rivera López is a Physics specialist in Complex Systems and Signal Analysis using techniques in the time domain (statistics, correlations and networks), Spectral analysis (Fourier transform) and in Phase space (Wigner and wavelets distribution function). In the line of Medical Physics, she has studied non-invasive physiological time series of electrocardiograms, blood pressure, electroencephalograms, genetics and human voices. In 1996, she obtained his doctorate in science (Physics) from the Universidad Nacional Autónoma de México (UNAM) directed by Dr. Bernardo Wolf (specialist in mathematical optics) and Dr. Serguei Chumakov (from the Levedev Institute of the USSR Academy of Sciences, physicist -Mathematical specialist in quantum optics). As a student, she won the "Gabino Barreda" medal for being the best average of her generation of Master in Space Studies. As a research, in 2018, she obtained "Sor Juana Ines de la Cruz" Medal from UNAM. She is a National Researcher Level II (SNI). She currently works at the Institute of Nuclear Sciences of the UNAM, and is the Academic Coordinator of Center for Complexity Sciences of UNAM. She was responsible for the creation of the curriculum of the UNAM degree in technology, being the first academic coordinator.



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Dr. Adel Mustafa

Associate Professor of Radiology and Biomedical Imaging
Director, Yale Diagnostic Medical Physics Residency Program, Radiology and Biomedical Imaging
Chief of Diagnostic Radiology Physics, Radiology and Biomedical Imaging

Dr. Mustafa is board certified by the American Board of Radiology (ABR) and the American Board of medical Physics (ABMP) in diagnostic imaging physics. Dr. Mustafa is an elected Fellow of the American Association of Physicists in Medicine. For many years he served as member, co-chair or chair of several AAPM scientific and professional committees. Dr Mustafa is examiner with the American Board of Radiology on diagnostic imaging physics conducting Part 3 oral examination since 2004. He is member of the accreditation committee and Chairman of the Oral Examination committee of the International Medical Physics Certification Board (IMPCB). His current clinical, teaching and research interests include image quality optimization, radiation dose management and quantification of disease conditions using multiple imaging modalities with particular interest in CT imaging. Currently leading a team of medical physicists and collaborating with scientists, radiologists and clinicians in areas of CT detection, quantification and optimization
https://medicine.yale.edu/profile/adel_mustafa/



Jorge Castillo-López, M. Sc. *Faculty of Pre-Symposium School*

Clinical Medical Physicists
Servicio de Radiodiagnóstico
Instituto Nacional de Cancerología

Coming soon.



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Dr. Eenas Omari

Invited speaker

Assistant Professor
Loyola University Chicago
Clinical medical physicist
Loyola University Medical Center-Palos South Campus

Following her clinical training, Dr. Eenas Omari joined Loyola University in Chicago, where she took on lead roles in commissioning an MRI linac and the clinical implementation of the MRgRT program. She was the lead physicist implementing MRI guided real-time on-table adaptive radiotherapy (ROAR). Dr. Omari is also the co-lead of the Radiation Oncology Department's treatment planning service. Dr. Omari's research interests include image guided radiotherapy (IGRT) with an emphasis on MRI and Ultrasound imaging. She is also actively working on the development of MRI compatible immobilization devices and enhancing the MRgRT clinical workflow. As a faculty member, Dr. Omari mentors therapy physics residents and holds various lectures in the area of imaging and therapy physics for medical residents. Dr. Omari has over 30 published peer-reviewed papers, conference proceedings, and abstracts. She is a member of the AAPM and has been awarded to become an Associate of the Science Council mentorship program (SCAMP) for 2019-2020.



Dr. Paulina Galavis

Assistant Professor
Department of Radiation Oncology
New York University Langone Health

Dr. Paulina Galavis received her Ph.D. in medical physics from the University of Wisconsin-Madison in 2013. Her dissertation focused on Robust Segmentation for Target Definition. Upon graduation, she went on to complete a residency program in therapeutic medical physics at the New York University, Langone Health. Dr. Galavis joined the Medical Physics Faculty at NYU in 2015, where she currently works as Assistant Clinical Professor in Radiation Oncology. She is American Board of Radiology (ABR) certified in therapeutic medical physics. Her research interests include radiomics, target definition for radiation therapy, treatment assessment, small field dosimetry, and patient safety.



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Dr. Eric Ehler

Assistant Professor
Director of Physics Residency Program
Department of Radiation Oncology
University of Minnesota, Medical School

Dr. Eric Ehler is an American Board of Radiology (ABR) certified clinical physicist. He earned his PhD in Medical Physics at the University of Wisconsin - Madison in 2009 followed by a clinical residency in Therapeutic Medical Physics at the University of Minnesota which he completed in 2011. He is currently an Assistant Professor in the University of Minnesota Department of Radiation Oncology. His clinical and research interests include pediatric radiotherapy, 3D printing, intrafraction tumor motion and compensation, small field dosimetry, and machine learning

<https://med.umn.edu/bio/departmentofradiationoncology/eric-ehler>



Dr. Guerda Massillon

Investigador Titular A, T. C.
Instituto de Física
Universidad Nacional Autónoma de México

Dr. Massillon's research is Basic Dosimetry and its application in Medical Physics. She has received several national and international awards for her research such as: "Fellow" of the Interamerican Network of Academies of Sciences (IANAS) 2011; "Young Scientist Prize" of the International Union of Pure and Applied Physics (IUPAP) 2015; "Research Fellow" of the Royal Society, England 2015; "Marie Curie Medal", 2017; National System of Researchers SNI (Conacyt Mexico) level II and PRIDE C of UNAM. As institutional work she is the actual president of the Medical Physics Division of the Mexican Physics Society, editorial board member of *Physica Medica: European Journal of Medical Physics* and a member of the TG-235 working group of the AAPM (American Association of Physicists in Medicine).



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Certification exams from the International Medical Physics Certification Board (IMPCB)

The International Medical Physics Certification Board (IMPCB) was formed in 2010 to define minimum professional standards and improve the practice of medical physics worldwide.

To this end, IMPCB has created a certification model based on the International Atomic Energy Agency (IAEA) guidelines and endorsed by the International Organization of Medical Physics (IOMP) and more than 20 regional organizations around the world. Through this certification, IMPCB aims at helping establish national or regional certification boards formed by qualified and certified clinical medical physicists.

You can get more information about IMPCB at www.impcbdb.org.

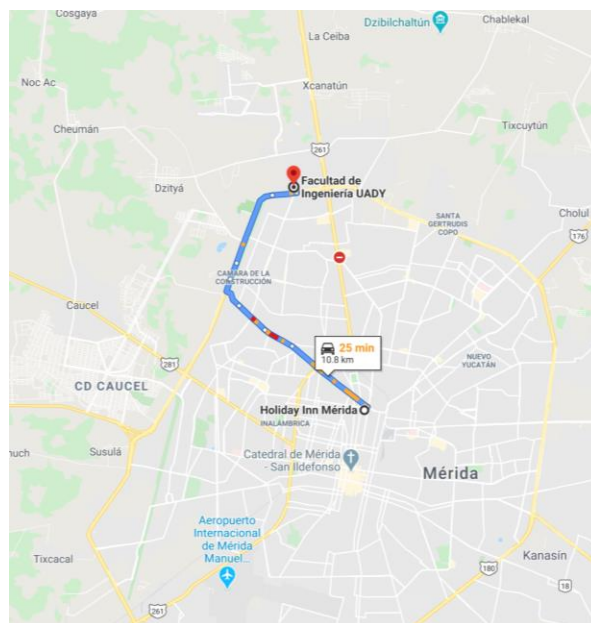
Saturday March 28, 2020: Facultad de Ingeniería – UADY

Time	Activity
15:00-18:00	IMPCB Certification Exam – Part I

Sunday March 29, 2020: Facultad de Ingeniería – UADY

Time	Activity
10:00-13:00	IMPCB Certification Exam – Part II

Facultad de Ingeniería UADY
Industrias No Contaminantes S/N, Sin Nombre de Col 27, Mérida, Yuc.



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Pre-Symposium School

Facultad de Ingeniería UADY

Industrias No Contaminantes S/N, Sin Nombre de Col 27, Mérida, Yuc.

Mach 30, 2020: Radiation therapy and dosimetry

Learning objectives:

1. Discuss the value of innovation in radiation therapy and clinical translation of new technologies
2. Discuss the physical principles behind beam quality assessment with thermoluminescent dosimetry
3. Review basic concepts of Monte Carlo methods in diagnostics, radiation therapy, and radiobiology

Time	Activity
9:00-11:00	<p>Innovation in Medical Physics: From the Lab to the Clinic to the Enterprise Dr. Thomas R. Mackie (University of Wisconsin-Madison, USA)</p> <p>Abstract: Radiation oncology and radiology have relied on advances in science and engineering from medical physics researchers. Medical physicists and clinicians are trained to have an orientation of professionalism that goes beyond the rewards of receiving grants, training students and publishing results. A relatively large number of medical physicists have successfully passed their ideas onto existing companies or started for-profit and not-for-profit enterprises that bring their technology into practical use. The more that a medical physicist knows about business and regulatory principles the more likely their success. This lecture will discuss innovation and development of research ideas into practice illustrated through examples. The importance of finding worthwhile problems to solve, involving potential customers in critiquing your solutions, and protecting your intellectual property will be emphasized. Principles of business formation, financing, product design, project management, regulation and reimbursement will be framed. The value of the lean startup methodology applied to the development of capital-intensive medical devices will be highlighted. Analysis of the root causes of business failures in radiation oncology and radiology will also be discussed.</p>
11:00-11:30	Break
11:30-13:30	<p>Advances in thermoluminescent dosimetry – Teletherapy beam quality assessment Dr. María-Ester Brandan (Instituto de Física, UNAM, Mexico)</p> <p>Abstract: The basics of thermoluminescent (TL) dosimetry will be presented, based on the experience and protocols developed in our laboratory at the UNAM Physics Institute. I will review the current use of TL dosimeters in radiation therapy and present novel results from our group assessing the mean energy of secondary radiation produced in a linac using TL dosimeters.</p>
13:30-14:30	Lunch

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14:30-16:00	<p>Monte Carlo Simulation in Voxelized Geometries: Applications in Radiation Therapy and Diagnostics Radiology Dr. Héctor Garnica (CINVESTAV-Monterrey, Mexico)</p> <p>Abstract: Monte Carlo simulation of radiation transport plays a crucial role in the Medical Physics field, from radiotherapy treatment planning to the modeling of the devices that generate the radiation used both in treatment as well as in diagnostics. In this workshop, the implementation of Monte Carlo simulations using CT scanner-derived patient information will be discussed, with emphasis on the methods employed to extract the CT image data required by most Monte Carlo radiation transport codes currently available. Among the topics to be discussed are: mechanics of photon transport in voxelized geometries, conversion from CT number to material density and composition, and x-ray source modeling. Applications with specific examples in radiotherapy treatment planning, CT scanner modeling and breast imaging will also be discussed.</p>
16:00-19:00	<p>Monte Carlo track-structure: An essential tool for elucidating the radiobiological damage Dr. José Ramos-Méndez (University of California San Francisco, USA)</p> <p>Abstract: The Monte Carlo method is an essential tool in the radiotherapy field, which assists with the interpretation of experimental results, design of experiments, and verification of dose distributions. In radiobiology, this tool may assist in extending the knowledge of biological damage from a nanoscopic point of view through the detail calculation of the individual interactions of ionizing radiation with biological targets. This modality, called track-structure Monte Carlo, provides information about the spatial, physical interactions of ionizing radiation, the subsequent radiolysis, and culminating with the heterogeneous chemistry. This information can be sampled with biological geometry models, e.g., DNA representations, to quantify biological damage in the form of double-strand breaks. This lecture aims to introduce the basic concepts that underlay track-structure Monte Carlo and to present the status and developments of the Monte Carlo toolkits TOPAS-nBio and Geant4-DNA.</p>



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Mach 31, 2020: Diagnostic imaging and physiological signal analysis

Learning objectives

1. Discuss the physical principles of Quantitative Ultrasound imaging
2. Cover the basic principles of non-invasive biomarkers based on physiological measurements
3. Discuss recent advances on computed tomography technology
4. Review recent quality control protocols of x-ray computed tomography

Time	Activity
9:00-11:00	<p>Physics of Quantitative Ultrasound Imaging Dr. Timothy Hall (University of Wisconsin-Madison, USA)</p> <p>Abstract: Ultrasound is one of the most widely used medical imaging modalities because of its relatively low cost, portability, and safety. Despite these advantages, in some applications utility of the information obtained depends on the imaging system configuration, the skills of the operator, as well as the skills of the clinician interpreting the data. This class will present the physics of novel quantitative imaging techniques based on ultrasound imaging, broadly known as Quantitative Ultrasound (QUS) that aim at overcoming these limitations. Special emphasis will be given to a technique known as Ultrasound Backscatter Spectroscopy, which allows obtaining acoustic and structural properties of tissue to inform on its microscopic changes during disease and/or treatment. This is achieved through the spectral analysis of backscatter echo signals generated by ultrasound equipment as part of the conventional image formation process. The class will close with a discussion of ongoing pre-clinical and clinical applications of QUS in tissues such as breast and cervix.</p>
11:00-11:30	Break
11:30-13:30	<p>Introduction to non-invasive biomarkers from physiological signals Dr. Ana Leonor Rivera (Centro de Ciencias de la Complejidad, UNAM, Mexico)</p> <p>Abstract: Human health is determined by the functionality of its various organs and the interaction between them that can be understood from the physical point of view as a complex system. Health can be considered as a condition that allows an adequate dynamic balance between robustness, supported by systems that allow it to maintain homeostasis and survive in a wide range of conditions, but also by its ability to rapidly and effectively adapt to a changing external environment. This balance between robustness and adaptability can be measured by biomarkers. Alterations in the range of these biomarkers may appear before symptoms arise and open up promising possibilities for applications in preventive medicine. In this short course we will take a glance of methods that allow to find relevant parameters that can be used as biomarkers characteristic of health from non-invasive physiological time series like electrocardiograms, breathing, and blood pressure signals. We introduce signal analysis techniques in the time domain using the distribution moments, autocorrelation functions, Poincaré diagrams, and the spectral analysis (Fourier transform). We will see how deviations from the range of these biomarkers can be used as early warnings auxiliaries in the diagnosis of diseases like Diabetes Mellitus type 2.</p>
13:30-14:30	Lunch



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14:30-15:30	<p>Advances in x-ray CT: technology, acquisition, clinical applications and dose management Dr. Adel Mustafa (Yale University School of Medicine) Abstract: Over the years, significant advances took place in CT equipment design aimed at achieving higher scan speed, better image quality and lower patient dose. Along with that, CT scanners clinical applications extended beyond the historical applications exploring body morphology to obtain material specific images. Advanced techniques would also allow for quantitative analysis, mass characterization, artifacts reduction and improved visualization. This presentation will focus on major developments that made all those achievements possible. This includes but not limited to multi-detector technology, auto exposure control using mA and kV modulation, adaptive collimation, organ dose modulation, 3D volume rendering, ECG triggered cardiac CT, iterative reconstruction algorithms and dual energy CT.</p>
15:30-18:30	<p>Workshop on CT quality control M. en C. Jorge Castillo (Instituto Nacional de Cancerología, Mexico) Abstract: Computed tomography (CT) is a broadly used imaging modality, including clinical diagnosis, interventional procedures, therapy planning and hybrid imaging with nuclear medicine systems. Quality control, which is the main topic of this course, is major tool to ensure that each study achieves a clinically relevant image quality at the proper radiation dose. Upon completion of this workshop, attendees should be able to demonstrate understanding about the influences of acquisition parameters on image quality, routine quality controls and annual survey of a CT unit. The workshop is divided in two parts: theory and practice. The first part will be imparted online and every participant should complete it before accessing practical session. Hands on will include an annual survey of a CT unit used for radiation therapy planning.</p>



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Symposium

Wednesday April 1, 2020

Hotel Holiday Inn

Time	Activity
8:00 - 18:00	Registration
8:30 - 9:00	Opening Ceremony
9:00 - 10:00	<p>Plenary talk: Quantitative Imaging Biomarkers: standardization and clinical use Dr. Timothy Hall (Vice-chair of the Quantitative Imaging Biomarker Alliance, Radiological Society of North America, USA)</p> <p>Abstract: As patient management moves toward personalized treatment strategies, the need for objective and quantitative information to accurately diagnose disease and monitor its response to therapy is more important than ever. Objective information derived from medical images have the potential to offer this information in the form of Quantitative Imaging Biomarkers (QIBs). QIBs are quantitative features extracted from medical images that can be linked to the phenotype of a disease in each patient. This talk will present current efforts of the Radiological Society of North America's Quantitative Imaging Biomarker Alliance (QIBA) to standardize the use of QIBs to maximize their reproducibility, clinical value, and impact. This effort involves all major imaging modalities, and all stakeholders in the design, use, and evaluation of medical imaging systems. One key aspect of this work is the integration of concepts from metrology into the physics and clinical aspects of image acquisition and feature extraction. The effort can be described as 'converting imaging systems into measurement systems'. Examples from several modalities will be presented with an overview toward future efforts.</p>
10:00 - 10:30	Exhibit hall, poster session, and coffee break
10:30 - 11:00	<p>Invited talk: Magnetic resonance imaging guided adaptive radiotherapy (MRgART) Dr. Eenas Omari (Loyola University Medical Center, USA)</p> <p>Abstract: Magnetic resonance imaging guided radiation therapy (MRgRT) has been playing a major role in offline treatment planning. In recent years, linear accelerators (linac) with onboard MRI has become clinically available. In addition, real-time MRI guided adaptive radiation therapy (MRgART) has led to a major paradigm shift resulting in personalized daily patient treatment. In this work, we first familiarize the audience with the emerging technology and discuss its advantages and drawbacks. We then discuss the steps to take in implementing an MRgRT program. This includes the acceptance and commissioning of a 0.35 T MRI linac and the clinical implementation of real-time on-table adaptive radiotherapy.</p>
11:00 - 13:00	Scientific session 1: Use of non-ionizing radiation in medicine
13:00 -15:00	Exhibit hall, poster session, and lunch

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15:00 -15:30	<p>Invited talk: Reproducibility and standardization in Radiomics: Are we there yet? Dr. Paulina Galavis (NYU Langone Health, USA)</p> <p>Abstract: Radiomics is a rapidly growing field in cancer research that looks for ways to personalize patient's treatments based on the extraction of texture features from routine clinical images. However, the implementation of Radiomics-based models in routine patient care poses important challenges, since they are multi-step processes that include image selection, region of interest (ROI) segmentation, texture-feature extraction, model development, and model-validation. Each of these processes needs extensive evaluation to ensure consistency and accuracy of the final Radiomics-based model, so that it becomes reproducible and translatable into the clinical practice. Image selection and ROI segmentation are a critical component in Radiomics, because they define the quality of the extracted features, which then become the input of the model. In this short review, after presenting a brief description of the Radiomics, we will concentrate on the status of various technical aspects of imaging modality and segmentation selection, including their shortcomings and possible solutions with emphasis to radiation therapy.</p>
15:30 - 16:30	Scientific session 2: Physics and dosimetry of medical images (ionizing radiation) – Part 1
16:30 - 18:00	Exhibit hall, poster session, and coffee break
18:00 - 19:00	Scientific session 3: Physics and dosimetry of medical images (ionizing radiation) – Part 2
19:00 - 20:00	<p>Plenary talk: Advances in molecular imaging Dra. Guillermina Ferro-Flores (Instituto Nacional de Investigaciones Nucleares, Mexico)</p> <p>Abstract: Molecular imaging detects and records the distribution in time and space of molecular processes for diagnostic and therapeutic applications. The techniques in which molecular imaging is applied include magnetic resonance imaging (MRI), optical imaging (OI), positron emission tomography (PET), and single-photon emission computed tomography (SPECT). Radionuclide-based molecular imaging involves SPECT and PET. Nuclear imaging is a technique that, in comparison to other imaging modalities, offers greater sensitivity and has no tissue penetration limits. Protein-protein, protein-peptide and protein-hormone interactions are crucial for the performing of biological processes. Several of these specific interactions are responsible for diseases, including cancer. In general, the development of synthetic inhibitors of protein interactions is an active research field in medicinal chemistry due to the advantage of obtaining low molecular-weight compounds for specific binding to protein surfaces. The development of radiolabeled protein-inhibitor peptides for molecular imaging and targeted therapy with rapid clinical translation is an interesting and active research field in the radiopharmaceutical sciences. In this presentation, recent achievements concerning the design, translational research and theranostic applications of structurally-modified small radiopeptides such as prostate-specific membrane antigen (PSMA) inhibitors, antagonists of chemokine-4 receptor ligands (CXCR-4-L) and fibroblast activation protein (FAP) inhibitors with high affinity for cancer-associated target proteins, will be reviewed and discussed.</p>



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Thursday April 2, 2020
Hotel Holiday Inn

Time	Activity
8:00 - 18:00	Registration
9:00 - 10:00	<p>Plenary talk: Is Upright Radiotherapy Medically and Financially Better? Dr. Thomas R. Mackie (Emeritus Professor, University of Wisconsin)</p> <p>Abstract: Treating patients in the upright position is not new but has been limited by image guidance in the upright position and specialized immobilization. Treatment planning images can now be acquired with MRI or CT scanners that allow upright patient positioning with secure immobilization. There are medical advantages to treatment in the upright position for conventional external beam photon radiotherapy. It has been shown that lung radiotherapy would be advantageous because the lung is more inflated, there is less normal tissue integral dose, the lung moves less in the upright position, and patients who cannot control coughing are more comfortable and less likely to choke. Treating the breast in a slightly forward leaning posture may better space the lung and heart as compared to supine treatments and be easier to set up as compare to prone treatments. Upright proton and carbon radiotherapy offer many cost advantages by eliminating the need for an expensive gantry. The potential size of upright megavoltage x-ray units is small enough that two treatment rooms can be contained within the size of a typical contemporary vault lowering facilities costs especially for green-field sites.</p> <p>Disclosures: Dr. Mackie is chairman of Leo Cancer Care. I am also co-founder and chairman of Asto CT, which has developed a multi-axis CT scanner for veterinary use. I also have financial investment in these companies.</p>
10:00 - 10:30	Exhibit hall, poster session, and coffee break
10:30 - 11:00	<p>Invited talk: Utilization of 3D Printing in Clinical Medical Physics Dr. Eric Ehler (University of Minnesota, USA)</p> <p>Abstract: 3D printing is a method of semi-automated custom fabrication. The advantages of this technology for medical physics is apparent; objects can be constructed for specific clinical needs and constructed with moderate expertise. The cost of 3D printing is cheaper compared to other custom fabrication methods or purchasing from established vendors. Phantoms can be constructed for specific quality control tasks and radiation dosimetry measurements, including patient specific measurements. Beyond phantoms, 3D printing can be used for procedure devices in the form of radiation bolus, immobilization devices, surgical planning models, and rudimentary radiation detectors. Real clinical uses of 3D printing will be presented as well.</p>
11:00 – 12:00	Scientific session 4: Physics and dosimetry of radiation therapy – Part 1
12:00 – 13:00	Assembly of the Medical Physics Division of the Mexican Physics Society
13:00 – 15:00	Exhibit hall, poster session, and lunch



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15:00 – 15:30	<p>Invited talk: A fundamental approach of low-energy radiation dosimetry Dr. Guerda Massillon-JL (Instituto de Física, UNAM, México)</p> <p>Abstract: Nowadays, low-energy photons (x-rays and gamma) are widely used in different areas including biomedical research and medical applications such as mammography, fluoroscopy, general radiography, computed tomography, and brachytherapy treatment amongst others. These photons interact with matter transferring energy to orbital electrons (called primary electrons), which generate secondary electron cascades along their paths via electron-electron interactions. In general, the absorbed dose (energy deposited per unit mass: $1\text{Gy}=1\text{J/kg}$) deposited along the electron track is defined as the product of the secondary electron yield and the linear energy transfer (LET) or the mass restricted stopping power averaged over the electron energy spectrum. From a standpoint of basic research, the physical processes by which very low energy electrons interact with matter are not well understood. Besides, accurate cross sections for the interaction of electrons energies below 1 keV with compound materials of dosimetric interest is scarce both, from theoretical and experimental studies. This is due, in part, to the complexity of electron interaction processes at these low energies, which require a quantum mechanical treatment. Thus, it is necessary to identify a model that allows us to understand the interaction processes of ionizing radiation with matter at energies where classical approaches do not hold. During the last 5 years, we have used a novel approach to radiation dosimetry based on fundamental quantum mechanics. In this talk, recent result will be presented and discussed. Work partially supported by Royal Society-Newton Advanced Fellowship grant NA150212 and PAPIIT-UNAM grant IN118120.</p>
15:30 - 16:30	Scientific session 5: Physics and dosimetry of radiation therapy – Part 2
16:30 - 18:00	Exhibit hall, poster session, and coffee break
18:00 - 19:00	Best student paper competition
19:00 - 22:00	Symposium's banquet (Facultad de Arquitectura, UADY)



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Friday April 3, 2020
Hotel Holiday Inn

Time	Activity
8:00 - 12:00	Registration
9:00 - 10:00	<p>Plenary talk: Advanced optoacoustic methods for biological discovery and precision diagnostics Dr. Daniel Razansky (Institute for Biomedical Engineering and Department of Information Technology and Electrical Engineering, ETH Zurich, Switzerland) ABSTRACT: Rapid progress of the Multi-Spectral Optoacoustic Tomography (MSOT) technology has enabled unprecedented insights into in vivo biological dynamics and molecular processes. This fast-emerging imaging modality is capable of entirely non-invasive longitudinal observations at penetration and spatiotemporal scales not covered by other bio-imaging techniques. The talk covers most recent advances pertaining ultrafast imaging instrumentation, intelligent reconstruction algorithms as well as smart optoacoustic contrast and sensing approaches. Our current efforts are geared toward exploring potential of the technique in studying multi-scale dynamics of the brain and heart, monitoring of therapies, fast tracking of cells and targeted molecular imaging applications. MSOT further allows for a handheld operation thus offers new level of precision for clinical diagnostics of patients in a number of indications, such as breast and skin lesions, lymph node metastases, thyroid conditions and inflammatory bowel disease.</p>
10:00 - 10:30	Exhibit hall, poster session, and coffee break
10:30 - 11:00	<p>Invited talk: Non-invasive biomarkers from physiological signals Dr. Ana Leonor Rivera (Centro de Ciencias de la Complejidad, UNAM, MEX) Abstract: From the point of view of Complex Sciences, human health is determined by the interaction of multiple organs and systems that try to preserve the homeostatic state of balance between the robustness and the adaptability to changes in the environment. Nowadays, technological devices can monitor continuously diverse physiological variables that reflect the dynamics of these homeostatic balance. Time series analysis of these variables allow to find relevant parameters that can be used as biomarkers characteristic of health. To do this, here we analyze the non-invasive physiological time-series records from rigorously screened healthy control subjects available on the CALMECAC database (records of electrocardiography, breathing, oxygen saturation, perfusion index, blood pressure wave-form, temperature and actigraphy) in three different conditions: supine, standing up, and controlled breathing at 0.1 Hz test. Analysis of the detrended time series were evaluated by the statistical moments and the homeostatic measurement parameter α that combines the variability of the heart rate (HRV) and the SBP, Fourier spectral analysis, and the resonance parameter β that measures the resonance peak at 0.1 Hz for controlled breathing. Alterations in the range of these biomarkers may appear before symptoms arise and open up promising possibilities for applications in preventive medicine.</p>
11:00 – 13:00	Scientific session 6: Biological physics, physiological measurements and mathematical methods in medical physics
13:00 – 15:00	Exhibit hall, poster session, and lunch



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15:00 – 16:15	Scientific session 7: Educational and professional issues
16:15 – 18:00	Exhibit hall, poster session, and coffee break
18:00 – 20:00	Round table: Towards better professional recognition of the Medical Physicist in Mexico (This activity will be open to the public)
20:00 – 20:30	Awards and closing ceremony

Round Table

Towards better professional recognition of the Medical Physicist in Mexico

Joint activity of the Mexican Society of Physicists in Medicine (SMFM) and the Medical Physics Division of the Mexican Physics Society

Mission:

Foster an inter-disciplinary discussion on the current status and challenges of the recognition of the Medical Physicists in Mexican health institutions.

Goal:

Device specific measures to improve the recognition of the Medical Physicist as a unique and essential profession in the health system

Participants:

Moderator: Adriana Moreno – President of SMFM

Radiologist: Dr. Flor Tanoira – President of the Colegio de Radiología e Imagen de Yucatán

Radiation Oncologist: Dr. Juan Miguel Pech León

Clinical medical physicist (radiation oncology): Orlando Soberanis, M. Sc.

Clinical medical physicist (radiology): Dr. Xochitl Lopez

Graduate program coordinators: Eleni Mitsoura, M. Sc. (UAEM) and Dr. Luis Medina (UNAM)



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Oral contributions

Scientific session 1:

11:00	Dorantes et al. UNAM, Mexico	Design and Implementation of a Configurable Pulse Programmer for Medium and Low Field Nuclear Magnetic Resonance Systems
11:15	Mooch et al. UNAM, Mexico	Solution to the Heaviside-telegraph-equation accounting for ultrasound scattering and dispersion, in PAT image reconstruction
11:30	Gupta et al. T. Jefferson University, USA	Non-invasive Pressure Estimation with Lumason and Sonazoid Microbubbles
11:45	Forsberg et al. T. Jefferson University, USA	Disrupting Biofilms in Synovial Fluid with Ultrasound Triggered Microbubble Destruction
12:00	Nam et al. Thomas Jefferson University, USA	Feasibility of Clinical Risk Assessment based on Pressure-gradient Estimation using 3D Contrast-enhanced Ultrasound
12:30	Jafarpisheh et al. Concordia University, Canada	Estimation of Effective Scatterer Size and Acoustic Concentration Quantitative Ultrasound Parameters Using Dynamic Programming
12:45	Castañeda-Martínez et al. UNAM, Mexico	Application of dynamic-programing estimation of acoustic attenuation and backscatter coefficient of breast carcinoma

Scientific session 2:

15:30	Pacheco et al. UNAM, Mexico	Breast density quantification using dual-energy digital mammography
15:45	Sefc et al. CAPI, Czech Republic	Use of Timepix detectors in preclinical CT/PET/SPECT imaging
16:00	Ayala et al. UNAM, Mexico	Design of a bilateral filter for noise reduction in contrast-enhanced micro-CT
16:15	Ochoa et al. UNAM, Mexico	Characterization of a Fricke-gel solution as a potential low-dose dosimeter

Scientific session 3:

18:00	Zapien-Campos et al. UNAM, Mexico	Monte Carlo modelling of kV and MV imaging systems of the Varian TrueBeam STx Linac
18:15	Lara et al. IPN, Mexico	Optical transport studies in monolithic LYSO crystals for PEM detectors
18:30	Ramírez-Hernández et al. UNAM, Mexico	Lipomics: a colloidal system with potential as a hydrophilic-lipophilic drugs carrier
18:45	Góngora-Servín et al. UNAM, Mexico	Preparation and Preclinical Evaluation of ⁶⁴ Cu-NOTA-IPsMA as a Theranostic Radiopharmaceutical for Prostate Cancer

Scientific session 4:

11:15	Challco et al. UNI, Peru	A Three-Dimensional Electronic Detector Array Readout Configuration for Radiotherapy based on Active Matrices
11:45	Muñoz-Rojano et al. UNAM, Mexico	Lung tumor motion evaluation in patients treated with SBRT

Scientific session 5:

15:30	Agüero et al. FEMN, Argentina	OSL nanoDot Response at High Dose Gradient Regions: Validation with phantom and <i>in vivo</i> tests
15:45	Palacios et al. CEMENER, Argentina	Image Guided Radiotherapy Protocols and Doses: A CEMENER Experience
16:00	Ali et al. U. of Oklahoma, USA	Adaptive radiation therapy with deformable image registration and 4D dose calculation
16:15	Pérez-Ahumada et al. UNAM, Mexico	A Proposed Method to Assure the Efficiency of Thermotherapy Treatments



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Best student paper competition

18:00	Badillo-Ramírez et al. UNAM, Mexico	Enhanced Raman spectroscopy for the study and detection of biomarkers in neurological diseases
18:15	Barajas-Martínez et al. UNAM, Mexico	Short-term Cardiorespiratory Variability During the Menstrual Cycle
18:30	Hernández-Ramírez et al. UNAM, Mexico	A preclinical model for radio-osteoporosis induction
18:45	Hernández-Cano et al. UNAM, Mexico	Sleep staging with a hyperdimensional specialized dense network

Scientific session 6:

11:15	Orozco-Sixtos et al. Inst. Tec. Sup. Purépecha, Mexico	Mathematical model of pulmonary mechanics evaluated by Luenberguer observers with sliding modes applied to clinical diagnosis
11:30	Legaria-Peña et al. UNAM, Mexico	Parallels Between Homeostatic Regulation and a Balance Robot Toy Model
11:45	Cruz-Valenzuela et al. UNAM, Mexico	Design of a Faraday Cage for Biomedical Measurements Based on Site Electromagnetic Field Mapping
12:00	Domínguez-Hernández et al. U. de Guanajuato, Mexico	Use of auscultation system to monitor the changes of ventilatory pattern in a group of healthy smoking men.
12:15	Marín-García et al. UNAM, Mexico	Spectral and Statistical analysis of actigraphic recordings of acute insomnia patients
12:30	Salcedo-Martínez et al., UPIBI-IPN, Mexico	Analysis of the exponent Hurst in RR series of healthy subjects and congestive patients in sleep and wake state and in healthy subjects during physical activity
12:45	Macías-Gallardo et al. Inst. Nal. Rehab., Mexico	Spectral analysis of electromyographic activity using surface electrodes in patients with carpal tunnel syndrome

Scientific session 7

15:00	García-Zúñiga et al. Hospital Central "Ignacio Morones Prieto", Mexico	2D Radiotherapy in Mexico Today
15:15	E. Mitsoura UAEM, Mexico	Professional and academic follow up of 100+ graduates of the UAEMININ masters and doctorate program in medical physics in Mexico
15:30	M. E. Brandan UNAM, Mexico	Academic offer in the UNAM M. Sc. (Medical Physics) program
15:45	Porrás-Chaverri et al. U. de Costa Rica, Costa Rica	International experiences on a budget: the role of online technologies in the training of young scientists in developing countries



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Poster contributions

AUTHOR	INSTITUTION	COUNTRY	TITLE	
A. PHYSICS AND DOSIMETRY OF RADIATION THERAPY, RADIATION PROTECTION AND HEALTH PHYSICS				
1	Flores-Mancera	UNAM	Mexico	Response of BANG3-Pro gel induced by 6 MV X-ray radiotherapy beam
2	L. Sánchez-Hernández	Centro Oncológico Oaxaca	Mexico	Implementation of the hexapod table in patients of the Oaxaca state center of oncology and radiotherapy
3	Rodolfo Alfonso-Laguardia	Universidad de La Habana	Cuba	Small field dosimetry in plastic with 2D arrays
4	Nesreen Alsbou	University of Central Oklahoma	United States	Respiratory motion detection and tracking of mobile phantoms with a microwave imaging system
5	Jiménez-Acosta, J.A	Hospital Médica Sur	Mexico	Quality assurance of the calculation algorithm of a radiotherapy treatment planning system before its clinical implementation
6	Osvaldo Torres	Universidad Veracruzana	Mexico	Design and characterization of a rat pelvic-phantom to evaluate a radiationinduced osteoporosis method
7	O. Ávila	ININ	Mexico	Thermoluminescent response of TLD-900 dosimeters to electron irradiation
8	Mauricio Santibañez	Universidad de la Frontera	Chile	Dosimetry response and water influence of delaminated-Gafchromic EBT3 irradiated at kilovoltage
9	Velázquez Trejo José de Jesús	Centro Médico Nacional del Bajío. IMSS	Mexico	Initial characterization of 6X-FFF beam in a Varian C-Series machine
10	Héctor Andrés Flores-Hernández	UNAM	Mexico	Accuracy Evaluation of CBCT Image Guideline of 6 MV TrueBeam Stx Linear Accelerator for a Rat Model
11	María de los Angeles Montes-Rodríguez	IPN	Mexico	Comments on the precise definition of the concept of absorbed dose
12	Christian Adame González	IPN	Mexico	Determination of α/β for a Mexican Cohort of PCa Patients Treated with External Radiotherapy
13	Alvaro D. Cruz	UNAM	Mexico	Imparted dose in blood components with a ¹³⁷ Cs irradiator
14	Abril D. Iglesias Ojeda	UNAM	Mexico	Dosimetry in fractionated irradiation of rat brain to evaluate radiobiological response
15	Jorge H. Wilches Visbal	Universidad de Magdalena	Colombia	On the usage of the multistart-Isqnonlin synergy of MatLab for the reconstruction of an energy spectrum of electrons
16	A Moreno-Ramírez	UNAM	Mexico	Analysis of absorbed depth-dose curves in liquid water from kilovoltage X-ray spectra measured by an HPGe detector
17	Mauricio Missael Sánchez Díaz	UNAM	Mexico	Impact of Detector-specific correction factors in Non-Conventional Radiation Fields for Dose Distribution Calculation in Radiosurgery
18	Erich Schnell	The University of Oklahoma	United States	Emulation of Gynecological Brachytherapy Doses with External Beam
19	Rojas-López J A	Instituto Balseiro	Argentina	Out-of-Field Dosimetry in IMRT with OSL

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20	Erika Muñoz-Moral	UNAM	Mexico	Implementation of total body irradiation using VMAT
21	Concepción Laura Silva Fierro	UNAM	Mexico	Personal dose assessment using thermoluminescent dosimetry
22	Sandra A. Hernández	UNAM	Mexico	Dosimetric evaluation of a 70 kV x ray tube for cell culture irradiation
B. PHYSICS AND DOSIMETRY OF MEDICAL IMAGES (IONIZING RADIATION)				
23	E Arzaga-Barajas	UNAM	Mexico	Relative efficiency of TLD-100 glow peaks induced by low photon energy beams
24	Gerardo J. Ramírez Nava	IPN	Mexico	Assessment of ^{99m} Tc-Octreotide through a hybrid quantification method
25	Jaime Morón Fernández	UNAM	Mexico	Scatter and attenuation corrections for a PEM system: A thesis protocol
26	Armando Sebastián Ordoñez-Canul	UNAM	Mexico	Thesis project proposal: ⁶⁴ Cu-Radiolabeled Trastuzumab for the diagnosis and monitoring of HER2 positive breast cancer patients with molecular PET imaging.
27	Eduardo López-Pineda	UNAM	Mexico	M3D: Mammography phantom to assess mean glandular dose using thermoluminescent dosimetry
28	Mario Raymundo Cabrera Vertti	ININ	Mexico	Development of the CMC for air kerma for X-Ray reference beams in the RQR-M qualities of the IEC 61267:2005 in the SSDL-ININ
29	David Valdes-Corona	UAEM	Mexico	Determination of image features in cone beam computerized tomography used in lung stereotactic radiotherapy: a phantom study
30	Alejandro Zepeda-Barrios	UAEM	Mexico	Does Cone Beam Computed Tomography image have the potential to monitor response to lung stereotactic body radiotherapy? Initial analysis
31	P.J. Guadarrama-Huerta	UNAM	Mexico	¹¹ C-Methionine PET Glial Tumors Characterization by Radiomics Features
32	Víctor D. Díaz-Martínez	UNAM	Mexico	Depth of Interaction in Monolithic Scintillators for Positron Emission Tomography
33	Héctor F. Valdovinos	INCan	Mexico	RADIOLABELING OF PEPTIDES IN CLINICAL USE WITH COPPER-64
34	Hernández-Cordero Lourdes Lizet	UNAM	Mexico	Subsurface laser engraving to pixelate scintillation crystals used in PET/PEM detectors
35	Eugenio Galicia Laríos	UNAM	Mexico	Comparison between NEMA NU-2 and the new report of AAPM TG 126 for PET-CT Image Quality
37	Paulina Galavis	NYU Langone Health	United States	Tumor Sphericity as Predictor of Tumor Changes In Patients With HPV-Positive Oropharyngeal Carcinoma
C. USE OF NON-IONIZING RADIATION IN MEDICINE				
38	E.I. Fuentes-Oliver	UNAM	Mexico	Space of asymmetries for the radiometric changes due to Diabetes Mellitus
39	I. López-Miranda	UNISON	Mexico	Zinc oxide nanoparticles in a gel wax matrix for use as optical phantoms
40	R. Ortiz-Sosa	UNAM	Mexico	On the stability of asymmetry of thermal emission in diabetic foot disease
41	Juan Alberto Martínez Martínez	UNAM	Mexico	Design and Building of a Phantom for the Recording of Internal Temperature, in an Ultra-Low Magnetic Field MR System

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42	Steve Alejandro Avendaño García	UNAM	Mexico	Development of Anatomical Phantoms for an Ultra-Low Field Magnetic Resonance Imaging System
43	Sergio Enrique Solís Nájera	UNAM	Mexico	Modified Petal Resonator Surface Coil for UHF-MRI
45	Lauren J Delaney	Thomas Jefferson University	United States	Ultrasound-Sensitive Prophylaxis for Prevention of Post-Operative Infection in Spinal Fusion Surgery
46	Mauricio Manríquez-Padilla	UNAM	Mexico	Initial experience on the application of quantitative tests for ultrasound quality control in Mexican hospitals
47	Hilario Texcahua-Escobar	UNAM	Mexico	Development and calibration of an immersion system to measure ultrasonic attenuation and speed of sound
48	Mayra B. Bastida-Cabello	UNAM	Mexico	Overview of acoustic scattering models to characterize breast cancer microstructure using Ultrasound Backscatter Spectroscopy
49	Fatima Fonseca-Rodriguez	UAM-I	Mexico	Multiple Scattering and Scattering Cross Section Models in Ultrasound
D. BIOLOGICAL PHYSICS, PHYSIOLOGICAL MEASUREMENTS AND MATHEMATICAL METHODS IN MEDICAL PHYSICS				
50	Wady. A. Ríos	UNAM	Mexico	Functional network of patients with temporal lobe epilepsy: characterization of the database
51	R.I. Rojas-Jiménez	UPIBI-IPN	Mexico	Parkinson's Disease Image Analysis
52	López-Canizales, R	UNISON	Mexico	Adherence is Affected in Macrophages Gamma Irradiated at High Doses
53	César Daniel Bravo Alvarado	Universidad de Guanajuato	Mexico	Measurements of long bones response by acoustic and electrical bioimpedance techniques
54	Karla P. García-Pelagio	UNAM	Mexico	Mechanobiological differences between cultured and mechanically isolated muscle fibers from muscle
55	Lisset Franco Martínez	Universidad de Guanajuato	Mexico	Detection of knee soft tissues distensibility submitted to traction by bioimpedance spectroscopy technique
56	Gerardo Bravo-Villegas	UNAM	Mexico	Design of ^{99m} Tc-VDAC-1-L for neuroglobin imaging by SPECT
57	Vázquez-Hernández, L	UNISON	Mexico	Gamma radiation effect on the expression of molecules associated with dendritic cells maturation
58	R.I. Rojas-Jiménez	UPIBI-IPN	Mexico	ECG Waveform Analysis Algorithm
59	Mireya Osorio-Palacios	UNAM	Mexico	Sleep in Crayfish: Relationships between Brain Electrical Activity and Autonomic Variables
60	Martínez-Angeles W. L	Universidad de Guadalajara	Mexico	Facial Palsy Estimation Algorithm
61	Iván Oliver-Domínguez	UNAM	Mexico	Dominant vs Submissive: Autonomic-like responses in crayfish
62	Jorge R. Alejandro	Universidad Michoacana de San Nicolás de Hidalgo	Mexico	Validation of Total Reflection X-Ray Fluorescence Spectrometry as trace and ultra-trace technique of Selenium in human body fluids

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63	Ramiro Humberto Aguirre-Maldonado	UNAM	Mexico	High dose-rate effect (1200 MU min^{-1}) on delay expression of cytokine pro-inflammatory IL-1 β in rats brain
64	C.D. Mandujano-García	UAZ	Mexico	Measurement of activity concentration of polonium-210 in species of the phylum Mollusca from Mexico
65	Lilia Guadalupe Blancarte Reyna	Universidad de Guanajuato	Mexico	Minimum and maximum bladder capacities assessed by electrical impedance spectroscopy
66	Silva-Campa, E	UNISON	Mexico	Direct effects of gamma radiation on membrane and functional properties of macrophage
67	Carla Montañó García	Centro Médico Nacional Siglo XXI, IMSS	Mexico	Breaking paradigms in cervical cancer radiotherapy treatment (RT) at "Hospital de Oncología, CMNSXXI"
68	C.F. López Sánchez	IPN-UIIG	Mexico	Green synthesis of gold nanoparticles by multiwave ultrasonic technique using Citrus limon as reducing agent
69	J.C. Martínez Espinosa, A. Vázquez Franco	IPN	Mexico	Raman spectroscopy for the characterization of β - cryptoxanthin in the pulp of Spondias mombin
E. EDUCATIONAL AND PROFESSIONAL ISSUES				
70	K. Vazquez	GRUPO VITALMEX	Mexico	From planning to operating of an ABT BG-75 Self-shielding cyclotron service of 7.5 MEV one-dose dispenser
71	Mariela A. Porras-Chaverri	Universidad de Costa Rica	Costa Rica	Turning undergraduate research assistants into scientific researchers: a wooden-block based method