EFOMP

EUROPEAN FEDERATION OF ORGANISATIONS FOR MEDICAL PHYSICS

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EFOMP Incoming President's report (2024-2026)

Efi Koutsouveli became President of EFOMP in January 2024; here she gives her first President's message, in a piece based on her recent article in the European Journal of Medical Physics

It is with great pride that I step into the EFOMP President role knowing that the Federation of the European Organisations for Medical Physics has continuously progressed from strength to strength under the guidance of our past leadership and the collective efforts of our National, Individual and Company members. I am aware of the responsibility that comes with this position, and I am fully committed to serving our federation with transparency, dedication and ethos. During the course of my career as Medical Physics and Radiation Protection Expert at Hygeia Hospital in Athens, Greece, I had the chance to work in a variety of fields of physics for both ionizing and non ionizing radiation, be part of quality management teams and get involved in the training and teaching of oncology professionals as well as administrative and hospital staff from Greece, Europe and across the globe. My daily work includes patient and family consultation and in this way, I have the opportunity to understand the patients' needs and make some difference in the patient's life and care. My daily work for EFOMP, which started back in 2016 gave me substantial experience and knowledge about EFOMP's structure, administration, functioning and most importantly brought me closer to the 37 National Member Organisations (NMOs) from which I continuously sought for feedback.

The Strategic Agenda for the period 2024-2026 is founded upon a strong commitment to social, economic, environmental and ethical sustainability. EFOMP's Sustainability Roadmap embraces and supports the healthcare practices which contribute to a sustainable future. Some of the 2024-2026 presidential ambitions are summarised below and in Table 1.

I will close this editorial by quoting the journey to the island of Ithaka, a small island of the Ionian sea (my place of origin) as a metaphor to the Medical Physics journey and our lifelong learning. It will be a pleasure to meet many of you in Munich, Germany at ECMP2024. EFOMP members, European and International stakeholders can contact me anytime by sending an email to: president@efomp.org

As you set out for Ithaka, hope your road is a long one, full of adventure, full of discovery.

Laistrygonians, Cyclops, angry Poseidon—don't be afraid of them:
you'll never find things like that on your way as long as you keep your thoughts raised high, as long as a rare excitement stirs your spirit and your body.

Laistrygonians, Cyclops, wild Poseidon—you won't encounter them unless you bring them along inside your soul, unless your soul sets them up in front of you.
.....

STRATEGIC AGENDA 2024-2026

PRESIDENTIAL AMBITIONS BY EFI KOUTSOUVELI

COMMON TRAINING FRAMEWORK

- National Registrations Schemes – Tackling harmonization challenges
- Common Core Curriculum (CC) for MPEs
- EFOMP School for Medical Physics Experts

AUTOMATIC RECOGNITION BY THE EU OF THE MPE PROFESSION

- Prepare the submission to EU by cross collaboration of the EFOMP Advisory Committees while gaining insight and support from the NMOs.
- Raise EFOMP's organizational profile
- Organise leadership courses

SUSTAINABILITY ROADMAP

- Expand the current education and training platform.
- Provide equal access to quality higher education to the entire medical physics workforce (incl. low fee policy).
- Special Interest Groups.
- Environmental footprint of the events and meetings.
- Memoranda of Understanding and practical agreements with various stakeholders.
- Excellence of the European Journal of Medical Physics.
- Raise awareness of the Medical Physics profession.
- Develop a volunteering platform.
- Empower the younger audience.
- Support regional meetings to decentralize expertise.

The Strategic Agenda for the period 2024-2026 is founded upon a strong commitment to social, economical, environmental and ethical sustainability.

Ithaka gave you a marvelous journey. Without her you wouldn't have set out.

She has nothing left to give you now. And if you find her poor, Ithaka won't have fooled you. Wise as you will have become, so full of experience, you'll have understood by then what these Ithakas mean.

'Ιθάκη', by Konstantinos Cavafy, a poem written in 1911.

This article is based on an article that was published in Physica Medica (January 2024) as E. Koutsouveli, "Incoming President of the European Federation of Organisations for Medical Physics editorial", Physica Medica, Volume 117 (Copyright Elsevier). It is reproduced here with permission.

Efi Koutsouveli has worked as a Medical Physics and Radiation Protection Expert and Laser Safety Officer in the Medical Physics department of Hygeia Hospital in Athens, Greece since 1993. Her professional focus is on radiotherapy units (external radiotherapy & brachytherapy). Her special interest is in Hospital Quality Management Systems and Oncology Information Systems. She is currently EFOMP's President. In 2019, she received the IOMP-IDMP award for promoting medical physics to a larger audience. Email: president@efomp.org

Table 1. Detailed Strategic Agenda 2024-2026

Common Training Framework	
National Registrations Schemes – Medical Physics workforce – Tackling harmonization challenges	Establish a common platform for training, educational standards, national registration and continuous professional development for the Medical Physics profession.
Common Core Curriculum (CC) for Medical Physics Experts (MPEs)	Finalise the revision of the three existing CCs in radiotherapy, nuclear medicine and radiology and incorporate curricular guidelines and policies in additional subfields (artificial intelligence, clinical trials, magnetic resonance, medical devices, physiological measurements, lasers and ultrasound).
EFOMP School for Medical Physics Experts	Target the School to existing and novel areas of scientific and research interest, educational and training space in order to achieve harmonisation of the knowledge, skills and competences.
Automatic recognition by the European Union (EU) of the Medical Physics Expert (MPE) profession	
Prepare the submission to EU by cross collaboration of the EFOMP Advisory Committees while gaining insight and support from the NMOs	A successful submission sets a general system for the recognition of evidence of training, automatic recognition of professional experience and allows free mobility of MPEs within the Member States while ensuring a more efficient and transparent recognition of professional qualifications. This will also act as a foundation for such recognition outside the EU.
Raise EFOMP's organizational profile	Forge strategic partnerships with relevant organizations, institutions, and stakeholders across Europe and beyond.
Organise leadership courses	Follow a multidisciplinary and multiorganisational approach, create networking opportunities, include in the faculty leading international policy makers.
Sustainability Roadmap	
Expand the current educational and training platform	Develop synchronous, asynchronous, combined courses accredited by the European Board for Accreditation in Medical Physics. Make the platform available for use by our NMOs to include courses in their own language and be accessed by communities speaking the same language worldwide. Deliver examinations as a qualification evidence of a common training level and expertise

Give equal access to quality higher education to the whole Medical Physics workforce	Keep the attendance fees for all EFOMP educational activities low. Increase the number of participants from countries with lower economies by providing subsidized fees and grants.
Reduce inequalities of training between member countries	Support regional meetings organized by NMOs by planning educational courses. Support Medical Physics training programmes for young physics graduates from low and medium income countries worldwide.
Special Interest Groups of EFOMP	These structures are vivid communities of professional experts in specific fields which produce educational webinars, symposia, schools, scientific publications, policy statements, guidelines, congress tracks, participate in projects and ensure a sustainable future for EFOMP.
Environmental footprint of the European Congress of Medical Physics, Symposia and training events	Provide hybrid editions for all our Schools. For the onsite events we will produce guidelines on the choice of ecological friendly venues and hotels, travel journey, waste management. Include green awareness sessions in the Congress programme.
Environmental footprint of leadership meetings	Increase the use of digital tools. Organise in person meetings with international organisations, networks, stakeholders during our main event, the European Congress of Medical Physics and ultimately minimize our carbon footprint.
Memoranda of Understanding and Practical Agreements with professional networks, regulatory authorities, scientific institutions, industry and patient communities,	Unite with organisations to address societal, economic and environmental challenges, foster partnerships on radiation safety legislations, exchange scientific and technical knowledge on the impact of the healthcare practices to climate change and vice versa, hence contributing to planetary health. Support the Europe's Beating Cancer plan and global coordinated efforts that will contribute to the United Nations Sustainable Development Goals (UNSDGs)
European Journal of Medical Physics - Ensure inclusive and equitable education for all	Increase the number of open access science publications. Invite submissions of articles for sustainable practices, research, technological innovations and advancements, scientific solutions to address the environmental crisis.
Raise awareness of the Medical Physics profession	Strengthen the communications and publications tools of EFOMP (website, social media, newsletter) by refreshing the current platforms.
Empower the younger audience - Create sustainability roles within EFOMP supporting and administrative structures	The sustainability people will suggest and oversee all actions that will respond to the UNSDGs. The new generation will get acquainted with EFOMP's work and get trained for becoming the future leaders.

Introduction to the New Secretary General, Brenda Byrne

It is my great pleasure to introduce myself as the Secretary General of EFOMP (term 2024-2026). Some of you may recognise me as the past chair of the Professional Matters Committee (term 2021-2023). I am really looking forward to meeting and working with our NMOs over the coming years. It has been a busy start to my term with many activities going on over the last few months.

Firstly a little about me. I am a diagnostic and nuclear medicine trained medical physicist with over 20 years experience and have worked at the Mater Misericordiae University Hospital, Dublin, Ireland since I graduated in 2000. I am a registered Medical Physics Expert and Radiation Protection Adviser. In my spare time I enjoy walking, travelling and spending time with my husband Patrick and two kids, Owen and Orla.

EFOMP Committees

EFOMP has requested that all NMOs review their committee membership to ensure each committee is energised over the coming years as we have a lot of work to do! This endeavour has been very successful with many new members from a number of different NMOs joining our committees. Our chairs have been busy organising virtual meetings and developing plans for the year ahead. Our Education and Training Committee are working to develop our new eLearning platform alongside Cevents who are a Spanish committee who were awarded the contract for this exciting project. Professional Matters alongside European and International Matters are working towards our application for MPE recognition across Europe. Our Publications and Communications committee have implemented a new method of article submission to EMP news and are busy reviewing our website to ensure it is user friendly to all our visitors. The Science Committee has had a number of requests for joint working groups with AAPM which highlights our need for a volunteer's database. Work is underway to develop this by our Projects Committee. Having a volunteer's database will make it more efficient for us to respond to these requests which often come with tight deadlines. Our Science and Education and Training Committees have new secretaries, John Dickson (UK) and Christie Theodorakou (UK). We would like to thank Irene Hernandez Girón (Spain) and Marion Essers (Netherlands) for their work as past secretaries to these committees.

SIGS

Our Early Career Medical Physicists SIG are very active organising webinars, preparing the Early Career Programme for ECMP 2024 and helping relaunch the EFOMP Mentorship Programme. We are very encouraged by their work and enthusiasm. Their work contributes greatly to EFOMP sustainability model for the coming years. I quote the EFOMP Presidents editorial in EJMP. Here she states "The sustainability model will be strengthened by creating sustainability roles within EFOMP supporting and administrative structures. Some members can originate from the Early Career Special Interest Group, thus the new generation will get acquainted with EFOMP's work, provide fresh ideas, amplify their voice, set ambitious targets, share their expectations and concerns, have an active role in decision making and build democratic spaces. Being part of these structures offers them opportunities of growth, learning, volunteering and mentorship, strengthens their identity, guides them to become the Medical Physics ambassadors and future leaders."

The first term of our Radionuclide Internal Dosimetry SIG Steering Committee comes to an end in March 2024, so nominations were sought for members to form the new Steering Committee. 12 applications were received for 9 positions. The results of the election will soon be published. This group has been a huge success over the last 3 years with many of their targets achieved including hosting a successful Symposium on Molecular Radiotherapy Dosimetry in Athens in November 2023 and the publication of EFOMP policy statement NO. 19: Dosimetry in nuclear medicine therapy – Molecular radiotherapy. They recently welcomed their 200th member to the SIG.

Our dental SIG has elected their Steering Committee and will commence their work soon. Our Particle Physics SIG will be holding their first kick off meeting in the coming weeks. You will get a chance to meet all our SIGs at the "Meet the SIG" dedicated sessions at ECMP 2024.

European Congress of Medical Physics 2024 in Munich

The Congress Planning Committee of which I am a member has held a number of online meetings over the last year. The Scientific Programme has been published on the ECMP 2024 website. A large number of abstracts have been received to date and this congress which is co-hosted by the tri-Nations of Austria, Germany and Switzerland is shaping up to be one of the highlights of the year for EFOMP. Our welcome nation for this Congress is France, the current home of our Congress President Yolanda Prezado. I am looking forward to meeting a lot of our NMO members there and we will also host our Annual Council Meeting at the Congress on Saturday 14th of September 2024.

EFOMP Working Groups (WG)

In February we launched a call to form a new WG to write Policy Statement 21 "The role of the Medical Physicist in the management of medical laser sources". Nominations must come directly from the NMO so please get in touch with your local NMO if you are a medical physicist with clinical experience working for medical laser sources.

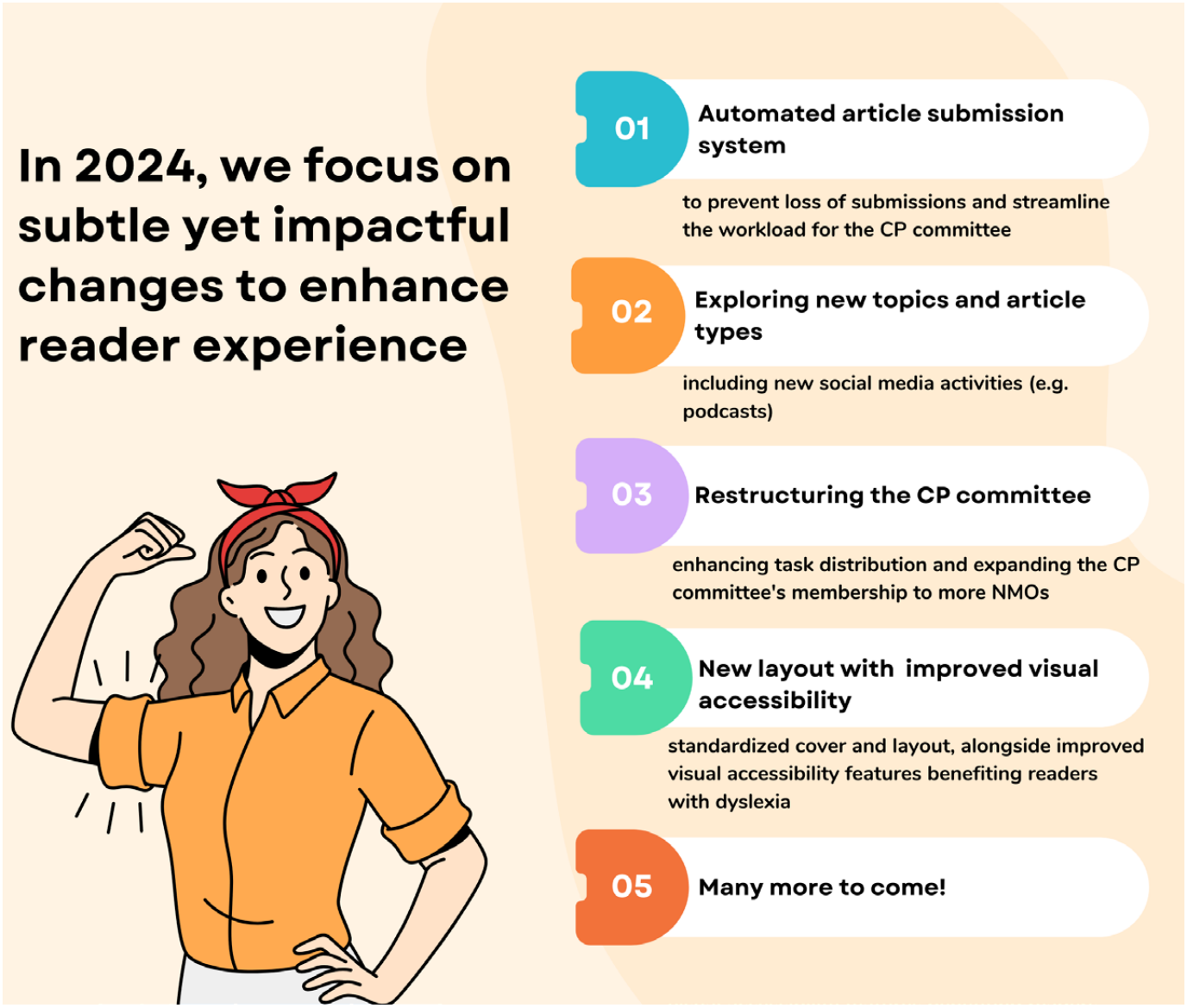
European School for Medical Physics Experts editions 2024

In February our ESMPE board held a very successful edition of Statistics and Uncertainties in Medical Physics in Prague. We are hosting three 1 day schools at ECMP 2024. You will find more information on the ECMP 2024 website and in October we will host a 3 day school in Milan on the topic "Quantitative MRI: basic principles, optimization, quality assurance". Registration is now open and spaces are filling up quickly so don't miss out.

Finally I would like to say please do not hesitate to contact me on secretary@efomp.org if you have any queries or would like to discuss EFOMP attendance at your scientific meetings. Please keep up to date with all our activities by following us on social media and checking our website.

Brenda Byrne is a Principal Physicist working in the Mater Misericordiae University Hospital, Dublin, Ireland. Her primary areas of interest are diagnostic radiology, nuclear medicine and radiation protection. She has been a registered radiation protection adviser (RPA) since April 2000 and is a recognised medical physics expert (MPE). Brenda is the current Secretary General of EFOMP and Past Chair of the EFOMP Professional Matters Committee.

Editorial



major goals from the CP committee for 2024-2025

Dear all,

Writing my first editorial in a new environment is both exciting and nerve-wracking. As a newcomer to many of you who are loyal readers of EMPNews and longstanding members of EFOMP, I'm eager to share insights into my background, professional journey, interests, and vision for the Communications and Publications Committee, including the newsletter. Without delay, let's begin this introduction.

Who am I?

My name is Sasha, I am a (relatively) young medical physicist specializing in Radiology and Nuclear Medicine at the University Medical Center of Groningen. While the term 'relatively' may be subjective, the evidence of time's passage and obvious wrinkles is undeniable.

Originally from Ukraine, I completed my education in medical physics in Kyiv in 2012. After a brief stint in R&D engineering for a biomechanics

company, I moved to the Netherlands for a PhD focused on developing preclinical molecular imaging scanners at TU Delft and MILabs. Despite intending a short stay, I've since settled here, completing a postdoc in image-guided surgery at the Netherlands Cancer Institute and a 4-year residency at Leiden University Medical Center, earning certification as a Medical Physics Expert (MPE) and securing my current position.

What is my career focus?

In the last 12 years, I've done quite a few different projects. Beginning with designing and calibrating preclinical SPECT and PET systems, I transitioned to developing a surgical navigation system for the operating room, which sparked my interest in advanced image processing and AI. Subsequently, a fortunate medical residency at a CT and dosimetry-strong center allowed me to deepen my expertise in image quality evaluation and dosimetry software development, for which I am deeply grateful. Towards the end of my residency, I realized my passion for returning to nuclear medicine to tackle challenges in quantitative imaging and personalized dosimetry in radionuclide therapy. Thanks to SIG_FRID, I had the opportunity to grow and learn, paving the way for my current role as a medical physicist overseeing quantitative imaging and personalized dosimetry at the largest nuclear medicine department in the Netherlands.

What are my passions outside of work?

For years, I've been deeply involved in science communication and activism. Around 2018-2019, I joined the Marie Curie Alumni Association (MCAA) editorial team, eventually becoming editor-in-chief and shaping the MCAA Newsletter. With 20k members, mostly former MSCA fellows, MCAA aligns with EFOMP's goals, emphasizing personal growth, sustainability, and inclusion. Like EMPNews, the MCAA Newsletter is a quarterly tool for sharing updates and events. Hence, while I'm new to the CP committee, I've been performing similar tasks elsewhere for years.

Additionally, I've always been and hope to remain an activist, advocating for inclusion, female leadership, and healthcare accessibility. When the war in Ukraine began over two years ago, after crying my eyes out for a few days, I joined the #ScienceForUkraine volunteering movement. Through this initiative, we centralized information about support opportunities for Ukrainian scholars, ultimately establishing the world's largest database of its kind. Leading the coordination of scholarly and Ukrainian outreach, I became a coordinator of the initiative, which later transformed into an NGO. Despite my background as a medical physicist and technical scientist, I'm immensely proud to say that the most impactful work I've done or published relates to my involvement with #ScienceForUkraine. We've helped thousands find new positions and funding sources, presented at major science diplomacy forums, and even published in prestigious journals like Nature and Science. This experience has taught me that passion drives learning and evolution in any direction we choose. But, in the end, my "spare" time is dedicated to coordination and fundraising for an NGO, making things a bit complicated.

What is my vision for the EMPNews?

Like many of you, I view EMPNews as the true face of EFOMP. Therefore, I aim to ensure that EMPNews remains true to its essence: a product of diligent work from the CP committees, resulting in a polished and professional output. It should serve as an effective communication medium and an engaging newsletter that members actively participate in.

In 2024, we focus on subtle yet impactful changes to enhance reader experience, such as:

- Implementing an automated article submission system to prevent loss of submissions and streamline the workload for the CP committee.

- Introducing standardized cover and layout, alongside improved visual accessibility features like a sans serif font and enhanced contrast, benefiting readers with dyslexia. We'll also enforce higher image quality standards and visual tags for easier navigation.

The front page of EMPNews will now feature three key images: EFOMP's mission, educational initiatives, and notable MPE events from the quarter.

- Exploring new topics and article types to better engage early career professionals in medical physics.

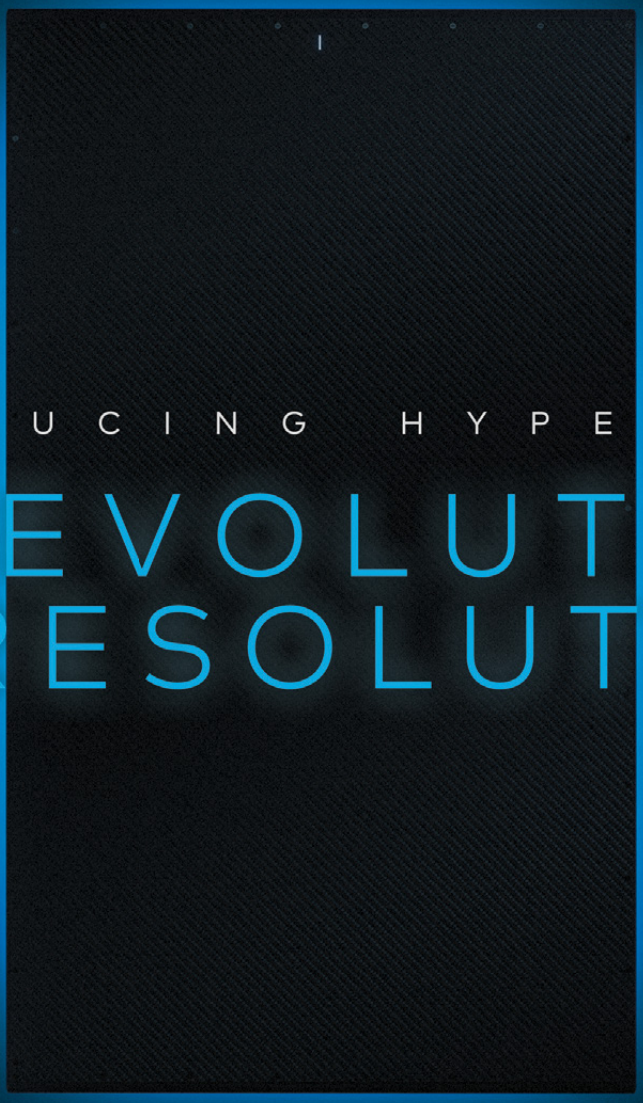
This includes creating new social media activities (e.g. podcasts) and other existing projects to follow later this year

- Enhancing task distribution and expanding the CP committee's membership to more NMOs for increased engagement and effectiveness.

With our exceptional team, I'm confident we can achieve these ambitious goals.

Thank you for your readership and contributions to EMPNews. Enjoy the Spring 2024 edition!

Sasha Ivashchenko, MPE at the Department of Nuclear Medicine and Molecular Imaging of the University Medical Center Groningen, chair of the CP committee 2024-2025.



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Meet the new chair

As the old saying goes, a new year marks a fresh beginning. Every two years, EFOMP committees hold elections for their chairs, attracting numerous candidates eager to contribute their ideas and vision to their chosen committee.

In January 2024, leadership changes occurred in two committees: Dimitris Visvikis now leads the Project Committee, while Sasha Ivashchenko chairs the Communications and Publications Committee. The transition in leadership within EFOMP committees carries significant implications, often sparking the initiation of multiple projects. However, as a reader and general member of EFOMP, these "behind the scenes" activities often remain unnoticed.

To bridge this gap, the editorial team at EMPnews has launched a new article series titled "Meet the New Chairman." With each committee election, we will provide the newly elected chair a platform to articulate their vision for the upcoming term. We are eager to learn about their plans for the future and extend our best wishes to the new chair as they work towards realizing their objectives.

Without further reduce, let here a bit more from Dimitris Visvikis!

Q: Dimitris, can you tell the readers something about yourself and your background?

I'm Dimitris Visvikis, a research director at INSERM and Director of the Medical Image Processing Lab in Brest (LaTIM, UMR1101). My journey in medical physics began with earning my PhD from the University of London in 1996, focusing on PET detector development.

Since then, I've held roles as a Senior Research Fellow at the University of Cambridge and as a Principal Medical Physicist at University College London, where I pioneered early clinical PET/CT systems.

My primary research focuses on improving PET imaging for oncology applications, including respiratory motion detection and correction, 4D PET image reconstruction, and tumor radiomics modeling.

Outside of research, I'm actively involved in professional societies such as EFOMP, IPEM, IEEE, AAPM, SNM, and EANM, with roles including Projects Committee Chair at EFOMP.

I'm currently honored to serve as Editor-in-Chief for the IEEE Transactions in Radiation and Plasma Medical Sciences, as well as president of the INSERM national scientific commission for Healthcare Technologies.

Over the years, I've been fortunate to receive recognition for my contributions to PET imaging, including the Edward J Hoffman Award of the Society of Nuclear Medicine and Molecular Imaging, “for contributions to advances in PET imaging and to education and dissemination of findings within the scientific community”, and the 2020 IEEE Nuclear and Plasma Sciences Society and Nuclear Medical Imaging Steering Committee, Medical Imaging Technical Achievement Award, “for contributions to PET/CT imaging methodological developments dedicated to respiratory motion correction, image reconstruction, detector modeling and automated image analysis and processing for predictive modeling in oncology”.

Q: Why you decided to apply for the position of chairman?

DV: I initially joined EFOMP over ten years ago in my role as VP International for IPEM. I have been playing the role of Secretary of the Project Committee for more than 7 years and during my last term as Secretary under the chairmanship of Konstantinos Koutsogiannis and the presidency of Paddy Gilligan, I noticed a clear evolution in the intentions of the Project Committee with the participation of EFOMP on multiple projects as a partner instead of in a simple advisory role, as was the case until then. I really enjoyed taking an active part in this evolution and this is what prompted me to apply to become chair of this committee.

Q: What would you like to achieve within your team as chair of the committee?

DV: I really believe that EFOMP can play a more active role in defending the interests of MPEs in EU projects covering both research and many professional matters at European level. There are two types of projects that we can participate in as partners; namely service contracts and research proposals. Over the past three years, we have focused our participation mainly on service contracts related to the implementation of legislation in EU Member States regulating the role of medical physicist in the field of ionizing radiation, both for diagnostic and therapeutic purposes. They cover different areas of the implementation actions of the SAMIRA initiative. Through EFOMP's successful involvement in EU projects, tenths of medical physicists from different countries are currently contributing to shaping the future direction of the medical physics profession at European level, both from an MPE/PRE but also from a research and development point of view .

My ambition for the future is to expand this activity to areas of medical physics other than ionizing radiation. Moreover, I strongly believe that EFOMP can become a privileged partner within appropriate research projects funded by the EU. The Special Interest Groups (SIGs) within EFOMP should be the playing field for the development of such EU research projects within the areas of interest of each of the SIGs. Within this context, the members of the SIGs consist of pan-European (through nominations from the various NMOs) experts in their field. The role of EFOMP within such research projects can be in terms of administrative coordination, but also in the coordination of dissemination activities through EFOMP's popular education and training program and the schools organization.

I look forward to working with all members of the project committees and the entire EFOMP and its NMOs to realize these plans.

Sasha Ivashchenko serves as the chair of the Communications and Publications Committee of the EFOMP as of January 2024. She holds a senior position as a medical physicist at the Department of Nuclear Medicine and Molecular Imaging of the University Medical Center of Groningen, and is active in personalized dosimetry research and science communication.

Physica Medica: Editor's Choice

For this spring issue of EMP News I selected the following three articles, recently published in Physica Medica (EJMP), which particularly attracted my attention.

S. Sauranen et al **Dual-energy computed tomography quality control: Initial experiences with a semi-automatic analysis tool** Phys. Med. 2024;118: 103211 https://doi.org/10.1016/j.ejmp.2024.103211 https://www.physicamedica.com/article/S1120-1797(24)00005-X/abstract

The use of dual-energy CT (DECT) imaging in the clinical practice presents numerous advantages but also challenges, among them being those related to the specific quality control (QC) system that needs to be developed and implemented to fully integrate DECT in the clinical practice. The aim of this publication was to introduce a QC system able to monitor the constancy of the CT images as well as the software used in calculating the DECT derived maps. The system appears to be highly effective and provides a workflow for constancy measurements that is easy to implement and ready to use. The authors generously make available the actual QC tool for other users at https://github.com/tomakela/dectqatool.

C. Noblet et al **A TPS integrated machine learning tool for predicting patient-specific quality assurance outcomes in volumetric-modulated arc therapy** Phys. Med. 2024;118: 103208 https://doi.org/10.1016/j.ejmp.2024.103208 https://www.physicamedica.com/article/S1120-1797(24)00002-4/abstract

This article is a perfect illustration of the increasing role of Artificial Intelligence (AI)-based tools in medical radiation physics at the clinic. Thus, it presents the methodology for choosing a machine learning (ML) model for optimising the workload of patient-specific quality assurance (PSQA) as well as its efficient integration into treatment planning system (TPS) via a C# script. The script was successfully tested and it proved to work as a complementary tool for PSQA measurements. By being also fully integrated into the clinical workflow, the result is a decreased risk of failing QA and potentially a reduction of the need for replanning, and additional verification measurements. So, this article is a demonstration of the advantages ML could bring into the clinic, in terms of helping the work of the medical physicists with high efficiency and excellent quality.

M. Nieminen et al **If you can make it, you can share it – Perspectives on the first DIY-fair at the European congress of medical physics (ECMP, DUBLIN 2022)** Phys. Med. 2023;118: 103214 https://doi.org/10.1016/j.ejmp.2024.103214

https://www.physicamedica.com/article/S1120-1797(24)00008-5/fulltext#%20

Last, but definitely not least, I would like to bring to your attention an extended invite commentary on the do-it-yourself (DIY) – solutions, to support clinical and research work presented at the DIY-fair held at the European Congress of Medical Physics (ECMP) in August 2022 in Dublin, Ireland. This event showcased 32 contributions of different types, including both software and hardware as well as various gadgets and phantoms. This paper is presenting them in a succinct but thorough manner, indicating where one could find the source or the relevant details regarding these contributions. Furthermore, this article highlights above all the importance for the medical physics community to create the opportunities and offer the platforms for sharing and distributing information regarding the DIY-solutions. I hope this initiative will continue and I am looking forward to visiting the DIY-fair at the ECMP 2024 meeting!

Iuliana Toma-Dasu, Editor-in-Chief of Physics Medica – European Journal of Medical Physics

EFOMP

EUROPEAN FEDERATION OF ORGANISATIONS FOR MEDICAL PHYSICS

MAJOR EVENTS IN 2024

ECMP congress 2024

You are invited to participate in the highly anticipated 5th European Congress of Medical Physics, which will take place between September 11 and 14, 2024 in Munich. As always, the Congress will be accompanied by a series of pre-Congress schools accredited by the ESMPE.

Learn more

ESMPE School on MRI

The European School for Medical Physics Expert (ESMPE) of the EFOMP would like to invite you to the upcoming school editions in 2024.
Don't miss your chance to learn more about quantitative MRI between October 24 and 26 in Milan!
Each school is accredited by EBAMP as a CPD event at EQF level 8.

Learn more

International mobility

EFOMP encourages international collaboration and lifelong educational activities of medical physicists and encourages them to use the ongoing ENEN2+ and PianoForte funding programs for this purpose. Each ESPE school and EFOMP events are eligible for travel funding through the above calls.

Learn more

A Cancer Workforce in Crisis - Their Fight Is Our Fight

ECO's campaign 'A Cancer Workforce in Crisis'

The European Cancer Organisation (ECO), together with its member societies and supporting communities, has launched an ambitious campaign to support cancer care professionals.

The current shortages within the cancer workforce are having a profound impact on the dedicated men and women on the frontlines of cancer care in Europe. Doctors, nurses, pharmacists, and many others – they are all struggling to cope. More and more of them report burnout, forcing them to leave their professions.

Those who remain are given more responsibilities, larger caseloads, and ever-taller stacks of paperwork, resulting in even less time with patients. Mistakes under these conditions are inevitable, and care is being compromised. Something must be done – and now. According to a recent landmark report, without decisive action, Europe is set to lack over 4 million cancer workers by 2030.

The campaign A Cancer Workforce in Crisis is providing new evidence, personal stories, and policy recommendations to bring about profound change in the cancer care workplace. It is an international effort, gathering data to improve cancer workforce policy based on three strong pillars:

- Improving data on working conditions and current workforce shortages in cancer care, country by country across Europe. ECO has launched its own survey to evaluate the working conditions and quality of life of cancer care professionals.

- Collecting first-person accounts from the men and women working on the frontlines of cancer care: how the crisis has affected their daily workload – and home life – and their ability to care for patients effectively. Read some of their stories here.

- Providing policy recommendations and good practice examples to help national and European decision-makers respond to the crisis.

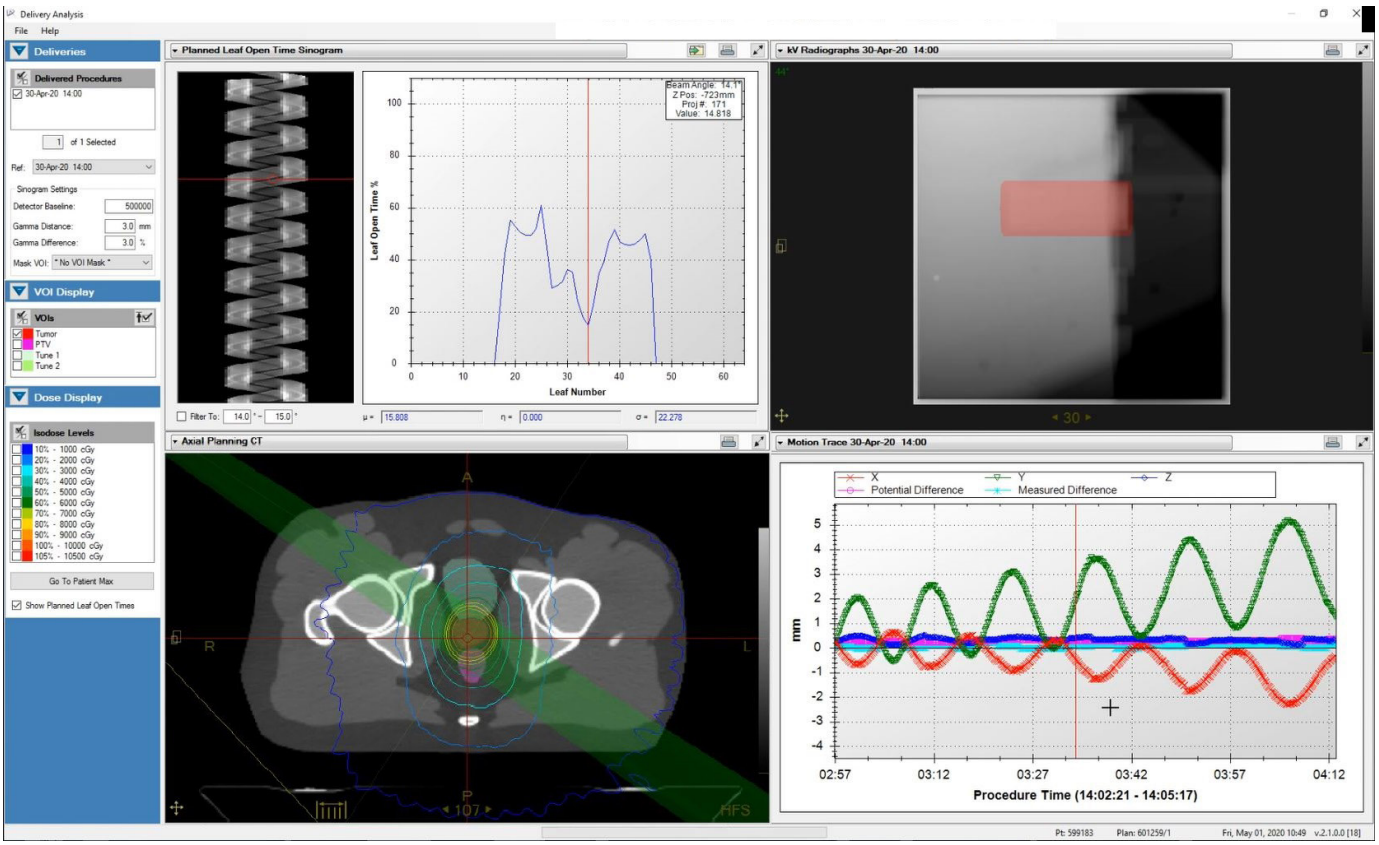
You can learn more about the campaign here.

The European Cancer Organisation is the largest multi-professional cancer organisation in Europe. It works to reduce the burden of cancer, improve outcomes and the quality of care through a multi-disciplined and multi-professional approach. As a not-for-profit federation of member organisations, the European Cancer Organisation convenes oncology professionals and patients to agree on policy, advocate for change and speak up for the European cancer community. More information is available here.

European Cancer Organisation

Contact email:
agnese.konusevska@europeancancer.org

Can measurement-based QA be exchanged for machine log file analysis?



User interface of sample data for a Radixact Synchrony patient treatment.

This is a major debate within the medical physics community [1]. Although measurement-based QA ensures the correct dose in a phantom, it is a laborious process, prone to systematic errors and human subjectivity, insensitive to certain types of errors, and devoid of specificity [1]. However, log file analysis can calculate the dose delivered on the daily CT and can be fully automated [1], increasing efficiency and freeing up time for the physicist to perform other tasks that require a human touch.

Over fourteen million new cases of cancer are diagnosed globally each year [2], with approximately 30% of surviving patients having undergone radiation therapies [3]. Current trends show that the increase in radiation therapy demands is outpacing supply by a factor of ten [4]. As the amount and complexity of radiotherapy treatment increases, so does the need for automation, efficiency, and objectivity in the clinic when assessing treatment data. Accuray provides such solutions.

Total Quality Assurance (TQA) streamlines machine quality control using log file analysis and quantitative evaluation of system performance

[5,6,7], using built-in instrumentation, in a series of tests that require minimal setup and runtime. The equations produced by TQA facilitate Accuray service technicians and physicians' assessment of the need for preventive maintenance or dosimetric validation [7].

Tolerance levels in TQA follow recommendations of Accuray, and AAPM Task Groups 142, 148, and 306, but may be customized. An array of tests are available including energy and output checks, source alignment, laser positions, jaw movement, MLC positions and timing used in Synchrony® dynamic delivery, and beam gating latency used in VitalHoldTM DIBH treatments. Water phantom tests for beam profiling and PDDs are available, as are abbreviated tests for spot checks when desired. TQA generates comprehensive reports for digital record keeping and can remove hours of work by the clinical physicist.

Delivery Analysis (DA) was designed to automate verification of patient treatments using transit dosimetry from on-board CT detectors and high-resolution MLC telemetry. Delivered sinograms can be compared against the delivery plan to ascertain performance data of the machine delivery. The patient's daily dose can be reconstructed, and trended, for treatments including helical and static field (TomoDirectTM) IMRT or 3DCRT and target-tracked dynamic treatments (Synchrony®). "DA is a powerful tool with high detection sensitivity and ability to detect body movement during treatment" [8] and can detect anomalies in patient anatomy, useful for observing dosimetric effects of patient alignment inconsistency or weight loss.

Delivery Analysis also includes leaf open time histogram comparisons, gamma calculations, and several Synchrony® treatment metrics including kV radiograph and fiducial viewing and tracking data. Users can customize their tolerance levels for these metrics for an at-a-glance view of the delivery after each fraction. DICOM data can be exported for independent dose calculations, aiding in QA for adapted treatments where lengthy patient QA procedures are not possible to implement [10].

It is imperative to understand the strengths and weaknesses of various IMRT QA methods. Log-file based QA, such as TQA and Delivery Analysis, has proven to be effective in complementing measurement-based methods [11, 12, 13, 14]. No matter the mixture of QA methods, a complete QA program should be augmented with robust commissioning processes and an appropriate periodic QA program. These log-based methods could also be suitable for some patient QA procedures [15,16]. The choice of how to perform machine and patient QA is at the discretion of each clinic and Accuray is supplying tools to aid in various methods of quality assurance to help ensure the efficacy of treatments and most importantly, the safety and comfort of patients.

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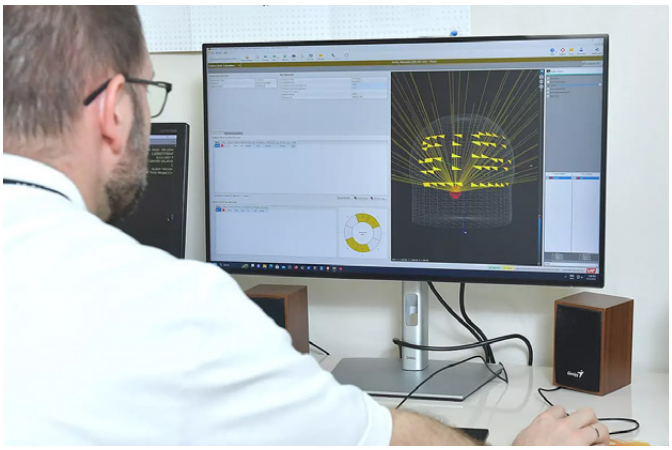
Michael Taylor Ph.D. has been a medical physicist at Accuray Incorporated since 2008. He works cross-functionally between clinical support, training, research, and marketing. He is most passionate about providing safe and effective palliative radiation treatments that serve to increase the physical and emotional comfort of patients and their loved ones.

LAP's RadCalc software ensures independent QA for Gamma Knife Perfexion treatment planning

Medical physicists at the University Clinical Centre of Serbia depend on the RadCalc Gamma Knife software module to verify their SRS treatment plans



Ljubomir Kurij, Chief medical physicist, National Gamma Centre in Belgrade utilizes the RadCalc Gamma Knife module for independent dosimetric verification

Independent patient QA is hard-wired into the stereotactic radiosurgery (SRS) programme at the National Gamma Centre, part of the University Clinical Centre of Serbia in Belgrade. As such, a core building block of the daily radiosurgery workflow is LAP's RadCalc QA secondary check software, a suite of widely deployed QA tools that provides radiation oncology teams with automated and independent dosimetric verification of their radiotherapy treatment planning systems (TPS).

Operationally, the heart of the Belgrade clinic's SRS programme is Elekta's Leksell Gamma Knife Perfexion treatment system (using GammaPlan TPS version 10.2.1). "Our Gamma Knife Perfexion machine provides intracranial radiosurgery to around 750 patients every year," explains Ljubomir Kurij, the facility's chief medical physicist. "We address a wide range of disease indications spanning benign and malignant tumours – including brain metastases, vestibular schwannoma and meningioma – as well as vascular disorders in the brain."

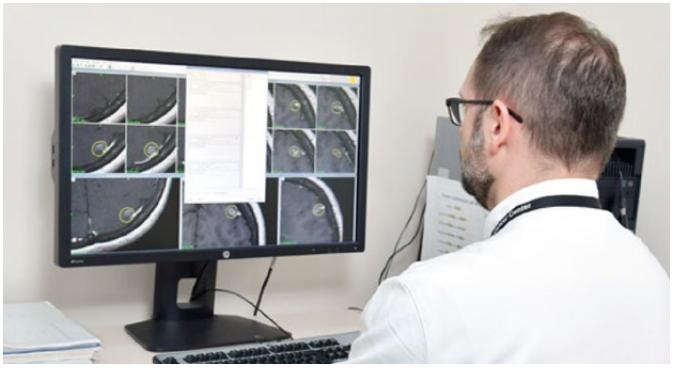
For context, the Gamma Knife exploits multiple narrow beams of gamma radiation from different directions to deliver conformal, high-dose radiation to the disease target in one or a few fractions while minimising collateral damage to surrounding healthy tissue and organs-at-risk (OARs). Despite widespread deployment in cancer centres worldwide, it's fair to say that the precision targeting inherent to SRS remains a non-trivial dose optimization challenge for the medical physics team – and not least when it comes to focusing "high-payload" radiation onto metastatic lesions (as small as 2 mm in extent) and having it fall off as quickly as possible.

Hence the requirement for independent verification and QA of those GammaPlan treatment plans.

"We needed a commercial second-check software product because developing our own in-house solution would have been too time-consuming," explains Kurij, "We use the RadCalc Gamma Knife software on a daily basis to verify all of our SRS treatment plans." So far, across a cohort of well over 400 patients, Kurij and his team of three medical physicists have seen no significant discrepancy versus the primary dose calculations in Gamma Plan (more than 1.5% in only three cases).

RadCalc Gamma Knife module

That reassurance, in turn, hinges on the independence of the RadCalc Gamma Knife module and its calculation algorithm from the SRS treatment system. As such, RadCalc stores and maintains its own copy of the Elekta proprietary data, with the table look-up and interpolation process also separate from Elekta's. In addition, external contour determination (from skull scalar-instrument measurements or threshold CT images) is fully independent as are the ray-tracing process for depth determination and the off-axis computation of the dose.



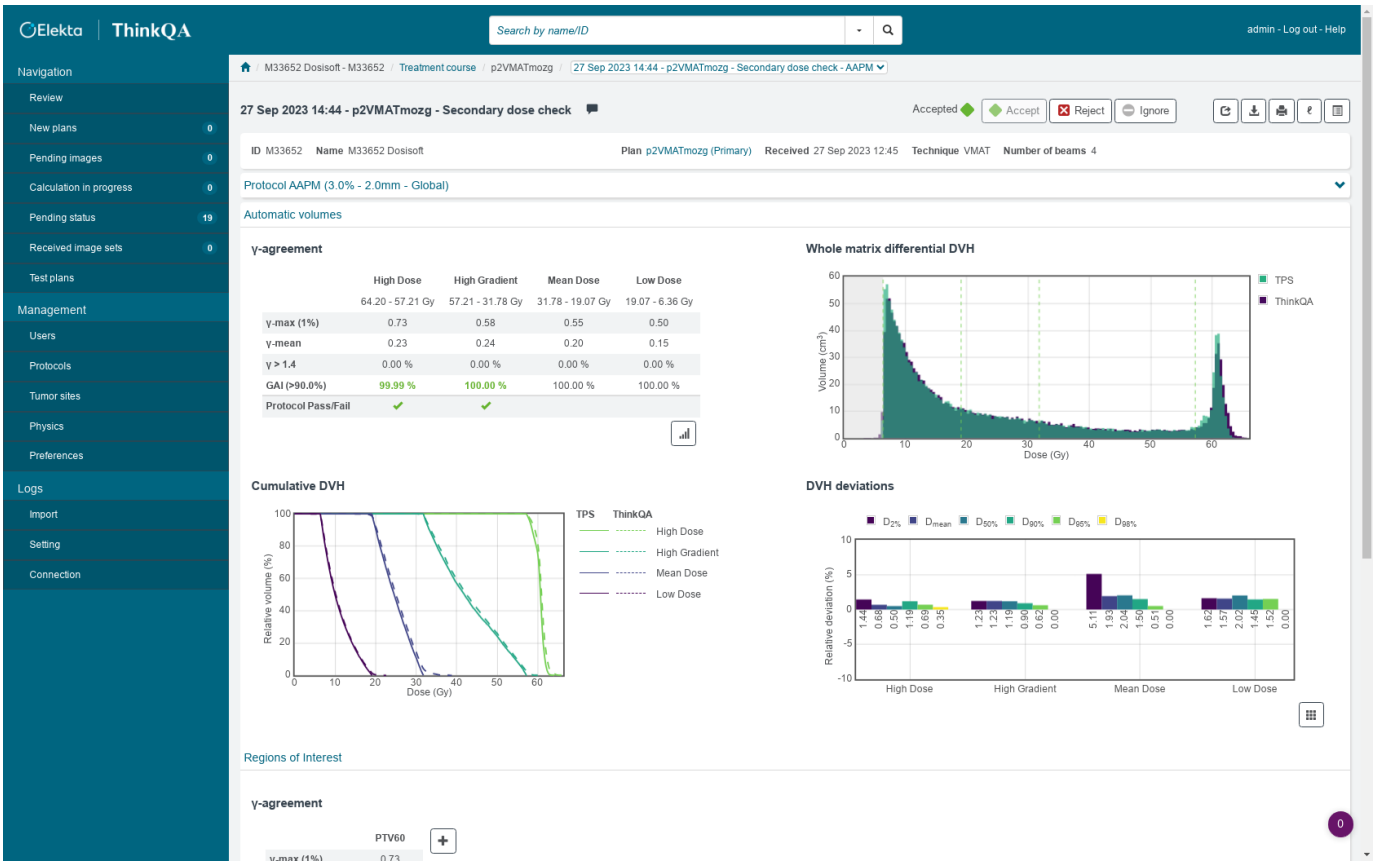
For Kurij, other notable features of RadCalc are the software's powerful search and reporting tools – which make it straightforward to view which treatment plans have been approved by the clinician or physicist – as well as the user-friendly visualisation tools. "The software has a neat visual representation of the target volume, so you can see where the beams are entering the patient's skull," he notes. "That's important because if the RadCalc dose calculation deviates significantly from the GammaPlan calculation, it's usually because the target is located in close proximity to the surface of the skull – allowing corrective measures to be taken if necessary."

Excerpt from the original interview with Ljubomir Kurij published in Physics World.

For further information also refer to the application report "Independent QA of Gamma Knife® Perfexion treatment planning with RadCalc"

Annette Schindler is an International Marketing Manager at LAP GmbH Laser Applikationen

ThinkQA secondary dose check is fda 510(k) cleared for conventional and online adaptive radiotherapy



ThinkQA Secondary Dose Check

DOSIsoft, leading provider of patient-specific imaging and dosimetry software solutions for Radiation Oncology and Nuclear Medicine, is pleased to share that it has obtained 510(k) clearance from the US Food and Drug Administration (FDA) on January 18th, 2024, for the commercialization of ThinkQA (Edition 2) Secondary Dose Check. This advanced Patient Quality Assurance (QA) for External Beam Radiation Therapy (EBRT) tool offers reliable, automated, and 3D independent calculation-based dose verification, specifically crafted for both offline and online adaptive workflows. This new technology breakthrough fulfills all key requirements, ensuring a streamlined workflow, safe patient treatments and compliance with AAPM recommendations – contributing significantly to the confidence of US medical physicists in the modern RT treatment modalities.

Compliant with AAPM Task Group 219 guidelines[1] to facilitate the fulfillment of QA requirements

Detecting errors before the actual radiation treatment commences is a crucial aspect of the

verification process for comprehensive Patient Quality Assurance. This holds particularly true for the new adaptive radiotherapy. In order to assist physicists in meeting the QA regulatory standards for the latest radiotherapy equipment and practices, ThinkQA Secondary Dose Check incorporates in its product R&D the specific recommendations outlined in AAPM Task Group 219 Report:

- Fast, simple and automated system to be used **for each plan**

- **Fully independent** algorithm and implementation: ThinkQA Secondary Dose Check uses an advanced model-based independent 3D dose calculation engine, a specifically adapted Collapsed Cone Convolution (CCC) algorithm – is compatible with both conventional and adaptive RT workflows

- **3D dose distribution comparison** providing analysis with respect to specific automatic volumes (High dose, High gradient, Mean dose and Low dose) as well as 3D Gamma Passing Rates (GPR) for High Dose / High Gradient regions and PTVs

- **Flexibility to define tolerance limits** and action levels, such as the proposed 90% 3% - 2mm

- **"Speed, accuracy & simplicity" confirmed key benefits for routine TPS plan verification**

CE marked and commercialized since April, 2023, the new software product has been considered as ***"an ideal solution for dose verification in the online adaptive workflow..."*** by the Hôpital Riviera-Chablais (Rennaz, Switzerland) (2), ***"Having a secondary dose calculation solution that is precise, fast and easy to use in the Elekta Unity online adaptive workflow has been extremely beneficial for department productivity and for our patients."*** highlighted by Suisse clinic's physicists. Automatically managing adapt-to-position and adapt-to-shape plans, ThinkQA Secondary Dose Check can swiftly verify, **within a few minutes**, the consistency of the TPS-calculated dose distribution with plan parameters. It confirms the plan's acceptability for each patient and each day.

With its user-friendly web platform and dashboard, the qualified professional users can visualize 3D dose distribution comparisons and key dosimetric indicators offered by ThinkQA Secondary Dose Check. These include whole matrix differential and cumulative DVH (Dose Volume Histograms) and Gamma Index Agreements (GAI) on automatic or target volumes. This enables the evaluation of potential dose calculation errors in the TPS plan.

Adding significant value to patient treatment safety within the U.S. adaptive radiotherapy market

FDA clearance paves the way for entry into the American market, enabling US clinics and hospitals to benefit from ThinkQA Secondary Dose Check - a valuable technological solution. This tool is designed with the flexibility to facilitate straightforward commissioning and seamless integration into diverse medical and IT environments.

Supporting multiple treatment techniques & energies (3D-CRT, IMRT, VMAT and FF & FFF beams) used in External Beam Radiation Therapy (EBRT) departments, ThinkQA Secondary Dose Check can be installed through a ready-to-use Elekta beam model template to ensure a perfect match with Elekta conventional Linacs for online and offline adaptive workflows.
Also customized for US clinics equipped with Elekta Unity MR-Linac, the solution is designed with careful consideration of the cryostat transmission and magnetic field effects on the dose. Utilizing gold standard beam model data for Elekta Unity, it provides a rapid secondary dose check outcome within the Elekta Unity planning workflow. *"Combining* ***dose computation accuracy, relevant dose comparison metrics, and ergonomic web design****, ThinkQA Secondary Dose Check*

simplifies and automates routine TPS plan verification." concluded by Jean-Elie KAFROUNI, CEO in DOSIsoft Americas, "We are confident that ThinkQA Secondary Dose Check can meet the reporting and reimbursement needs of US Radiation Oncology departments, ensure compliance in plan quality, and instill confidence in patient safety by seamlessly integrating essential Patient QA."

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ThinkQA (Edition 2) Secondary Dose Check is CE marked as a class I medical device in Europe, under the new European Medical Device Regulation (EU) 2017/745. ThinkQA (Edition 2) is FDA 510(k) cleared as class II Medical Charged-Particle Radiation Therapy System. In line with other DOSIsoft Patient-QA solutions - EPIbeam for pretreatment verification and EPIgray for in vivo dosimetry - ThinkQA Secondary Dose Check is seamlessly integrated into the Elekta ONE Smart Workflows, exclusively distributed by Elekta.

[4] About DOSIsoft www.dosisoft.com
Founded in 2002, DOSIsoft designs, develops & delivers patient-specific imaging & dosimetry software solutions in Radiation Oncology & Nuclear Medicine to improve cancer patient safety & treatment quality. More than 20 years of innovation and R&D investments have led to world leading software used in over 600 hospital centers in 60 countries. Spin-off between Gustave Roussy and Institut Curie, DOSIsoft constantly innovates in partnership with the major cancer institutes and research centers in the world. It is now recognized as a key player in the dosimetry market.

Marc Uszynski Chief Executive Officer at DOSIsoft, France. 30-year-experience in product & business development in software, media and digital sectors bringing the company to a next level of international development.

COMPANY ARTICLE

Standard or Customised: X-Ray Imaging Phantoms by QRM

Medical imaging phantoms are an essential tool for the performance evaluation of modern imaging systems. With over 25 years of experience in phantom design and manufacturing, QRM, a PTW company since 2020, offers one of the widest ranges of commercial and custom-designed phantoms for assessing the accuracy of different imaging modalities. QRM phantoms are utilised for routine quality assurance in diagnostic imaging and radiation therapy, for research & development, and for scientific or OEM purposes.

Customised Phantoms for Various Purposes – a Core Competence of QRM

Do you need a dedicated phantom for a specific study, research project, or a new application? Do you want to evaluate a new imaging technique in a controlled, reproducible environment? As a recognised phantom specialist company, QRM's core competence lies in the design, development, and production of customised phantoms for various applications and customers such as manufacturers in medical and industrial X-ray markets, as well as scientists and physicians working on research projects and studies worldwide.

Projects are realized in close cooperation with the customer to create the best solution possible for their specific testing requirements. They usually begin with a detailed customer request for a dedicated phantom. We then contact the customer to learn more about their specific requirements and find the best way to turn their idea into a product. First, the modality in which the phantom will be used must be defined, since phantoms are manufactured for different modalities using different components or materials. Custom-designed phantoms are available for a wide range of imaging modalities, such as CT, PET, SPECT, or radiation therapy. After defining the required modality, we discuss the project in more detail, which helps us to thoroughly understand the purpose of a customer's project and the characteristics of the phantom needed. Following the specification process, we prepare a drawing of the phantom and submit it for approval. Once the design and specifications of the phantom have been approved, we start production – and your idea finally turns into reality.

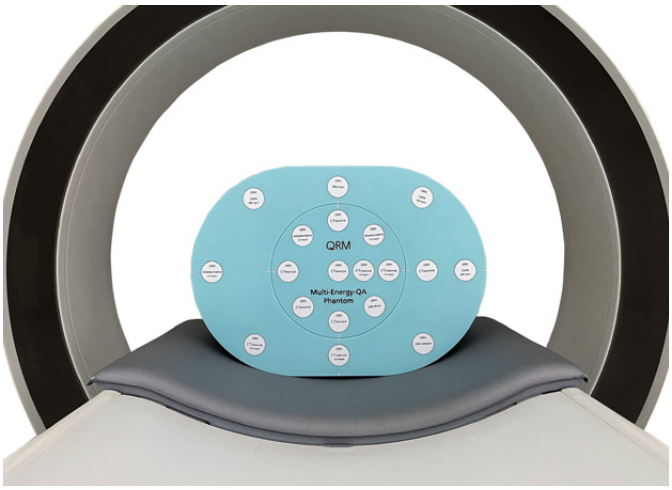
Custom-designed imaging phantoms for a wide range of imaging modalities by phantom specialist QRM.

A New Phantom for Multi-Energy CT Applications in Diagnostic Imaging

In conventional computed tomography (CT) imaging using a single polyenergetic spectrum, materials with different effective atomic numbers can have the same CT values at the same energy level, making material differentiation difficult. In multi-energy applications, however, it is possible to differentiate materials with different effective atomic numbers because they

have different linear attenuation coefficients at high- and low-energy levels. Some substances, such as iodine or calcium, absorb more x-rays at low-energy levels, while substances such as uric acid or adipose absorb more x-rays at high-energy levels. In clinical practice, multi-energy imaging can be performed using different techniques, such as photon-counting detector CT, dual-layer CT, kV-switching or dual-source CT, which allow for material-specific imaging. Unlike other multi-energy imaging techniques, photon-counting detectors convert the absorbed x-rays directly into electrical signals, resulting in higher spatial resolution at lower doses. The new QRM Multi-Energy CT Phantom has been designed for the evaluation and testing of all multi-energy techniques, including photon-counting detector CT.

It is equipped with enriched rods containing several contrast media (water and iodine, adipose and iodine) as well as calcium (water and calcium hydroxyapatite) in different concentrations, which makes this phantom the best solution for testing different types of CT modalities with dual-energy, multi-energy, or photon-counting setups.



QRM Multi-Energy CT Phantom – quick and easy phantom setup and alignment.

The water-equivalent (CTwater) compact body of the phantom consists of a removable head section, allowing stand-alone use of the phantom. In addition, water- and soft tissue-equivalent inserts (adipose, liver, brain) are available. Other materials, such as blood and iodine or various ICRU tissues, can be manufactured upon request. Phantom setup and scanner alignment is quick and easy. After the phantom is accurately positioned at isocentre using the CT scanner's internal alignment lasers, it can be scanned at two different energy levels. The images obtained from phantom scanning can then be evaluated for correct material separation and concentration by using various post-processing techniques and algorithms.

For more information on customised and commercial imaging phantoms by QRM, download our catalog or visit www.qrm.de.

Burcu Hiz Temizer is a Physics engineer and holds a Master's degree for Medical Physics. She currently works as a product manager at PTW Freiburg. In this role, she is responsible for developing phantom solutions for diagnostic radiology.

COMPANY ARTICLE

Regardless of Speciality, RadMachine Does It All

A Powerful Platform for All Your Therapy, Diagnostic, or Nuclear Medicine QA/QC Data

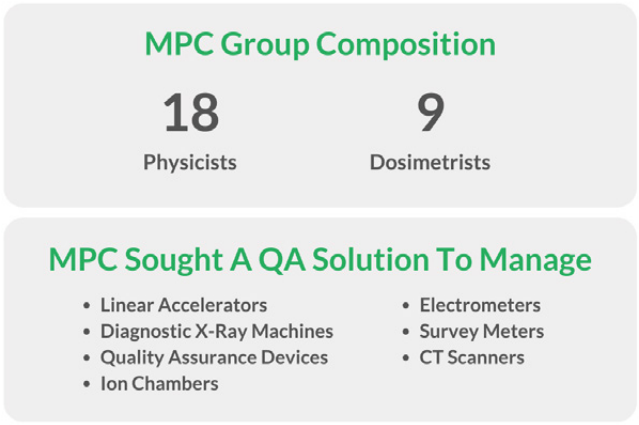
Regardless of whether you're working with linear accelerators, radionuclide calibrators, or an x-ray bucky, the tool used to analyse and store your data is likely the same: a spreadsheet. Probably multiple spreadsheets! And for good reason. They're as simple or as complex as you need them to be. They're reliable. They do the job.

While spreadsheets are known for their ease of use and accessibility, they fall short in incorporating essential features required to meet the challenges faced by physicists in today's dynamic environment. We can do better.

With its centralised hub and a suite of image analysis tools, RadMachine streamlines QA data collection, analysis, and reporting, eliminating scattered data and siloed workflows in the process. From built-in analysis tools to comprehensive reporting, RadMachine empowers departments to dig deeper into their QA/QC while meeting the unique needs of modern healthcare delivery. Better yet: it provides a platform for physicists of all specialities: radiation oncology, radiology (diagnostic), and nuclear medicine.

Clinic in Focus: Medical Physics Consulting, Inc

Medical Physics Consulting (MPC), Inc. is a service and support company that provides a wide range of therapy and diagnostic medical physics services. With a team of 30 physicists, dosimetrists, and QA specialists scattered across a large geographic area, MPC knew it would be challenging to find a blanket solution to benefit all sites. Moreover, no two sites share the same equipment, with a wide variety of machines and software from various commercial vendors.



Medical Physics Consulting, Inc. sought a solution to manage its large group and diverse set of equipment.

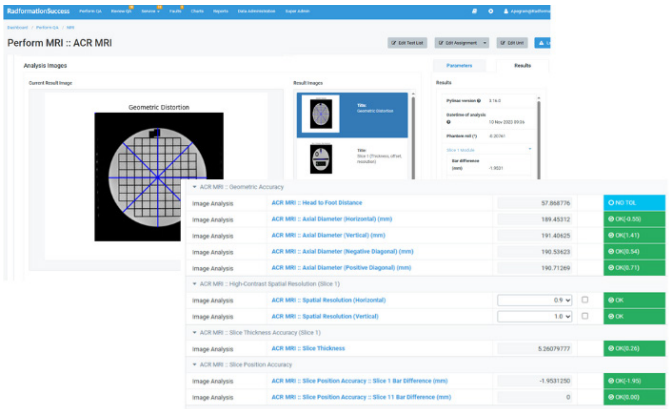
With the ability to accommodate a diverse range of equipment and machine types, MPC turned to RadMachine to provide a common QA platform for all sites. The physics consulting group was so convinced of the benefits of having their entire clinical team use the same software that they opted to purchase it themselves instead of convincing each clinic to buy in.

"I love the flexibility to make global changes that I can push out to a number of our facilities while also maintaining the ability to make site-by-site tweaks to accommodate facility-specific needs

and desires. The ability to centralise and automate morning machine QA review has shown a lot of promise to improve this clinical process for on-site physics," says physicist Ryan Gerber.

Diagnostic QC: High Contrast Improvement

When it comes to managing QC data for a large number/diversity of machines, spreadsheets don't cut it. RadMachine provides a central repository for all data and analysis, displays insightful testing trends, and creates detailed reports. The platform supports the Leeds TOR, ACR CT, ACR MRI Large phantoms, and customisable tests accommodate any other required tests.



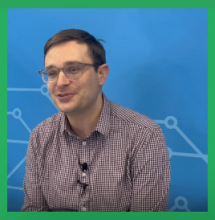
Powerful analysis tools support routine diagnostic testing of nearly any machine type or test.

Accessible to all by a simple internet browser, RadMachine provides a common working solution for quality assurance for all involved. With powerful real-time notifications when data is out of tolerance, ensuring compliance with testing standards has never been easier. For diagnostic needs, RadMachine proudly supports:

- ✓ **Imaging Devices: CT, MR, Mammography, Ultrasound, Nuclear Medicine, etc.**
- ✓ **Sensors, Detectors, Survey Meters, and other measurement devices**
- ✓ **PACS Workstations, Lead Apron Tracking, and more**

RADformation RadMachine

"One major advantage of RadMachine is being ready for an inspection anytime. We're able to pull information up quickly, which was a big driver of why we want all of our modalities to be on this centralised product."



Kevin Little, PhD
University of Chicago

In Pursuit of a Platform That Does it All: Nuclear Medicine

In an abstract presented at the Spring 2023 meeting of the British Nuclear Medicine Society, GenesisCare UK shared its success implementing a QA platform that fit its unique needs. In their search for the right solution, they had specific requirements in mind. They sought a solution that was customisable, user-friendly, supported QA scheduling, offered trend analysis capabilities, could be implemented across multiple sites, and was vendor-neutral.

GenesisCare

The pursuit led them to RadMachine, Radformation's comprehensive cloud-based QA platform. According to physicist Nathaniel Scott, "The customisation of RadMachine is something that really stood out to us, particularly with the wide array of vendors, equipment, and tests that we have in nuclear medicine. We have been able to design and implement all of our tests in the exact way that we required."

The physics group created and implemented tests for a range of nuclear medicine equipment, including PET-CT, SPECT-CT, radionuclide calibrators, dose rate metres, and contamination monitors. The results of implementing the new

software were transformative. They no longer manage 20 unique spreadsheets and have consolidated over 200 individual tests into the centralised platform. Nathaniel Scott adds, “RadMachine’s flexibility and ease of use has saved many hours of work when it comes to implementing new tests and equipment.”

Their work with RadMachine has allowed them to organise QA information for three unique departments within the GenesisCare umbrella, unifying and standardising their workflows in the process.

Do yourself a favour and learn about RadMachine in more detail for your specialty. Schedule a Demo to see how RadMachine can meet your QA/QC needs.

Tyler Blackwell, MS, DABR is a medical physicist at Radformation focused on clinical collaborations and community engagement. Before joining Radformation, he spent a decade working as a clinical physicist. He is active on several committees for the American Association of Physicists in Medicine and volunteers for the American Board of Radiology.

RAD formation

Automation from Start to Finish

From planning and documentation to QA and beyond, Radformation's solutions ease resource strains and increase precision in all stages of the treatment planning workflow. Our tools are user-friendly, clinically relevant, and seamlessly integrate with various treatment planning systems.

RadMachine

The Comprehensive QA Platform

- Daily, Weekly, Monthly, Annual QA
- Vendor and Device Agnostic
- Integrated Image Analysis
- Trending Tools
- Automated and Scheduled Reports
- Cloud-based, No Hardware
- Event, Fault, and Service Logging
- Multidisciplinary Platform

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COMPANY ARTICLE

Eclipse v18.0 from Varian: Meeting the Challenges of Patient Care Today

With Eclipse treatment planning system v18.1 on the horizon, bringing support for significant innovations, the time is favourable to review the efficiency and accuracy features of v18.0, which will underly the coming v18.1 advances. Upgrading to v18.0 now will put clinics that use Eclipse for treatment planning on course to implement an optimally aligned and efficient Varian ecosystem, as well as enable a quicker and easier adoption of v18.1.

Eclipse v18.0 is designed to meet the challenges of patient care today: to improve outcomes with more accurate techniques while relieving the strain on clinical resources. It provides several powerful features whose goal is to improve both precision and clinical efficiency today including SBRT NTO (a tool for normal tissue optimization for stereotactic body radiotherapy), Enhanced Leaf Modeling (ELM), and a new, intuitive way, to interact with dose via the Multi-Criteria Optimization (MCO) tool.

SBRT NTO

Clinics seeking to apply stereotactic accuracy to extracranial disease sites can create complex plans more quickly and easily with the automated

SBRT NTO algorithms provided in Eclipse v18.0. SBRT NTO automates the process, eliminates time-consuming optimization steps, reduces error-prone manual contouring of optimization shells, and enforces sharp dose fall-off around target volumes to safeguard healthy tissues. SBRT NTO supports coplanar and noncoplanar techniques for extracranial disease sites, enabling flexible design of treatment plans aligned with each clinic's expertise.

SBRT NTO helped achieve highly conformal SBRT plan quality (controlling R50%) without needing to create tuning or ring structures and/or adjusting NTO conditions to spare the doses to nearby normal tissue."

—Todd Pawlicki, PhD, Chief of Medical Physics, University of California, San Diego

Enhanced leaf modeling (ELM)

Traditional multileaf collimator (MLC) modeling can result in cumbersome beam configuration workflows and challenges with treatment plan quality assurance. Eclipse v18.0 introduces ELM to overcome these challenges. It can help ensure precision for even the smallest of field sizes found in SRS and SBRT. Specifically, ELM improves the modeling of the leaf tip and screw cutout of the MLC, with one dosimetric leaf gap (DLG) for all energies.

MCO Isodose Line Dragging

In Eclipse v18.0, Multi-Criteria Optimization (MCO) has been enhanced to give planners more control over dose distribution. The Isodose Line Dragging feature allows planners to interact intuitively with isodose lines or the color wash to sculpt or adjust dose in real time.

"MCO Isodose Line Dragging has enabled our planners to make small modifications that can have a high clinical impact, by helping to reduce hot spots in critical OARs and refining the low dose bath associated with VMAT planning."

—Kenny Guida, DMP, DABR, director of treatment planning services, University of Kansas Cancer Center

Eclipse v18.0 includes many other features aiming to enhance accuracy and clinical efficiency today and set course for the future. To learn more, view a demo video, or download a feature sheet, visit this web page.

Nancy Heifferon has been writing about medical technology and advances in cancer care for two decades. Before that she was a communications programs manager for IT companies and a college lecturer.

COMPANY ARTICLE

A Validated Methodology for 4DCT QA

New studies + on-demand webinar outlines automated workflow for periodic QA of 4DCT systems

In just over 20 years since its introduction, 4DCT has become the standard tool for simulation and treatment planning when delivering radiation therapies to mobile tumours—more specifically, thoracic and upper abdominal tumours, heavily impacted by breathing motions. We've seen adoption expand worldwide and utilisation increase as clinicians recognize benefits of getting more accurate and detailed information on the tumour and organ-at-risk motion that can be expected during treatment.

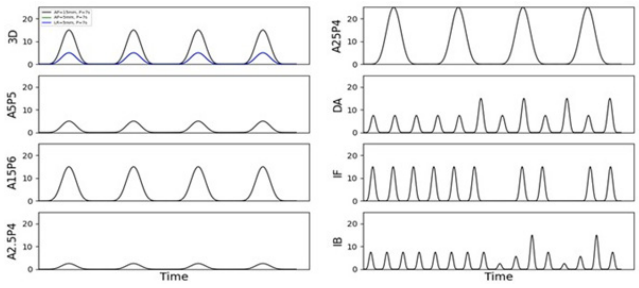
But 4DCT is not without its limitations. Factors like intra-slice residual motion and inaccuracies caused by breathing irregularities can produce artifacts that can have clinically significant impact on radiotherapy target volume definition. The core issue is that real, live human bodies don't always behave exactly according to predefined models.

The answer to these limitations is regular quality assurance (QA) of 4DCT image quality. Yet, previously, practitioners have had no clear guidance on the best way to do QA on 4DCT systems. Sites have developed their own ways of doing 4DCT QA. Without established standards or task group reports, there is no way to know whether those home-grown QA methodologies are robust enough. How can clinical staff be sure what they're getting is accurate enough for treatment planning?

My colleagues and I set out to fill these gaps in 4DCT QA by developing and validating a standardised way of doing QA for 4DCT systems.

QAMotion: Validated, reproducible methodology for 4DCT QA

A comprehensive quality assurance program for four-dimensional computed tomography in radiotherapy lays out the validated methodology we created: a comprehensive, reproducible and automatic 4DCT QA workflow that evaluates image accuracy across various regular and irregular breathing patterns. We named this 4DCT QA methodology QAMotion.



Overview of selected breathing patterns: Five regular and three irregular breathing curves with their respective periods (P: 2.8-7 s) and peak-to-peak amplitudes (A: 2.5-25 mm). All curves are one-dimensional, except for the '3D' motion curve that was added to allow for a more comprehensive test. Double Amplitude (DA), Irregular Frequency (IF) and Irregular Breathing (IB) were created. In addition, the lowest amplitude (A2.5P4) was defined based on the breathing curves of seven pancreatic cancer patients where a compression belt was used during acquisition.

QAMotion includes a very detailed description of the required acquisition procedures and a dedicated workflow so that any site can perform a comprehensive QA workflow of 4DCT imaging that

is capable of quantifying image quality following the CPQR recommendations. Validation of the automated workflow showed excellent repeatability across, and robustness against, different imaging protocols and reconstruction methods. QAMotion was able to flag image artifacts in its automatically generated report, identify limitations in novel i4DCT algorithms related to breathing curves with varying amplitudes, and quantify differences between imaging protocols and reconstruction methods. QAMotion also is recommended to be used during the commissioning of new 4DCT equipment, or after a major upgrade.

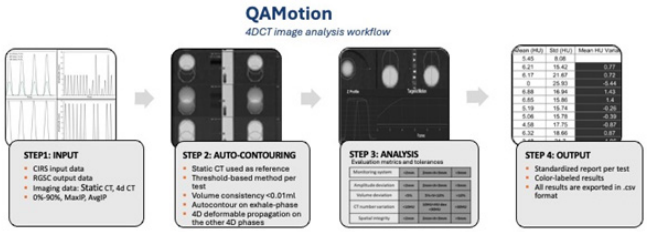
4DCT QA Audit

The purpose of a multicenter 4D computed tomography quality assurance audit was firstly to apply the QAMotion 4DCT evaluation workflow in a multi-centre 4DCT quality assurance audit, and secondly, to compare several 4DCT systems with each other and quantify the current level of performance of the 4DCT equipment. All centres invited to participate in the audit responded positively, highlighting the need for a 4DCT QA program, which enabled a multi-vendor benchmarking of thirteen clinical 4DCT systems.

This was a great opportunity for us to expand our QAmotion workflow in order to analyse data from various imaging and/or treatment planning systems. The majority of the participants replied that a major limitation is dynamic phantom availability (9 site-visits, and 3 remote support).

Perhaps most relevant for the modern demands of radiotherapy clinics: The entire 4DCT QA workflow can be completed very quickly, making it an ideal tool for periodic QA—without bogging down clinical workflows or impacting patient throughput.

One of the main barriers to establishing QA standards for 4DCT has been the availability of a lung phantom that could be used for 4DCT QA. Creating a phantom that can move with sub-millimeter



The QAMotion workflow involves four distinct steps: Input, Auto-Contouring, Analysis and Output.

and sub-millisecond accuracy is an incredibly complex challenge.

Fortunately, several leading innovators have taken on this challenge, investing in developing the tools the industry needs as treatment modalities evolve. Multiple vendors now offer phantoms designed for 4DCT QA.

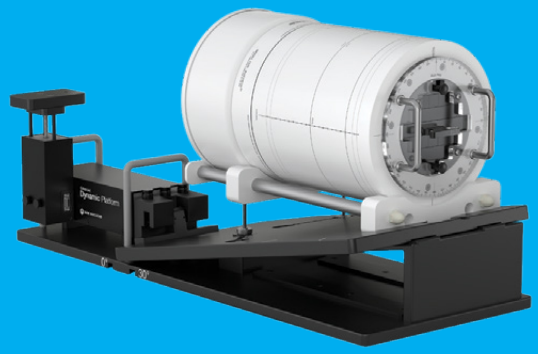
We chose to use the Sun Nuclear Dynamic Thorax Phantom in our study. Of the options available on the market today, the Dynamic Thorax Phantom offered software that allowed us to include predefined patterns, or patient-specific patterns exported from patients.

QAMotion in on-demand webinar

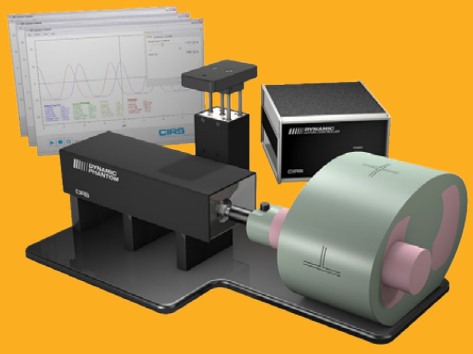
I recently hosted a webinar where I walked through how we developed and clinically validated the QAMotion methodology. The webinar goes into detail about the challenges of 4DCT QA, the techniques we used to address those challenges, and the results from a multi-centric 4DCT QA audit. Watch the webinar on-demand here.

Dr. Manuela Burghelea, is a medical physicist at the Institute Jules Bordet, Brussels, involved in the clinical transition of CT innovations in radiation oncology.

Enhance Precision with Motion Management QA



MotionCHECK™ 3D

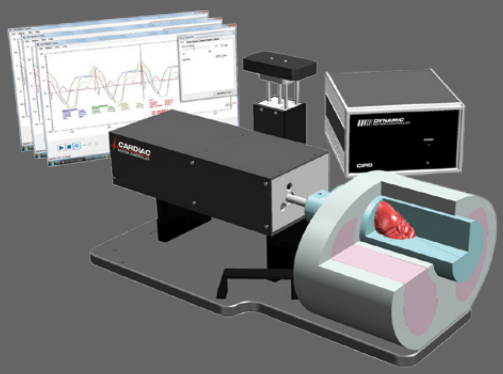


Dynamic Thorax Phantom

Comprehensively analyze image acquisition, planning, and dose delivery.

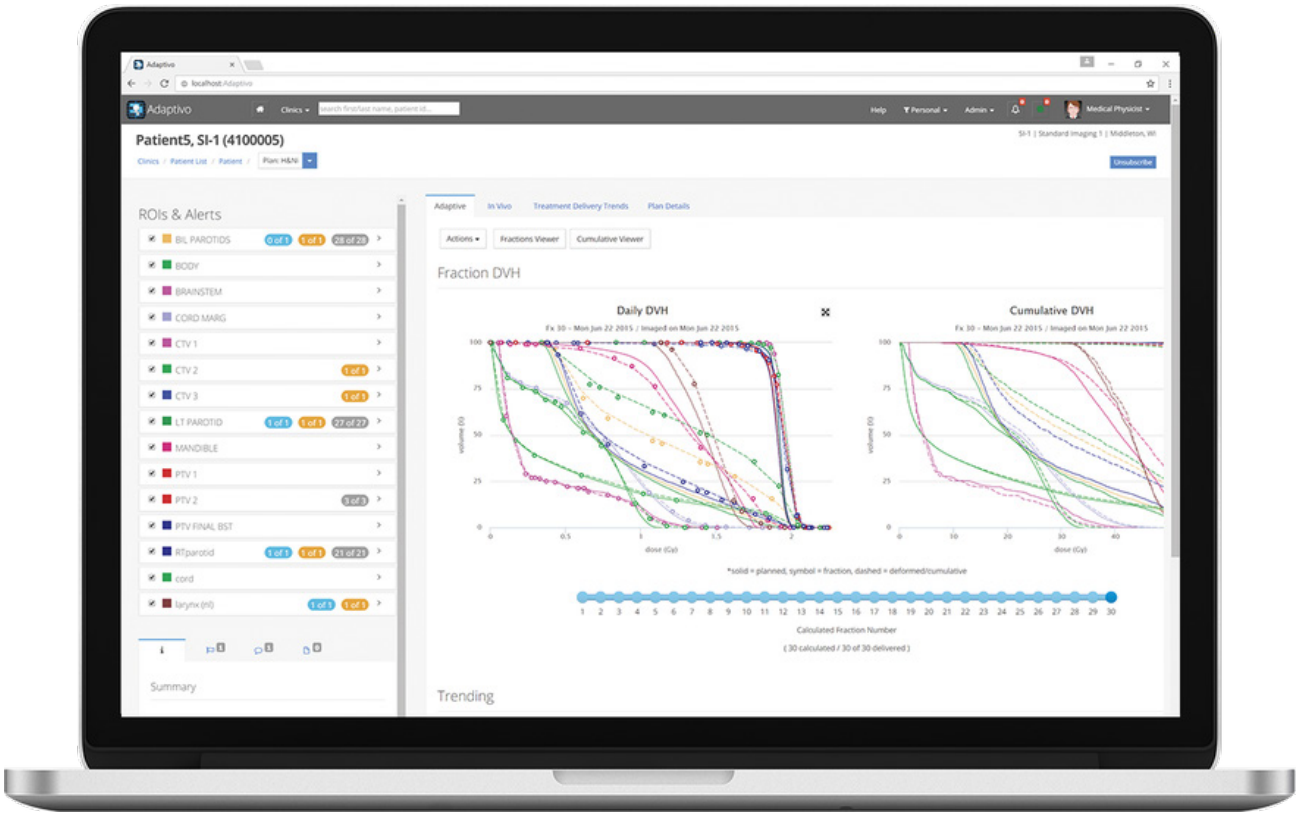
Learn more: sunnuclear.com

ZEUS: MRgRT Motion Management QA Phantom



Dynamic Cardiac Phantom

Advancing Comprehensive Patient QA with Adaptivo™ Software



Monitor and evaluate the quality of a treatment plan delivery from the first to the last fraction with Adaptivo Software.

Adaptivo™ is one-of-a-kind patient dosimetry software that provides a true picture of patient and dose at each stage of treatment. The just-released version is packed with powerful new features and enhancements including support for FFF beams, enhanced Gamma analysis for interrupted treatments, custom low dose thresholds, interactive profile adjustments, and more.

"With the latest release of Adaptivo, we introduce powerful new features and capabilities that evolve our QA Solutions and improve the quality assurance in radiation-based treatments," said Eric DeWerd, MBA, President of Standard Imaging. "Our commitment to advancing patient-specific QA is unwavering, providing clinics with the tools they need to deliver precise and effective treatment plans".

Newest Software Features

- New support for In Vivo analysis of FFF beams in Relative Mode for Varian TrueBeam.
- Increased accuracy of Predicted Mode to measured comparison for EDW beams which now incorporates MLC leaf attenuation, EDW SST tables and collimator rotation.
- Low dose thresholds can be applied to gamma comparison calculations for Pretreatment

Mode, In Vivo Relative Mode, and In Vivo Predicted Mode.

- Gamma analysis can be performed on beams or plans where the dose was delivered as planned in more than one treatment session. The software automatically combines and analyses measured EPID images from two or more image files with subsequent images appearing when the actual treatment delivery is completed at a later time. The UI will visually alert the user to the beam/fraction that has been evaluated based on a combination of images and the beam details will reflect the composite treatment delivery.
- The beam summary information for In Vivo images will show the number of acquired images along with the date and time of each image acquisition, the recorded Meterset Exposure for each image and the Total Meterset Exposure for all images. These values will be compared to the Total Delivered Meterset from the RT Record and the planned monitor units from the Treatment Planning System.
- An alert is generated when there is an incomplete EPID image capture of a completed fraction or if there is a true incomplete delivery.
- An alert is generated when the total Meterset exposure from all acquired images exceeds the expected Total Delivered Meterset from all RT Records by 10% or more.
- When evaluating Pretreatment or In Vivo Mode reference versus measured gamma results, the X- and Y- location of the profile planes can be easily adjusted and viewed using the interactive crosshair, allowing the user to better evaluate areas of interest within the Hot/Cold Gamma over the Reference Portal image or the Hot/Cold Gamma over the Measured Portal image.

“I am excited to have an innovative and improved version of Adaptivo as part of our comprehensive patient QA software portfolio," said Vicky Howard, MS, MBA, DABR, Standard Imaging Product Manager and Support Physicist. "Adaptivo takes patient specific quality assurance to a new level, providing the physicist with valuable, real-time In Vivo QA analysis for every fraction of every patient’s treatment journey.”

Adaptivo is a fully automated In Vivo quality assurance tool, which uses EPID images to automatically evaluate treatment delivery conformance for every fraction. These end-to-end quality assessment solutions will ensure physicists and physicians alike have confidence in the radiation treatment plans they are delivering and the comprehensive tools on hand to evaluate the need quickly and easily for adaptive therapy or identify patient positioning issues. Learn more about Adaptivo, watch our recorded webinars, or talk with our team to learn more!

About Standard Imaging

Standard Imaging is a leading manufacturer of QA instruments for radiation-based treatments that improve patient safety and cancer treatments. Grounded in reliability and trust, we've dedicated more than 35 years to developing solutions that save you time, while maintaining accurate and precise results with unmatched support along the way.

Ashley Reis is the Marketing Specialist at Standard Imaging, Inc. and has been with the company since 2020.

Enhancing radiosurgery excellence: The role of external evaluation, dosimetry audits, and quality programs

The effectiveness of Stereotactic Radiosurgery (SRS), as a non-invasive therapeutic modality for treating various intracranial and extracranial lesions, relies heavily on the accuracy of radiation dose delivery and the quality of treatment plans. One key aspect of ensuring the safety and efficacy of radiation therapy treatments is the need for continuous improvement and Quality Assurance (QA). External dosimetric evaluation, dosimetry audits, and the establishment of comprehensive Quality Programs have become essential elements in maintaining and enhancing the quality of care in radiation oncology departments. Multiple surveys globally on the multifaceted aspects of QA processes have shed light on the significance of an audit in improving treatment outcomes, minimizing errors, and elevating patient care standards.

SRS treatments are inherently complex and require meticulous planning and execution. Some common areas of failure in SRS treatments include:

1. Target Localization: Precise target localization is paramount in SRS. Errors in target identification or inaccurate patient positioning can lead to irradiation of healthy tissues and compromised treatment outcomes.

2. Beam modeling, Dose Calculation and Delivery: SRS treatments demand highly accurate dose calculations and delivery. Any discrepancies in these aspects can result in underdosing or overdosing of the target, leading to treatment failure or excessive side effects.

3. Monitoring and QA: Routine monitoring and QA protocols are vital to identify any deviations from the treatment plan. Failure to conduct thorough quality checks can result in undetected errors.

The imperative of external dosimetric evaluation, audits and quality programs: Governmental societies, regulatory bodies, scientific communities, and organizations in the field of radiation oncology, such as the International Atomic Energy Agency (IAEA), American Association of Physicists in Medicine (AAPM), and the International Stereotactic Radiosurgery Society (ISRS), consistently emphasize the need for external dosimetric evaluation in SRS treatments. These organizations recognize that the precision required in SRS demands rigorous QA procedures. They recommend regular external audits performing physics quality checks as a means to verify the accuracy of treatment planning and delivery, but also external evaluation of staffing, facilities, equipment, and patient management as part of a quality system to control the overall safety of SRS procedures. These recommendations underscore the commitment of these societies to ensuring the highest standards of patient safety but also fos-

ters trust in the healthcare system and promotes advancements in the field of radiation oncology. It's worth noting that in some countries, compliance with these guidelines is a prerequisite for obtaining a license to clinically practice SRS.

The establishment of quality programs, encompassing external evaluation and dosimetry audits, address failure risks and aim for three key goals:

- Risk Mitigation: identify and mitigate radiation therapy risks to reduce errors and adverse events.
- Continuous Improvement: use regular dosimetric evaluations and audits for process enhancement and learning.
- Regulatory Compliance: ensure adherence to regulatory standards, upholding the highest patient care standards.

The Role of Consulting Services

External Evaluation involves benchmarking, peer review, and QA protocols. Dosimetry audits ensure precise dose delivery, treatment planning accuracy, and data validation. Quality Programs promote continuous improvement, risk reduction, and enhanced patient care. These elements collectively bolster radiosurgery QA, delivering safe, precise treatments, crucial for patient well-being and field advancement. To achieve optimal QA in radiation oncology, many institutions seek the assistance of specialized consulting services. These services are offered by companies and organizations that bring extensive experience, expertise, and technology to help healthcare providers implement and maintain effective Quality Programs. They offer:

- Dosimetry audits, scrutinizing treatment plans, dose calculations, and delivery procedures to identify discrepancies and recommend corrective actions.
- Training and educational resources to radiation therapy teams, ensuring that staff are well-informed about best practices and the latest technologies.
- Access to advanced technology and software tools that enhance dosimetry and QA processes.

RTsafe offers 3D-printed anthropomorphic phantoms, advanced dosimetry services, and consultation services for dosimetric QA, extending its support to the SRS community. The company's mission is to empower healthcare centers to excel in rigorous dosimetry audits, which are integral to comprehensive external evaluations.

Emmanouil Zoros is responsible for product management, data analysis, and film dosimetry at RTsafe. He has a Diploma in Applied Mathematics & Physics from the National Technical University of Athens and a Master of Science in Medical Physics from the National and Kapodistrian University of Athens. His research interests focus on radiation therapy with emphasis on quality assurance in stereotactic radiosurgery, experimental and computational dosimetry using Monte Carlo simulation techniques.

succeSRS

Promoting a culture of excellence

succeSRS is a powerful tool for quality improvement in intracranial stereotactic radiosurgery applications through a remote end-to-end dosimetry audit service.

Key features

- Confidence and reliability
- High quality treatments
- Dosimetry traceable to BIMP-France

RTsafe

info@rt-safe.com **www.rt-safe.com**

Special Interest Group for Radionuclide Internal Dosimetry

The objective of the SIG_FRID is to establish a network of medical physicists working in radionuclide dosimetry. The SIG_FRID aims to fulfil the need for networking, education, research and professional exchanges in this field. The number of SIG_FRID members is currently 195. New applications are always welcome (see below how to become a SIG member).

Last term, the Steering Committee (SC) had virtual meetings on December 21st, January 10th and February 5th. A general meeting of the SIG_FRID was held on January 25th from 13:30 to 15:30 with the attendance of up to 63 SIG_FRID members. A screenshot taken during the meeting can be seen below.

The SIG_FRID SC priorities are:

- Priority 1. Scientific meetings
- Priority 2. Focus group management and follow-up
- Priority 3. Teaching/Education/Dissemination
- Priority 4. Communication
- Priority 5. Professional/Regulatory/Economic matters

Below you will find a summary of the latest activities carried out under these priorities. Please note that some priorities may not be listed if there has not been recent progress.

Priority 1. Scientific meetings

SIG_FRID members are kindly invited to propose topics for the scientific meetings and case reports to be held in 2024. As a reminder, a scientific meeting typically includes three 30-minute lectures followed by a general discussion (30 minutes), and a case report is a 30-minute presentation followed by a general discussion (30 minutes).

We are in the process of determining the timing for these events. The number will probably decrease compared to 2023 (4 scientific meetings and 4 case reports), as we also need to leave room for educational webinars (see below).

Priority 2. Focus Group (FG) management and follow-up

NOTE: To clarify the difference between an EFOMP Working Group and a SIG_FRID Working Group, the name of the latter is now changed to “Focus Group”.

The updated FGs and leaders are as follows:

- FG0 Survey, chaired by Caroline Stokke and Steffie Peters
- FG1 TAC fitting, chaired by Gerhard Glatting
- FG2 Treatment Planning Systems, chaired by Lidia Strigari
- FG3 Absorbed dose-effect relationship, chaired by Lidia Strigari
- FG4 Voxel S-values, chaired by Julia Brosch-Lenz

and Marta Cremonesi
- FG5 DICOM Standard, chaired by Manuel Bardiès

Some updates were provided by the FG leaders to report on the status of their work.

Priority 3. Teaching/Education/Dissemination

A proposal for educational courses in nuclear medicine dosimetry has been submitted to the EFOMP Board and is currently being studied. This includes a series of webinars on the basics of dosimetry to be organised in 2024, followed by an in-person ESMPE School course on the practical applications of clinical dosimetry in 2025.

Any SIG_FRID member who volunteers to participate in this priority is welcome. Dates are being discussed for the first webinars, but the objective is to deliver a webinar every other month. Stay tuned!

Priority 4. Communication

The SIG_FRID members are all invited to distribute relevant information directly using the SIG_FRID email list or through Slack.

Priority 5. Professional/Regulatory/ Economic matters

The Focus Group on the communication of the role of physics in therapies with radionuclides is seeking SIG_FRID members.

How to become a SIG_FRID member:

The SIG_FRID is intended for network professionals with an interest in radionuclide dosimetry. Membership is open to all EFOMP members. The membership application procedure is explained on the SIG_FRID pages of the EFOMP website and can be found here.
The application form and a brief CV should be sent to the SIG_FRID secretary: sec.sig_frid@efomp.org

Past Meeting on "Symposium on Molecular Radiotherapy Dosimetry"

The abstract book is available at https://smrd2023.efomp.org/, and the presentation slides can be accessed in the EFOMP e-learning system.

Pablo Mínguez Gabiña (PhD Lund University) is a senior medical physicist at the Gurutzeta/Cruces University Hospital in Barakaldo, Spain and a part-time professor at the faculty of engineering of the University of the Basque Country in Bilbao. He is also a member of the Steering Committee of SIG_FRID.

The Journey of EFOMP's Early Career SIG for Medical Physicists

The Birth of an Idea

As the world awakens from its winter snooze, spring breathes new life into the atmosphere, inspiring growth. Similarly, to rejuvenate the medical physics world, an idea was sparked, aiming to blossom into something worthwhile for the future generation of medical physics.

In March 2022, ideas and thoughts began to stir within EFOMP. Marcu et al. [1] conducted a survey to determine the need for a dedicated group to support early career medical physicists across Europe. The results of the survey revealed a promising start within the organisation; most NMOs had shown interest in establishing an EFOMP Early Career SIG (Special Interest Group) and that was where the ideas started becoming more of a reality.

From an Idea to Reality

With the groundwork laid by the results of the survey, the concept of an Early Career SIG began to develop within EFOMP's European and International Matters Committee. However, it wasn't until the 4th European Congress of Medical Physics (ECMP) in Dublin, Ireland, that the SIG began to take form.

In May 2022, amidst the discussions and exchange of ideas at the EFOMP Spring Officers meeting in Helsinki, Finland, the Early Career SIG received its official approval for operation. This was a pivotal moment for EFOMP; creating the roots of a formal platform to support the aspirations and needs of early career medical physicists.

This energy was taken to the ECMP in August 2022, where the very first Early Careers section was revealed, sponsored by the Institute of Physics. This section offered several sessions, including talks, presentations, and workshops, which were open to anyone who considered themselves to be early in their careers. The aim was to empower and equip such professionals with the tools they needed to flourish and thrive in their field.

Among the variety of topics presented during the ECMP, were job and research opportunities, EFOMP courses, educational initiatives such as the Erasmus programme, grants for early careers, interviews and publishing scientific papers and others that provided a platform for knowledge-sharing and networking between peers.

Forming the Early Career SIG

The Early Career SIG was established after the success of the ECMP 2022. In this build-up of energy and vision, a group of dedicated professionals stepped forward to lay the foundations for the future of the SIG.

A number of individuals submitted their names to formulate the SIG. These were the founding members, which consisted of 11 people. On 10th September 2022, a call for members was distributed through the NMOs, and EFOMP announced the SIG as "Early Career Medical Physicists.". During this time, the first paper regarding the early career medical physicists section at the ECMP congress by Irazola et al. [2] was published in October 2022.

The 9th of December was a pivotal day for the SIG, where the kick-off meeting was held. During this meeting, members of the parent committee offered insights into the purpose and mission of the SIG. With the help of this, the early career members gained a better understanding of what to expect to better navigate the SIG.

Formation of the Early Career SIG Steering Committee

More individuals applied as 2023 began, showing eagerness to contribute to the growth of the SIG. January 2023 marked another major step as interested members applied to join the Early Career SIG Steering Committee. During a meeting on 7th March, the candidates who applied for the position on the steering committee expressed their experiences, motivations, and visions for the SIG's future to all SIG members and EFOMP panellists. Each candidate brought a unique perspective and dedication that reflected the diverse voices of early career professionals in the medical physics community.

Ballots were distributed among the SIG members, leading to the announcement of the newly elected Steering Committee on 22nd March. Its composition led to a blend of expertise and passion amongst the candidates, comprising individuals from different places around Europe, all holding at heart the needs of early career medical physicists. Another meeting on 29th March was held to elect the board members; their role being to lead and guide the steering committee to focus their efforts in support of the SIG's endeavours.

Ongoing and Future Prospects

Since its inception, the SIG has been a beacon of support and a safe space for early careers, offering several opportunities for professional development and networking through the different focus groups. Looking ahead, the SIG aims to expand its reach and impact within EFOMP. While preparations are underway to secure our booths

and sections at the ECR, ESTRO, and ECMP 2024 congresses, educational programmes, early career events and activities, and partnerships with industry stakeholders are the projected next steps for 2024.

How to Join

Interested EFOMP members (members of their NMOs or individual associate members) can apply to join this SIG by sending a professional CV and member application form (accessed here) to board.sig.frec@gmail.com. As we celebrate the SIG Steering Committee's first anniversary in their operations in this SIG, we welcome all early career medical physicists to join us in shaping the future of medical physics.

References:

[1] Marcu, L. G., Caruana, C. J., Lopez-Medina, A., Mazzoni, L. N., Polycarpou, I., Manetou, A., & Koutsouveli, E. (2022). Early career medical physicist groups in Europe: An EFOMP survey. Physica Medica, 95, 89-93. https://doi.org/10.1016/j.ejmp.2022.02.001

[2] Irazola, L., Marcu, L. G., & Koutsouveli, E. (2022). Early career medical physicists' section at the 4th European Congress of medical physics. Physica Medica, 103, 74-75. https://doi.org/10.1016/j.ejmp.2022.09.014

Katryna Vella is a Medical Physics Trainee in Diagnostic and Interventional Radiology, practicing within the Medical Imaging Department at Mater Dei Hospital, Malta. She is a member of the Malta Association of Medical Physics (MAMP) and a Steering Committee member of the Early Career SIG of EFOMP.

Design and Fabrication of Patient-specific Lumbar Vertebra Phantoms for Nuclear Medicine Using 3d Printing Technology

In this article, Anna-Lena Theisen presents her Master's thesis that she completed at Eberhard Karls University in Tübingen in collaboration with the University Hospital Würzburg, Germany, in March 2024

INTRODUCTION

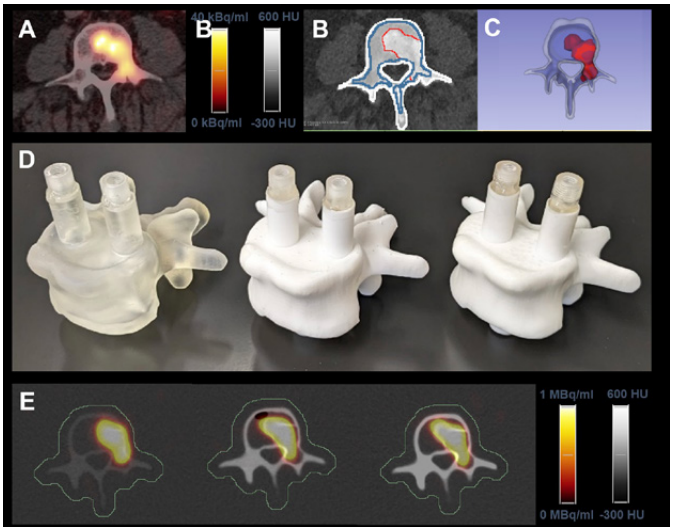
Radiopharmaceuticals are crucial for diagnosing and treating conditions like tumors, but they can also harm healthy tissue. Accurate dosimetry is vital for effective treatment and minimizing damage. Red bone marrow dosimetry is essential for safety, but it's challenging due to limitations in imaging sensitivity. To address this, a master's thesis focused on creating a realistic 3D-printed phantom to quantify uncertainties in bone marrow imaging using ^{177}Lu SPECT/CT, based on a patient with metastatic prostate cancer treated with [^{177}Lu]Lu-PSMA-I&T.

METHODS

To create a phantom that accurately mimics quantitative SPECT/CT imaging, it's crucial to replicate realistic attenuation and scatter conditions. Achieving this involves accurately reproducing the electron density of lumbar vertebrae to simulate realistic attenuation and scatter. While soft tissues like the kidneys have densities close to water (kidney density: 1.05 g/cm^3 [1]), which is within the mass density range of standard clear resins ((Formlabs Clear V4: 1.13 ± 0.26 g/cm3 [2]), bone has significantly higher mass density (cortical bone: 1.90 g/cm^3, lumbar spongiosa: 1.11 g/cm^3 [1]), resulting in increased attenuation. To find suitable materials for bone-equivalent printing, various resins were tested by printing solid cubes and assessing their Hounsfield units using CT imaging.

To assess various candidates for bone equivalent printing materials, solid cubes were printed using commercially available resins (Formlabs Clear V4, Formlabs 10k Rigid, Formlabs Elastic 50A, Phrozen Onyx Impact Plus, Phrozen Phrozen, Formfutura Stonefill) with an on-site printers (Formlabs Form 2, Formlabs Form 3+, Phrozen Sonic Mighty 8k, S3 Ultimaker). Next, they were placed in a water-filled NEMA IEC PET Body phantom and scanned on Siemens Symbia Intevo Bold SPECT/CT system to evaluate the Hounsfield units (HUs) at 100 kVp.

To replicate the higher electron density and uptake observed in metastatic lumbar vertebrae, a dual-compartment phantom was designed from PET/CT images. Several prototypes were printed with materials of different densities (Figure 1A-D): Formlabs Clear V4 (1.13 g/cm^3), Formlabs 10k Rigid (1.45 g/cm^3) and Phrozen Ceramic (1.62 g/cm^3). In addition, a kidney was simulated by placing a 100 ml bottle next to the vertebral phantom. SPECT/CT measurements were performed using a Siemens Symbia Intevo Bold SPECT/CT system, with reconstructions performed using PyTomography with various corrections and parameters (Figure 1E).



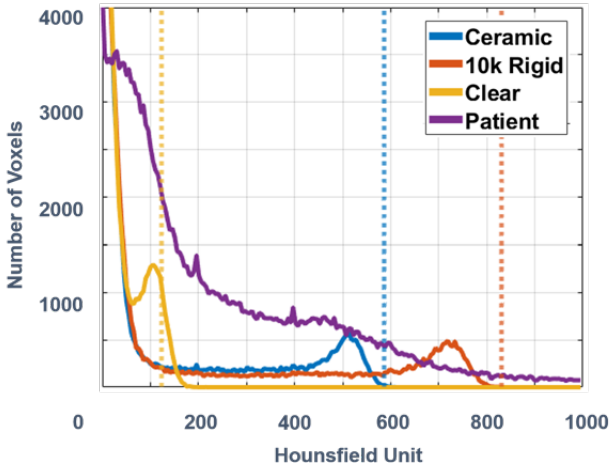
Lumbar vertebra phantom fabrication from patient data. A: Axial [18F]F-PSMA-1007 PET/CT section of lumbar vertebra L4 of a patient suffering from metastatic castration-resistant prostate cancer. B: Segmentation of the lumbar vertebra in 3D Slicer C: 3D Model of the vertebra. D: Phantoms printed with three different printing materials. Clear V4 (left), 10k Rigid (center), Ceramic (right). E: Phantom SPECT/CT of the reproduced patient vertebra (heatmap/greyscale) of different printing materials with an enlarged VOI (green). Clear V4 (left), 10k Rigid (center), Ceramic (right).

Resulting Hounsfield units (HUs) in both the patient vertebra and the corresponding phantoms were analysed using MATLAB R2022b. This involved analyzing HU-voxel histograms from the CT scan, with a volume of interest (VOI) enlarged by 9 mm from the original segmentation. Additionally, we evaluated activity quantification accuracy in the patient-specific phantom by examining activity concentration-volume histograms and total activities from SPECT data.

RESULTS

The printing materials tested cover a range of Hounsfield units from 34 to 890. This range includes densities corresponding to those of blood, water, and soft tissue and approaches the upper limit of trabecular bone without reaching the range of cortical bone. Moreover, the SPECT/CT measurements of the patient-specific phantoms showed good print quality of the higher-density materials such as 10k Rigid and Ceramic.

Figure 2 shows HU-voxel histograms for the patient vertebra and three corresponding phantoms (solid lines), with measured HUs for printed cubes of the three materials (vertical dotted lines). The patient exhibits a wide range of HUs reflecting different tissue types. In contrast, the phantoms initially decline sharply towards zero, forming Gaussian peaks below the nominal HU measured with the cubes before returning to zero, possibly due to thin phantom walls (1.5 mm) within the resolution range of CT reconstruction (1 x 1 x 3 mm).



Hounsfield unit-voxel histograms (solid lines) based on the low-dose CT of the patient vertebra (purple) and the three fabricated, water-filled phantoms (blue: Ceramic resin phantom, orange: 10k Rigid resin phantom, yellow: Clear resin phantom). The HUs of the phantom material based on the cube analysis are given as dotted lines.

CONCLUSIONS

This master's thesis establishes methods for creating patient-specific vertebra phantoms for SPECT/CT imaging using 3D printing with materials of varying densities. Although the tested materials reached a maximum of 890 Hounsfield units (HU), approaching trabecular bone levels, they fell short of cortical bone range. The combination of electron density and cortical bone wall thickness didn't achieve realistic attenuation. Consequently, no significant differences were observed in activity quantification between materials in concentration-volume histograms. Challenges included low count rates in healthy bone marrow and high activities in metastatic areas and adjacent kidney-like structures. While this work suggests the potential for realistic bone phantoms, further research is needed to quantify activity and related uncertainties in bone sites with HUs exceeding 890 HU.

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Anna-Lena Theisen is a graduate of the MSc program in Medical Radiation Sciences at the Eberhard Karls University in Tübingen. Alongside her MSc, she completed her training as a medical physics expert in nuclear medicine and external beam radiotherapy and has just started her doctorate at the University Hospital Würzburg's Department of Nuclear Medicine, where she will be continuing the work she began in her master thesis.

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Meet the Professor: Carmel J. Caruana

Full Professor and Head of Medical Physics at the University of Malta, Professor Caruana has dedicated the last twenty years of his career to educational and professional issues and has over ninety papers and innumerable conference presentations in these areas to his name. He is past-chairperson of the EFOMP E&T Committee, lead author of the role and education and training chapters of the 'European Guidelines on the Medical Physics Expert', lead author of EFOMP policy statement on E&T (PS12.1) and the role of the Medical Physicist (PS16) and past Associate Editor for E&T for Physica Medica. Recognizing that the issue of strong leadership is critical for the profession he set up the EUTEMPE-EFOMP leadership module which was the first such module worldwide. In 2020, he published the first ever book on leadership in medical physics 'Leadership and Challenges in Medical Physics: A Strategic and Robust Approach' (ISBN 978-0-7503-1395-7). He has presented on leadership all over the world and is considered a world leader in this area.

DD: Let's go back a little bit in time. Can you tell me something about your first experience as a teacher or your experience in teaching?

CC: My first experience in teaching was when I started teaching 11-year-olds. When I finished my bachelor's in physics and mathematics, I had to decide what to do here in Malta. There was practically no research here, and I had to decide to either go into teaching at a lower level or work in industry. And the issue as usual was the pay, in the sense that the industry paid much more. But I didn't like the working conditions since I wanted to have time to travel and keep studying. And teaching gave me that. I had more holidays so I could travel, and for me, coming from a small island, especially at that time, 45 years ago, Malta was still an isolated island. My knowledge of what was outside Malta was from books. There was no Internet. The world was totally different at the time, so for me, having time for travel was crucial. Plus, the time to have quite a long evening so that I could go on studying physics. That's why I went into teaching at first.

DD: So, you didn't really actively choose to be a teacher, but did you enjoy it, nevertheless?

CC: It's my character that if I go into something, whatever it is, I want to enjoy it. And I think that if you try to be very good at whatever you try to do and you become good at it, then you will really enjoy it because you feel that you are doing a good job. And especially in education, students appreciate what you do.
I have never had problems when I started teaching 11-year-olds. I was teaching mixed classes with students who were super good and stu-

dents who were totally unmotivated. And actually, some of them even ended up as convicts in prison. One of them ended up as a murderer! Believe it or not, he actually murdered another person, and it taught me a lot of things. For example, I could realize that this boy might, sometime in the future, do something really nasty. I realized that it was something in his brain that was not wired to be able to control his emotions, and I could see that when a boy teased him he would lash out. He was also a boy, who had been rejected by his family, and there were a lot of social problems with these kids. I think it was an important experience in my life because it taught me to get along with all types of people.

And then after these 11-year-olds, I moved to older students and then pre-university students. What you would call a gymnasium. I taught there for about 9 years and then I moved to the University of Malta. I was teaching in the Physics department, but then I wanted to move to applied physics. My favorite things have always been nuclear and particle physics, but I knew that with nuclear and particle physics I couldn't do much in Malta... I didn't have accelerators here! I had decided to remain in Malta especially for family reasons. I like to travel a lot, but I think that for raising a family, Malta is a safe place and it's a nice place. In a quarter of an hour, you're at the beach, in half an hour you're at work. You can leave the children outside playing till 8:00 or 9.00 o'clock in the evening and nothing happens to them.

Since I had decided to stay here, I wanted to find something that would be useful for Malta so that I'd feel that I'm doing something for society, as I felt I would be happier like that. And that was medical physics because medical physics included nuclear and radiation physics which were my favorites and I could also do something for society as well. I consider education and health our most precious possessions in life, so I said OK, let me do both: educating and health. That's how I decided essentially.

DD: OK, so you've been teaching for many, many years now!

CC: About 45 years. I'm 68 now, and I started teaching when I was 21, since when I finished my bachelor's in physics and mathematics. Then I stopped for a year to do the postgraduate certificate in education. After that I couldn't go on for a master's in physics in Malta because the government at the time had decided that the physics faculty was too theoretical, and they closed it down. About 9 or 10 years later there was a change in the government and I wanted to do a master's in physics, but there was nobody with whom to do the master's, so I did it in England.

When I came back, the director of the university told me: "Carmel, we're going to set up a new faculty. It's called the Faculty of Health Sciences. And it's for nurses, physiotherapists, radiographers, etc." He told me that the future of healthcare is technological, and they needed somebody like me to work there. And I started teaching again. It was a good experience because since I was the only physicist, I had to teach everything; X-rays, MRI, ultrasound, biomechanics, physiological measurement, you name it. This gave me a very wide overview of medical physics.

DD: There is this saying that if you want to learn something well, you have to start teaching it.

CC: Indeed. It forces you to learn it well because it forces you to analyze your own knowledge. If you're going to explain something and you'll start questioning yourself, like "I know it's like that, but why is it like that?" You know certain things, but you have never had the time to think deeply enough for you to reach a full understanding of something. And teaching helps you to do that a lot.

DD: I remember you told me once something like 'you're only a good teacher when you're able to explain very difficult concepts in a very easy way, and if you can't do that, then you don't have a good understanding of it'.

CC: Yes, it's like that. Many people say that physics is difficult. But physics is really not difficult at

all, because it's so logical. The problem is to find a good physics teacher. I have never had a good physics teacher in my life, never from secondary to university in Malta and even abroad. I always tell my students that I learned physics after I left university. I learned because I bought books from the best physicists and physics teachers in the world, like Richard Feynman, for example. I bought their textbooks and I learned from those and that made me a good teacher, but I often had to unlearn what I had been taught before.
There's another issue, which is that many teachers try to explain things which actually cannot be explained, especially when things are at the subatomic level, at nuclear and particle or quantum for example physics. The quantum world and the atomic world are so different from the macro world that we live in, that we cannot understand it. We don't even have the language to describe it. I tell my students they shouldn't try to understand it because you will not understand it. You have to accept that at that level down there, things work differently from what you're used to at the macro level. Understanding means taking something new and trying to fit it in what you already know. But the problem is that what we know is the macro world. For example, with an electron; we've never seen an electron, it's something which is totally outside the experience of our senses. So, what is the point of trying to just say an electron is something very small with something called a negative charge on it. But then I tell them at the same time, this is what makes, in my opinion, physics such a fantastic science.
We know that there's charge, or something we call charge. I ask them: "Can you tell me what charge is?" and they start telling me. Then I tell them they're all wrong because nobody knows what charge is. We know that there is something in nature which we call charge. We know that there are two types of this charge, which we have decided to call positive and negative. But we don't even know what positive and negative charges are. But yet this is, in my opinion, what makes man fantastic. We have built the computers that we have here. I can see you on my monitor right now. We work with electrons which we don't know what they are. We have sent people to the moon, and we have mobiles and communications and computers which are extremely powerful, but they all work with things which we don't know what they are and this for me is something really amazing. And I keep telling you, don't try to understand, but accept the laws of nature as they are. And then you can move forward.

DD: In all those years of teaching, did your way of teaching change over the years?

CC: I don't think so, because what I have always focused on, is not using technology, but going deep down in the ideas and the concepts, to make sure that I understand them well before I deliver, because I have found that the more I work on understanding things myself, the easier it becomes to teach them. Practically, all we need is a white board and a marker. And the imagination of yourself and the students.
For example, we can do models. You can have a model of an electron moving as a small ball, but I keep telling them the electron is no small ball. There are no small balls down there. In fact, we don't know. If you keep trying to explain things, which we can't understand in terms of things in everyday life, often we fail because the models that we have from everyday life fail at that level and then it produces even more confusion within students. So what I always do before every lecture is quality control my lecture. I go over it again, the same lecture, trying to improve perhaps add new developments that have occurred in the last year in the medical physics or radiation protection, but I also analyze each sentence that I'm going to say and the sentence that is written on the PowerPoint and I ask myself if the language that I'm using there is accurate and to the point. Is that really what I'm trying to say?

DD: Is there somebody who inspired you or who has been important in becoming a teacher or scientist?

CC: I became a person who loves knowledge, thanks to the teacher that I had when I was eight years old. He was one of these persons who was interested in everything from geography to fossils to nature in general. When I was eight, he drove me crazy. I started collecting everything: flags of the world, coins of the world, stamps of the world. I always say that I owe my enthusiasm to him. When I become more mature, I want to understand the laws of nature as much as possible. We live in this world, and we might as well try to understand it as much as possible. I can't understand how people can live in the world, every day, without trying to understand how the world works, how machinery works, how our body works, how nature works.
I mean, if you go in the countryside, you can start saying "OK, that's a tree, that's a butterfly, that's a flower." You can stay at that level and say how beautiful the flowers are. They have a nice color and that's one level. That's what I call the level of art. In the sense of beauty. But then and I will always ask: "Why is that flower red and that one blue?' I mean, why is the sky blue? During the day it becomes darker in the evening. And why is it as it is? I want to go a bit deeper than just looking at the color, I want to know why it is like that. That's what turned me then towards physics.

DD: That sounds like an important quality of a scientist and teacher: curiosity!

CC: I always say good scientists are not made at university. Good scientists are made at primary school. Give me a student here who has curiosity and wants to learn and obviously has a certain amount of intelligence, and I'll teach him anything. But give me one who came to university and who's not really motivated. He's just here to get a degree or just because her parents are telling him that he has to go to university, and it's actually boring teaching him.

DD: So what do you think is the most important feature of a good teacher?

CC: Well, the most important feature I think is generosity.
I think ultimately, it's generous to take 5, 6, 7, 8 hours of your precious time to produce a one-hour lecture. I mean you have to feel generous towards your students and I also believe that if you want to do something, even if it's a lesson, a lecture, it should be done well. We're always talking about quality control of equipment and quality control of medical images, but how about quality control of our teaching?

DD: In my job I meet a lot of doctors and researchers who have to teach. And when I talk to them about teaching, they often tell me it takes too much time. They say they don't have that much time, but I think when you want to teach well, you have to spend time on it. It takes time to be a good teacher!

CC: You know, I had people telling me that and I told them "If you don't have the time, please resign, so that we can get somebody who has the time or who's ready to give the time". Because it's not fair that they stay in their post there and perhaps prevent a better teacher from coming in while they don't deliver what they are supposed to deliver. If you have taken on teaching duties, then you have a duty to deliver quality teaching. Again, this boils down to generosity.

DD: How do you think your students would describe you as a teacher?

CC: Well, let's put it this way. I have never had problems. I will not say how they describe me, I never asked them and will not do so, but I will just say that I have never had problems with students and they respect me a lot and appreciate what I do for them.
The criminal I mentioned before, believe it or not, I knew that he would never learn science, so I tried to give him things like cleaning my laboratory. I had a lot of chemicals cleaning the laboratory and cleaning the lenses, and he used to

love it. He was quiet. He didn't disrupt the rest of the class. Other teachers ended up sending him from their classes to get rid of him by sending him to my lab.
So, I never had a problem. You know you have to look at the student, whoever he is, whether he's this type of student or a genius, because even geniuses have their needs.
If you have a student who is very bright it's even more difficult to satisfy their needs because he or she comes out with questions which perhaps even you hadn't thought about.
But at the same time, one has to be calm and say if it's a question that you can answer, you will answer. And if there's a question that you cannot answer at that time, I tell them that's a very good question. Nobody has asked me that before, I will explain it in the next lecture. Once you say that, you've already calmed the situation. I mean, we are teachers. We're not Supermen, we can't be expected to know everything either. I mean, it's no matter how generous you are. And no matter how many hours you spend, there's always something new to learn. This makes it interesting.

DD: I think you are maybe a very good example of lifelong learning!

CC: It's in my DNA. I remember when they came out with this concept of lifelong learning, I was saying: What are these people talking about? Are we supposed to stop learning somewhere? Are we to stop at 23 or something like that? No! You keep on learning!
Of course, there are those who choose not to perhaps learn a lot. But then they end up usually bored and always grumbling, uninspired and do not have much imagination.

DD: To be a good teacher you have to use your imagination and creativity, do you agree?

CC: I agree, but you also have to keep in mind that university students are mostly worried about their examinations. That's always at the back of their mind. The biggest thing that you can give your student is to prepare a lecture which they understand. I don't mean write down equations without explaining why the equation is like that and its implications in the real world. If it's medical physics, how will it affect the production and optimization of the images? And what makes this equation so important?
As a teacher, you have to make it relevant to what they need to learn. And understandable so that they will not be fearful that they will fail the examination. And you also have to make sure the amount of work that you give is also reasonable.

DD: Looking back, can you maybe share a teaching experience with us that really stood out that you look back at with good memories?

CC: I think every day is a good memory for me, in the sense that no one day is the same as the other. I don't know whether I have ever had some flashes of deep inspiration. I'm a caring person in the sense that I think about things, or I say: "OK, this lecture, this thing worked, but this thing I really don't feel it worked." I could see that the students were not understanding, so I asked myself: "Why didn't they understand it? Can I explain it in a different way? Did I use the right terminology?" I mean, this is teaching. I don't think you need to have flashes of inspiration from some geniuses or philosophers of education in your mind. And just be practical. Understand that their biggest worry is passing the examination, but at the same time you want them to pass because they really know their work and they have understood well.

DD: As a last question, I wonder if you have any tips for other teachers or professors?

CC: A general tip that I would give to anybody is to try to find the fairest balance between your own interests and the interests of students. This is a continuous struggle within us. If I have 10 hours, I can use them to write and publish another paper for my CV, or I can use them for prepar-

ing better lectures. Now if you always use them for your CV and you never use them for your lectures, it's not fair on your students. But if you go to the other extreme and always prepare and don't take care of your CV, it's not fair on yourself either.

DD: Because then you don't develop yourself?

CC: If your career doesn't develop, it's not good for the students either, because you never become a good professor. It's important to have the right balance so that you as an academic can be happy in your job. Then the students will be happy too and there will be an atmosphere where you're going forward, and when you're going to sleep in the evening, you look back at your day and you can say: 'OK, I've done something useful today with my time and I have moved everything a bit forward in this world. I've made the world a slightly better place."

DD: You feel that you have made a contribution to something?

CC: I think ultimately that's what makes you happy. This feeling of contributing. So ultimately, again, it is generosity.

DD: Yes, generosity! I think that's a beautiful thing, also to say that's the most important quality of a teacher.

CC: I think it's everything. If you are a parent you need to have generosity towards your own children, and your partner, even generosity for the wider society at large. Ultimately, generosity is not something for teachers only! It's a way of life!

DD: I love that. Thank you for this interview, Carmel!

Danielle Dobbe-Kalkman is an educational advisor at the Radboud University Medical Centre, and the educational expert of the EUTEMPE consortium. She regularly presents on tactics to improve educational efforts and assists with the design of courses to enhance their didactic value. Danielle sits on the Editorial Board of EMP News as an Advisor.

Art to Challenge and Inspire: Images and Reflections for Medical Physics (11)

Professor Jim Malone writes about artist Edward Hopper (1882–1967), especially his often misinterpreted portrayal of younger women. We can learn a lot from him.

My introduction to Edward Hopper was the ever-popular poster of his Nighthawks (1942), often regarded as an ICON of loneliness and alienation. But that is not my experience of it. Hopper, himself, felt the loneliness thing is overdone. I later saw the original at the Arts Institute of Chicago while at the RSNA.
In later life Hopper worked slowly, often completing only one or two pictures a year. He looked for something beyond language and struggled with it until he captured it in a painting. He is a twentieth century Vermeer (also a slow artist), and one of the special artists that paints things we all know are there but can't articulate.

Automat (1927)

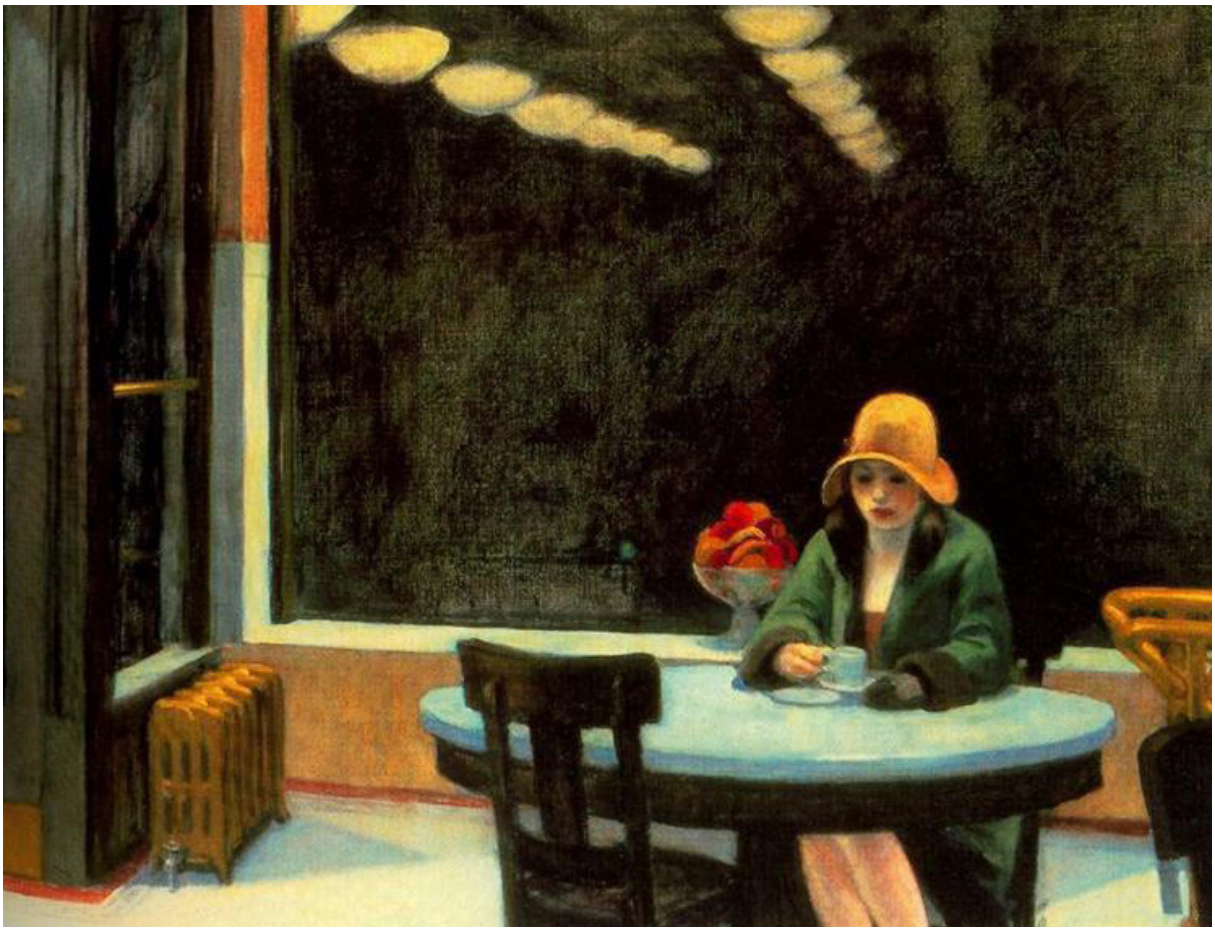
(see next page)

The young woman in Automat is alone. Critics often suggest that she appears lonely or alienated, but this need not be so. The lack of animation in her features is commonly seen in a person lost in thought and may not imply depression or disaffection. Could she be a medical physicist negotiating a difficult personal or professional issue? For example, is she just finished working for her PhD and preparing to finalise the thesis with her supervisor? Her solitude is not a burden, she needs it and has chosen it. She is self-contained despite a vulnerable exterior.

Hopper celebrates and validates her private, intimate, solitude. His works are metaphors of silence carrying a visible trace of what he finds most interesting in a scene. He is like a scientist or treatment planner who keeps refining the experiment/theory/plan until it conveys a truth or executes its objective.

Jim Malone is Professor (Emeritus) of Medical Physics and was Dean of the School of Medicine at Trinity College Dublin/ St James's Hospital. He also works/worked regularly with WHO, IAEA, IEC, ICRP and the EC. Awarded the EFOMP Medal, he is an active researcher with wide interests in the humanities. Recent publications include books on Ethics for Radiation Protection in Medicine, Mystery and the Culture of Science, and Tales from the Ivory Tower, an unusual memoir, with an oblique view on being a medical physicist for 50 years. Drawing on the left by Desmond Hickey. Contact Jim at jifmal@gmail.com

Three Paintings by Edward Hopper. Main: Automat (see previous page). The smaller images illustrate solitary women in different settings, L: Compartment C, R: Movie in New York



Main Image: Automat (1927). Des Moines Art Center, Des Moines, IA, US Oil on canvas (91.4 x 71.4 cm). Bottom left: Compartment C (1938). IBM Corporation NY. Oil on canvas, 51 x 45.7 cm.. Bottom right: Movie in New York (1939) MOMA New York Oil on canvas. (81.9 x 101.9 cm). Given anonymously to MOMA NY.

Malta Association of Medical Physics (MAMP) Annual Conference November 2023

Julia Cassar, Sam Agius, Carmel J. Caruana

The Malta Association of Medical Physics (MAMP) recently held its national annual conference and annual general meeting (AGM), which brought together clinical professionals, academics, trainees and students in the field to discuss the latest advancements in Medical Physics and Radiation Protection. The conference is organised annually to coincide with the International Day of Medical Physics, and in 2023 it was held in the presence of Efi Koutsouveli, who at the time was EFOMP Secretary General and vice-President. Attendees had the opportunity to discuss topics such as CT patient dose estimations, 3D printing applications, MRI physics, and the utilisation of lasers in healthcare. These presentations, led by both local and international experts, provided valuable insights into different scientific developments and their potential impact on healthcare practices in Malta and overseas.

An in-depth exploration of the current and future vision of the Medical Physics and Radiation Protection educational programmes at the University of Malta were highlighted by Professor Carmel J. Caruana. Updates on educational initiatives, events and proposed changes to the current Bachelor of Science (Honours) in Physics, Medical Physics and Radiation Protection, as well as the Master of Science in Medical Physics in Malta were presented. Students were given the opportunity to present their dissertation projects to the attendees.

Ms Koutsouveli, added an international perspective to the discussions through her overview and update of EFOMP activities through the years, and also touched on strategic themes, European projects and funding. She outlined the different opportunities within EFOMP and how all Medical Physics professionals, academics, trainees and students can be involved in different EFOMP working groups for the broader European community.

The event concluded with the Annual General Meeting (AGM), where MAMP president, Mr Sam Agius, and the executive members had the opportunity to present organisational matters and future initiatives. The AGM served as a platform for members to actively participate in shaping the future direction of MAMP and its contributions to the field of Medical Physics in Malta. The conference highlighted the dedication towards excellence in promoting healthcare through cutting-edge technologies, collaboration, and ongoing learning in Malta. The vibrant and enthusiastic atmosphere highlighted the success of this national event.

resentations delivered by local and international experts.

Master of Science in Medical Physics students presenting their 3D printing project for use in the Nuclear Medicine department at Mater Dei Hospital.

EFOMP Vice President Efi Koutsouveli discussing the use of lasers in Medical Physics.

MAMP members present at the national conference and AGM.

Julia Cassar is a former student of the BSc Physics, Medical Physics and Radiation Protection of the University of Malta. She is now doing her Masters in Medical Physics and plans to start her traineeship soon after. She is deeply engaged in promoting Medical Physics. Her professional journey is complemented by a strong interest and practical experience in media and communications, which allows her to bridge the gap between complex scientific concepts and their accessible public understanding, contributing to the wider dissemination of Medical Physics knowledge and the promotion of the profession among the general public.

Prof. Carmel J. Caruana is a Professor and Head of Medical Physics at the University of Malta. Carmel specialises in diagnostic and interventional radiology, radiation protection and legislative, professional and educational issues. He is past-Chairperson of the Education and Training Committee of EFOMP, lead author of the role and education, and training chapters of the EU document "European Guidelines on the Medical Physics Expert", lead author of several EFOMP policy statements and past-Associate Editor for Educational and Training, and Professional issues for Physica Medica.

Sam Agius is the lead Medical Physicist at Mater Dei Hospital and Sir Anthony Mamo Oncology Centre, with specialisation in Nuclear Medicine and Molecular Radiotherapy. Within the hospitals he also serves as a Medical Physics Expert and Radiation Protection Expert. He is currently president of MAMP, secretary of the Professional Matters Committee within EFOMP and assistant lecturer at the University of Malta.

Highlights from the Hellenic Association of Medical Physicists' (HAMP) Scientific Symposium on Ultrasound Imaging and General Assembly

Despoina Stasinou

The HAMP symposium

The Hellenic Association of Medical Physicists (HAMP) recently organised an extensive scientific symposium focused on the latest developments in the field of medical ultrasound. The event, held on January 27, 2024 at the Amphitheater "A. Argyriadis" of the National and Kapodistrian University of Athens, brought together esteemed professionals, researchers and experts to delve into the fields of physics, technology and emerging trends in ultrasound applications

The first session began with the description of the fundamental principles and physical aspects of ultrasound, providing the audience with valuable insights into the core fundamentals underlying this imaging modality. Following this, innovations and emerging trends were discussed, ranging from improvements in the design of ultrasound transducers and signal processing techniques for improved image quality to the integration of artificial intelligence and holographic and virtual reality imaging. The session continued with the description of quality assurance (QA) procedures in ultrasound, including the evaluation of equipment settings, verification of proper calibration and collection of imaging parameters, to ensure they meet safety guidelines for maintaining high standards in ultrasound applications.

In the second session, the symposium resumed with a focus on the advanced clinical applications of ultrasound. The clinical applications of the latest imaging methods in diagnostic ultrasound were described, including elastography for different anatomical locations, implementation of contrast-enhanced ultrasound, new microvascular ultrasound techniques, as well as molecular ultrasound imaging. Emphasis was placed on the need for fusion imaging that takes advantage of different imaging modalities, where ultrasound provides real-time imaging, while CT or MR provide higher spatial resolution and combines them to increase diagnostic accuracy. The symposium concluded with presentations on new imaging

methods and modern applications of ultrasound in cardiology and intensive care, showcasing the growing role of ultrasound in various medical specialties, as well as its versatility and impact on patient care.

The symposium provided a platform for rich discussions and collaborative exchange among participants. Attendees left with a deeper understanding of the latest developments in ultrasound technology, its applications in clinical practice, and the ongoing efforts to ensure quality and innovation in this dynamic field.

General Assembly Updates

The General Assembly convened to discuss various important matters. The HAMP Board provided updates on its activities since the last election, including the handover of association funds, financial reports, and educational initiatives. Furthermore, the Assembly was informed about the ratified amendment to the HAMP statute and ongoing communication with Public Bodies and Ministries regarding crucial modifications related to the field of Medical Physics.

The meeting concluded with the cutting of HAMP's traditional New Year's cake called "Vasilopita" and a social event in the foyer of the Amphitheatre.

Vasilopita" cake tasting

A piece of the "Vasilopita" cake was specially reserved for EFOMP's esteemed President, Efi Koutsouveli, who was present at the Scientific

HAMP General Assembly

This gesture acknowledged not only her past contributions as a member of HAMP's Board but also celebrated her ongoing role in representing Greece within the European Medical Physics community.

Three lucky charms were hidden in the "Vasilopita" cake with rewards being provided by the HAMP's Board to the ones who found them in their pieces. The first prize provided was the registration fee for the 5th European Congress of Medical Physics Conference 2024 and 500€ for the participant's expenses, while the second and the third prizes included the registration fees for the upcoming "2nd Panhellenic Congress of Medical Physics".

Looking Ahead

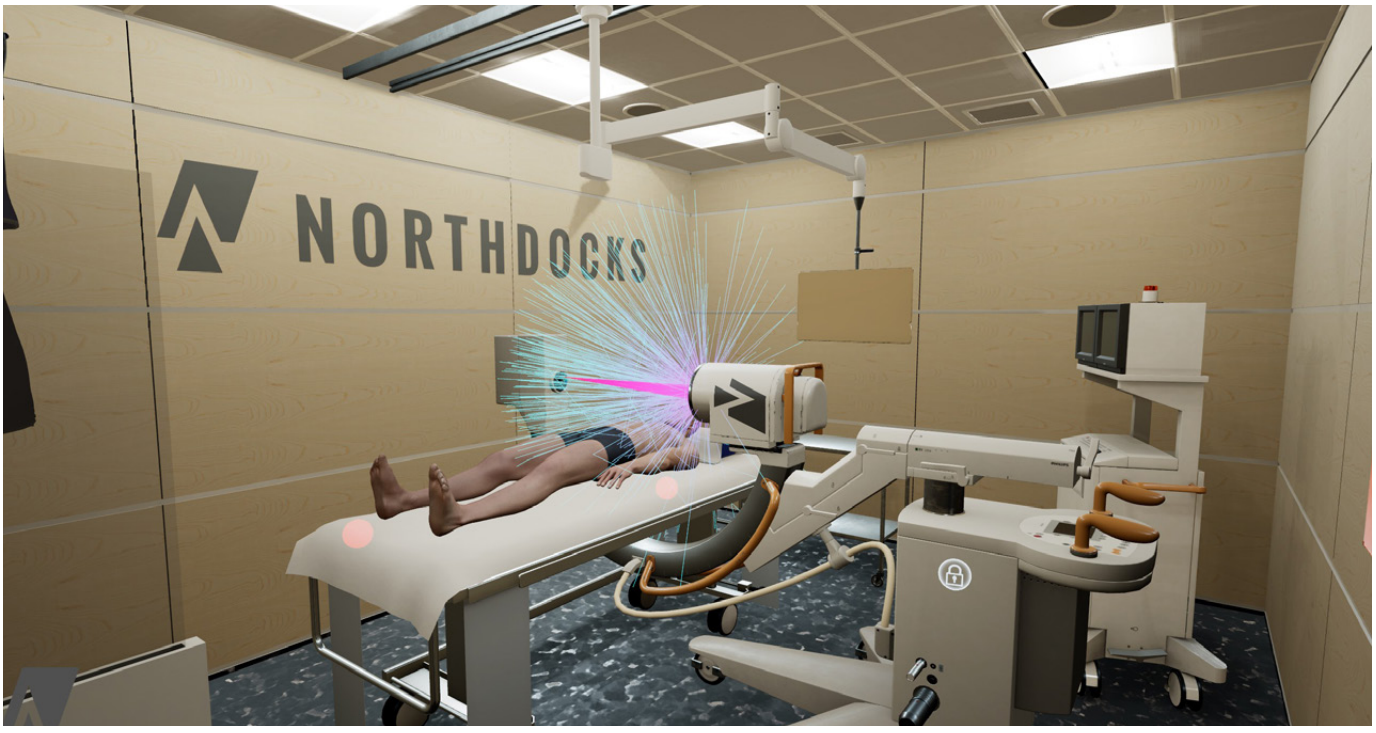
As we reflect on the success of the Scientific Symposium, we also look forward to future endeavours. HAMP remains committed to advancing the field of medical physics through educational initiatives, scientific symposiums, and collaborative efforts with national and international organisations.

Stay tuned for updates on HAMP's upcoming events, including the "2nd Panhellenic Congress of Medical Physics" scheduled for October 4-6, 2024!

Despoina Stasinou is a Medical Physicist working at the Radiation Oncology and Stereotactic Radiosurgery Centre of Mediterraneo Hospital in Athens, Greece. Her professional focus is on external radiotherapy. She is a PhD candidate researching the geometric and dosimetric uncertainties inherent in single-isocenter multiple brain metastases stereotactic radiosurgery. She is currently HAMP's Secretary Assistant.

Virtual training sessions for radiation protection in interventional rooms

The German Federal Office for Radiation Protection and Northdocks GmbH have introduced **Radiation-Protection-VR**, an advanced virtual reality training designed to optimise medical personnels' radiation protection behaviour, at the European Congress of Radiology. The software solution offers a comprehensive and reliable virtual reality training that visualises the radiation (doses) for adequately training medical personnel in the dose-intensive field of interventional procedures.



In recent years attention to the dangers of radiation exposure for patients and medical personnel has increased. Particularly during interventional procedures, medical personnel are exposed to high levels of radiation in the course of their professional activity. Despite the well documented damages that excessive exposure to radiation can have, protective measures are often not ap-

plied correctly because they are not adequately trained. To address this need Northdocks GmbH, under the supervision of the German Federal Office for Radiation Protection (BfS), developed a virtual reality (VR) application to train and encourage medical personnel to better understand and adopt protective behaviour without being exposed to further radiation.

In the course of the project, a virtual catheter lab was recreated as a virtual environment - a so-called digital twin. In the virtual catheter lab devices such as the C-arm or radiation protection equipment can be operated. However, not only was the real environment modelled in VR, but a newly developed simulation runs in the background to give medical personnel the opportunity to calculate the radiation exposure (e.g., organ and effective doses) of people present in the virtual environment in real time. The estimation was validated against a Monte Carlo simulation and delivers close and deterministic radiation doses. To support the learning process, the ionising radiation can be visualised. For instance, scattered radiation and the shielding effect of radiation protection equipment can be visualised in real-time. Consequently, the VR application can be used to test the influence of shielding and protective behaviour (e.g., varying distance from the patient or from the x-ray tube, use of different frame rates and collimation diameters) without endangering yourself or others.

In order to practise radiation protection behaviour as closely as possible to everyday life, two pre-defined interventions can be carried out in the virtual cath lab: diagnostic coronary angiography and carotid stenting. While performing the interventions, virtual displays provide continuous information on the organ dose and effective dose and provide valuable insights into the radiation exposure. In this way, for example, the optimum behaviour for cone beam CT acquisitions and the influence of the operator's hands on the automatic exposure control can also be practised.

First results from a pre-post-comparison showed an increase of 57% in the number of correct answers regarding the protective factor of the available measures indicating that short, focused sessions with the Radiation-Protection-VR are helpful for the understanding of radiation protection issues in interventional procedure rooms [1].

Northdocks GmbH continues to refine Radiation-Protection-VR based on user feedback and market trends in technology and treatment. Future enhancements will focus on further interventions and continue creating a more seamless experience for medical personnel.

Radiation-protection-VR offers a revolutionary solution for enhancing the training and safety of medical personnel. Its ability to visualise the radiation, provide accurate radiation doses and show the influence of radiation protection equipment marks a significant advancement in the field, empowering medical personnel to optimise their radiation protection behaviour.

For more information on the project and to try the virtual reality training on MediTrainVR, you can consult the website of MediTrainVR or the project webpage.

Acknowledgements
This research project received funding from the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection under project code number 3621S42350.

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Julia Barenthien, Ph.D., is a post-doctoral researcher and got her PhD at the CAU (Kiel, Germany). Her work focuses on education and learning processes. At Northdocks GmbH she conceptualises virtual reality training.

Katharina Stella Winter, MD, graduated in human medicine (University of Munich) and trained as a specialist in radiology (University Hospital LMU Munich). She is currently a scientific officer at the Federal Office for Radiation Protection (BfS) in Germany.

Silas Fuchs studied multimedia production (BA) and Media Conception (MA) at the University of Applied Sciences Kiel. At Northdocks he is responsible for developing new projects and translating real-world problems into Virtual Reality Simulations.

Hugo de las Heras Gala studied physics in the UCM (Spain), got his PhD in the TUM (Germany) and was postdoc at the US FDA (Silver Spring, MD). He worked in x-ray radiology for a hospital (San Carlos, Madrid), at a company (QUART, Germany) and is currently officer at the Federal Office for Radiation Protection (BfS, Germany).

Felix Höfer is a graduate from Goethe University Frankfurt with a Masters degree in mathematics and physics. Drawing from his experience in tutoring and several programming languages, he has worked as an Unreal Engine Developer at Northdocks GmbH.

EVENT

My first experience in European Congress of Radiology together with EFOMP

Agnese Katlapa

Recently Early Career SIG's Steering Committee members received an offer from EFOMP to man the EFOMP's booth at European Congress of Radiology 2024 (ECR2024) in Vienna, Austria. I agreed to volunteer for this task as I had heard before that ECR is a huge event for the radiology field. As one doctor from the hospital I work at told me:"Ahh, yes, that's the week when you can't find any radiologist in the country."

According to ECR webpage:
"ECR is an international meeting and one of the leading events in radiology. It is one of the largest medical meetings in Europe and the second-largest radiological meeting in the world. ECR attendees span all areas of the radiology arena, including radiology professionals, radiographers, physicists, industry representatives."

Societies in ECR have separate places – Society Booths - where they can introduce the attendees of the congress of what they do and what possibilities they offer. From 28th February till 2nd March I was spending my time exactly there rep-

resenting the EFOMP at EFOMP's booth together with many other society representatives.

Being at the EFOMP's booth was an interesting experience. There were different reasons why people passed by the booth. Some of them of course stopped by because they wanted to know what EFOMP is and what we are doing. I hope I could introduce them well enough with EFOMP activities. It was also interesting to find out more about these people. As for example, there were those radiologists who did have medical physicists working in their hospitals, those who didn't have and also those who didn't even know if they had.

Then there were medical physicists who stopped by wanting to know more or simply wanting to say hello to one of their own. That was really nice. Once in a while there were also really memorable moments – when some really legendary medical physicists were passing by and introducing themselves and my answer sometimes was: "Yes, I know who you are." They were very well known physicists whose names or faces I have seen before only on the internet, but hey – there they suddenly were standing right in front of me.

The EFOMP's booth was also a place for meetings – EFOMP executives and many medical physicists were meeting during breaks exactly at the booth to discuss different actualities. In those moments the booth was a very lively place.

During this week I also had a chance to walk around the congress exhibitions. It was interesting to see many industry representatives with the technologies they are offering – from the newest MRI and CT models and different software, AI and VR solutions to some smaller companies and startups. The crowds and talks at the industry booths were neverending – which is understandable because technologies play a very important role in radiology. Not surprisingly, this year's congress was exactly about this – "through incredible advancements in both technology and techniques, the future of medical imaging will be the central theme".

Networking and socializing is an important part of such congresses. Therefore, all medical physicists were invited to the social event – Physics Social Table Quiz at Charlie P. There were Physics trivia with very interesting and not easy questions, Irish food, drinks and karaoke. A nice event organized by EFOMP's Past President Paddy Gil-

ligan and kindly supported by Hospital Services Ltd. and Amray Medical. I believe that everyone who came was really happy about this opportunity to meet in the informal atmosphere.

ECR2024 has ended and manning the EFOMP's booth has probably resulted in several things – more people knowing about EFOMP and its activities, more people knowing about medical physicists, new members in some of our special interest groups, at least one new Company Member, new contacts and new ideas.

Thank you EFOMP and especially its president Efi Koutsouveli for giving Early Career SIG this opportunity – we are definitely growing with every such possibility. Next time you will meet some of our Early Career SIG members in ESTRO Congress in May – if you are there, come and say hello!

Agnese Katlapa, Secretary of EFOMP Early Career SIG. Working as a clinical Engineer/Medical Physicist in Children's Clinical University Hospital in Latvia. The previous work experience includes working in the field of radiation safety in the National Regulatory Body. Has studied in Riga Technical University and University of Eastern Finland.

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Getting Inside the Latest Scientific Seminar Organised by Cyprus Association of Medical Physics and Biomedical Engineering

Eleni Skouridi reports on the Optimising Radiation Protection Practices in the Clinical Environment seminar, which took place Nicosia on the 10th February 2024.

On a sunny winter afternoon, over 100 Medical Physicists, Radiology and Nuclear Medicine Technologists, and Consultants gathered in Nicosia to share knowledge and exchange new ideas. Like every year, the Cyprus Association of Medical Physics and Biomedical Engineering (CAMPBE), an independent and non-governmental organisation established in 1988, organised a scientific meeting with the scope to bring professionals and students within the medical physics and biomedical engineering related fields together. This year's topic tackled developments in radiation protection within healthcare and specifically, how practices can be optimised. Joint-organisers were the Cyprus Association of Medical Physicists (CYMPA) and the Cyprus Society of Registered Radiologic Technologists and Radiation Therapy Technologists (CSRRT), both closely affiliated with CAMPBE for over a decade.

At the start of the event, participants were greeted by the newest European Federation of Organisations for Medical Physics (EFOMP) president, Dr Efi Koutsouveli, who recently started her European tour, with Cyprus having the honour of being the first National Member Organisation (NMO) to welcome her (Figure 1). The audience had the opportunity to learn about EFOMP's key priorities for the coming triennium, with Dr Koutsouveli sharing the most crucial topics that EFOMP will dive into and as stated in the latest President's editorial "transform challenges into solutions" [1].

On the left, the audience consisting of medical physicists, technologists and consultants. On the right, Dr Efi Koutsouveli presenting EFOMP's plan for the next three years

A common European core curriculum for Medical Physics Experts (MPEs) is top of the list along with the aim to achieve the automatic recognition of MPEs within the EU. Worth noting that CAMPBE is among the first 10 NMOs that were granted EFOMP approval of their National Registration Scheme (NRS) for MPEs. The latter poses an important milestone for MPE's in Cyprus and during the event, CAMPBE's current Board President, Dr Irene Polycarpou, had the pleasure to receive the accreditation certification (Figure 2).

Dr Irene Polycarpou (right), current Board President of CAMPBE receiving the accreditation certification by Dr Efi Koutsouveli (left).

The seminar continued with five more presentations from representatives of Cyprus's largest healthcare providers. Dr Prodromos Kaplanis and Ms Georgiana Kokona, medical physicists, Mr Stelios Stylianou and Ms Lamprini Paralyki, radiology technologists employed at the SHSO, had the opportunity to share the pearls and pitfalls of their experience in Nicosia General Hospital, while preparing for a QUAADRIL accreditation. QUAADRIL constitutes a strong quality and optimisation tool for diagnostic radiology services and, as also highlighted by the speakers, heavily relies on the close collaboration of medical physicists, technologists and radiologists [2]. Furthermore, Ms Eleni Skouridi, a medical physicist also working at the SHSO, shared her experience as the person leading the integration of a dose management system within Cypriot Public Hospitals and the project's current status (Figure 3). Approximately 70% of SHSO's ionising radiation equipment is connected on the system, with one of the most important goals being to incorporate patient dose information within the SHSO's Health Information System (HIS), currently under development.

Mr Stelios Stylianou and Ms Lamprini Paralyki (top), Dr Prodromos Kaplanis (middle) and Ms Eleni Skouridi (bottom).

Mr Panayiotis Hadjitheodorou, Head Medical Physicist of Nuclear Medicine at the German Oncology Centre.

Mr Costas Michael, a medical physicist working at the Bank of Cyprus Oncology Centre (BOCOC), shared insides from the Regional Train the Trainers Course for Radiation Protection Officers (RPOs) of Medical and Industrial Facilities, a training organised by the International Atomic Energy Agency (IAEA), which Cyprus hosted last December. The presentation emphasised the responsibilities of an RPO and how they differ from those of an MPE. He also pointed out that it is crucial that RPOs should be given the appropriate resources in order to be able to fulfil their duties effectively.

Optimisation in new theragnostic practices was the last topic of the seminar. Mr Panayiotis Hadjitheodorou and Ms Kyriaki Kyrou (Figure 4), a nuclear medicine physicist and a nuclear medicine technologist working at the German Oncology Centre (GOC), shared insightful results from a study that was conducted at GOC, relating to the diagnosis and treatment of neuroendocrine and metastatic prostate cancers, using Fluorine-18 and Lutetium-177. The presentation pointed out the optimisation done at the stages before and after treatment based on the results of the study, and how pre-treatment patient dosimetry is done using voxel-based calculations.

The event closed with a special recognition ceremony, honouring Dr Stelios Christofides, one of the founders of CAMPBE who also served as an EFOMP President between 2009-2011. Dr Christofides was awarded an honorary plaque, presented by

Dr Stelios Christofides receiving the honorary plaque by Dr Efi Koutsouveli.

Dr Koutsouveli, for his invaluable contribution to the medical physics field in Cyprus and beyond (Figure 5).

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Eleni Skouridi is a young medical physicist at the State Health Services Organisation (SHSO), the largest healthcare provider in Cyprus. Her past experience included working at the Nuclear Medicine Department and the East Anglian Regional Radiation Protection Service, based at Addenbrooke's Hospital, Cambridge. She is currently leading the integration of a radiation dose management system in eight Cypriot Public Hospitals and the five National Breast Screening Centres. Over the past two years she has focused on medical imaging informatics and the information technology aspects of medical physics, including PACS/RIS workflows and decision making on their application in SHSO's radiology departments.

39th annual BHPA symposium

The 39th annual symposium of Belgian Hospital Physicist Association (BHPA) happened on 2nd and 3rd of February 2024 in Antwerp. It was organised by Iridium Netwerk. The Organizing Committee was co-chaired by Emy van Aert and Hannelore Van Dyck. Our symposium is organised every year in a different city by a different Institution.

The main topics this year were AI and automation.

A total of 416 people registered for the event, including 77 representatives of sponsoring companies. In addition to Medical Physics Experts (MPE) from radiotherapy, radiology and nuclear medicine, Medical Physics Assistants, Quality Managers and students also join. Even if the participants are Dutch or French speaking, every presentation is in English.

Scientific meeting

The core of the symposium is a scientific meeting, with oral communication, posters and invited speakers, both from Belgium and surrounding countries. The Scientific Committee, chaired by Nadine Linthout, selected 47 oral presentations to fill the 12 planned sessions. Seven posters were displayed and discussed during specific sessions. There were more than thirty oral presentations by young physicists. BHPA fully supports them by providing the opportunity to present their work to the community, hoping that they will continue to do so at other national and international meetings.

Thank to sponsors, the Scientific Committee also choose the winners of 3 awards:

- Best Young Physicist presentation (600 EUR) to Palakpreet Singh from Iridium Network (Clinical Implementation of total body irradiation technique using VMAT)
- Best Abstract (250 EUR) to Rodin Noël Koffeing from UCLouvain (Comparison of toxicity induced by online adaptive proton therapy and online adaptive radiotherapy)
- Best Poster (400 EUR) to Chloé Dumont from CH Epicura (Implementation of a Hidden Target Test for SRS multiple brain metastases (multimets) treatments)

The Belgian Radioprotection Society also joined the event for their annual meeting.

Association's meeting

Our annual symposium is far more than a scientific meeting. It's the perfect place to meet colleagues and share experience. We can also discuss with the representatives of 27 companies.

The program included a presentation about well-being in a stressful environment. We also discussed practical aspects of European Medical Device Regulation (MDR) implementation for homemade software or devices.

The BHPA annual General Assembly also takes place during the symposium. For a few years, it became the opportunity to go further than just some mandatory votes: reports of different working groups, discussion about professional matters, and debate about the present and future of our association.

We are also happy to invite a representative of the Federal Agency for Nuclear Control (FANC), the governmental authority that controls the use of ionising radiations. We are proud to keep very constructive discussions with FANC, in order to find the best balance between safe use of ionising radiation and efficiency in a clinical environment.

Last but not least, many members participated in the Social Event on Friday evening, again sold out this year.

We are all waiting for the 40th symposium next year!

Best abstract award: Scientific Committee giving the Best Abstract award

Best Young Physicist Award: The Best Young Physicist award winner

Best Young Physicist Award: The Best Young Physicist award winner

Organizing Committee chairwomen: Hannelore Van Dyck and Emy van Aert, co-chairwomen of the Organizing Committee. They did a hard and good job to organise all aspects of the symposium.

Social event: The social event on Friday evening, again sold out this year

Alain Sottiaux is a Medical Physicist for 16 years at CHU de Charleroi. He is a member of the board and secretary of BHPA. He was this member of the Scientific Committee.

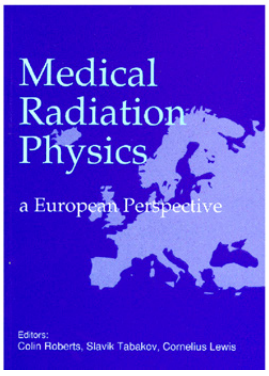
Various Anniversaries of European Medical Physics Education and e-Learning in 2024

2024 marks several anniversaries associated with important moments of medical physics education and e-learning in Europe.

Slavik Tabakov reports.

The first one is related to the professional links between West and East European Societies of Medical Physics. The democratic changes in Eastern Europe during 1989 are undoubtedly some of the milestones of 20th-century history. During the 1990s, colleagues from East and West Europe continued the collaboration, which had been dormant for many years. One of the fields of cooperation was related to the harmonisation of education and training in all professions, leading to the future expansion of the European Union (EU). One important moment for medical physics was to expand EFOMP into Eastern Europe and to agree with the new members on the standards of medical physics education (already presented in the EFOMP Policy Statements). As a result, the first European Conference on Post-graduate Education in Medical Radiation Physics was organised in Budapest in 1994 (Figure 1). The Conference was supported by the European Commission project CIPA 2623.

The delegates to the Conference were from 37 Institutions, Societies and Universities in 23 European countries. The photo from this Conference presents most of the delegates (many of them - Presidents of National Medical Physics Societie - Figure 1) The materials of this Conference were published in a book, which was distributed free to all countries and provided further practical guidance for creating new MSc programmes in Eastern Europe [1]. Also, this Conference linked EFOMP and the newly formed European Scientific Institute in Archamps, which later became one of the main EFOMP Schools.



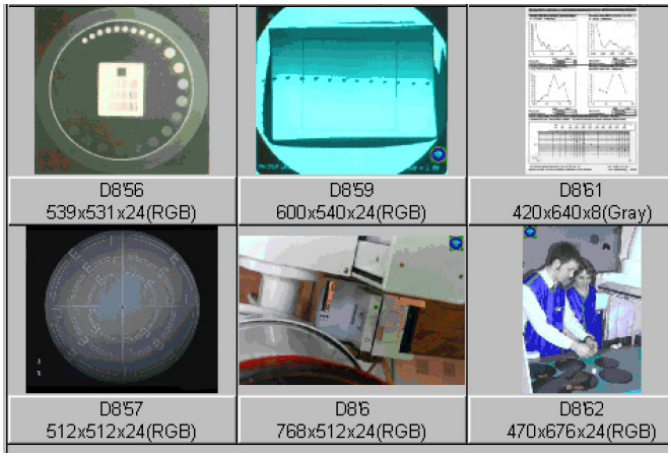
Some of the delegates to the European Conference on Post-graduate Education in Medical Radiation Physics, Budapest, 12-14 November 1994; Book following the Conference in Budapest 1994

Several international projects started after this Conference. The author developed European projects, creating MSc programmes in Bulgaria,

Latvia, Lithuania and Estonia [2]. These activities were later expanded as support for the development of MSc programmes in a further 15 countries. Most importantly, in Budapest, a European team was formed aiming to develop electronic teaching and training materials for medical physicists (at that time, the term e-learning did not exist yet). The new EU pilot project EMERALD (standing for "European Medical Radiation Learning Development") included eminent colleagues from the UK, Sweden, Italy, Portugal, and ICTP. The project developed its concepts for e-learning, including the first Educational Image Databases in the profession [3, 4]. The CD-ROM created by the project was the second in the world CD-ROM with ISBN number as a book [5] – Figure 2.

The project EMERALD expanded into a new project, EMERALD II, which included additional partners from France, Ireland, and the Czech Republic. Its main aim was to disseminate in Europe the created by the team e-learning materials. As part of these activities, the project developed the first Educational Website in the profession, www.emerald2.eu. This website has been active from 1999 to the present day and although it now needs updating, parts of it still attract over 2000 students and trainees per month [5].

Educational Image Database CD-ROM



While EMERALD created e-learning in Diagnostic Radiology, Nuclear Medicine and Radiotherapy, it

Worlds Top-3 ISBN-numbered e-Learning materials:

1. Atlas of Pathology: Urological Pathology CD-ROM, 30 Dec 1997, Springer-Verlag, ISBN 3540146571

2. EMERALD Image Database, Training Courses in Medical Radiation Physics CD-ROM, 19 Feb 1998, King's College London, ISBN 1870722035

3. Developmental Psychology Image Database CD-ROM, 30 April 1998, McGraw-Hill, ISBN 0072896914

EMERALD Image Database – one of world's first 3 CD ROM with ISBN Number; all 5 CD ROMS with Image Databases (now over 3500 images included in the web site http://www.emerald2.eu/cd/Emerald2/)

was necessary to have additional materials covering Ultrasound and Magnetic Resonance Imaging. Thus, the author led the development of a new European project – EMIT (standing for "European Medical Imaging Technology Training"). The team of the project EMIT used the experience from the previous project (related to its databases, images, and website), and soon the new e-learning material was ready – which was unique at the time. To disseminate it further, the project team developed

an electronic Dictionary of Medical Physics Terms, initially covering only some of the European languages: English, French, German, Italian, and Swedish. This was the first international dictionary in the profession. A conference was organised at ICTP, Trieste (November 2003), aiming to lay the foundations for further use of e-learning in the profession. This was the First International Conference on e-Learning in Medical Physics and it attracted not only experts from 26 European countries but also from the USA and Asia.

All projects summarised so far were supported by EFOMP, but EMIT was the first project to include EFOMP as a full project partner [6]. This brought significant income to the Federation and triggered the need for EFOMP incorporation to allow easy participation in various other EU projects.

The success of Project EMIT was seen as an e-learning showcase for the EU. The project was shortlisted (out of over 500 other educational projects) and in December 2004, the project EMIT was awarded the inaugural European Award for Vocational Education, the Leonardo da Vinci Award. This was the second anniversary discussed in this paper (Figure. 3). This milestone of e-learning in the profession triggered various other projects in medical physics, where professionals usually have excellent IT skills. The strong e-learning activities in the profession were of great help during the pandemic period 2020-21 [7].

The official EU Leonardo da Vinci Award Diploma, listing all partners of the EMIT project (including EFOMP)

The following decade 2004-2014 was associated with the largest project of the profession – the European project EMITEL, which developed the first e-Encyclopaedia of Medical Physics. The project was constantly expanding and, in the end, included 114 members from 24 countries. The result was a free online Encyclopaedia, used by over 5,000 medical physicists per month. Additionally, the website of the e-Encyclopaedia (www.emitel2.eu) included an e-Dictionary [8], which expanded significantly outside Europe and currently cross-translated medical physics terms between its 32 languages (over 200 medical physicists were initially working on the translation of the Dictionary in various languages). As part of the EMITEL project, another large International Conference was organised (October 2008, ICTP, Italy). It included past, current and future Presidents of 26 National Medical Physics Societies (most from Europe) (Figure 4).

The current 32 languages in the Scientific e-Dictionary are Arabic, Bengal, Bulgarian, Chinese, Croatian, Czech, English, Estonian, Finnish, French, Georgian, German, Greek, Hungarian, Italian, Japanese, Korean, Latvian, Lithuanian, Malaysian, Persian, Polish, Portuguese, Romanian, Russian, Slovenian, Spanish, Swedish, Thai, Turkish, Ukrainian, and Vietnamese. The web design of the e-Dictionary and e-Encyclopaedia sites was made by M. Stoeva and A. Cvetkov and the 32 teams of translators expanded to over 300 colleagues.

Delegates to the Medical Physics Encyclopaedia Conference, 23-26 October 2008, ICTP, Italy

After the official end of the EMITEL European project, the coordinator and a team of Editors continued working on the paper print of the Encyclopaedia

with CRC Press (Taylor and Francis). The two-volume Encyclopaedia was published in 2014, which was the third anniversary discussed in this material [9].

Following this, the author published in 2014 a free e-book about these projects [10], aiming primarily to be a souvenir and a token of gratitude to all colleagues who took part in these milestone pilot projects. To our surprise, the book has over 40,000 downloads, probably due to the included elements of the methodology of creating e-learning materials, educational image databases, and online encyclopaedia and dictionary.

It was by coincidence that 2024 is the 30th Anniversary of the first International Conference of Medical Physics Education, Budapest, 1994; the 20th Anniversary since the Leonardo da Vinci Award for pioneering e-learning projects in the profession; and the 10th Anniversary of the publication of the Encyclopaedia of Medical Physics. During the time after 2014, the core members of the existing Encyclopaedia team plus another 52 new contributors developed the second updated edition of the Encyclopaedia, which was published by CRC Press in 2022 [11].

Other significant Education and e-Learning activities are planned for 2024. In a recent conversation with EFOMP Education and Training Committee Chair Dr Veronica Rossetti, it was clear that it is expected that EFOMP to launch its new e-learning platform in 2024. Also, the Multilingual Dictionary of Medical Physics Terms will be published this year as a separate e-book. I am sure these activities will be subject to additional materials.

In conclusion, after starting a sequence of European projects in 1994 with a handful of enthusiasts from the UK, Sweden, Italy, Portugal, Ireland, and Bulgaria, we could not even dream that 30 years later our huge project EMITEL would attract some 320 specialists from 36 countries. The fantastic collaboration, mainly of colleagues from Europe (and supported financially by the EU and other European Universities and Institutions, as well as IOMP and its member societies), created a melting pot of ideas, hard work, and dedication, which now form part of the foundation of medical physics education not only in Europe but also in many other countries worldwide.

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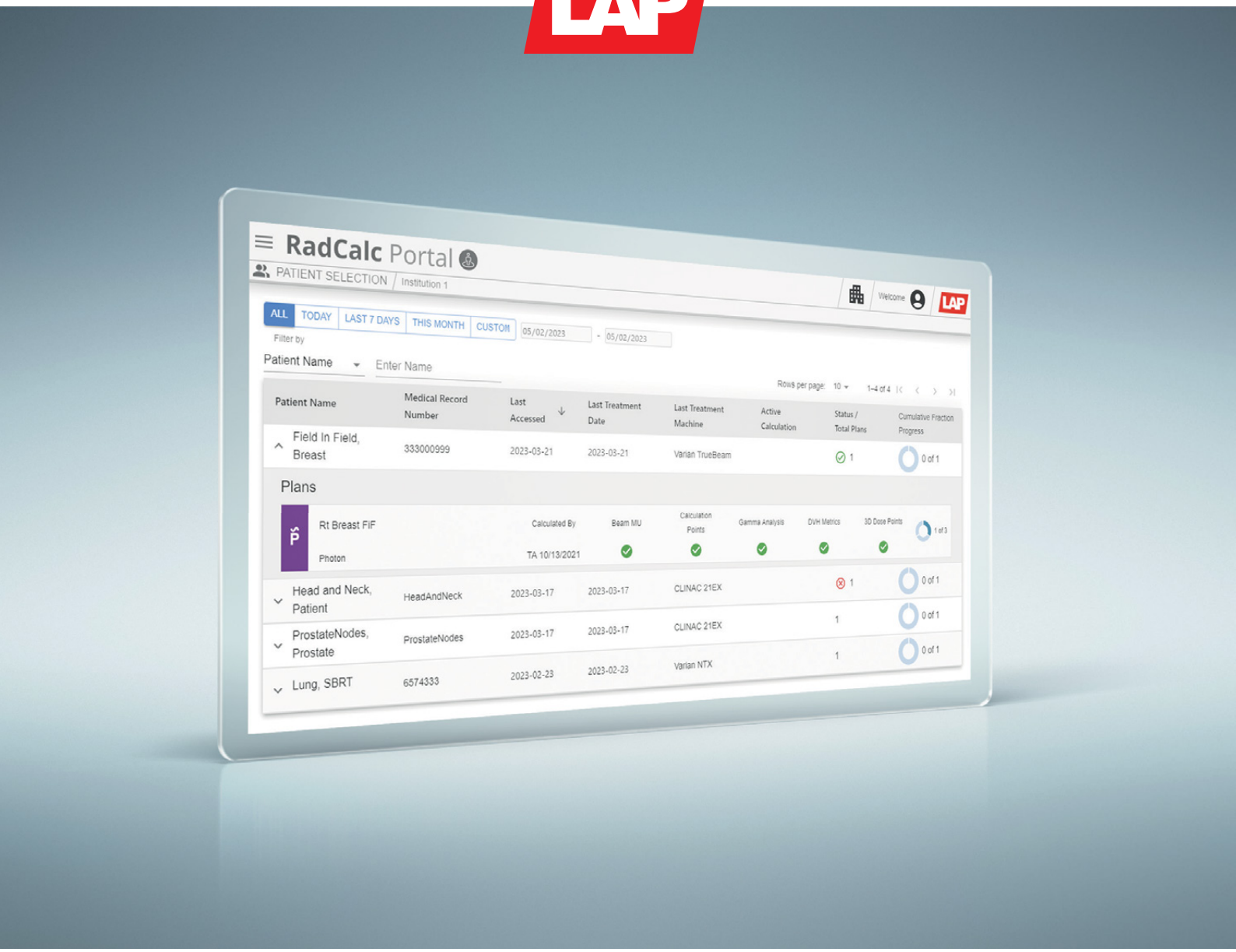

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BSc. in Physics, Medical Physics and Radiation Protection, at the University of Malta.

Kristian Galea, Carmel J. Caruana, Eric Pace

Introduction

On the 21st of November 2023, the first cohort of eleven students who followed the newly introduced Bachelor of Science (Honours) in Physics, Medical Physics and Radiation Protection (hereafter, 'Degree') successfully graduated from the University of Malta. This article, written by one of the graduates, aims to provide an overview of this innovative course.

The group during graduation day on November 21st, 2023

B.Sc Programme

The graduates enrolled for the four-year Degree back in 2019, a year which also marked the Degree's foundation. Coordinated by Professor Carmel J. Caruana, the Degree is an interfaculty programme, i.e. delivered by the Faculty of Science (Department of Physics) and the Faculty of Health Sciences (Department of Medical Physics).

To ensure the necessary physics and mathematics foundations as required by the IAEA [1] and RP174 [2] documents, the Degree includes the same physics study units as are offered to other students following an undergraduate degree in Physics. To complement these topics, applied Physics components specific to Medical Physics and Radiation Protection are included. These aim to provide a broad overview of the three main areas of medical physics: Radiation Oncology, Nuclear Medicine, and Diagnostic & Interventional Radiology. Owing to the growing need of scientific programming and software development, especially for emerging areas such as AI, the Degree provides study units on computational physics, currently taught in the Python programming language.

To ensure the professional competence of the graduates spans from a scientist to a healthcare professional, the Degree includes study units on anatomy, physiology, and pathology, as followed by other healthcare professionals in the Faculty of Health Sciences. It also aims to tackle professional aspects found in the workplace including ethical considerations, legislation and management. Finally, as with all degrees, a final year project on medical physics or radiation protection permits the student the opportunity to investigate a particular topic in more detail.

Clinical Practice

A clinical practical component at the university hospital is included under the supervision of qualified medical physicists and medical physics experts. These are undertaken once weekly in the latter three years of the Degree, where the students alternate between the three main specialities of medical physics. The placements offer a lens into the daily duties of the medical physicist expert and radiation protection expert in which several tasks were observed: including tasks related to patient and staff dosimetry, quality assurance and treatment planning.

Concluding Remarks

The group during a clinical placement session

Challenging but very intriguing, the Degree provides the necessary preparation for the Master's degree in Medical Physics in line with EU and international recommendations. Finally, the undergraduate degree, which undergoes constant scrutiny from clinical medical physicists aims to expand its curricular content into potential future role developments of medical physicists including the ever-expanding field of physiological measurements. The full course programme can be found on the University of Malta page [3].

References

[1] International Atomic Energy Agency. (2021). Guidelines for the Certification of Clinically Qualified Medical Physicists (IAEA Training Course Series No. 71). https://www-pub.iaea.org/MTCD/Publications/PDF/TCS-71web.pdf (see page 3)

[2] European Commission. (2014). European Guidelines on Medical Physics Expert (Radiation Protection No. 174). Publications Office. https://data.europa.eu/doi/10.2833/18393

[3] https://www.um.edu.mt/courses/(insert 'medical physics' in the search box)

Kristian Galea graduated from the University of Malta with a Bachelor of Science (Honours) in Physics, Medical Physics and Radiation Protection. Currently, he is pursuing a Master of Science (Honours) in Medical Physics. He is particularly interested in the field of magnetic resonance imaging and forms part of the University of Malta's Magnetic Resonance Imaging (UMRI) Platform.

Professor and Head of Medical Physics at the University of Malta, **Carmel J Caruana** specialises in diagnostic and interventional radiology, radiation protection and legislative, professional and educational issues. He is past-chairperson of the Education and Training Committee of EFOMP, lead author of the role and education and training chapters of the EU document 'European Guidelines on the Medical Physics Expert', lead author of several EFOMP policy statements and past Associate Editor for Educational and Training and Professional issues for Physica Medica.

Mr. **Eric Pace** is an MPE and RPE in DIR with 10 years of clinical experience and is employed with the University of Malta as an assistant lecturer. He is currently pursuing a PhD on the topic of clinical protocol optimization in CT. His interests are computational applications to medical physics and automation. He is a member of the EFOMP education and training committee.

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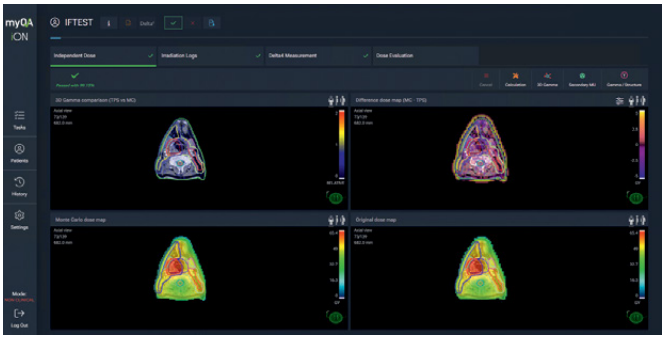

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Upcoming Conferences and Educational Activities

This list was correct at the time of going to press.
For a complete, up-to-date list, please visit our **EVENTS WEB PAGE**

Jul 21st, 2023 - Apr 24th, 2024
Virtual Imaging Trials in Medicine – International Summit
Duke University, Durham, NC

Oct 18th, 2023 - Oct 4th, 2024
6th European Congress on Infectious Diseases
Amsterdam, Netherlands

Oct 26th, 2023 - May 23rd, 2024
Challenges in Reirradiation: From Art to Science
Webinar Series

Apr 3rd, 2024 - Apr 5th, 2024
MRinRT 2024
Rome, Italy

Apr 11th, 2024
17th EURADOS School The importance of dosimetry in innovative medical applications
Examination Schools, Oxford University 75-81
The High Street Oxford, OX1 4BG and online

Apr 12th, 2024
The structure of medical physicist education in the Nordics
Microsoft Teams

Apr 19th, 2024 - Apr 21st, 2024
Royal College of Radiologists 2nd Global Radiology Conference
InterContinental Hotel, Dubai Festival City,
Dubai, United Arab Emirates

Apr 22nd, 2024 - Apr 24th, 2024
Virtual Imaging Trials in Medicine – International Summit
Durham, NC

Apr 25th, 2024
Hybrid Symposium: "Radioresistance?"
online or in Santiago de Chile

Jun 10th, 2024 - Jun 15th, 2024
62nd Annual PTCOG Conference
& 4th PTCOG-AO Meeting
Singapore

Jun 12th, 2024 - Jun 14th, 2024
62ème Journées Scientifiques - SFPM
Dijon, France

Jun 17th, 2024 - Jun 19th, 2024
Flash Workshop 2024: The Role Of Oxygen In Flash Radiation Therapy
Heidelberg, Germany

Sep 11th, 2024 - Sep 14th, 2024
5th European Congress for Medical Physics
Munich, Germany

Oct 7th, 2024 - Oct 11th, 2024
Joint ICTP-IAEA Workshop on Radiation Protection in Image-Guided Radiotherapy (IGRT) | (smr 3972)
Trieste, Italy

Oct 24th, 2024 - Oct 26th, 2024
Quantitative MRI: basic principles, optimization, quality assurance
Milan, Italy

Nov 7th, 2024 - Nov 11th, 2024
Radiation Dosimetry, Imaging for Radiotherapy, Treatment Planning and Patient Specific Dosimetry with workshops
Chelsea, UK

Nov 18th, 2024 - Nov 19th, 2024
Womens Health Conference2024
Dubai

Sep 29th, 2025 - Oct 4th, 2025
IUPESM World Congress on Medical Physics and Biomedical Engineering 2025
Adelaide, South Australia

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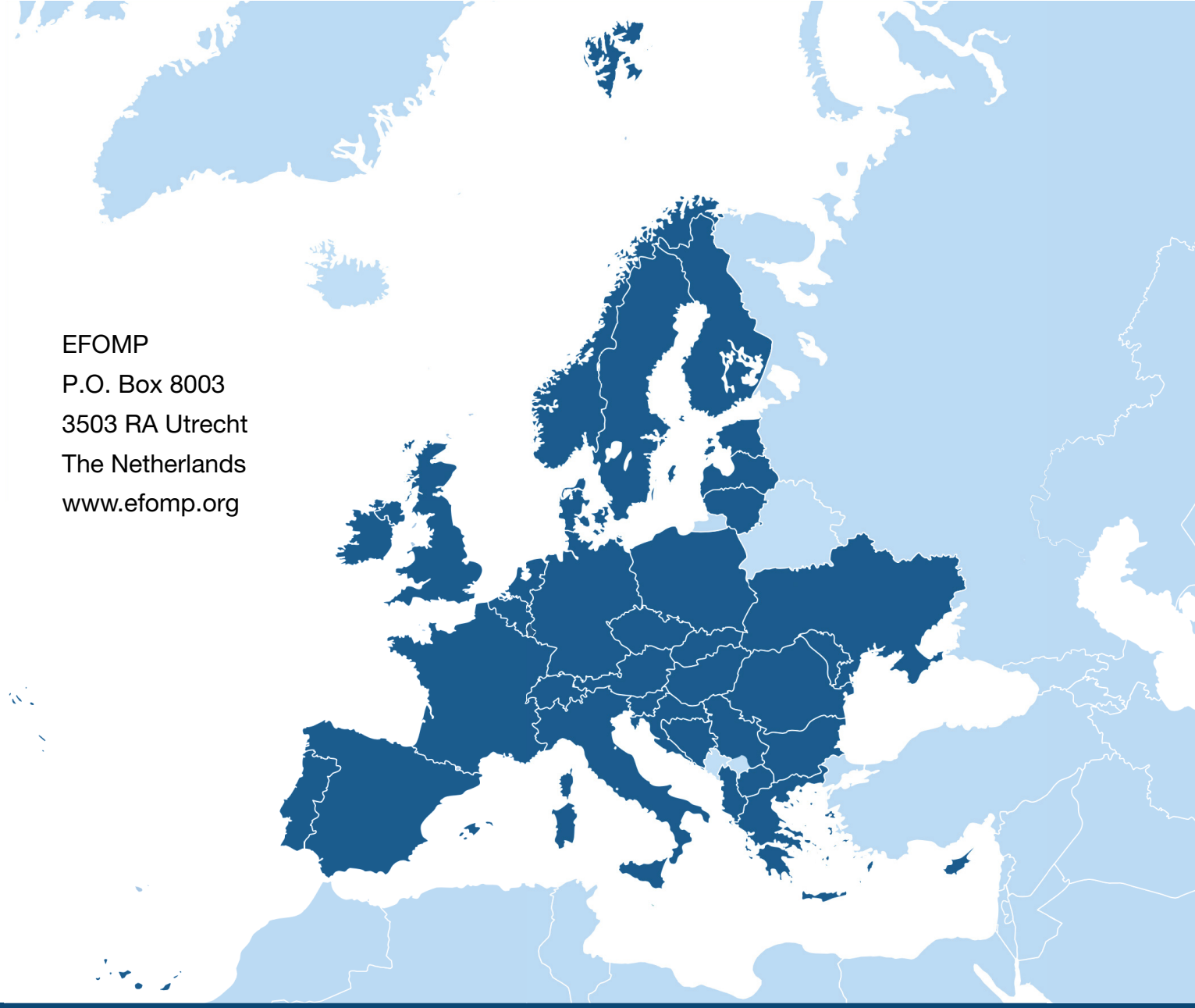

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EFOMP

EUROPEAN FEDERATION OF ORGANIZATIONS FOR MEDICAL PHYSICS

The European Federation of Organisations in Medical Physics (EFOMP) was founded in May 1980 in London to serve as an umbrella organisation for medical physics societies in Europe. The current membership covers 36 national organisations which together represent more than 9000 medical physicists and clinical engineers working in the field of medical physics. The office moved to Utrecht, the Netherlands, in January 2021.

The motto developed and used by EFOMP to underline the important work of medical physics societies in healthcare is “Applying physics to healthcare for the benefit of patients, staff and public”.

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