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EUROPEAN FEDERATION OF ORGANISATIONS FOR MEDICAL PHYSICS
Quarterly Newsletter

European Medical Physics News

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EDITORIAL

Welcome to the Winter 2023 Issue Of European Medical Physics News, The Quarterly Newsletter of EFOMP, by **Mohamed Metwaly**

The winter season is very stunning. It is not hard to understand how this breathtaking natural representation has served as an inspiration for cultural celebrations all through history, what with the chilly mornings, sunny, crisp days, and dusted snow. There are several winter festivities, including Boxing Day, Chinese New Year, Christmas, Diwali, Hanukkah, Kwanzaa, Las Posadas, St. Lucia Day, and Three Kings Day. These foreign winter festivities are fascinating to learn about, regardless of the holiday you celebrate this year!

This issue marks a dramatic shuffling of the EFOMP structure at the top level as per the outcome of the election of the governing committee's officers for the 2024–2026 term of office (EFOMP officers). So from the beginning of January 2024, Efi Koutsouveli (the current General Secretary and Vice President) will hold the presidential position of the EFOMP, while Paddy Gilligan (the current President) will be the Past President. Brenda Byrne (the current Chair of the EFOMP Professional Matters Committee and the Assistant General Secretary) will become the General Secretary of the EFOMP, while Itembu Lannes will become her successor in the Chairmanship of the EFOMP Professional Matters Committee after being its Vice Chair. Oleksandra V. Ivashchenko (currently the vice chair of the committee) will be the chair of the Communications and Publications Committee, succeeding Mohamed Metwaly, who will be the past chair of the committee. Oleksandra V. Ivashchenko will also be the editor-in-chief of this newsletter. Dimitris Visvikis, currently the Vice Chair of the Project Committee, will become its new chair, while the current chair of the committee, Constantinos Koutsojannis, will become the committee's part chair. All the best to everyone in their new position.

The commemoration of the International Day of Medical Physics (IDMP) served as the inspiration for this issue's cover. Every 7th of November (date of birth of Maria Sklodowska Curie), the community of Medical Physicists worldwide celebrates the International Day of Medical Physics, IDMP. "Standing on the shoulders of Giants" is the main theme chosen by IOMP to celebrate the event this year. Several NMOs have shared their celebratory events in this issue: the Italian Association of Medical Physicists (AIFM) organised a meeting that took place in Bergamo on that day; the 16th International Conference and Workshop "Medical Physics in the Baltic States 2023" and International Day of Medical Physics celebration took place in Lithuania; on the occasion also, the Young Committee of the Spanish Society of Medical Physics (SEFM) organised the III Curie Meeting in Madrid; and the Croatian Medical Physics Association (CROMPA) celebrated the International Day of Medical Physics in Zagreb with the 4th CROMPA Symposium, "Medical Physics in Croatia."

Iuliana Toma-Dasu, Editor-in-Chief of Physics Medica, chose three articles for this winter's issue of EMP News from the most recent issue of Physica Medica (EJMP) and the book "The Physics of Radiotherapy X-rays and Electrons," which Maya Shariff and Sarah Stefanowicz reviewed. In addition, Laurynas Gilys presented his PhD thesis titled "Lead-Free Multilayered Polymer Composites for Radiation Shielding in the Range of Medical Diagnostic Energies," which was defended at the Kaunas University of Technology, Faculty of Mathematics and Natural Sciences, Department of Physics, this year.

In addition, our popular Medical Physicist's art and hobby collection includes Professor Jim Malone's article about relatively unknown but exceptional paintings by Alberto Giacometti. They emphasise observation of the unknowable, and Professor Edwin Aird writes an article on honouring and remembering the life, professional contributions, influence, and lasting effects of Professor Jack Fowler.

This issue contains a major meeting announcement (ECMP2024): Katia Parodi and Yolanda Prezado announce the 5th European Congress of Medical Physics (ECMP2024) that will integrate for the first time the Joint Conference of the German (DGMP), Austrian (ÖGMP) and Swiss (SGSMP) Medical Physics Societies. The meeting includes an interesting AI Track that was announced by Oliver Díaz and Gerd Heilemann.

There is also a major training course announcement for early next year: the European School for Medical Physics Experts (ESMPE) announces the Uncertainty Analysis and Statistical Methods in Medical Physics course that will take place from 8th to 10th February 2024.

Meeting reports are also presented in this issue, including Pablo Mínguez Gabiña report on Symposium on Molecular Radiotherapy Dosimetry: The Future of Theragnostics, November 9th -11th 2023, Athens, Greece; Prof. Dr Markus Buchgeister provides feedback on the 54th Annual Conference of the German Society for Medical Physics, September 27–30, 2023; Stevan Vrbaški reported on the 11th Alpe Adria Medical Physics Meeting, 19–22 October 2023, Novi Sad, Serbia; and Áine Matthews provided an overview of the 7th European Radiation Protection Week (ERPW) on October 9th–13th 2023 that was hosted by the University College Dublin, Ireland.

In terms of medical physics education organisations and professional matters, Prague, Czech Republic; Marco Esposito reports on the 60th anniversary and the first decade of the Master of Advanced Studies in Medical Physics at the Abdus Salam International Centre for Theoretical Physics; and Carmel J. Caruana provides a historical overview of the development of the Qualifications Framework for Medical Physics in Europe.

In this release, there are also some updates regarding the special interest and other working group activities by Pablo Mínguez Gabiña report on the Special Interest Group for Radionuclide Internally Arranged Dosimetry (SIGRID) Symposium in Athens on November 2023, as well as a new working group introduction, "Volumetric Modulated Arc Therapy—Breast" by Tuomas Koivumäki.

A compilation of recent articles authored by members of the EFOMP company is also provided for your perusal. It is guaranteed that reading about the businesses they manage and the products and services that they offer will be both enlightening and enjoyable. I hope you enjoy whichever article you decide to peruse in this issue of European Medical Physics News. This occurs frequently within the journal.

Finally, as this editorial article marks the end of my tenure as chair of the Communication and Publication Committee, I'd like to end on a high note by wishing my colleague Oleksandra V. Ivashchenko the best of luck as she takes over the chairmanship in January 2024, the same year in which I will be serving as past chair.

Mohamed Metwaly, PhD, is a lead consultant clinical scientist and registered medical physics expert (MPE) in the RPA2000 record (UK). He is the head of the Dosimetry and Imaging Quality Assurance Service (radiotherapy physics) at the United Lincolnshire Hospitals NHS Trust. He is the editor-in-chief of the Institute of Physics and Engineering in Medicine [IPEM] Report Series and the IPEM Rep to EFOMP. Since 2018, he has been an MPE reviewer at the Health Research Authority (HRA), which reviews and approves ionisation radiation exposure for research and clinical trials. He joined the UK Accreditation Service's (UKAS) technical evaluation team for BS70000 in 2018.

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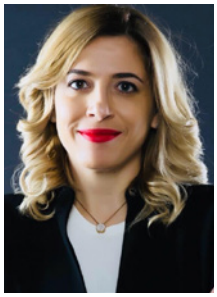

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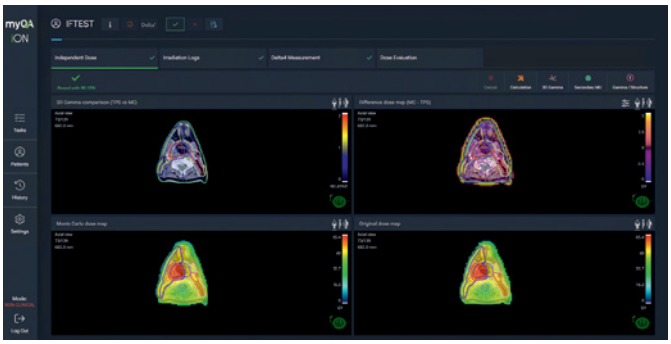

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ECMP
EUROPEAN CONGRESS OF MEDICAL PHYSICS

European Congress of Medical Physics

Munich, Germany
11–14 September 2024

Save the Date

EFOMP
EUROPEAN FEDERATION OF ORGANISATIONS FOR MEDICAL PHYSICS

In association with the Trination Conference

DGMP

OGMP
Österreichische Gesellschaft für Medizinische Physik

SGSMP
SSRPM
SSRFM

www.ecmp2024.org

(outgoing) President's Message

Greek Roman wedding ring with Omonoia

Medical Physics friends

In Celtic traditions the end of November marks the beginning of the Celtic new year and a period of renewal. I have the pleasure of writing my final EMP news article as president of EFOMP. It is a chance to look back at the last three years with honour and gratitude to represent this wonderful federation. When I took over as president from Marco Brambilla in January 2021, the covid pandemic was still raging with a promise of the vaccine in sight but not yet delivered. In summer of that year, we delivered our first online European congress of medical physics in a virtual Torino. Our first meeting together as an EFOMP executive was in Utrecht where we moved our office in 2021 to facilitate access to European Union research funds post Brexit . Our first return to a hybrid council and officers meeting was held in Kaunas in Lithuania in November 2021 in association with the regional Baltic conference and a Eurados/ESMPE school on dose monitoring.

In February 2022, the Russian invasion of Ukraine escalated. This war grinds on .EFOMP continually looks for ways to support our Ukrainian NMO (UAMP) and has some good initiatives developing in association with ESTRO, which will hopefully be expanded to other disciplines in medical physics. Our hearts and thoughts go out to all patients, medical physicists, and healthcare workers in war-torn regions and we urge the international community to do everything possible to support and protect them.

Despite the headwinds of war and covid, our federation has continued to grow. A highlight of my presidency was the first face to face ECMP in Dublin August 2022 hosted with my local NMO, the IAPM. It showed how we had grown as a federation and the resilience of a volunteer's federation. The special innovative features of the congress were particularly exciting such as the early careers special section and the DIY fair, a green session and meet the SIG. The SIGS have been a special development within EFOMP. The radionuclide dosimetry group had been particularly productive culminating in an excellent workshop in Athens in November 2023. This event was held in an area in Athens called Omonia which is the Greek for harmony. Harmonization is a current theme for EFOMP and will be a core principle of the next presidency, particularly as EFOMP moves toward a common training platform. We know from MR physics that coherence sustains signal strength above noise. This is very important for the voice of the medical physics community is heard. This will be true for desired implementation of policy statement 19 which represented EFOMP views at the Simplerad workshop in Brussels where I am writing this article . It also shows the value of our participation now as a full stakeholder in European Projects.

EFOMP also has initiated special interest groups in Dental imaging , particle therapy, medical physics topics that do not have a home in any other organisation.

The early careers SIG, founded under the EU and international matters committee will write the future for their own working lives. It is important that we hand over a federation and a vision for medical physics that will benefit them rather adversely affect them. This also anticipates the sustainability pillar of the next presidency. Part of sustainability is education. Electronic learning reduces access to education across a broad geographic area with differing economic realities. EFOMP are pleased to have signed a contract for the new educational platform with Spanish company C-events. The updating of the core curriculum has been a very successful journey for radiotherapy. This will be followed by the nuclear medicine syllabus next summer. Discussions with the European Society of Radiology have begun in relation to the diagnostic radiology which should be quicker to update now a strong structure based on a common syllabus underpinning the subspeciality training. The syllabus will ultimately form a basis for the common training platform. This is key to the project of mutual recognition of medical physicists in the European region as well as defining what it means to be a medical physics. Some of this is outlined in our many policy statements form our hard-working working groups and the recent updated Malaga declaration. However, in any process harmonisation will remove some bumps we need to gain coherence and have full clarity on what we want before progressing discussions with commission. For this reason, we will be looking at the elements described in RP 174 and filling gaps and adding clarification where these are felt to be needed.

I do not have enough print space or word count to reflect on the significant work done by EFOMP volunteers during my presidency. I do not have enough a word count

to list all of the wonderful medical physicists I have met on our journey through the “four corners of EFOMP”. I have been humbled and honoured to be president such a federation. also want thank and acknowledge my wife, Darina and family, Aengus, Roisin, Cormac and Oscar, colleagues, employers and friends who have supported me over the last three years. Without these supports EFOMP volunteers could not operate at the level we do.

I have been asked should EFOMP move to an association model with a stronger secretariat similar to the clinical societies. I think the federation volunteer model works well with a relatively small profession living under such different economic, regulatory and health infrastructures. However, that may always not be the case as we are growing in numbers and identity. EFOMP would like to see greater alignment and Omonia where there are more than one medical physics organisations exist in one state. EFOMP has been blessed with gifts of our volunteers, chairs and members of our committees’ schools, WG, and our sister clinical societies.

It is with great anticipation I hand over to the next president Athens based female radiotherapy physicist Efi Koutsouveli. If any of you know Efi, you will know her absolute 24/7 commitment and tireless dedication to the vision of EFOMP to communicate, integrate and educate. She will be backed up by a most able governing committee and board which includes many familiar faces and a strong history in EFOMP. The recent six nominations for science committee chair shows the strength of interest in EFOMP activities. Although I attended my first EFOMP school in 1991, I was a relative newcomer to the EFOMP governance structures. The experience has been most positive, and I am reminded of the WB Yeats quote“ there are no strangers here only friends who haven’t met”, so please continue to volunteer for committees, contribute to your local NMO.

In this festive season in Europe, I want to wish you, your families and friends a happy and peaceful Christmas. Happy new year and all the best for 2024.

Go Raibh Mhaith Agaibh go Leir. (Thank you All)

Paddy Gilligan, President of EFOMP

Assoc. Prof. Paddy Gilligan, President of EFOMP.
Assoc. Prof Paddy Gilligan, chief physicist at the Mater Misericordiae University Hospital , Dublin Ireland has over 30 years experience as a medical physics and radiation protection expert . He served on the board of the Irish radiation protection regulator between 2007 and 2014.He is co chair of the faculty of radiology in Ireland radiation safety committee. He was a former member of the Eurosafe imaging steering committee and the chair of the European congress of radiology 2019 physics committee. He is a board member and secretary of the Euramed consortium. He is current president of EFOMP for the years 2021-23

ESMPE European School for Medical Physics Experts

Uncertainty analyses and Statistical methods in Medical Physics

8th-10th February 2024, Prague, Czech Republic

EFOMP in collaboration with the Czech Association of Medical Physics (CAMP) would like to invite you to the next ESMPE on **8th-10th February 2024**.

The school will be aimed at advanced tasks connected with the use of uncertainty analyses and statistical methods in data handling and interpretation. The school will cover the methods of inferential statistics most frequently used in the medical field in the first day, and the treatment of errors an uncertainties in medical imaging, radiation dosimetry, radiomics and epidemiology in the following days. The focus will be on worked examples

This two-and-half day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) and is intended for practicing clinical Medical Physicists who are involved in data management and research . There will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

Please note: All times shown are in CET

Content

Sample Size determination. Sample size determination for different study designs
Evaluation of a diagnostic test – Sensitivity, specificity, diagnostic accuracy, ROC methods
Applied regression analysis. Analysis of variance, Analysis of Covariance, multiple regression, logistic regression
Survival analysis – Relative risks Odds ratio. Survival curves with Kaplan Meyer; Log-rank test; Cox models
Reproducibility and repeatability in radiomics.
Errors an uncertainties in radiation dosimetry – Theory of error and uncertainty analysis: Type A and B uncertainty, assessment of the quality of a measurement or calculation.
Agreement in Radiotherapy – How to assess agreement in Dose distributions and Volumes

Final exam

The final exam is voluntary. Participants can gain additional credits when successfully pass the test.

Organisers

Brendan McClean (Chair of the School)
Marco Brambilla (Scientific Chair)

Faculty

Jonas Andersson	Umeå University Hospital, Sweden
Anna Bäck	Sahlgrenska University Hospital and University of Gothenburg, Sweden
Marco Brambilla	University Hospital, Novara, Italy
Pierre Henri Conze	IMT Atlantique, LaTIM, Inserm, France
Brendan Mc Clean	Saint Lukes Radiation Oncology Network, Dublin, Ireland
Osvaldo Rampado	Citta della Salute e della Scienza, Torino, Italy
Peter Sharp	University of Aberdeen, Scotland, UK
Jenia Vassileva	National Center of Radiobiology and Radiation Protection, Sofia, Bulgaria.

Thursday 8th February 2024				
	Session	**Title**	**Description**	**Lecturer**
8:00-9:00	*Registration*			
9:00-9:15	Introduction	Setting the scene	Presentation of the ESMPE and introduction to the course	Brendan McClean
9.15-10.00	Diagnostic tests	Agreement and reproducibility	How to assess the agreement between two methods of clinical measurement How to assess the reproducibility of different observers	Marco Brambilla
10:00-10.30	*Coffee break*			
10:30-11:15	Diagnostic tests	Evaluation of a diagnostic test. I: Theory	Sensitivity, specificity, diagnostic accuracy, ROC, FROC, AFROC	Osvaldo Rampado
11.15-12.00		Evaluation of a diagnostic test. I: Worked examples	The practical session will focus on how to lead ROC analyses	Osvaldo Rampado
12:00-12:30			Question & Answer discussion on the morning lectures	All Faculty
12:30-14:00	*Lunch break*			
14.00-14.45	Applied Regression Analysis	ANOVA, ANCOVA. Worked Examples	Design of the experiment. One-Way ANOVA; Multiple-way ANOVA (Main effects; Factorial; Repeated Measures). Analysis of Variance Tables. The practical session will focus on how to interpret the results of ANOVA/ANCOVA studies lead in the field of medical physics	Marco Brambilla
14.45-15.30		Multiple linear regression. Worked examples	Selecting the best regression equation; Strategy for selecting variables; Reliability with split samples. Coefficient of determination, Standardized regression coefficients. The practical session will focus how on how to lead and interpret multiple regression studies in the field of medical physics.	Osvaldo Rampado
15:30-15:50	*Coffee break*			
15:50-16:20	Survival Analysis	Survival Analysis. I. Theory	Relative Risks. Odds ratio. Survival curves with Kaplan Meyer; Log-rank Test; Cox Models	Peter Sharp
16:20-17:00		Survival Analysis. II. Worked examples	The practical session will focus how on to build and interpret survival curves	Peter Sharp
17.00-17.30			Question & Answer discussion on the afternoon lectures	All Faculty
20:00-23:00	Social dinner - participants + lecturers			

ESMPE

Friday 9th February 2024				
	Session	**Title**	**Description**	**Lecturer**
09:00-09:45	Introduction	Uncertainty analysis in Medical Physics	On the need to understand and communicate uncertainty in academia as well as healthcare.	Jonas Andersson
09:45-10:30	Uncertainty in surveys	Biases and errors in surveys	A guide to the development and use of health scales, questionnaires and surveys	Marco Brambilla
10:30-11.00	*Coffee break*			
11:00 – 11:45	Uncertainty in Radiation Protection	Stochastic effects and radiation detriment: uncertainty analyses	Uncertainties in effective dose assessment. Uncertainties in the derivation of risk. Sensitivity analysis	Jenia Vassileva
11:45-12:15	Uncertainty in Radiomics	I - Workflow and feature categories.	Definition and rationals. Radiomics workflow. Histogram-based, textural and higher order statistical features.	Pierre Henri Conze
12:30-14:00	*Lunch break*			
14:00-14:30			Question & Answer discussion on the morning lectures	All Faculty
14:30-15:30	Uncertainty in Radiomics	II - Properties of an ideal radiomics feature. Methodology for evaluation.	Radiomics standardization. Multi-centric harmonization (image, feature domains). Deep radiomics. Explainability and interpretability.	Pierre Henri Conze
15:30-16:00	*Coffee break*			
16:00-16:45	Uncertainty in medical image segmentation	Tackling uncertainty in deep medical image segmentation	Problem formulation. Convolutional encoder-decoders. Epistemic and aleatoric uncertainty. Monte-Carlo dropout. Test-time augmentation.	Pierre Henri Conze
16:45-17:30	Agreement in Radiotherapy	Comparing doses	Comparing measured and calculated dose distributions: distance to agreement, dose difference and gamma evaluation	Brendan McClean
17.30-18:00			Question & Answer discussion on the afternoon lectures	All Faculty

Saturday 10th February 2024				
	Session	**Title**	**Description**	**Lecturer**
09:00-9.45	Errors and Uncertainty analysis in Radiation Dosimetry	Treatment of uncertainties in Radiation Dosimetry. I: Theory	The lecture will go through theory of error and uncertainty analysis: Type A and B uncertainty, Standard deviation of the mean, probability density functions	Brendan McClean
09:45-10:30		Treatment of uncertainties in Radiation Dosimetry. II: worked examples	The practical session will focus on the assessment of the quality of a measurement or calculation; the quantitative comparison of results from different investigators; the critical analysis of measurement or calculation method	Brendan McClean
10:30-10:50	*Coffee break*			
10.50-11.30	Absorbed dose uncertainty in radiotherapy	Sources of absorbed dose uncertainties in radiotherapy and the importance of minimizing them	Sources of absorbed dose uncertainty in radiotherapy and how this uncertainty affects clinical trials and can impact the knowledge which future treatments are based on.	Anna Bäck
11.30-12.15		Methods to assess absorbed dose uncertainties in radiotherapy clinical practice	Methods to assess dosimetric uncertainties in radiotherapy, such as measurements, complexity metrics, robustness analyses, etc.	Anna Bäck
12.15-12.45			Question and Answer discussion on the afternoon lectures	All Faculty
130.0-14:00	*Final examination (optional ; for those seeking a higher number of CPDs beyond attendance)*			

ESMPE

Course language	English
Level	Medical Physics Expert
Registration fee* (2 main meals, 5 coffee breaks, 1 social dinner)	300 € 350 € (from 10th January 2024)
Reduced registration fee* subsidized by EFOMP first-come, first-served policy	150 € - for the first 30 participants (max. 2 from one country) coming from the following European countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, Greece, Hungary , Latvia, Lithuania, Moldova , North Macedonia, Poland, Portugal, Romania, Serbia, Slovak Republic, Slovenia, Ukraine.
Maximum number of onsite/online participants	60/90
Duration	8th-10th February 2024
Study load	15 hours of lectures and demonstrations
Venue	Department of Dosimetry and Application of Ionizing Radiation, Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague, Břehová 7, 115 19 Prague 1, CZECH REPUBLIC
GPS coordinates	50°5'27.737"N, 14°24'58.713"E
Accommodation	Individual
Information, programme at:	www.efomp.org
Registration	Electronic registration via EFOMP website
Registration period	1st September 2023 – 14th January 2024 (31st January 2024 for online participation only)

* payment must be done in 7 days following the pre-registration, otherwise pre-registration will be cancelled and neither free place nor subsidized or ordinary fee can be granted for repeated registration

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ČSFM CZECH ASSOCIATION OF MEDICAL PHYSICISTS

EFOMP COMPANY MEMBER ARTICLE

Towards CyberKnife® Beam Standardization

ACCURAY

Accuray Inc. has established a new way of beam twinning and a flexible hybrid beam model for accelerated treatment planning system commissioning.

Accuray Incorporated has established a new way of beam twinning and a flexible hybrid beam model for accelerated treatment planning system (TPS) commissioning. Preliminary results were presented earlier this year at the American Association of Physics in Medicine (AAPM) Annual Meeting in Houston.

Knife® M6™ and S7™ models include three independent collimation systems: 12 fixed cones with diameters 5-60 mm; Iris™ Variable Aperture Collimator with similar diameters; multi-leaf collimator (MLC) with 26 leaf pairs and 11 commissioning field sizes. Despite one 6 MV energy, more than 35 fields must be measured for the TPS. The beam data must be of high quality and resolution. For example, dose profiles are scanned in steps of 0.2-0.5 mm and the tissue-to-phantom ratio (TPR) is directly measured for energy characterization instead of the percent depth dose (PDD).

An accelerated commissioning method was recently tested, including a method to interface CyberKnife Systems to a standardized beam model. It is intended to significantly reduce beam data collection time and commissioning time for the site physicist when initially installing the system and recommissioning after a major maintenance event.

Beam twinning is carried out in the factory in two stages: initially with a liquid-filled 2D array with real-time feedback, then in a 3D water tank with 0.07 cc ion chamber for 60 mm cone (0-300 mm PDD, profiles at 50 mm) and the primary beam (profiles at 50 mm). Gamma matching to the twinning reference is 1mm/1% locally for PDD and 1mm/0.7% globally for profiles.

To develop the beam data model, 12 systems were merged and then fully commissioned using PTW microDiamond with unique collimator sets measuring 35 field sizes (FS) 5-115mm for TPR, profiles at 15, 100 and 300mm depth, output factors (BY). These data were analyzed to develop a generalized bundle data model and each data set was evaluated against the model using strict and relaxed matching criteria.

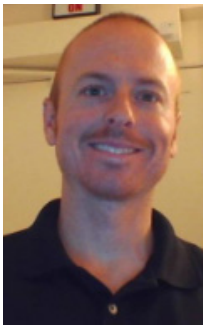
Comparing each of the 12 systems to the model, OF showed deviations: FS 12.5+ mm 0.4%/0.5% (RMSE/max), two smallest FS (5, 7.5 mm) 5% max. For TPR, gamma 1 mm/1% locally in a depth of 0-200 mm, and 1.5% locally in 200-300 mm exceeded 95%. For profiles, the following ranges passed 95%: for cones and iris, 0.3/0.6 mm (small/large FS), 0.5%, 0.7%, 1.5% overall (15, 100, 300 mm depth); for MLC, DTA 0.3-1 mm (from small to large FS), 1%, 1%, 1.5% overall (same depth). This strict control of beam characteristics provides a way to accelerate commissioning, rather than an extensive measurement campaign, and a beam data model is adopted into the TPS. To limit the risk of deviation from the model, a scheme of random checks of bundle data was also developed.

The CyberKnife system is primarily used for hypofractionated SRS/SBRT treatments. Thus, it was essential to study the effect of the bundle data model on these types of highly accurate clinical plans. We evaluated 26 cone/iris and 22 MLC plans with different target sizes, number of targets, shallow and deep-seated, both intra- and extracranial locations. While the plan solutions remained intact, these plans were recalculated using the model in the Accuray Precision® Treatment Planning System and compared to independently deployed beam data sets (several of these 12 linked systems). The comparison showed that the plans using small beams are the most sensitive to system-to-system variations. This finding suggested a hybrid beam model approach for commissioning, where the three smallest beams (5, 7.5 and 10 mm for cones/iris and 7.7, 15, 23 mm for MLC) are measured directly, and all larger beams are adopted from the model. Plans with such a hybrid beam data model showed < 1% PTV Dmean effect, and 90% passed 2D and 3D gamma 0.9mm/0.9% global with 50% Dmax cutoff.

The beam model provides strict beam control deemed to be acceptable for SRS/SBRT. Measuring the full dataset for the three smallest beams and spot-checking the others against the model reduces commissioning time by approximately 40%.

Acknowledgement: Authors would like to thank San Raffaele Hospital, Italy, and the Institute Gustave-Roussy, France where a portion of the study was piloted.

Valery Taranenko is an R&D Physicist at Accuray Incorporated, with extensive expertise in CyberKnife® physics, culminating in a senior support role, contributing to the commissioning of over 50 clinical sites. His career began in academic research focused on radiation transport before transitioning to medical physics over 15 years ago. Valery holds a PhD in applied physics and gained valuable postdoctoral experience during his tenure at UCSF and MGH.



John M. Noll (Matt) is a Senior Manager of R&D Physics at Accuray Incorporated and has over 12 years of experience with the company where he has focused on the CyberKnife System. Matt is involved with the AAPM TG-135, is a member of IEC 62C US TAG, and holds Physics and Applied Physics degrees from Penn State and Stanford University respectively.

EFOMP Secretary General's report (2021-2023)

In this article, **Efi Koutsouveli**, the EFOMP's Secretary General & Vice President, provides the last report as Secretary General before taking on the President role

Looking back into my 3 years term as Secretary General of EFOMP, the last one also having the role of Vice President, I witnessed a Federation growing year by year despite the challenges that we had to face. These uncertainties affected the normal operation of our National Member Organisations (NMOs) and consequently EFOMP's as well as our daily work within the hospitals, universities, industry, regulatory authorities.

Our first challenge was the move of our administration office from York, UK to Utrecht, NL due to the Brexit. The primary goal of the executive committee (President, Vice President, Secretary General and Treasurer) was to coordinate effectively the logistics, transport of physical documents, opening of bank accounts, officers' registry in NL, financial issues, EU projects, use of new management softwares and ensure a smooth transition with minimal disruption to the organization's operations. Some services are already running by the NL office-Cantrijn. For the year ahead, we have as a plan to define processes and standard operating procedures to assist EFOMP's supporting bodies and these will be followed by our NL office by prioritizing tasks based on urgency and importance.

The second challenge has been the pandemic. I was part of the teams that took initiatives and converted our onsite scientific events (Schools and Congress) to fully online events and organized a series of educational webinars. We created a COVID19 discussion forum on our website based on evolving needs to sustain the field of Medical Physics especially during the pandemic crisis and keep our community connected.

The third challenge was the war in the heart of Europe, that affected the healthcare infrastructure, scientific research and education, medical physics workforce. Together with affiliated societies, we initiated supporting programmes on education and training for the medical physics community.

My role as Secretary General included various tasks: daily administration of the Federation, internal communication with officers, committee members, Working Groups (WGs) and Special Interest Groups (SIGs), the EFOMP School for Medical Physics Experts (ESMPE) and the EFOMP Examinations Board (EEB). Regular communication and organisation of leadership meetings with the National Member Organisations, European and International Stakeholders as well as with EFOMP representatives in various committees, events, projects. Preparation of calls, set up electronic ballots and collect replies. Organisation and management of the biannual in person Officers meetings and the Annual Council including agenda setting and documentation. During this term, we have been honored to be hosted by the Finnish Association Medical Physics Meeting, the Conference of Medical Physics in the Baltic States, the Nordic Association of Clinical Physics Symposium and the Alpe Adria Medical Physics Meeting (Fig. 1). The 2022 Annual Council was organized in Dublin in conjuction with the European Congress of Medical Physics. For the year ahead, we have a plan to organize regular online teleconferences with Committee and SIGs chairs for better coordination of the increased activities and dissemination of the enormous volume of committees' actions.

Fig. 1 Annual Council 2023 in Novi Sad, Serbia in conjuction with the 11th Alpe Adria Medical Physics meeting

I had the privilege to be invited to represent EFOMP in several Medical Physics Conferences and Symposia in

Europe, engage with the national medical physics societies to address their needs and exchange opinions on professional development and training initiatives.

In 2021, we designed new EFOMP logotypes and brand identities. Information about colour code, limitations about the usage of logotype, guidelines, fonts and some examples of logos applied in various applications such as posters, advertisements, banners and for EFOMP supporting bodies were added in the brand manual.

Our bigger successes during this period have been the EFOMP's Special liaison status with the International Commission on Radiological Protection (ICRP) for a joint long term investment in radiation protection research and education around the world and the affiliation with the European Cancer Organisation (ECO) for working together with other professionals for a high quality cancer patient care.

The 'Symposium on Molecular Radiotherapy Dosimetry: The future of Theragnostics' was the major achievement of the 1st EFOMP SIG on Radionuclide Dosimetry group (SIGFRID), a three days event which gathered 180 healthcare professionals who shared experiences on dosimetry. It was also the first time Paddy Gilligan and myself had the chance to meet in person with the SIG Steering committee and discussed the future of this vivid, pioneering, leading community of Medical Physicists who participated in projects and working groups, produced publications, webinars and Policy Statement 19 on dosimetry in nuclear medicine over a relatively brief period. This SIG will serve as an operating model for all other SIGs (Fig. 2).

Figure 2. EFOMP President and Vice President with SIGFRID steering committee (left to right) in Athens, Greece: Ana Denis Bacelar, Gerhard Glatting, Glenn Flux, Pablo Minguez Gabiña, Manuel Bardiès, Steffie Peters, Caroline Stokke, Carlo Chiesa.

Another responsibility associated with the Secretary General position was to be part of the European Congress of Medical Physics bid committee. During the latest evaluation, the bid process was reconfigured by setting up decision criteria for awarding the congress and introducing an independent observer role to ensure transparency and accountability.

Part of the Secretary General role is to contribute to the development and implementation of the organization's strategic plan. Together with President Paddy Gilligan, Treasurer Jaroslav Ptáček and Officers, we set goals, defined priorities, and worked towards the advancement of medical physics. I am very grateful to Paddy Gilligan and Marco Brambilla, immediate Past President, who during these past 3 years helped me to grow my leadership skills and trained me to become the next EFOMP President. I am delighted to handle the duties of the Secretary General to Brenda Byrne, a competent and qualified person to effectively manage administrative and strategic functions of the Federation.

The Strategic Agenda and Sustainability Roadmap for the period 2024-2026 will be published in our European Journal of Medical Physics in January.

Thanks to all those who assist EFOMP community in achieving our common mission and shared goals.

NMOs Presidents and delegates can nominate colleagues interested to join EFOMP committees by sending a nomination email to: secretary@efomp.org

Efi Koutsouveli works as a Medical Physics, Radiation Protection Expert and Laser Safety Officer in the Medical Physics department of Hygeia Hospital, Athens, Greece. 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 Secretary General & Vice President. In 2019, she received the IOMP-IDMP award for promoting medical physics to a larger audience. Email: secretary@efomp.org

EFOMP COMPANY MEMBER ARTICLE

How Dose by Qaelum Tackles the Goals of Patient Exposure Analysis of the New IAEA Safety Report Series No. 112

DOSE by Qaelum is a dose management solution that contains all the necessary tools to monitor patient radiation dose, image quality, and department performance across patients, modalities, facilities, and vendors

The recently published report from the International Atomic Energy Agency [1] provides a comprehensive description of dose management systems, including the rationale for monitoring patient radiation exposure, the required data and its collection, the relevant analysis, as well as its implementation. DOSE by Qaelum is a dose management solution that contains all the necessary tools to monitor patient radiation dose, image quality, and department performance across patients, modalities, facilities and vendors.

It is widely known that optimization in medical radiation exposure must account for both radiation dose and image quality following the ALARA principle [2]. The IAEA report provides recommendations on assessing the collected data to track the relationship between the size of the patient, exposure, and quality of the image. Ensuring a 20% confidence interval at a 95% confidence level requires study cohorts of 20-30 procedures within a sufficiently narrow category of e.g. clinical indication, patient size, scanner etc. Cohort trends in DLP and CTDI with respect to patient size (e.g. weight, water equivalent diameter) and image quality as visualized in DOSE can be seen in Figures 1 and 2.

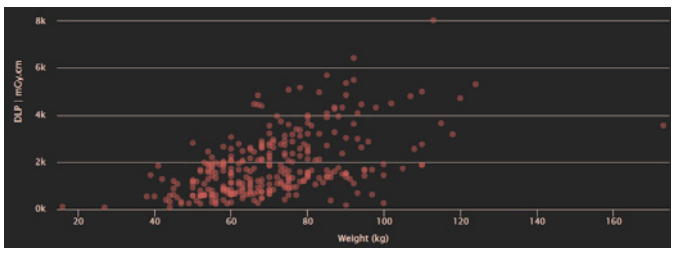


Figure 1. DLP as a function of patient weight for the same scanner. Outliers can be easily spotted and investigated to determine deviations in exposure parameters and technique.

Automated image quality analysis is performed using the Global Noise Level metric [3,4]. Noise is presented as the standard deviation in Hounsfield units per tissue type on a three-dimensional chart (Figure 2) as a function of patient size (e.g. water equivalent diameter) and dose (e.g. CTDIvol), and linked to the convolution kernel reconstruction. DLP can also be visualized as a function of patient height, and chart data can be filtered by patient age and weight groups, as specified in Table 3 of the IAEA report.

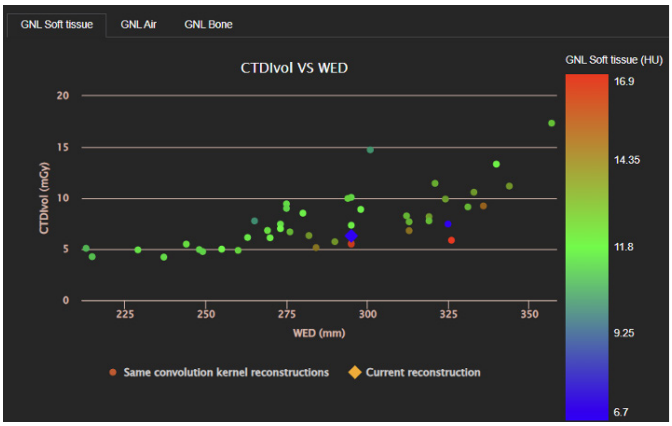


Figure 2. Automated image noise for soft tissue evaluated on a three-dimensional chart as a function of patient water equivalent diameter and CTDI.

Four specific goals of patient radiation exposure data analysis are outlined in the report and summarized below, including some examples of their implementation in DOSE.

Goal 1: Optimization and consistency of imaging practices across and within devices, facilities, and operators. More specifically, the monitoring of:

- Dose data trends over time
  - Trends in dose data as a function of the time of day to identify and target any differences between shifts
  - Trends in dose data and number of exams to assess optimization efforts, changes in exam frequency, and collective dose to a population in terms of typical values (Figure 3)
  - Changes in imaging protocols and assessment of dose reduction in newly purchased equipment (Figure 4)

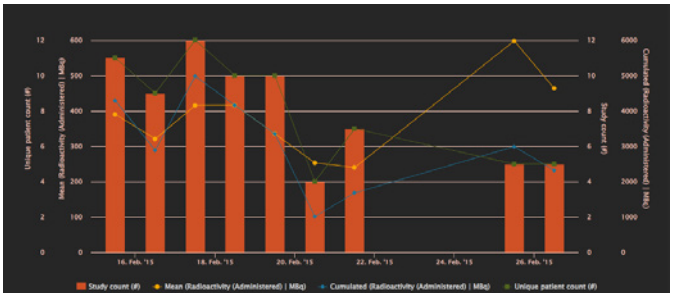


Figure 3. Daily trend of the number of studies, mean and cumulated administered radioactivity (MBq), and unique patient count for a nuclear medicine hotlab management system. The parameter can be changed to e.g. effective dose to evaluate collective population dose.

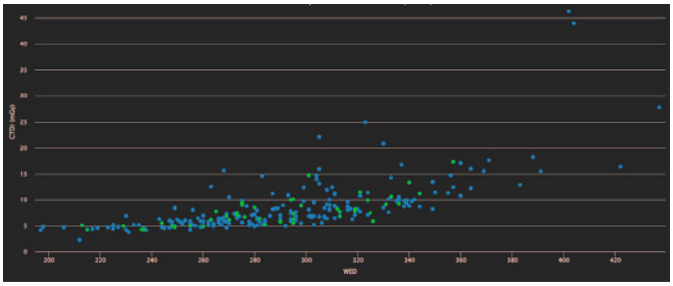


Figure 4. CTDI as a function of patient size and attenuation (in terms of the water equivalent diameter) for two scanners. The scanner plotted in blue clearly contains more outliers and a more dispersed distribution, indicating more potential for optimization.

  - Examinations performed most frequently and examinations with the highest contribution to patient radiation exposure for better optimization targeting
  - Variability in protocols including acquisition parameters, patient positioning and attributes, deviations from typical values
  - Adequate image quality for diagnosis

Charts can be created for individual and multiple devices at the same time, as well as across facilities, that can be further filtered by multiple parameters including date range, operator, protocol name, patient age and size, and many others. Moreover, DOSE offers the ability to customize exam groupings to facilitate the transition from protocols on the basis of anatomical region only to protocols that take into account clinical indications, as well as the monitoring of typical values and local, regional, and national diagnostic reference levels as described in table 5 of the report.

Goal 2: Safe and precise individual patient imaging, utilizing:

- Dose alerts for threshold and trigger level exceedances for deterministic effects in individual patient cases, configurable in DOSE for customizable combinations of parameters, time intervals and reference values
- Data outliers per protocol and patient size in the 5th and 95th percentiles to investigate potential reasons for under- and over-exposure
- Close exposure monitoring and organ dose estimates for pregnant and pediatric patients
- Flagging functionality for unintended exposures such as duplicated examinations, outliers, incorrect protocol use/patient/body part etc.)

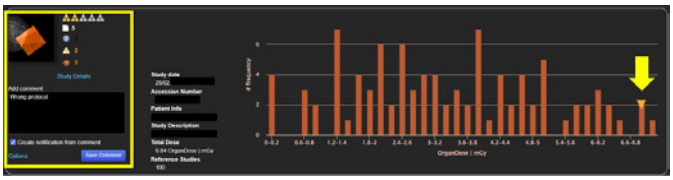


Figure 5. Live dashboard feature for operators that displays the last studies performed, benchmarks its dose against similar studies, and allows technologists to flag any issues related to unintended exposures or justify abnormal dose ranges.

- Record of patient exposure history across different modalities

Goal 3: Supporting the justification and appropriateness process by:

- Providing typical effective dose values for specific referrals

Goal 4: Information on the collective dose to a population from different medical exposures.

Table 8 of the report lists all the feature specifications of a dose management system, including reporting, queries, and metrics.

If you want to know more about DOSE by Qaelum visit qaelum.com/solutions/dose or send an email to info@qaelum.com.

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[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Patient Radiation Exposure Monitoring in Medical Imaging, Safety Reports Series No. 112, IAEA, Vienna (2023).

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[3] Christianson O, Winslow J, Frush DP, Samei E. Automated Technique to Measure Noise in Clinical CT Examinations, American Journal of Roentgenology. 2015; 205: W93-W99.

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Anna Romanyukha, received her PhD degree in medical physics from the Centre of Medical Radiation Physics (UOW, Australia) and her M.Sc. degree in health physics from Georgetown University (Washington, DC, USA). She worked as a post-baccalaureate and pre-doctoral fellow at the National Cancer Institute (NIH, Washington, DC) on various projects, including radiation dose estimation from diagnostic exposures. She now works at Qaelum NV, focusing on advanced software tools for patient radiation dose management and quality.

Niki Fitousi, PhD, is a certified medical physicist with professional experience in all fields of Medical Physics (Radiation Therapy, Diagnostic Radiology, Nuclear Medicine, Radiation Protection). She is currently the Head of Research and Applications in Qaelum, focusing mostly on the fields of radiation dose management, quality, and efficiency in medical imaging. She is also a member of the Medical Physics World Board of the International Organisation for Medical Physics.

Treasurer's Report of the Financial Year 2023 & Budget 2024

Income
EFOMP was able to function in 2023 thanks to several factors:

- subscription fees (NMO, IAM, and Company members)
- activities of EFOMP (advertisement within the EMP News, EEB, and ESMPE)
- participation in projects
- European Congress of Medical Physics
- European Journal of Medical Physics - Physica Medica

The EFOMP budget contains items that, in themselves, represent net income. There are also other items whose costs are "counterparts," and the net income is determined by their deduction.

No EEB events will be organised in 2023. It has been decided to postpone the activities of the EEB until at least early 2025.

EFOMP organised three ESMPE's in 2023 – Computed Tomography, Stereotactic Body Radiotherapy and Artificial Intelligence in Medical Physics. At the time of reporting the financial situation to the General Assembly, it was known that the income from these three events together was 29892 EUR (also taking the online part of AI ESMPE into account). EFOMP uses the recordings from ESMPEs to enrich the content of the e-learning platform. Audio/video recording and processing are paid extra, and the most usual cost of this service is 2400 EUR per edition, with slight variations depending on the organiser and number of learning hours.

EFOMP's support of low-income countries to be associated with EJMP will be discontinued as of 2024 due to negligible interest from NMOs. The cooperation with EJMP stays in redistributing the payments of honoraria to the editor-in-chief and managing editor. The royalties from EJMP tend to increase over the years and this was also the case in 2022 - EFOMP received 43488 EUR in 2023.

The success of ECMP 2022 was reflected in the final payment that was received from the organiser in 2023. The income from the Dublin Congress was 24156 EUR.

EFOMP's increasing involvement in EU projects was presented in 2023's budget. Following the accountant's advice, it was decided to move the project's funding to a balanced part of the budget. The result will only appear when the project is finished. EFOMP uses contractors to reach the projects' goals but keeps a part of the overall funding for administrative purposes (25% for new projects, and 10% for some older ones).

Expense
Each part of EFOMP, such as the Governing and Advisory committees, has its own budget. All costs linked to EFOMP activities are listed in the financial report table.

EFOMP leads many active working groups and an increasing number of special interest groups. Working groups have a deadline to complete the task, and only those working groups that are still active within the agreed time frame are funded. This differs from Special Interest Groups that operate within a specific time frame. The most efficient way to support Special Interest Groups is still being discussed within the EFOMP board.

Budget 2024
The income part of the budget is designed based on expected income developments. The educational activity of EFOMP – ESMPE is planned as a non-profit organisation. For budgetary reasons, income and expenditure are designed to be the same. Due to the many degrees of freedom in terms of income and expenses, predicting the financial outcome of these activities is a challenge. This could easily be demonstrated in the Education and Training Committee's budget item for e-learning content creation. The intention was that this money would be spent on a new e-learning platform and its new functionalities. Instead, much smaller expenditures will be realised in 2024. The e-learning tender committee spent a lot of time finalising the contract between EFOMP and the e-learning platform supplier. It is the duty of the EFOMP board to have the contract as precise as possible in order not to harm EFOMP as a structure and to invest the money invested by all NMOs in the most secure way.

A little bit of creativity is needed to design the budget for the next year. There are many expectations from EFOMP officers, ESMPE, working groups, and Special Interest groups, but the reality of income/spending can sometimes be so far from those. That's why each committee is also equipped with "contingency" money, labelled "committee – other".

Apart from Association management payments, the other larger expense in 2024 will be caused by the e-learning platform. It's not only the payment for the installation of the platform but also content creation and maintenance. Not much income is expected in 2024 from this activity since there will be only a few pilot courses available. On the other hand, the ECMP 2024 in Munich will generate additional income to cover any potential loss.

The financial report presents the results as of October 13, 2023. There are numerous payments to be made before December 31, 2023, which is the date marking the end of EFOMP's financial year 2023. Despite this fact, and in stark contradiction to the planned deficit budget, EFOMP will have to pay a 19% income tax. Whether reality will match the financial plan is influenced by many factors. The treasurer's effort to present EFOMP as a non-income association could simply fail on officers' caution in spending NMO's money. Which is a positive message.

EFOMP REPORT

The Treasurer's Report For the Financial Year 2023 and the Budget For the Year 2024

This report covers the Income and Expenditure Account 2023 and Budget 2024 - by **Jaroslav Ptáček**, the Treasurer of the EFOMP

Income and Expenditure Account 2023 and Budget 2024

	Actual 13.10.2023	Budget 2023	Budget 2024
Income			
NMO subscription	€ 39 416,50	€ 40 000,00	€ 40 000,00
IAM subscription	€ 8 987,60	€ 10 000,00	€ 11 500,00
Company member subscription	€ 18 150,00	€ 17 000,00	€ 18 000,00
EMP News and Web advertising	€ 11 262,50	€ 10 000,00	€ 11 000,00
Physica Medica – associated NMOs	€ -	€ -	€ -
Physica Medica – royalties	€ 43 487,95	€ 35 000,00	€ 45 000,00
Physica Medica – honoraria	€ 24 000,00	€ 24 000,00	€ 24 000,00
EEB	€ -	€ 1 000,00	€ -
ESMPE	€ 86 077,75	€ 1 000,00	€ 1 000,00
ENEN+	€ -	€ 9 687,50	€ 9 687,50
ECMP	€ 30 355,46	€ -	€ 20 000,00
SAMIRA BSS	€ -	€ 64 900,00	€ 6 490,00
SAMIRA SIMPLERAD	€ -	€ 19 600,00	€ 3 920,00
HORIZON-EURATOM-2021-NRT-01-10 SECURE	€ -	€ 41 250,00	€ -
HORIZON-EURATOM-2021-NRT-01-13 ENEN#	€ -	€ 36 250,00	€ -
EU-REST	€ -	€ -	€ -
BSS RPE PRO MPE	€ -	€ -	€ -
Symposium Molecular Radiotherapy Dosimetry	€ 48 608,90	€ -	€ -
Other Income	€ -6,00	€ -	€ -
Total Income	**€ 310 340,66**	**€ 309 687,50**	**€ 190 597,50**
EFOMP board			
President	€ 3 437,87	€ 4 000,00	€ 6 000,00
Past-President	€ 1 174,45	€ 2 000,00	€ 2 000,00
Secretary General	€ -	€ 1 000,00	€ 1 500,00
Treasurer	€ -	€ 1 000,00	€ 1 500,00
Committee Chairs	€ -	€ 6 000,00	€ 1 000,00
Officers' meetings/Gerneral meeting	€ 8 602,45	€ 15 000,00	€ 18 000,00
Total Expenditure EFOMP board	**€ 13 214,77**	**€ 29 000,00**	**€ 30 000,00**

Communications & Publications Committee			
web domain fee	€ -	€ 200,00	€ -
website maintenance and administration	€ 8 709,86	€ 3 000,00	€ 10 000,00
online platform maintenance and administration	€ -	€ 7 000,00	€ -
GoToMeeting, GoToWebinar licences	€ 3 792,00	€ 4 000,00	€ 4 000,00
DOI service fee	€ 217,80	€ 300,00	€ 300,00
EMP News production	€ 1 290,00	€ 2 000,00	€ 2 000,00
Graphic art (posters, logos etc.)	€ -	€ 1 500,00	€ 1 500,00
Communications & Publications Committee - other	€ -	€ 1 000,00	€ 1 000,00
Total Expenditure Comm. & Publ. Committee	**€ 14 009,66**	**€ 19 000,00**	**€ 18 800,00**
European and International Matters Committee			
EFOMP membership	€ 4 500,00	€ 4 100,00	€ 4 500,00
SIG - Early career Medical Physicists	€ -	€ 1 500,00	€ 5 000,00
European Matters Committee - other	€ -	€ 7 000,00	€ 7 000,00
EFOMP Representatives	€ 2 167,10	€ -	€ 4 000,00
Total Expenditure European and International Matters Committee	**€ 6 667,10**	**€ 12 600,00**	**€ 20 500,00**
Education & Training Committee			
ESMPE	€ 46 190,17	€ 1 000,00	€ 1 000,00
EEB	€ -	€ 1 000,00	€ -
e-learning content creation	€ 4 770,00	€ 50 000,00	€ 29 500,00
WG - Training for the healthcare professionals	€ -	€ 5 000,00	€ -
WG - Diagnostic and Interventional Radiology Core Curricullum revision	€ -	€ 5 000,00	€ 5 000,00
WG - Nuclear Medicine Core Curricullum revision	€ -	€ 5 000,00	€ 5 000,00
Education & Training Committee - other	€ -	€ 1 000,00	€ 1 000,00
WG - PS clarification and update RP174			€ 5 000,00
Total Expenditure Education & Training Committee	**€ 50 960,17**	**€ 68 000,00**	**€ 41 500,00**
Professional Matters Committee			
Professional Matters Committee	€ -	€ 1 000,00	€ 1 000,00
Professional Matters Committee - other	€ -	€ 1 000,00	€ 1 000,00
WG - Policy Statement on Physiological Measurements	€ -	€ 5 000,00	€ 5 000,00
WG - PS on medical physicist role in lasers			€ 5 000,00
Total Expenditure Professional Matters Committee	**€ -**	**€ 7 000,00**	**€ 12 000,00**

Projects Committee						
Projects Committee	€	-	€	1 000,00	€	1 000,00
ENEN+	€	-	€	-	€	-
Projects Committee - other	€	-	€	1 000,00	€	1 000,00
SAMIRA (Jan 2022 - Dec 2023)	€	-	€	64 900,00	€	-
HORIZON-EURATOM-2021-NRT-01-10 (July 2022 - June 2025)	€	-	€	33 000,00	€	-
HORIZON-EURATOM-2021-NRT-01-13 ENEN# (July 2022 - June 2026)	€	-	€	29 000,00	€	-
SAMIRA radiopharmaceuticals (June 2022 - June 2024)	€	-	€	19 600,00	€	-
EU-REST (August 2022 - August 2024)	€	-	€	-	€	-
BSS RPE PRO MPE (February 2023 - February 2025)	€	-	€	-	€	-
Total Expenditure Projects Committee	**€**	**-**	**€**	**148 500,00**	**€**	**2 000,00**
Scientific Committee						
Scientific Committee	€	-	€	-	€	1 000,00
WG - SPECT QC	€	-	€	5 000,00	€	5 000,00
WG - Angiographic and fluoroscopic syst.	€	-	€	-	€	-
WG - Role of MPE in clinical trials	€	-	€	4 000,00	€	-
WG - VMAT breast	€	-	€	5 000,00	€	5 000,00
SIG - Radionuclide dosimetry	€	3 050,58	€	5 000,00	€	5 000,00
Symposium Molecular Radiotherapy Dosimetry (by SIG_FRID)	€	-	€	-	€	-
Scientific committee - other	€	552,29	€	10 000,00	€	1 000,00
SIG - Imaging in Dentistry	€	-	€	500,00	€	5 000,00
SIG - Particle Therapy					€	5 000,00
Total Expenditure Scientific Committee	**€**	**4 102,87**	**€**	**29 500,00**	**€**	**27 000,00**
EFOMP administration						
Bank charges	€	346,99	€	1 100,00	€	1 100,00
Audit fees	€	-	€	2 000,00	€	2 000,00
Assocation management	€	15 154,20	€	24 000,00	€	24 000,00
Legal and professional fees	€	-	€	1 000,00	€	1 000,00
Currency fluctuation	€	-	€	-	€	-
Other / contingency	€	207,18	€	10 000,00	€	5 000,00
Assocation tax - provision	€	-	€	-	€	-
Physica Medica – associated NMOs	€	-	€	5 200,00	€	-
Physica Medica – honoraria	€	24 000,00	€	24 000,00	€	24 000,00
Total Expenditure EFOMP administration	**€**	**39 708,37**	**€**	**67 300,00**	**€**	**57 100,00**
ECMP						
ECMP	€	-	€	-	€	-
Total Expenditure	**€**	**128 662,94**	**€**	**380 900,00**	**€**	**208 900,00**
Result	**€**	**181 677,72**	**€**	**-71 212,50**	**€**	**-18 302,50**

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Physica Medica: Editor's Choice

For this winter issue of EMP News, Iuliana Toma-Dasu selected the following three articles, recently published in Physica Medica (EJMP), which particularly attracted her attention.

A. Collarino et al **Radioguided surgery with β decay: A feasibility study in cervical cancer** Phys. Med. 2023;113: 102658

https://doi.org/10.1016/j.ejmp.2023.102658

In this paper, the authors present the first step towards a possible application of radio-guided surgery with the β-radiation (β-RGS) technique in cervical cancer. Radioguided surgery is not particularly new, as attempts to aid with gamma-ray and β-radiation surgical procedures have been made in the past. The success, however, was limited. Based on input from 38 patients, the study showed that a measuring time of about 2–3 s might be sufficient for discriminating the tumour from the background in the case of cervical cancer, with a sensitivity of about 99% and a specificity of at least 95%. These results are very encouraging, and as this is likely the first study on the β-RGS technique applied to cervical cancer, it is expected that it will be followed by more studies for further validation and eventually will make a substantial contribution to assisted surgery by radiation detection.

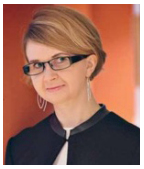
L.A. Cerbone et al **Monte Carlo and experimental evaluation of a Timepix4 compact gamma camera for coded aperture nuclear medicine imaging with depth resolution** Phys. Med. 2023;113: 102663 https://doi.org/10.1016/j.ejmp.2023.102663

This article is part of the Focus Issue "IV Geant4 International User Conference Invited Papers," edited by Giovanni Mettivier, Susanna Guatelli, Sebastien Incerti, and Jeremy M.C. Brown, and it presents a novel compact gamma camera (MediPROBE4). The prototype of this camera was designed to perform various nuclear medicine tasks. Among them, one could mention radio-guided surgery, which was the focus of the first paper selected above, as well as the imaging of sentinel lymph nodes with a 99 mTc radiotracer. The study includes both the experimental tests of the first spectroscopic imaging as well as the Monte Carlo (MC) simulations for image performance assessment. The results confirmed the high expectations of the system for gamma-ray 3D imaging, prompting the MediPROBE4 compact gamma camera to be among the strong competitors for the above-stated applications in nuclear medicine.

E. Bezak et al **Global status of medical physics human resource – The IOMP survey report**, Phys. Med. 2023;113: 102670 https://doi.org/10.1016/j.ejmp.2023.102670

The third paper selected for this issue presents the results of recent surveys on global medical physics human resources carried out by the International Organisation for Medical Physics (IOMP). This survey aimed at collecting and presenting the most updated information about the current numbers of medical physicists (MPs) in individual countries, as well as their MP training and accreditation pathways, complementing the previous surveys carried out by IOMP in 2015 and 2018. The results are very relevant for our medical physicists' community, as

they might guide our efforts towards harmonisation of resources and practice. They confirmed the fact that in the low-income countries of Asia, Latin America, and Africa, the numbers of MPs were the lowest and that the high-income countries of Europe, Australia, and North America have the largest number of MPs. However, the number of MPs is not enough overall, as 73% of the respondents reported MP shortages in their respective countries. The training of MPs is sub-optimal as only 69% of the respondents reported the existence of an official programme that comprises university courses and in-service training. The availability of academic programmes, however, in Medical Physics is better, as 85% of the respondents indicated the availability of MP university courses, primarily at the Master's degree level. The conclusion based on the analysis of the input provided by the survey was that there is a shortage of diagnostic X-ray physicists, which is rather concerning and would require mitigation. The effort of IOMP in conducting these surveys and reporting periodically should be commended, as it is providing not only food for thought but also a quantitative assessment of the global status of medical physics human resources, which is otherwise very difficult to grasp.



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

EFOMP COMPANY MEMBER ARTICLE

Dosisoft: AI-Based Research Explores The Future Of Radiation Oncology QA Procedures and Medical Quantitative Imaging

DOSIsoft initiated two medical physics thesis works, successfully completed in November 2023, showing that AI models could be a promising alternative algorithmic approach to allow automation and optimisation of the workflow in radiotherapy.

Research and innovation have been two important pillars of DOSIsoft since its creation. In recent years, Artificial Intelligence (AI) has been introduced into the medical domain, especially in radiation oncology and nuclear medicine. The application of Machine Learning (ML) and Deep Learning (DL) techniques is growing considerably to gain a deeper understanding of patient data, offer powerful radiotherapy patient safety, and contribute to more personalized cancer patient care.

Guided by this trend, DOSIsoft initiated two medical physics thesis works, successfully completed in November 2023. The research outcomes show that AI models could be a promising alternative algorithmic approach to allow automation and optimisation of the workflow in radiotherapy, such as auto-segmentation, diagnosis, treatment planning, and the external radiotherapy QA process.

1) Lucas DAL BOSCO introduces a new dosimetry tool by Artificial Neural Networks for Patient-Specific Quality Assurance in External Beam Radiotherapy, - In collaboration with Dr. Marie-Véronique Le Lann (CNRS LAAS DISCO Laboratory, Toulouse, France).

In external radiation therapy, the patient treatment workflow is a complex process involving many steps, actors, and decision-making. Quality Assurance (QA) procedures such as pretreatment verification and In Vivo Dosimetry (IVD) allow for the verification of the deliverable dose from the linear accelerator and the dose delivered during the treatment course to ensure the quality and safety of patient care. For these two procedures, the Electronic Portal Image Device (EPID) can be an ideal dosimeter. However, its use for dosimetry purposes in the presence (transit) or absence of an attenuator (non-transit) between the radiation source and the imager requires conversion of the acquired portal images into absolute dose.

Traditional dose computation algorithms used in external radiotherapy can be either fast but incorporate simplified assumptions or penalised by their execution time when high accuracy is required. This is particularly true for QA procedures when their application takes place before, during, and after each treatment fraction for all patients.

The growth of data collection and sharing, as well as the increase in computing power, have greatly facilitated the development of machine learning and Deep Learning (DL) algorithms, including Convolutional Neural Network (CNN) models. These techniques are considered efficient tools for a wide range of applications in external radiotherapy, such as QA process virtualization and improvement of accuracy and speed of dose computation.

In this work, two CNNs were developed for EPID-based non-transit dosimetry. The first model was trained to convert acquired gray-scale portal images into absolute dose distributions. The second model was trained to predict absolute dose distributions from treatment planning data. For both computational engines, a specific architecture based on the U-net model coupled with a non-trainable neural layer called True Dose Modulation (TDM) and a two-step training method were developed. The calculated dose distributions show very good agreement with those of current analytical models. GAI scores higher than 97.40% and 98.09% (criteria of 2% / 2 mm > 10% Dmax of the Y-index) were obtained by the conversion CNN and the prediction CNN for all clinical control beams, respectively.

This work also aimed to propose a formalism and a methodology for applying CNNs to IVD. A reference sys-

tem based on a commercially available solution was developed with the purpose of producing the data needed to develop DL models applied to transit dosimetry. A first CNN was developed to predict the scattered dose from the attenuator in transit conditions. The results obtained show a good reconstruction of the relative contribution of the scattered dose. An average GAI of 90.66% was obtained with the clinical control beams.

To conclude, this work shows that DL models could be a promising alternative algorithmic approach for EPID-based dosimetry applications.

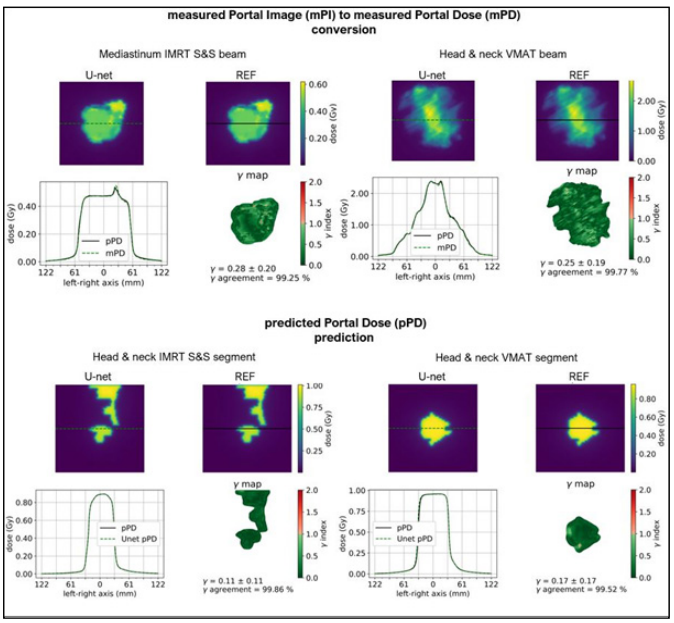


Figure 1. EPID image dataset for the training of the neural network

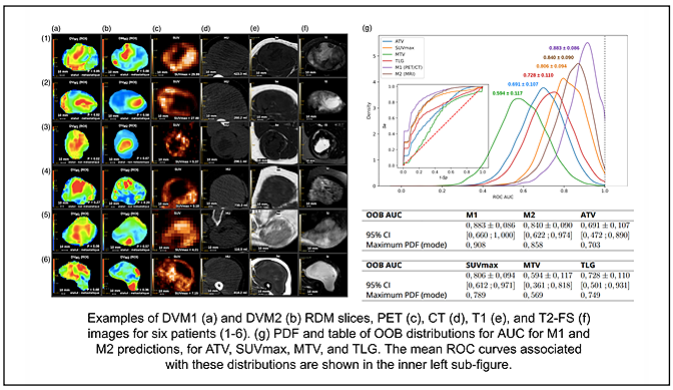
Scientific Publications

L. Dal Bosco, X. Franceries, B. Romain, F. Smekens, F. Husson, et M-V. Le Lann, **"A convolutional neural network model for EPID-based non-transit dosimetry"**, Journal of Applied Clinical Medical Physics, vol. 24 e13923, doi: 10.1002/acm2.13923.

2) Thibault ESCOBAR introducing radiomic models with machine learning approaches for planning and monitoring cancer treatments using multi-parametric PET/CT/MRI imaging - In collaboration with Dr Irène Buvat Laboratoire d'Imagerie Translationnelle en Oncologie - U1023 Inserm/Institut Curie, France

This thesis explores the growing role of digital sciences in healthcare, particularly in the field of medical imaging for cancer. The use of different medical imaging techniques, such as computed tomography (CT), positron emission tomography (PET), and magnetic resonance imaging (MRI), plays an essential role in the diagnosis, treatment planning, and follow-up of cancer patients.

The adoption of radiomics and machine learning approaches in clinical practise seems promising but remains limited today, partly due to the lack of interpretability of the associated models.



Examples of DVM1 (a) and DVM2 (b) RDM slices, PET (c), CT (d), T1 (e), and T2-FS (f) images for six patients (1-6). (g) PDF and table of OOB distributions for AUC for M1 and M2 predictions, for ATV, SUVmax, MTV, and TLG. The mean ROC curves associated with these distributions are shown in the inner left sub-figure.

Figure 2.

Scientific Publications

Escobar, T., Vauclin, S., Orlhac, F., Nioche, C., Pineau, P., Champion, L., Brisse, H. & Buvat, I. **Voxel-wise supervised analysis of tumors with multimodal engineered features to highlight interpretable biological patterns**. Medical Physics 49, 3816-3829 (2022)

Khalid, F., Goya-Outi, J., Escobar, T., Dangouloff-Ros, V., Grigis, A., Philippe, C., Boddaert, N., Grill, J., Frouin, V. & Frouin, F. **Multimodal MRI radiomic models to predict genomic mutations in diffuse intrinsic pontine glioma with missing imaging modalities**. Frontiers in Medicine 10, 1071447 (2023)

Key Awards

1ST place of PIDSC Young Investigator Award of SNMMI 2022 (Society of Nuclear Medicine and Molecular Imaging (SNMMI)) on "Radiomic decision maps reveal patterns discriminating between glioma progression and radiation-induced necrosis in static and dual time [18F]-FDOPA PET"

1ST place of the best paper during the competition "head and neck tumor segmentation and outcome prediction in PET/CT images, third edition " (HECKTOR 2022) at the 25th international conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI) congress in Singapore.

Contributor to the software development ICARE: Individual Coefficient Approximation for Risk Estimation (ICARE) model 2022. https://github.com/Lrebaud/ICARE

About DOSIsoft www.dosisoft.com

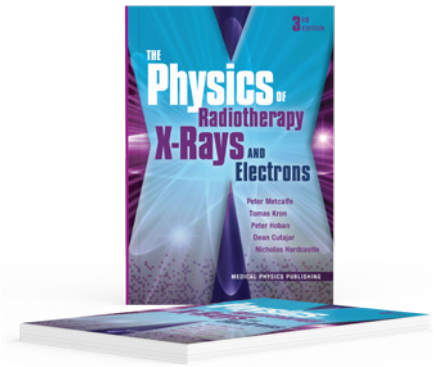
Founded in 2002, DOSIsoft designs develops & delivers patient-specific imaging & dosimetry software solutions in Radiation Oncology & Nuclear Medicine to improve cancer patient safety & treatment quality. 20 years of innovation and R&D investments have led to world-leading software used in over 300 hospital centres in 60 countries. Spin-off between Gustave Roussy and the Institut Curie, DOSIsoft constantly innovates in partnership with the major cancer institutes and research centres in the world.

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

BOOK REVIEW

Book Review: "The Physics of Radiotherapy X-rays and Electrons"

The Physics of Radiotherapy X-rays and Electrons by Peter Metcalfe, Tomas Kron, Peter Hoban, Dean Cutajar and Nicholas Hardcastle, Third Edition, Medical Physics Publishing (2023), 704 pages. Hardcover: ISBN 978-1-951134-10-5, eBook: ISBN 978-1-951134-11-2, price: US$ 185.



Written by Peter Metcalfe, Tomas Kron, Peter Hoban, Dean Cutajar, and Nicholas Hardcastle, the book "The Physics of Radiotherapy X-rays and Electrons" is presented as a classic reference for students, established physicists, as well as dosimetrists or radio-oncologists in radiation therapy. Since March 2023, a third edition of the book, supported by two additional authors, has been available and includes full-colour illustrations and images as well as revised chapters reflecting recent developments in radiation therapy.

Structurally, the book is divided into 14 chapters. Each chapter begins with a brief introduction to the topic, followed by a list of relevant references and a handful of questions. The solutions to these questions are found in the Appendix and can be used to test the comprehension of the learning material. The sections are well-written and easy to follow, containing both practical examples as well as more foundational theoretical passages. The texts are further enhanced through descriptive graphics, images, formulas, and references, significantly improving comprehensibility. For further reading, the references contain both scientific publications and books.

"The Physics of Radiotherapy X-rays and Electrons" introduces the medical linear accelerator in its first chapter as the most frequently used and important radiation treatment machine. The operating principles and components are described and explained, including the modulator, magnetron, waveguide, wedges, and multileaf collimators. As parts of modern machines, image-guiding devices, i.e., onboard kV imaging, CBCT, and portal imaging devices, are also covered. The chapter concludes with innovative treatment devices currently available on the market, such as the Ethos, Unity (MR linac), and CyberKnife.

Over the next three chapters (nos. 2-4), the physics of X-rays and electron beams are covered, as well as their interactions with matter. Important quantities like the absorption coefficient, absorbed dose, and kerma, as well as processes such as mass-energy transfer and photon/electron interactions, are all explained alongside their corresponding formulas. By means of water phantom measurements, the characteristics of X-ray beams, e.g., depth dose curves and penumbra, are clearly explained, as are their dependencies on different factors such as multileaf collimators or wedges. Even an overview of kilovoltage X-ray therapy is given. It has to be highlighted that the clinical implementation and applications are described in detail, especially those of total skin irradiation. Beyond the stated scope of the book, chapter 4 also briefly addresses the basics of proton beam therapy, its challenges, and its opportunities.

Chapter 5 covers multimodal imaging procedures, especially CT imaging used in radiation therapy. Included in these chapters is the necessary background for understanding x-ray CT machines, machine calibration, spectral, and single- as well as dual-energy CT techniques. Furthermore, typical 4D-CT entities are discussed and illustrated with examples. Even if the focus is not on explaining the theoretical background of MRI acquisition, a good overview of the MRI sequences frequently used in radiotherapy can be found in Chapter 5. Unfortunately, there is little information given about recent research in synthetic CT generation on the basis of MRI scans. The typical nuclear medicine scans used in radiotherapy, PET and SPECT, are also briefly reviewed. Importantly, while the fundamentals of registration and fusion of multimodal imaging are covered, the pitfalls of rigid and deformable registrations are missing.

With the fundamentals required for treatment planning introduced, a closer look at different radiation techniques can be found in Chapter 6. An

overview of 3D-CRT, IMRT, and VMAT, as well as recommendations for treatment planning quality assurance, are given. However, the dosimetric properties of MLCs are only covered superficially, and although the book is titled "The Physics of Radiotherapy X-rays and Electrons," planning with electrons has been omitted entirely.

Chapter 7, “Image-guided radiation therapy and motion management,” contains several topics, e.g., target definition, patient immobilisation, and different, up-to-date approaches to image- and surface-guidance and motion management. Some of these, like the target definition, might, however, have been better structured as part of Chapter 6.

Chapters 8 and 9 delve into more specialised radiation therapy applications like adaptive and stereotactic radiotherapy. The authors cover the most important aspects and approaches in adaptive radiotherapy and outline the current capabilities of X-ray- and MR-guided devices. Stereotactic treatment approaches are described in detail, including specially developed devices for these treatments – the Gamma Knife and CyberKnife. Additionally, the differences between head frame-based and frame-less treatments, as well as cone-based and MLC-based radiation delivery, are presented. However, the stereotactic body radiotherapy section does not contain any images or graphics to help with understanding the topic.

Chapter 10 deals with the different irradiation models and dose calculation algorithms. Special emphasis is placed on Monte Carlo calculations and the clinical impact of different dose calculation algorithms is discussed. For the first time in the book, brachytherapy is mentioned in the dose calculation segment. However, the core concept of brachytherapy is not discussed in depth in the book. Additionally, it is worth considering if this chapter would not have been better placed as an introduction to radiation planning before Chapter 6.

Chapters 11 and 12 focus on dosimetry and quality assurance. A good overview is given of phantoms important in dosimetry, e.g., water- and anthropomorphic phantoms, as well as of various dosimetric instruments. Included among these instruments are diamonds, films, and TLDs. Background and definitions are not lacking; however, the referred literature should still be perused to deepen the theoretical understanding. In terms of QA, a general roadmap of quality management, assurance, and control is drawn. Due to the authors' national background, references refer to the American guidelines and protocols (from AAPM), which may not be transferred to the regulations in European countries.

In the final chapters, 13 and 14, radiation protection and radiation biology are addressed. Fundamental concepts are presented with the help of graphs and formulas. Of note, the models of tumour and normal tissue response are described in a particularly enlightening manner. The book finally concludes with a brief exploration of the emerging field of flash therapy.

The exercises consist of a mix of comprehension questions and calculations. The corresponding solutions are thorough and supported by pertinent calculations or graphics. However, a larger collection of exercises could enhance this textbook even further.

In summary, “The Physics of Radiotherapy X-rays and Electrons” is an excellent book that can serve as an educational or reference book for both students and professionals in the medical physics of radiotherapy. Surprisingly, more topics than those implied by the book's title are covered, even if a few topics one might expect are missing. In general, the book can be considered a success: the balance of key concepts, illustrations, and theoretical formulas, as well as practical exercises, make it an instructive resource for anyone seeking a basic understanding of this dynamic field.

Dr. Maya Shariff, Department of Radiation Oncology, Universitätsklinikum Erlangen, Germany. Maya Shariff's journey in medical physics began at the University Hospital of Tübingen in 2015. In 2017, she joined the University Hospital of Erlangen as a Medical Physicist Expert and earned her PhD in 2023. Since 2019, she has been chair of the Young Medical Physicists of the DGMP and a co-opted DGMP board member. Her responsibilities within DGMP encompass event certification, expert qualification applications, and oversight of the DGMP Academy. From 2023 onward, she held the positions of postdoctoral fellow and certified Medical Physicist at the University Hospital Erlangen. Maya Shariff's contributions continue to advance the field of medical physics.

Sarah Stefanowicz, M.Sc., Department of Radiation Oncology, Klinikum rechts der Isar of the Technical University of Munich, Germany. She has been working in the field of medical physics in Germany and abroad for more than ten years. She obtained her certification as an MPE for photon and proton beam therapy (in 2015 and 2020) and has been employed as a medical physicist at the Klinikum rechts der Isar of the Technical University of Munich since 2020. Her professional focus is radiosurgery/stereotactic treatment with the Gamma Knife. She is in the process of completing her PhD thesis on proton beam therapy at the OncoRay Center in Dresden, Germany. Sarah is an active member of both the DGMP and the German Society of Radiation Oncology (DEGRO) and is engaged in various working groups. In 2016, she co-founded the young section of the German Society of Medical Physics (DGMP) and was its spokesperson from 2017-2019. Sarah is looking forward to meeting the EFOMP community at the ECMP in Munich in 2024.

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ART AND SCIENCE

Art to Challenge and Inspire: Images and Reflections for Medical Physics (10)

Professor **Jim Malone** writes about relatively unknown but exceptional paintings by Alberto Giacometti. They emphasise observation of the unknowable.

Alberto Giacometti (1901–1966) grew up in Italian-speaking Switzerland. He had a talent for art and attended Geneva Art School. Later, he moved to Paris. There, he found all he needed right in front of him, especially in the heads of family and friends.
His unique approach captured the zeitgeist of Europe's WWII existential crisis and the nuclear age. He had a close friendship with the like-minded Irish writer Samuel Beckett. His work was not confined to his well-known sculpted emaciated figures and perhaps his lesser-known paintings are of equal importance. They are extraordinary and do not refer to any other artistic school or style. Feedback is welcome at jifmal@gmail.com

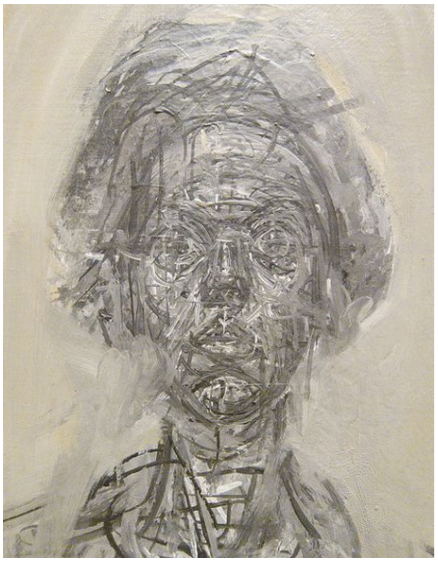
Annette by Alberto Giacometti

(See next page.)

Giacometti's sculpted, emaciated, insubstantial men cut through space, reminding us of the fragility of our situation. His paintings are unique and quasi-mystical. Alberto said of his brother Diego: When he sits for me, I don't recognise him. The more he looked, the more mysterious Diego's head became. He noted of one of his sitters: She sits for me almost every evening from nine to midnight, an illustration of his persistence. Annette, his wife (next page), often sat for him.

The paintings admit us to the mystery, the small infinity, of our unknowing of those we know best. They are sufficient in themselves and don't require an explicit link to medical physics. But it is difficult to avoid the parallel between visual art and the sciences, i.e., intense, honest observation and acknowledging what one cannot know.

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 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 an 'almost true' memoir, Tales from the Ivory Tower. Drawing on the left by Desmond Hickey.

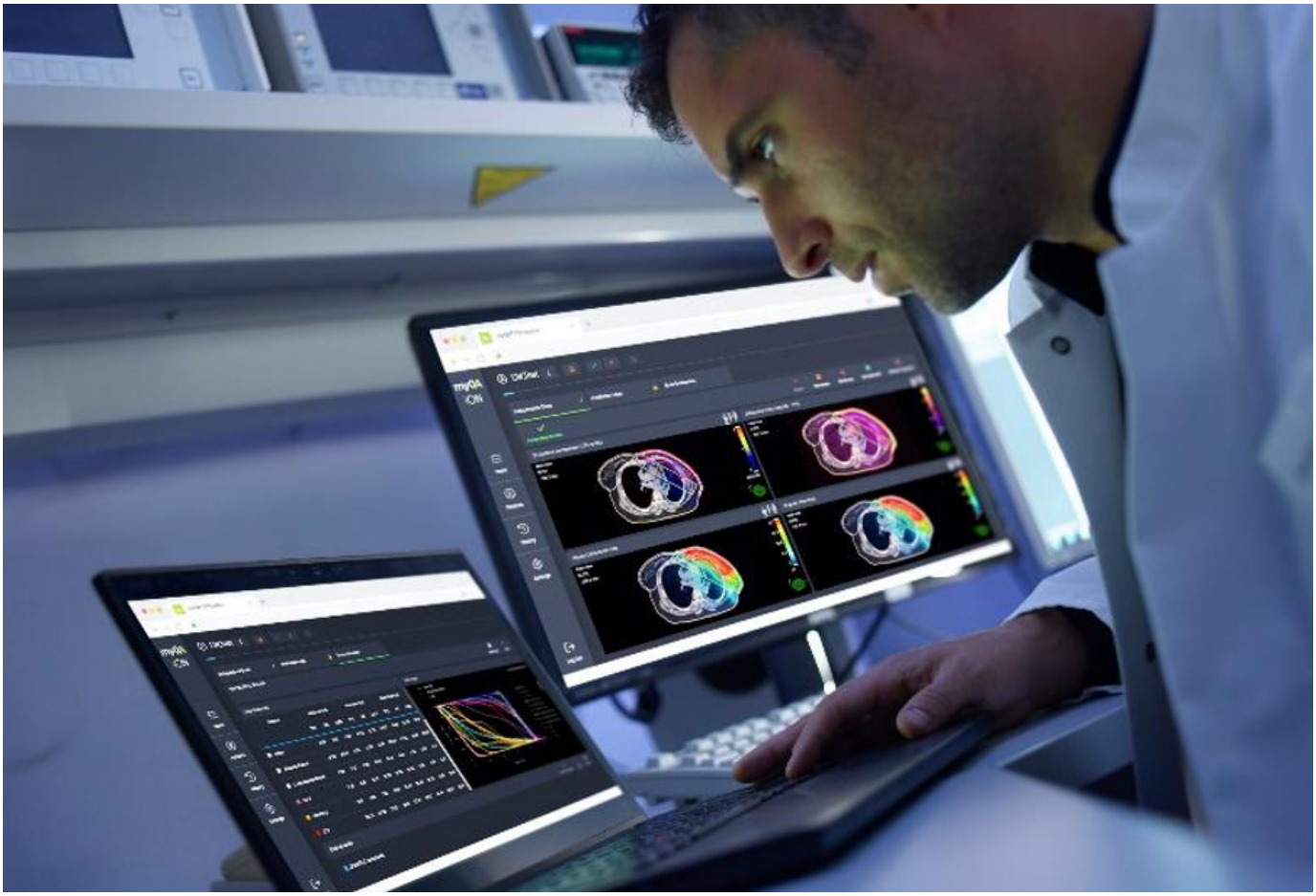


Above, Annette (1961). Alberto Giacometti (previous page) Oil on canvas 21 x 18 in. Private collection. Right: A version of Walking Man, ~2m, and Annette at MoMA, New York. All © Succession Giacometti plus ADAGP. Creative Commons.

EFOMP COMPANY MEMBER ARTICLE

Providing Independent, Precise, and Comprehensive Verification Data to Enhance Treatment Accuracy

IBA Dosimetry has introduced myQA iON, an advanced software solution designed to enhance the accuracy and efficiency of radiotherapy treatment planning and delivery. The software offers comprehensive and reliable verification data to guide clinicians in the increasingly complex field of radiotherapy.



In the realm of radiotherapy, treatment plans have become more intricate, demanding more accurate methods to calculate, measure, and verify radiation doses delivered to patients. This need is particularly pronounced for stereotactic treatments, where high doses of radiation are concentrated in small target volumes. To address this challenge, IBA Dosimetry developed myQA iON, an end-to-end software solution, initially launched in 2019 for proton therapy and extended to photon radiotherapy in 2022.

myQA iON integrates independent three-dimensional (3D) dose calculations, real-world measurement data, and irradiation log files. By employing the gold-standard Monte Carlo algorithm, the software enables precise 3D dose distribution analysis in relation to a patient's anatomy. This functionality significantly enhances the accuracy of dose calculations compared to traditional planning systems.

A notable example of myQA iON's impact is evident at Duke University Medical Center, where medical physicist Guoqiang Cui evaluated its potential in stereotactic radiosurgery (SRS) treatments, investigating multiple treatment sites simultaneously. myQA iON's ability to provide accurate 3D dose distribution information proved invaluable in planning and verifying these complex treatments.

Traditionally, clinics have relied on 2D detector arrays to measure and verify dose distribution. However, this approach lacks the ability to access detailed 3D dose profiles for individual targets. myQA iON allows clinicians to comprehensively analyse the 3D dose distribution across the entire treatment plan and evaluate doses for each individual target.

One distinct advantage of myQA iON is its integration with treatment machine log files generated during treatment. This feature allows clinicians to verify the delivered dose against the treatment plan, enhancing accuracy and enabling adjustments as needed. The software's web-based portal offers easy access to quality assurance data from any hospital network-connected device, streamlining workflows and enhancing overall efficiency.

ed close alignment between planned and delivered doses.

Mehgan Boone, product manager at IBA Dosimetry, emphasises the software's ability to merge independent dose calculations, log-file data, and real-world measurements to provide valuable insights for complex treatments. This integration enhances flexibility and efficiency by eliminating the need to gather data from disparate sources.

IBA Dosimetry continues to refine myQA iON based on user feedback and market trends in technology and treatments. Future enhancements will focus on further automation and integration, aiming to create a seamless experience for clinicians.

myQA iON offers a revolutionary solution for enhancing the precision, safety, and efficiency of radiotherapy treatment planning and delivery. Its ability to provide accurate 3D dose distribution information and integrate with log-file data marks a significant advancement in the field, empowering clinicians to optimise complex treatment plans and ultimately improve patient outcomes.

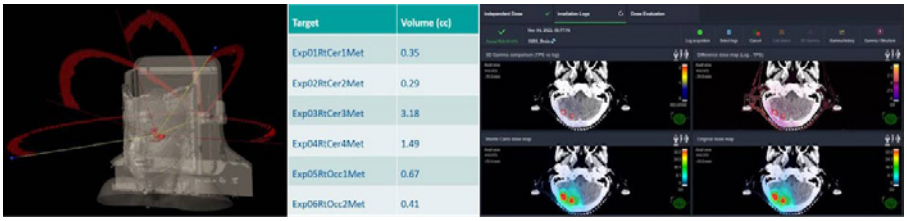


Fig. 1: A six-target SRS case using a single isocenter. It's planned with one coplanar arc and three non-coplanar arcs. The target volumes ranged from 0.29 cc to 3.18 cc (left). As compared with the treatment planning dose, myQA iON's Monte Carlo dose calculations based on log-file data yielded a gamma passing rate of 99.95% using a passing criterion of 3%/1mm with a 10% dose threshold (right).

Guoqiang Cui's team at Duke University utilised myQA iON to plan an SRS treatment targeting six distinct brain tumours. The software's Monte Carlo dose calculations yielded accurate results, and a 3D gamma analysis based on log-file data demonstrat-

For more information on myQA iON and its role in advancing radiation therapy, visit: https://www.iba-dosimetry.com/product/myqa-ion-radiation-therapy.

Guoqiang Cui, Ph.D., is an Assistant Professor of Radiation Oncology at Duke University Medical Center in Durham, North Carolina. His major clinical and research interests are in automated treatment planning in stereotactic radiation therapy and radiosurgery, image-guided radiation therapy, as well as quality assurance of treatment equipment and patient-specific plans via radiation measurement and simulation.

Mehgan Boone, MSc. is a Product Manager at IBA Dosimetry. Throughout her career, she has worked in the industry in support, training, and product validation, as well as clinically, with a focus on commissioning and clinical programme implementation. Her main point of interest is software and workflow optimisation.

MEDICAL PHYSICS THESIS

Lead-free Multilayered Polymer Composites for Radiation Shielding in the Range of Medical Diagnostic Energies

In this article, **Laurynas Gilys** presents his PhD thesis that was defended at the Kaunas University of Technology, Faculty of Mathematics and Natural Sciences, Department of Physics, in 2023

Introduction

The rapidly increasing use of ionising radiation in industry and medicine poses new challenges for protecting workers and patients from ionising radiation. Due to the harmful effects of ionising radiation on biological organisms, shielding elements with adequate radiation absorption properties is essential. In most cases, such elements contain naturally abundant and relatively inexpensive lead (Pb), a heavy chemical element with a high density (11.3 g/cm³) and efficient absorption of radiation in the medical diagnostic energy range (40–140 keV). Despite its radio absorption efficiency, lead has several disadvantages. Lead-based shielding elements are heavy, have low elasticity, and are highly toxic. Lead may damage the central nervous system, brain, kidneys, cardiovascular system, and immune system. The lead recycling process is costly due to the additional costs associated with protecting workers or automating processes [1, 2]. Therefore, replacing lead with alternative nontoxic or less toxic materials in the design of protective elements is considered a viable solution.

Silicone-based polymer composites containing high atomic number additives are prioritised for the development of new materials for radiation shielding due to their mechanical, thermal, electrical, and multifunctional properties. The X-ray attenuation properties, as well as mechanical properties, of the newly developed lead-free multi-layered structures for radiation shielding based on silicone composite layers containing tin, cerium oxide, tungsten oxide, and bismuth additives, were analysed and discussed in this thesis. It was shown that by varying the additive concentrations in silicone composites, lead-free and flexible layered structures exhibiting the required lead-equivalent for X-ray shielding can be fabricated [3, 4].

Therefore, the aim of this research was to develop and evaluate lead-free polymer composites with efficient X-ray absorption in the range of medical diagnostic energies (40 keV–141 keV), including the blind zone characteristic of lead compounds, to be used across a wide range of radiation protection devices.

Materials and Methods

Experimental composites were prepared (Figure 1 and Table 1) by mixing in equal parts two components (A and B) of thermally-curable vinyl terminated polydimethylsiloxane (PDMS) silicone rubber, Endeavour T-1006 (Endeavour Enterprise Co., Taipei, Taiwan), and admixing different additives in the powder form, such as tungsten oxide, tin, cerium oxide, tantalum, tantalum oxide, or bismuth. Polymer composites with different additives were mixed separately by using a laboratory overhead stirrer LS-2000 (IRIS Analytical, Miami, FL, USA) equipped with a Teflon-coated 25-mm diameter impeller (mixing speed – 60 rpm, duration ≥3 min). The filled form was placed in an ultrasound bath with a Sono Swiss SW3H cleaner (ultrasonic frequency – 38 kHz, effective ultrasonic power – 80 W) for 360 seconds for the removal of air bubbles from the composite's volume and from its inner surface. After this procedure, samples were placed in a furnace for 10 minutes at 100 °C.

Figure 1: Experimental composites: Layer 1—PDMS + Sn; Layer 2—PDMS + CeO2; Layer 3—PDMS + WO3; Layer 4—PDMS + Bi; Multilayer structure—all layers starting with Layer 1 from the bottom side (Table 1).

Table 1. Thickness of prepared polymer composites

Molality, mmol/g	Thickness, mm				
	Layer 1 PDMS + Sn	Layer 2 PDMS + CeO_2	Layer 3 PDMS + WO_3	Layer 4 PDMS + Bi	Multilayer
0.8	0.695	0.912	0.730	0.731	3.949
1.6	0.888	1.033	0.801	0.873	4.031
3.2	0.919	1.072	0.847	1.006	4.161

The X-ray attenuation properties of the polymer composites were simulated using the NIST XCOM database. The X-ray attenuation of samples containing additives was experimentally investigated while following the international guidelines and using a diagnostic X-ray machine AXIOM ICONOS R200 (Siemens Healthcare GmbH, Erlangen, Germany) and a Piranha detector (RTI Electronics, Mölndal, Sweden). Static and cyclic mechanical properties were investigated according to ISO 6721 Standard and using the ElectroPuls E10000 Linear-Torsion (Instron, JAV) machine. The artificial sweat test was done according to the ISO105-E04-2008E Standard. For the analysis of various functional groups and chemical bonds in the samples, a SPECTRUM GX 2000 with HATR (Horizontal Attenuated Total Reflectance) FT-IR spectrometer was used. The optical properties of transparent samples were investigated by using a (UV-VIS) Perkin Elmer Lambda 25 spectrometer.

Results and Discussion

Composites containing tin, cerium, tungsten, tantalum, and bismuth with indicated higher X-ray absorption efficiency as compared to lead in the medical diagnostic energy range (29.5–88.01 keV) have been selected for the investigation. A method for the formation of polymer composites using molality concentration to estimate the metal content of the filler material has been proposed, and various compositions of the selected materials with polymers and their aqueous solutions have been investigated. It was found (Figure 2) that saturated solutions of silicon tungstic acid and sodium tungstate in concentrations higher than 40% effectively absorb X-rays in the blind zone of lead absorption (69.5–88 keV). However, only the lead equivalent of a saturated 79% solution of silicon tungstic acid (0.576 mmPb) satisfies the standard guideline equivalence of 0.5 mmPb to lead; the optical transparency of this solution at 550 nm is ~80% and is close to the values (83 -90%) of optical transparency of the solid-phase transparent screens used in practice which are in the range of 83–90%.

The X-ray absorption efficiencies of the polymer composite samples with tungsten and tantalum fillers at 50 wt% filler concentration were: 73.66% for PDMS + $Na_2WO_4 \cdot 2H_2O$ sample, 86.54% for PDMS+WO_3 sample, 93.64% for the UNSI + Ta_2O_5 sample, and 94.78% for the UNSI + Ta sample at 81 kV X-ray tube voltage (lead absorption blind zone). As the X-ray tube voltage was increased to 121 kV, the fraction of photons passing through the sample without interaction increased, which resulted

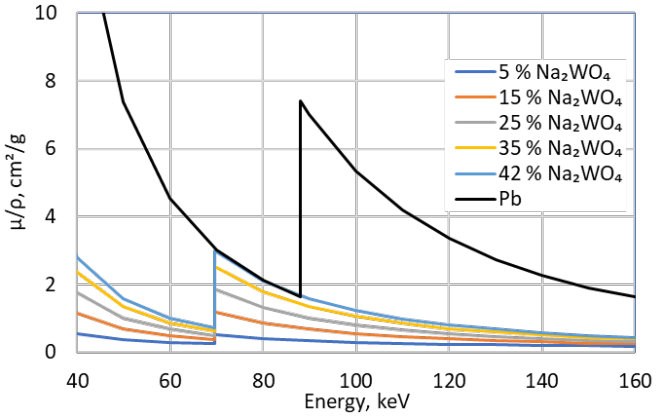


Figure 2: Values of mass attenuation coefficients of sodium tungstate solutions of different concentrations at different energies For comparison, mass attenuation coefficient values for pure lead are shown as given in the XCOM database.

in a decrease in the absorption efficiency, respectively: 66.45% (PDMS + Na2WO4·2H2O), 78.68% (PDMS + WO3), 88.06% (UNSI + Ta_2O_5) and 90.56% (UNSI + Ta). Only the composites with tantalum met the recommended lead equivalence of 0.25 mmPb for X-ray shields: the lead equivalence values were: 0.364 mmPb for the composite with the tantalum filler and 0.313 mmPb for the composite with the Ta_2O_5 filler.

Synergetic analysis of the theoretical and experimental results in polymer composites with metal/metal compound fillers allowed for an estimation of the buildup factor as a radiation efficiency parameter related to radiation scattering in monolayer and multilayer structures.

After the evaluation of the absorption efficiency of monolayer polymer composites with Sn, CeO_2, WO_3 and Bi fillers of the same concentration and after analysis of the photon absorption (the photo effect) and Compton scattering, a multilayer composite was formed in the following sequence from the bottom to the top: PDMS+Sn, PDMS+CeO_2, PDMS+WO_3, and PDMS+Bi, directing the beam of photons to the composite with Bi filler. Multilayered polymer samples with a 3.2 mmol/g additive concentration arranged in this way were found to provide X-ray absorption equivalency corresponding to 0.25 mm Pb applied to the leaded polymer used for the design of personal protective equipment at X-ray tube voltages >100 kV. The sequence of the layers does not significantly affect the photon absorption efficiency at X-ray tube voltages up to ~100 kV, but, at higher voltages, the order of the layers Bi-W-Ce-Sn enhances the X-ray photon absorption efficiency by ~17% compared to the inverted structure Sn-Ce-W-Bi.

Mechanical tests (static and cyclic tension) have shown that the multilayered polymer is elastic, ductile, and resistant to cyclic deformation. The performed artificial sweat test indicated that the highest material leakage after one month was found for the bismuth-enriched

composite (top layer of the multi-layer composite); however, it was still emphatically low (1.189 ± 0.213 μg/cm^2, or 0.0017% only) compared to the total initial weight of the filler. Considering that the multi-layer composite meets the lead equivalence requirement of 0.25 mm Pb and that the surface density of the 2-mm thick multi-layer composite is 0.331 g/cm^2 (0.375 g/cm^2 for the leaded aprons), the multi-layer composite PDMS+Bi – PDMS+WO_3 – PDMS+CeO_2 – PDMS+Sn can be considered a suitable candidate for the manufacture of personalised radioprotective devices for medical diagnostics.

Conclusions

The investigation of the X-ray attenuating and mechanical properties of the newly developed lead-free multilayer polymer composites revealed the potential of these composites in the application of these materials as toxic lead substitutes for the construction of shielding elements against ionising radiation. Polymer mass reduction, keeping the same amount of metallic additives in the composite, may be an elegant solution for the development of thinner multilayer polymer composites with the required X-ray attenuation properties; however, in this case, some deterioration of mechanical properties will be inevitable.

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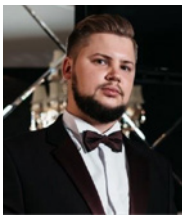

Laurynas Gilys, recently graduated with a PhD in Physics from the Kaunas University of Technology and is currently working on lead-free protective materials against ionising radiation. Additionally, he is a medical physicist and cyclotron operator at the Nuclear Medicine Department and Nuclear Medicine Research Centre at the Hospital of Lithuanian University of Health Sciences Kauno Klinikos. Over the past three years, he has implemented a quality assurance programme at the Nuclear Medicine Department related to gamma cameras and PET/CT quality control, waste management, monitoring of radiation exposure, patient preparation, diagnostic and therapeutic clinical protocols, and has participated in the planning and implementation of the new cyclotron infrastructure.

MEDICAL PHYSICS HISTORY

Professor Jack F Fowler, The Former Director of Gray Lab

Professor **Edwin Aird** writes an article on honouring and remembering the life, professional contributions, influence, and lasting effects of Professor **Jack Fowler**.

Jack Fowler [formally Professor John Francis Fowler, PhD, DSc, MD (Hon), FInstP, FRCR, FBIR, FAAPM, FASTRO, FACRO [1]] (1925 - 2016)

Jack's Early Life

Jack was born in Dorset in 1925; he obtained a first-class degree in physics at London University. He then worked for Metropolitan Vickers on microwaves?!

For two years, he joined a theatre group: Joan Littlewood's Theatre Workshop, where he gained stage management and lighting experience.

In 1950, he worked with Frank Farmer in Newcastle as a junior medical physicist, where he was able to do some research work as well as radiotherapy physics for patients.

Some key moments (and "connections"):

- Jack in Newcastle 1950s questioned the variation in dose between clinicians for the same treatment target.
- Lecture by Gilbert Fletcher; Frank Farmer and Jack go to Cambridge for a 2-week radiation biology course. 1957
- John Yarnold (Radiation Oncologist) attends a 1-week course at Gray Lab; "Radiobiology for Clinicians," in 1975 [See "Breast Hypo-fractionation.....later]
- (My connections: Newcastle/Carlisle; Mount Vernon Hospital next to Gray Lab : Jack, then Julie Denecamp; Stan Dische and the CHART trial... beginnings of QA in Clinical Trials in the UK)

Personal note: I have a recollection of looking through Jack's science notebooks when visiting Carlisle Hospital (Cumberland Infirmary).] which I did from 1968-1982...Jack had done this from 1950-1954. I found records of his measurements on the dosimetry of arc therapy (see reference?).

At some point, I also know he worked on:

1. The first 4MV linac at Newcastle with Frank Farmer
2. Helping with the first simulator to use xeroradiography in Newcastle (with Frank Farmer and John Haggith)
3. For his PhD, he studied the electrical conduction of insulators under the impact of radiation (which I used in 1970 when deciding the best insulator for the Farmer chamber when we realised that there would not be enough amber for mass production of the chamber ... and chose PTCFE).

He then went back to London to work at Kings College: then Barts (as Reader with Rotblat), Head of Physics at Hammersmith Hospital and MRC Radiotherapeutics, and later at the Cyclotron Unit. He was involved in the BIR radiotherapy trials, conducted by Frank Ellis in the 1960s-70s, and the neutron therapy trials at Hammersmith Hospital.

He directed Gray Lab for 18 years, starting in 1970.

(following a short period by Oliver Scott after Gray's death in 1965)

- Early experiments using early reactions in pig skin: (5 fractions over 5 days, 28 days, or 21 fractions over 28 days) showed that: the main factors determining the increase in dose required for equal effect when giving a larger number of fractions were the size of the fractions (dose/fraction)

- Demonstrated that the size and number of fractions determined the level of early reactions. (see Figure 1)

- Houston Group (Withers, Thames, and Peters) extended this work to show that fractionation effects were greater for late than early skin reactions.

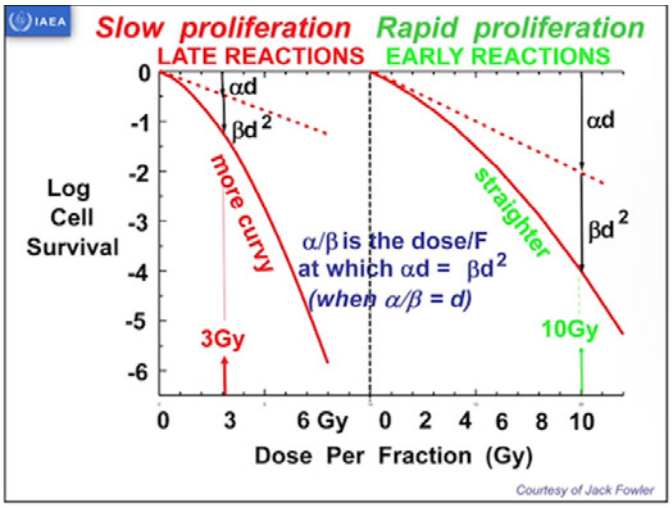

Figure 1 shows how the size and number of fractions determined the level of early skin reactions.

The Linear Quadratic (LQ) Model

"His greatest contribution to Clinical Oncology was to exploit knowledge, derived from experimental and clinical radiotherapy schedules, of factors influencing the relationships between overall time, dose per fraction, and number of fractions."

"There were immediate applications (of the LQ model and Jack's interpretation of it) in routine practice, for example in the management of dosage errors and unintended treatment interruptions (see RCR), in comparing existing fractionation schedules where certain percentage tolerance BEDs could be determined for organs at risk, and in providing a rational method for adjusting dose when dose-rate changed (with Roger Dale), particularly in brachytherapy. His willingness and ability to engage with clinicians had an enormous impact on how radiotherapy is given today" (Obituary by John Yarnold and Peter Hoskin Clinical Oncology 2017).

The Equations:

- (E = αD+βd2) that α/β =10 for tumour and for late effects α/β=3

- BED = D(1+d/ α/β)

BED (Biological Effective Dose) is "the true biological dose delivered by a particular dose/fr(d) and total dose (D) to a particular tissue."

$$EQD_x = nd(\frac{d+(\frac{\alpha}{\beta})}{x+(\frac{\alpha}{\beta})})$$

Equivalent dose, often notated EQDx where x is the reference dose per fraction, is used to find an equivalent fractionation scheme to a reference scheme. Because standard 2Gy per fraction is the most common, EQD2 is most often used.
n is the number of fractions delivered
d is the dose per fraction
α/β is the alpha over beta value derived from the linear quadratic model

Some particular achievements:

- He defined the "biologically effective dose" to better describe radiation treatment schedules, assisting in the prediction of radiation damage when dose rate (particularly brachytherapy) and dose-per-fraction are altered.

- Published more than 500 peer-reviewed papers and dozens of book chapters and received more than 30 honours and marks of distinction.

- A Passion for LQ modelling made Jack a coveted adviser, speaker and analyst of clinical fractionation schedules across the globe

At retirement (from Emeritus Professor at the University of Wisconsin) in 2003, the Department of Human Oncology established the "Jack Fowler Professorship" and ESTRO –Jack Fowler-University of Wisconsin Award

During the 18 years, since 1970, he was at the Gray Lab "enormous scientific output of publications from Jack and his staff, including Ged Adams, Julie Denekamp, Mike Joiner, Nic McNally, Barry Michael, Fiona Stewart, Boris Vojnovic, Peter Wardman, and Georg Wilson."

Jack's works extends to modern hypofractionation models in breast and prostate radiotherapy

The link with Professor John Yarnold (ICR and RMH), who recently received the Claud Regaud Medal for his outstanding work in breast radiotherapy at the ESTRO annual congress in 2021, creates this connection with hypofractionation breast cancer radiotherapy.

He writes:

- "My first exposure to Jack Fowler... was at the Gray lab in June 1975, during the first RCR week-long radiobiology teaching course organised by Hugh Thomlinson for 1st-year trainees."

- "A few days of contact with these individuals did more than anything else to stimulate... a lasting interest in clinical radiobiology. Jack Fowler rose to prominence as a leading interpreter of the Withers and colleagues' linear quadratic model in the years that followed.

John Yarnold's wanted to start using larger fractions, but the only safe way to do this was to set up phase lll clinical trials. After preliminary studies (START, which was financed by the Clinical Trials and Statistics Unit at ICR in London), he found support for START A [2] and START B [3] (1998-2002)from the MRC.

The next step was to test the safety of increasing the fraction size from around 3 Gy to 6 Gy, with the possibility of reducing the number of fractions from 15 to 5. The **UK FAST trial** (2008): 1 fraction/week 30 Gy (6 Gy per fr) and 28.5 Gy (vs. 50 Gy in 25 Fractions). The 3–year results for the FAST trial were published in 2011 [4]; then, in 2020, the 10-year results confirmed that the shorter treatment course is as safe in the long term for side effects [20]. This informed the design of **FAST-Forward: 5 fractions** (to 26 or 227 Gy) in 1 week vs. 40 Gy in 15 fractions [6].

It's also important to note the impact of our understanding of the alpha/beta ratio for prostate cancer and its impact on the Present Status of Hypofractionation in Prostate Radiotherapy [7], as well as on high dose rate after-loading brachytherapy for localised prostate cancer [8].

Scientific meetings in honour of Jack

"The Scientific Basis of Modern Radiotherapy," an international meeting in honour of John Francis Fowler (to mark his retirement after 18 years as Director of the Gray Laboratory. 30th June-2 July 1988 at the Gray Laboratory. Subjects: Fractionation; Hyperthermia; Vascular approaches; Modifiers; Prognostic Factors; Historical Perspectives.

1st L H Gray Memorial Trust Symposium 19th June 2015 (just prior to his death in 2016). Topics: dose fractionation and repopulation, hypoxia and response modifiers, new techniques, and predictive tests. Speakers: Soren Bentzen, Rob Bristow, Rob Coppes, Andre Dekker, John Fenwick, Amato Giaccia, Cai Grau, Ester Hammond, Tony Lomax, Wolfhang Tome, Catharine West, Brad Wouter, and John Yarnold

Jack's Awards

1965 BIR Roentgen Prize
1983 The ESTRO Breur Medal
1984 The Juan del Regato Gold Medal
1986 The Gilbert Fletcher Society Gold Medal
1995 The ASTRO Gold Medal
2002 The RRS Failla Award

Relevant Publications

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Professor Edwin Aird: His senior career in Medical Physics includes: Head of Radiation Physics at Newcastle on Tyne; Head of Radiotherapy Physics at Bart's Hospital, London; and Director of Medical Physics at Mount Vernon Hospital. He has been involved with teaching radiographers, radiotherapists, radiologists, and physicists; he is an examiner for IPEM and FRCR and an ESTRO teacher. He is a founder member of RTTQA, the group overseeing QA in Radiotherapy Clinical Trials. His awards include the BIR Roentgen Prize and the Silvanus Thomson Award.

EFOMP COMPANY MEMBER ARTICLE

LAP Leaps Into SGRT with Cutting-edge Innovation

New dose-free positioning and monitoring device from the Luna

LAP proudly unveiled its newest addition to the product portfolio, LUNA 3D, at this year's ASTRO Annual Meeting in San Diego, California. LUNA 3D marks a significant leap forward in Surface Guided Radiation Therapy (SGRT), utilizing high-resolution cameras to provide precise and dose-free patient positioning and monitoring throughout the radiotherapy process.

SGRT represents a significant diversification and evolution of LAP's existing healthcare portfolio. That product offering to date includes patient positioning (for efficient surface marking of tumor position during CT/MR imaging and correct patient positioning prior to treatment); RadCalc software for dosimetric verification of patient quality; a range of hardware phantoms to support MR imaging and radiotherapy quality; as well as multileaf collimators for precise beam shaping and targeted tumor irradiation. Just as importantly, LUNA 3D relies on – and directly benefits from – LAP's accumulated domain knowledge in laser projection and laser metrology, serving industries as diverse as steel production, composite processing and concrete part production.

Delivering the clinical upside

The LUNA 3D value proposition is about ease of use for the radiation oncology team. That means intuitive and flexible browser-based user interfaces, pre-defined "treatment steps" for quick and easy selection of SGRT parameters, and synchronized data presentation across in-room displays (including tablet devices) and control-room workstations. Workflow support is also designed to be as friction-free as possible with a virtual laser for fast and easy patient set-up; automated import of patient and treatment data; and all SGRT data easily accessible by clinical staff for preparation, reporting, and decision-making throughout the treatment cycle.

Collaborative innovation

Zooming in on product development and technology innovation, it's evident that LUNA 3D is very much the outcome of a collective and cross-disciplinary effort. Throughout the journey from project initiation to finalized SGRT offering LAP's R&D and product engineering teams worked hand-in-hand with a network of clinical partners at the sharp-end of treatment delivery. Right now, for example, LUNA 3D is being evaluated at several early-adopter sites around the world – among them Pius Hospital in Oldenburg, Germany; CCGM Clinique Clémentville

in Montpellier, France; and Penn Medicine in Philadelphia, PA, US.

LAP's commitment to innovation and cross-disciplinary collaboration underscores its dedication to advancing the field of radiotherapy, providing healthcare professionals with tools that improve patient care.

To learn more about LUNA 3D you can access the following materials

1: Webinar recording: "Discover LUNA 3D, the New More in Surface Guided Radiation Therapy"

2: IOP Article: "Collaborative product innovation: mapping the A to Z of the SGRT clinical opportunity"

Thomas Speck is the Vice President New Product Solutions at LAP. Thomas has more than 15 years of experience in the medical device industry with a strong focus on patient positioning and monitoring solutions in radiation therapy.

510(k) pending (K232031) – not available for sale in the US. Availability of products, features, and services may vary depending on your location.

NMO ARTICLE

Celebrating International Day of Medical Physics (IDMP) 2023 in Italy - "Standing on the shoulders of Giants"

The Italian Association of Medical Physicists (AIFM) organised a meeting that took place in Bergamo on Tuesday, November 7th, and was attended by almost 100 medical physicists and about 40 boys and girls from high school to celebrate IDMP. Report by **Caterina Ghetti**

Every 7th of November (date of birth of Maria Sklodowska Curie), the community of Medical Physicists worldwide celebrates the International Day of Medical Physics, IDMP. "Standing on the shoulders of Giants" is the main theme chosen by IOMP to celebrate the event this year.

Following this topic, AIFM, the Italian Association of Medical Physicists, which represents more than 1400 professionals, organised a meeting that took place in Bergamo on Tuesday, November 7th, and was attended by almost 100 medical physicists and also about 40 boys and girls from high school. The theme was interpreted with a focus on the role and activities of young medical physicists. These emerging talents represent the future of the discipline, supported by the discoveries and innovations of those who preceded them.

With this event, several key objectives were achieved. First of all, we have tried to provide a unique platform for open and constructive dialogue between different generations of medical physicists.

Moreover, we have explored the opportunities for entering this stimulating sector as well as facilitating professional development through the sharing of skills and knowledge.

We, therefore, talked about the Schools of Specialisation in Medical Physics; some topics were research and technological innovations, and we also had some talks with those who have chosen to carry out their profession abroad and with the young medical physicists who are at the beginning of their careers.

Furthermore, some scientific works carried out by young medical physicists and selected through a call for abstracts were presented. Finally, the speech by the well-known journalist Ferruccio De Bortoli proposed a broader reflection on the relationship between young people and work in order to help us understand and support young generations.

Caterina Ghetti is an Italian medical physicist; she is the chief of the Medical Physics Department at the University Hospital of Parma. Her professional interests are mainly in imaging (tomosynthesis, Computed Tomography, model observation, iterative reconstruction) and radiation protection. She is a member of the directive board of the Italian Association of Medical Physics (AIFM) and of the scientific board of the next ECMP congress.

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EFOMP COMPANY MEMBER ARTICLE

FLASH Radiotherapy: Dosimetric Challenges and Solutions

The First Commercially Available Detector for FLASH Dosimetry - the flashDiamond Detector, a recently developed PTW detector, namely the T60025 model, has undergone a successful implementation and rigorous validation process in ultra-high pulse dose rate beams

Sparing healthy tissue while maintaining or improving tumour control is the primary goal of radiotherapy. In recent decades, this goal has been advanced primarily through technological innovations. Since the rediscovery of the so-called FLASH effect in 2014, many preclinical studies have shown that ultra-high dose rate (UHDR) irradiation (mean dose rate > 40 Gy/s) results in significant healthy tissue sparing. Accurate dosimetry of these ultra-high dose rates is a major challenge and crucial for the safe transition of FLASH radiotherapy (FLASH-RT) into clinical practise. To address this need, PTW joined the European UHDpulse project to provide a framework for dose measurements at UHDR [1], which was successfully completed in February 2023.

Ionisation chambers need to be adapted to operate under high dose rate conditions

Vented ionisation chambers (ICs) are considered the gold standard for reference dosimetry and are most commonly used as secondary standards. Unfortunately, established ICs show significant saturation effects due to ion recombination at UHDR in pulsed beams (Figure 1).

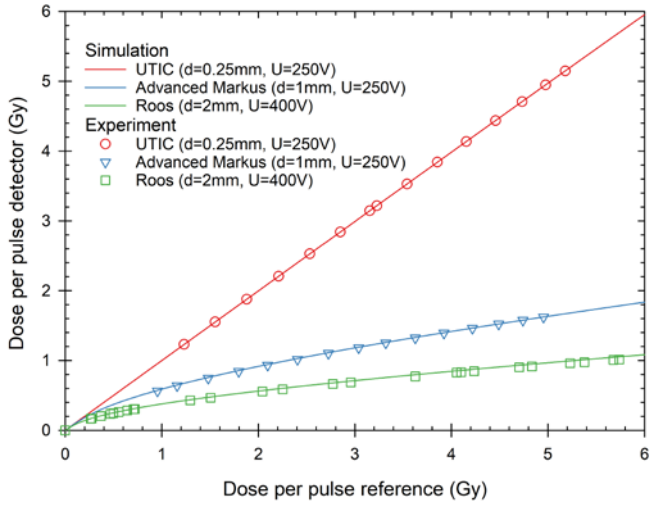

Figure 1: Detector reading from parallel plate ionisation chambers with different electrode distances d and operational voltages U (Roos PTW T34001 (d = 2 mm), Advanced Markus PTW T34045 (d = 1 mm), and a prototype PTW UTIC (d = 0.25 mm)) without correction for ion recombination effects as a function of dose per pulse from experiments (symbols) and simulations (lines)

In addition, other conventional active real-time detectors, such as solid-state detectors based on semiconductors, start to fail at UHDR. For this reason, passive dosimeters, such as alanine, radiochromic films, or luminescence dosimeters (TLDs and OSLDs), are mainly used under these conditions. However, the use of passive dosimeters is complex, very time-consuming, and usually lacks traceability to primary standards. There is therefore a need for active real-time dosimeters and traceability. It is also desirable to use ionisation chambers as a secondary standard under UHDR conditions.

To find a solution to this challenge, the role of the distance between the electrodes of vented ICs and its impact on ion recombination has been analysed experimentally and by numerical simulation [2]. The results show that this parameter is the most relevant to achieving negligible recombination losses. With an electrode distance of only 0.25 mm in vented ICs, also known as ultra-thin ICs (UTIC), more than 99% of the charge is collected during a 2.5 µs pulse of 5 Gy (Figure 1). Ionisation chambers are therefore excellent candidates as a secondary standard for reference dosimetry in UHDR beams because they are also waterproof, easy to handle, and can be used according to the existing methodology in current codes of practise.

flashDiamond: the first detector for FLASH dosimetry

However, ICs are limited in spatial resolution due to the diameter of the sensitive volume, especially when measuring lateral dose distributions and in small fields.

A detector that is particularly well suited for these applications, which require high spatial resolution, is the well-established microDiamond detector by PTW (type T60019). It can also be used for electron radiation, including high-dose per pulse (DPP) applications such as those used in IOeRT [3, 4]. Due to the high water equivalence of its sensitive volume in terms of effective atomic number, no conversion from ion dose to absorbed dose to water is necessary when determining depth dose curves for electron beams. This characteristic, along with its good stability of response as a function of the accumulated dose, made the micro-

Diamond detector a promising detector for use in UHDR environments [1]. However, the detector has been shown to exhibit saturation behaviour at UHDR pulsed electron beams [5]. A thorough investigation under ultra-high pulse dose rate (UHPDR) conditions using different samples and modified designs was performed by Marinelli et al. [6] and Kranzer et al. [7]. These studies confirmed the observed saturation behaviour (Figure 2) and investigated the influencing parameters.

It was found that the critical parameters to improve the dose-response linearity of the detector are the sensitivity and the total series resistance. Optimising these parameters results in a new type of detector adapted to UHPDR conditions, the flashDiamond detector by PTW (type T60025). This new detector, which is now commercially available, has been successfully tested in terms of linearity with UHDPDR (Figure 2), three-dimensional relative dose distributions (percentage depth dose curves and lateral dose profiles), and output factors [8].

Together with the flashAdapter (T16055), the flashDiamond detector can be used with PTW electrometers and integrated into scanning water phantoms, which makes the application very easy and familiar for medical physicists. The flashDiamond is therefore an ideal detector for a wide range of applications under UHDR conditions.

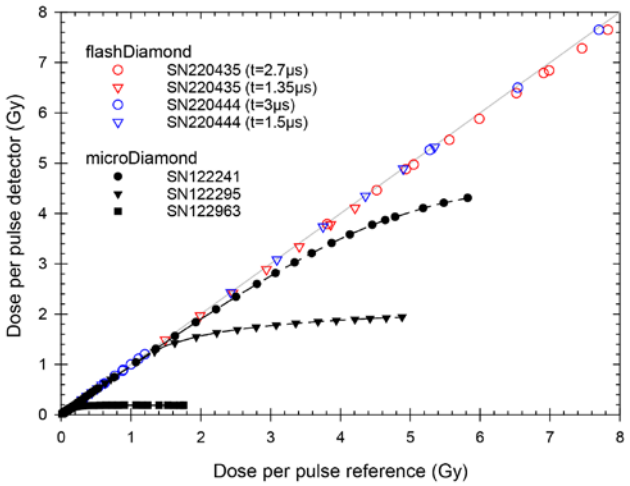

Figure 2: Detector reading as a function of the dose per pulse in a water phantom for three microDiamond detectors (PTW T60019) under the same beam conditions (2.5 µs pulse duration) as well as for two flashDiamond detectors (PTW T60025) at different pulse durations t.

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Rafael Kranzer studied biomedical engineering at Technische Hochschule Mittelhessen (THM) and completed his doctorate at Carl von Ossietzky University. He works as Team Lead Radiation Physics at PTW Freiburg, focusing on the research and development of dosimetry equipment and detectors.

MEETING REPORT

The 16th International Conference and Workshop "Medical Physics in the Baltic States 2023" and International Day of Medical Physics in Lithuania

A quiz called "On the Shoulders of Giants" was also organised with participants from 14 different countries (Latvia, Lebanon, Lithuania, Sweden, Malta, Turkey, Germany, Sudan, Venezuela, Italy, Pakistan, Ukraine, Bulgaria, and Poland) in the events; **Sundus Osman** and **Gustė Laurikaitytė** report

Photo 1: The winners of the quiz "On the Shoulders of Giants" time (Milda Bareikė -1st place, Lithuania, Kristaps Palskis - 2nd place, Latvia, Sandra Stepina - 3rd place, Latvia) and the main participants of the conference.

The International Day of Medical Physics in Lithuania was mentioned and celebrated at Kaunas University of Technology together with the 16th International Conference & Workshop "Medical Physics in the Baltic States 2023." Participants from 14 different countries (Latvia, Lebanon, Lithuania, Sweden, Malta, Turkey, Germany, Sudan, Venezuela, Italy, Pakistan, Ukraine, Bulgaria, and Poland) took part there; a quiz called "On the Shoulders of Giants" was also organised at the conference (Photo 1). The main idea of this quiz was formulated according to the message of the IDMP Coordinator at the International Organisation of Medical Physics (IOMP), which emphasised the main achievements in the Medical Physics field and reminded us of the main historical facts, enlightening the importance of medical physicists' role in the future of healthcare.

On the 9th-11th of November, 2023, a hybrid type (held both in person and virtually) International conference and workshop was organised. It is usually held every second year by Kaunas University of Technology/ Lithuania, Society of Medical Physicists/Lithuania (a member of the Lithuanian Association of Medical Physics and Biomedical Engineering Medical Physicists Society), Malmö

University Hospital, Lund University/Sweden and is endorsed by the European Federation of Organisations for Medical Physics (EFOMP) (Photo 2).

Photo 2: Welcome talk from Athens with the EFOMP President Paddy Gilligan and Vice-President Efi Koutsouveli; Marco Brambilla presentation "EFOMP's Role in Promoting the Medical Physics Profession in Europe", and Vice-Convener Antonio Jreije talk "The Main Activities of The EFOMPs Special Interest Group for Early Career Medical Physicists".

The course of the conference has been accredited by EBAMP as 24 CPD points for Medical Physicists at EQF Level 8. This event brings together medical physicists, researchers, radiation protection experts, and other experts from many countries who share their expertise and experience via research and educational sessions and roundtable discussions and contribute to the fostering of new national and international collaboration.

Conference proceedings from 2009 until now are included in the CA WoS database (without citation index).

This year was a special occasion to celebrate as the international MSc study programme "Medical physics" is already 20 years old and running successfully at Kaunas University of Technology (Photo 3)!

Photo 3: Students of the MSc study programme in Medical Physics graduated from 2003 to 2023.

Everyone who wishes to visit Lithuania and share knowledge in the medical physics field, enjoy interesting and informative discussions, or start new collaborations is welcome at the 17th International Conference and Workshop "Medical Physics in the Baltic States 2025," which will be held on November 6-8, 2025, in Kaunas. Mark the date in your calendar and come to meet our amazing team, "I love Medical Physics" (Photo 4).

More detailed information regarding this event can still be found on the conference website.

Photo 4: The main organising team "I Love Medical Physics" of the 16th International Conference and Workshop "Medical Physics in the Baltic States 2023."

Sundus Osman graduated with a Bachelor of Science (BSc Hons) in Medical Physics from Alneelain University,-Sudan. Following graduation, she served as a Teaching Assistant in Radiological Science at the University of Medical Science and Technology in Sudan. Currently, she is pursuing an MSc in Medical Physics at Kaunas University of Technology through the Marie Sklodowska-Curie Fellowship Programme scholarship (IAEA MSCFP).

Gustė Laurikaitytė is pursuing an MSc in Medical Physics at Kaunas University of Technology with a Bachelor of Science in Computer Science. She is working at UAB Medical Physics as a medical physicist assistant, where she assists in performing dosimetric, quality control, and shielding measurements.

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EFOMP COMPANY MEMBER ARTICLE

For Immediate Release

Qaelum NV and Philips Forge Global Strategic Partnership to Advance Radiation Dose Management Solutions

[Leuven, Belgium, November 22nd, 2023 / RSNA 2023, Booth #2708, South Hall]

Qaelum NV, a leading provider of innovative healthcare solutions, and Philips, a global leader in health technology, have a strategic partnership to revolutionize radiation dose management in medical imaging. This collaboration marks a significant milestone in the quest to enhance patient safety and optimize healthcare workflows.

By offering a like-for-like replacement, Qaelum will ensure seamless continuity for existing Philips customers, providing them with ongoing support and access to Qaelum's expanding portfolio of software solutions. This partnership underscores the commitment of both parties to creating safer, more efficient, and higher-quality medical imaging environments.

Qaelum NV's expertise in dose monitoring and quality management, coupled with Philips' cutting-edge healthcare technology, creates a powerful synergy aimed at addressing the evolving challenges in radiation dose management. The collaboration will leverage Qaelum's Dose, a state-of-the-art radiation dose monitoring solution, and Philips' advanced imaging systems to deliver comprehensive and integrated solutions for healthcare providers worldwide.

Mr. Jurgen Jacobs, CEO and co-founder of Qaelum NV, commented, "This strategic partnership with Philips is a testament to our commitment to advancing healthcare solutions that prioritize patient safety and quality of care. By combining our expertise in radiation dose management with Philips' state-of-the-art imaging technology, we are poised to make a meaningful impact on global healthcare."

Mr. Vincent Roording, Procurement Manager OEM Solutions at Philips, added, "We are excited about the possibilities that this collaboration brings to the healthcare industry. The like-for-like replacement option of Qaelum, will also ensure continuity of service to our existing customers."

The partnership between Qaelum NV and Philips is set to redefine the landscape of radiation dose management in medical imaging, with a shared vision of advancing healthcare through innovation and collaboration

About Qaelum NV

Qaelum NV is a leading provider of medical software solutions based in Leuven, Belgium. With a mission to advocate patient safety and quality improvement in medical imaging environments, Qaelum develops and implements user-friendly software solutions that are extensively validated by key opinion leaders in the field. Through its innovative products, Qaelum aims to create patient-safe and optimized medical imaging environments for healthcare stakeholders worldwide.

Website: https://www. qaelum.com

About Philips

Philips is a global leader in health technology, delivering comprehensive solutions across the healthcare continuum. With a strong focus on innovation, Philips aims to improve people's health and well-being through meaningful innovations that address pressing healthcare challenges. Through its integrated portfolio of products, services, and solutions, Philips is dedicated to enabling better outcomes for patients, healthcare providers, and society as a whole.

Website: Global home | Philips

For media inquiries, please contact
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Phone: +32 (0) 16 585157
Email: scarlette.ye@qaelum.com - marketing@qaelum.com
Website: https://qaelum.com

Jurgen Jacobs: co-founder and CEO of Qaelum, has more than 15 years of experience in radiology. He initiated software solutions for patient dosimetry and physicotechnical quality control while working at the University Hospitals of Leuven.

NMO ARTICLE

III Curie Meeting Organised by the Young Committee of the Spanish Society of Medical Physics (SEFM)

On the occasion of the International Day of Medical Physics, the Young Committee of the Spanish Society of Medical Physics (SEFM) organised the III Curie Meeting in Madrid.

Although registration was open to everyone, it was aimed at medical physicists in training, PhD students, and young medical physics experts.

The meeting began with an interview with doctors José Perez-Calatayud and Mª Ángeles Fidalgo to talk about research beyond hospital practise.

Image 1: Attendees of the third Curie meeting at the first conference on research beyond hospital practice.

We then had a round table on adaptive radiotherapy, where we were able to see the point of view of different professionals working with offline and online techniques using CBCT and MRI.

This was followed by the second edition of the science communication competition, 'My job in 226 seconds'. In this competition, young people from the Society present their projects at a specific time to commemorate the massive radium count.

After lunch, we were able to discuss the present and future of radiophysics in areas such as artificial intelligence, radiodiagnostics, nuclear medicine, brachytherapy, and external beam radiotherapy.

Image 2: Finalists of the "My job in 226 seconds" contest.

The meeting then continued with a talk aimed specifically at undergraduate students who want to pursue a career in medical physics to show them the different paths they can take, whether from a research or a clinical perspective. Leticia Irazola, from the steering committee of the special interest group Early Career Medical Physicists, also presented the group, its functions, and the different working groups in which one can participate.

Image 3: Leticia Irazola presenting the Early Career Medical Physicists SIG.

The day ended with the first edition of the CrossPhys Games, a sport that combines CrossFit with physics, using various materials from a radiophysicist's daily work (phantoms, cables, etc.) as CrossFit elements.

The Young Committee is very proud of the results of these sessions, which have not only served to raise awareness of our profession, but have also been a meeting point between young people and professionals in the field of medical physics.

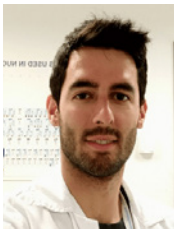
Leticia Irazola, PhD. Is a medical physicist at Centro de Investigaciones Biomédicas de La Rioja, Logroño, Spain. She is also an assistant teacher at Universidad de Valencia for the Medical Physics Degree. She is the secretary of the SEFM Youth Committee, secretary of the EFOMP Communication and Publications Committee and Chair of the EFOMP Early Career SIG.

Teresa Cuenca is a medical physicist at the Clínica Universidad de Navarra, Pamplona, Spain. She is a member of the SEFM Young Committee and also belongs to the Early Career Medical Physicists SIG.

Beatriz García is a medical physicist in training at the Hospital Provincial de Castellón, Castellón, Spain. She is a member of the SEFM Young Committee and belongs to the National Medical Physics Specialty Commission.

Fátima Leo is a medical physicist in training at the Hospital de Santa Creu y Sant Pau, Barcelona, Spain. She is a member of the SEFM Young Committee.

Daniel Puerta is a PhD student at Universidad de Granada, Granada, Spain. Holding an MSci degree in Mathematics and Physics from the University College London and a MASt in Applied Mathematics from the University of Cambridge. He is a member of the SEFM Young Committee.



Víctor González is a medical physicist in training at Hospital Universitario Puerta de Hierro, Majadahonda, Spain. He is a member of the SEFM Young Committee.

Marta Ferrer is a medical physicist in training at Hospital Universitario Virgen del Rocío, Sevilla, Spain. She is a member of the SEFM Young Committee.

Andrea González is a medical physicist in training at Hospital Universitario Miguel Servet, Zaragoza, Spain. She is a member of the SEFM Young Committee.

Tamara Lusa is a medical physicist at Hospital Virgen del Consuelo, Valencia, Spain. She is a member of the SEFM Young Committee and also belongs to the Early Career Medical Physicists SIG .

EFOMP COMPANY MEMBER ARTICLE

Reimagining Physics Review for Departments of the Future

ChartCheck automatically compares relevant treatment data from each treatment fraction to the values you expect to see, closely monitors treatment progression, imaging shifts, and approval status, and can be configured to send you alerts

These days, technology keeps us informed. We have abundant options for data, alerts, and notifications in the consumer world, including the status of our home security system, various sleep and heart rate trends, or even the GPS coordinates of our beloved canine housemates should they stray from home.

Unfortunately, we haven't had the same ease and convenience when it comes to clinical data. Instead, large volumes of patient records are not properly monitored in a way that provides meaningful status updates, or we're not notified immediately when something changes.

Challenging The Status Quo

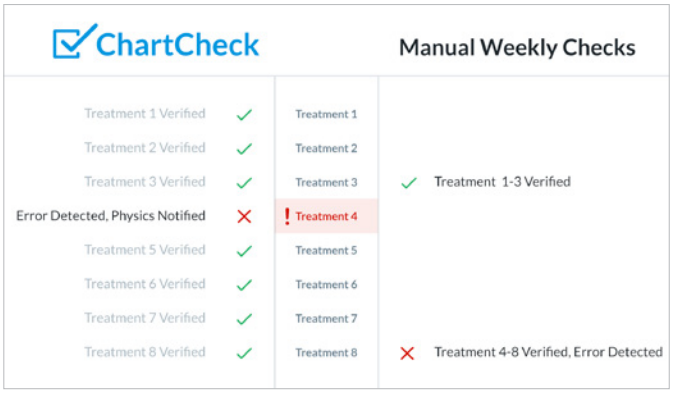
We are doing chart checks the same way that we've done them for decades. Why is it important to check a patient's chart every five fractions? Before electronic charts, you didn't want to do weekly checks any more frequently because obtaining physical charts from the technologists was a task on its own! But it's 2023, and we can do better.

They don't take long to accomplish, and weekly checks are not technically challenging. But certain conditions—volume, interruptions, time of day, number of clicks, multiple applications required, data load times, etc.—keep physicists busy. And though it can be rare to find errors in the plan after thorough initial plan checks, it's important to maintain focus and attention while performing these checks to ensure real problems don't go unnoticed.

But here's the good news: we have data from each and every treatment fraction—including imaging—at our disposal. We just need a platform to pull it all together in a user-friendly format so we can bring automation to weekly physics checks. We've tackled the challenge, and we call it ChartCheck.

Automation Brings More Data To Your Fingertips

We believe automation can be helpful in comparing any instance of new data—in real-time—to baseline values. So we've designed ChartCheck to automatically compare relevant treatment data from each treatment fraction to the values you expect to see. ChartCheck closely monitors treatment progression, imaging shifts, and approval status and can be configured to send alerts whenever parameters deviate from expected values.



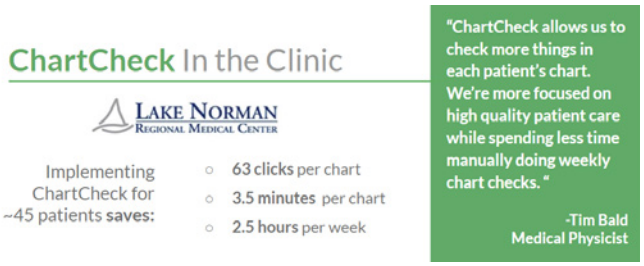
With automated alerts, physicists can find out about deviations in plan data immediately, well before the next plan review is due, and plan errors can be resolved before the next treatment.

One of the challenges of current weekly physics checks is managing multiple screens and applications. This can lead to fatigue and require multiple clicks to simply navigate windows and compare data. By bringing multiple sources of data into a single platform, there is more powerful functionality within a single browser, limiting interruptions to other applications.

We know that there is more to weekly physics than just comparing a few plan parameters. There are tasks that take place after the chart is reviewed that also require attention. To that end, we've added the ability to configure automated standardised documentation for all weekly and end-of-treatment checks. More than that, this documentation can also be synced to the ARIA documents section for efficient record keeping.

Clinical Impact: Higher Quality Plan Review

Let's look at an example of ChartCheck in the clinic. Physicists at Lake Norman Regional Medical Centre implemented ChartCheck and evaluated their physics weekly review process. In addition to saving 3.5 minutes per chart, summing to 2.5 hours of physics time each week, they made their process much more efficient, minimising the burden of each check by an average of 63 clicks per chart. The time savings from weekly checks have empowered the team to concentrate on other tasks that promote top-notch patient care.



Shifting from Reactive to Proactive

With in-depth analysis of each treatment fraction, we get closer to the data. Much of the information we regularly review involves simple number-to-number comparisons or basic logical testing, which are ideal candidates for automation. This not only makes the checks faster and easier, but can improve the reliability and quality of these checks. Furthermore, it affords efficiency that allows physicists to focus more attention on the review tasks that require critical expertise and human judgement.

Learn more about ChartCheck and schedule your free trial today.

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—including the board of directors—and volunteers for the American Board of Radiology.

NMO ARTICLE

International Day of Medical Physics 2023 in Zagreb

Croatian Medical Physics Association (CROMPA) celebrated the International Day of Medical Physics in Zagreb with the 4th CROMPA Symposium, "Medical Physics in Croatia." **Hrvoje Hrsak**, **Iva Mrcela**, **Tomislav Bokulic** and **Ivana Kralik** report

During its annual meeting (Figure 1), with more than 50 participants registered, the CROMPA celebrated the International Day of Medical Physics in Zagreb. While the Meeting focused on the challenges medical physicists face on their way to a regulated profession in healthcare with an established specialisation and accreditation programme in Croatia, the Symposium presented a selection of clinical and scientific work done by Croatian medical physicists in 2023 and activities in projects funded by the IAEA and EU under the EU4Health programme (Figure 2). This way, medical physicists addressed professional and scientific activities during the annual meeting as the two most important.

Figure 1. Participants of the 4th CROMPA Symposium at the Department of Physics, Faculty of Science, University of Zagreb.

Professional activities in 2023 and the September meeting with Prof. Arun Chogulue, IOMP ETC Chair (Figure 3), were presented and discussed. As a result of this, the IOMP officially supported regulating the medical physics profession as an essential healthcare profession in Croatia. Why is official recognition of so much importance? It opens the door to a change in the status of the medical physics profession, the introduction of the specialisation and accreditation programme, and the establishment of an appropriate qualification framework for medical physicists working in clinics. Croatian law states that these changes are impossible without recognising medical physics as a healthcare profession.

The clinical and scientific activities of the medical physicists presented at the symposium aimed at the improvement and optimisation of diagnostic and therapeutic

Symposium Programme

14.00 - 14.10	Introduction
14.10 - 14.25	Optimisation of the Agility MLC model in the Monaco TPS based on clinical treatment plans *Miljenko Murković, University Hospital Centre Zagreb*
14.25 - 14.40	Optimising dosimetric leaf gap for a stereotactic linear accelerator *Mihaela Mlinarić, Specialty hospital Radiochirurgia Zagreb*
14.40 - 14.55	Dosimetry Verification of the Convolution Algorithm for Calculation of the Absorbed Dose in Leksell Gamma Knife Brain Radiosurgery *Gabriela Jazvac, University of Zagreb, Faculty of Science*
14.55 - 15.20	Introducing LUNA 3D: LAP leaps into Surface Guided Radiation Therapy with cutting-edge innovation *Markus Zelch, LAP GmbH Laser Applikationen*
15.20 - 15.45	Coffee break
15.45 - 16.00	IAEA CRO6021 PROJECT - AN OVERVIEW *Dea Dundara Debeljuh, University Hospital Rijeka*
16.00 - 16.15	IAEA COMPREHENSIVE CLINICAL AUDIT IN QUALITY IMPROVEMENT IN DIAGNOSTIC RADIOLOGY: EXPERIENCE FROM UNIVERSITY HOSPITAL CENTRE OSIJEK *Ivana Bjelobrk, University Hospital Centre Osijek*
16.15 - 16.30	Dosimetry measurements on Radgil 2 blood irradiator *Tomislav Viculin, Ekoteh dosimetry Ltd.*
16.30 - 16.35	Announcement of activities within the i-Violin project *Ivana Kralik, Dubrava University Hospital*
16.35 - 16.40	Announcement of activities within the PrISMA project *Ivana Kralik, Dubrava University Hospital*
16.40 - 17.40	CROMPA assembly
17.40 -	Symposium reception

Figure 2. Specialisation and accreditation Symposium programme presented a selection of clinical and scientific work done by Croatian medical physicists in 2023 and activities in projects funded by the IAEA and EU under the EU4Health programme.

procedures, QA programmes, the development of dosimetry methods, and the contribution to the aforementioned EU projects, clearly showing the potential and motivation of Croatian medical physicists to improve the quality of clinical work and expand scientific achievements.

CROMPA has existed for four years, increasing the number of members from 30 in 2019 to nearly 80 in 2023. Our annual symposiums are becoming a tradition and

a genuine celebration of the medical physics profession in Croatia.

Figure 3. September meeting with Prof.Arun Chogulue at the School of Medicine, University of Zagreb: Hrvoje Hrsak, Assoc Prof. Sanja Dolanski Babic, Arun Chougule, Tomislav Bokulic, and Iva Mrcela.

Hrvoje Hrsak is the CROMPA President, medical physicist at the Department of Medical Physics, University Hospital Centre Zagreb, and Assistant Professor at the Department of Physics, Biophysics and Medical Physics, School of Medicine, University of Zagreb. His main interests are radiosurgery, small beam dosimetry, and medical physics professional matters.

Iva Mrcela is a medical physicist at the Department of Medical Physics, Sestre Milosrdnice University Hospital Centre in Zagreb. Her main interests are in radiotherapy physics with a focus on patient

Tomislav Bokulic is a medical physicist, an Assistant Professor at the Department of Physics, Faculty of Science, University of Zagreb, and a member of the CROMPA Steering Committee. His major research interests are clinical radiotherapy physics, dosimetry and dosimetry audits, and physics in nuclear medicine.

Ivana Kralik is a medical physicist at the Department of Diagnostic and Interventional Radiology at Dubrava University Hospital in Zagreb. She is an assistant professor at the School of Medicine, University of Zagreb, and a member of the CROMPA Steering Committee. She is involved in the implementation of national and international scientific and professional projects in the fields of medical physics and radiation protection.

EFOMP COMPANY MEMBER ARTICLE

New Product in X-ray QA Testing As RTI Releases its Most Accurate, Efficient And Versatile X-ray Meter to Date. Meet Mako!

RTI has made significant progress in X-ray quality assurance (QA) and testing by introducing their revolutionary new X-ray meter, Mako, at the Radiological Society of North America Meeting in Chicago, United States.

The next-generation multimodal X-ray meter has industry-leading accuracy (uncertainty of ±1.5% kVp) thanks to innovative new detector technology. Focused on efficiency, Mako offers the ultimate hassle-free experience, easy installation in all X-ray applications and fully wireless capabilities. The modular, future-proof system design offers ultimate configuration flexibility, with the widest application range ever for X-ray quality assurance testing.

When it comes to protecting patients and staff in medical x-ray imaging, regular and proper quality assurance

and testing is of the utmost importance. Mako is not just a tool; it is the complete tool belt for X-ray examination, which protects patients and medical staff from unnecessary X-ray radiation while guaranteeing the best image quality and extending the life of the system. This game-changing product is the result of more than 40 years of experience in X-ray quality assurance and testing, with Mako delivering the most advanced hardware platform, fully integrated into the leading software and cloud solutions, for unparalleled efficiency and full traceabilitv.

The modular, platform-based design breaks new ground in performance for all medical x-ray applications, designed to excel in radiography, fluoroscopy, mammography, dental and CT applications, with seamless integration of a wide range of probes simultaneously.

The new Mako R/F probe adds superior dynamic range from low to high dose rates, and the system integrates non-invasive mAs capabilities, for an industry-leading solution in radiography/fluoroscopy applications. The Mako Mammo Probe covers the entire clinical kV range in mammography from 18-49 kV with superior accuracy, while other mammography sensors are limited to 40 kV. It can also be used for testing dental X-ray applications, with a sensor that is four times narrower yet more sensitive than comparable systems on the market. With the ability to integrate DAP, mAs, CTDI, Light and many other QA measurements, Mako, one can say, is a unique solution for all X-ray QA applications.

The new technology is complimented by RTI's warranty program of up to 10 (ten) years and extensive calibration cycle, which, together with free online training programs and dedicated support, embodies the company's vision of "Setting the standard for the Quality Assurance of X-ray imaging." Dr. Michael Olding, Head of Product Management at RTI Group, said: “Our meters must deliver not only measurement accuracy, but also efficiency in setup and performance. Only Mako offers this unique combination, where the advanced detector design always delivers the best sensitivity and accuracy while user experience is transformed with hassle-free installation and streamlined data collection.”

To learn more about Mako and book your free demo today, contact sales@rtigroup.com or visit https://makobyrti.com.

Michael Olding, PhD, is Head of Product Management at RTI Group. Michael works on the interface between product development at RTI and global end users of RTI’s products and solutions (physicists, engineers, and medical professionals) and is passionate about ensuring user needs are at the forefront of new product development at RTI Group

EFOMP COMPANY MEMBER ARTICLE

Advancing Quality Assurance In Contemporary Radiosurgery: A Dosimetric Evaluation of the Zap-X Gyroscopic Radiosurgery System

Combining advanced technology and expertise for safe and precise radiosurgery treatments

As technology continues to advance, driving the development of even more advanced and effective treatment options, the challenges of contemporary radiosurgery will only continue to grow. Contemporary radiosurgery demands a high level of precision, safety, and patient comfort. Patients expect minimally invasive, non-surgical treatments that offer shorter treatment times, reduced recovery periods, and minimal side effects, allowing them to quickly return to their normal activities. Additionally, healthcare providers require radiosurgery systems that are efficient, cost-effective, and easy to use.

To meet these demands, contemporary radiosurgery systems utilise advanced imaging and targeting technologies, such as the gyroscopic motion used in ZAP-X, to precisely locate and target tumours and lesions. ZAP-X Gyroscopic Radiosurgery System is an advanced medical technology that delivers hundreds of uniquely angled non-coplanar beams to treat benign and malignant intracranial and cervical spine lesions [1]. This cutting-edge treatment method eliminates the need for head frames or masks as it employs a unique gyroscopic motion to keep the patient's head still during treatment. ZAP-X is a non-invasive, outpatient procedure that can be performed in a single session with minimal side effects [2].

While ZAP-X's single-session treatment option, along with its ability to deliver high-dose radiation directly to the tumour or lesion, provides significant advantages, it is important to acknowledge that it multiplies the risk of potential radiation-induced damage, as any failure in the treatment chain, no matter how small, can result in significant injury. This highlights the critical importance of a comprehensive Quality Assurance (QA) programme to ensure the safety and accuracy of the treatment. QA is an essential aspect of any medical treatment, and ZAP-X is no exception. QA protocols must be integrated into every aspect of the treatment process, from pre-treatment planning to post-treatment follow-up, to ensure that patients receive the highest quality of care.

RTsafe's solutions provide advanced QA tools to mitigate the risk of potential errors and enhance the overall safety and efficacy of such radiosurgery treatments. The anthropomorphic 3D-printed phantoms, along with the remote dosimetry services, allow for accurate simulation of patient anatomy, enabling healthcare providers to validate their treatment plans and test the accuracy of their radiosurgery systems in a realistic environment. Additionally, RTsafe's phantoms can be used for staff training, allowing healthcare providers to gain experience in using new radiosurgery technologies and techniques in a safe and controlled environment. By providing advanced QA tools for radiosurgery, RTsafe is helping to meet the growing demands of contemporary radiosurgery and improve the overall quality of patient care. This allows for a higher level of confidence in the treatment process, which ultimately leads to better patient outcomes [3].

RTsafe technology assists healthcare professionals in performing the dosimetric evaluation of a ZAP-X Gyroscopic Radiosurgery System during commissioning and periodic QA. The overall accuracy of the radiosurgery procedure can be evaluated by performing end-to-end tests utilising the Prime anthropomorphic head phantom and remote dosimetry services provided by RTSafe. Dose measurements are performed on a 3D reproduction of a real patient's anatomy, simulating an actual treatment process. The well-established 2D film dosimetry using radiochromic films, in combination with the unique advantage of 3D polymer gel dosimetry that RTsafe provides as a service, offers the information needed for a comprehensive evaluation of the radiosurgery system.

References:

[1] Weidlich GA, Bodduluri M, Achkire Y, Lee C, Adler JR. Characterization of a Novel 3 Megavolt Linear Accelerator for Dedicated Intracranial Stereotactic Radiosurgery. Cureus. 2019;11(3):1-18. doi:10.7759/cureus.4275
[2] ZAP: https://zapsurgical.com/
[3] RTsafe: https://rt-safe.com/

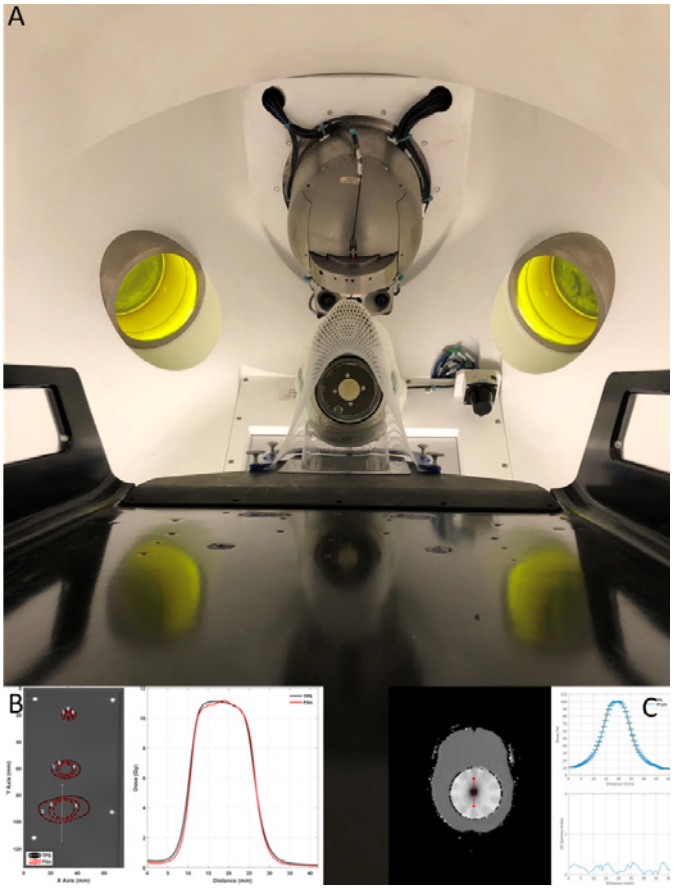


Figure (A) Photo of the Prime phantom into the ZAP-X Gyroscopic Radiosurgery System. (B) Film and (C) Gel results (absolute and relative dose profiles, respectively) of a treatment plan with three targets

Emmanouil Zoros is a medical physicist and a product manager. Emmanouil 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 an emphasis on quality assurance in stereotactic radiosurgery and experimental and computational dosimetry using Monte Carlo simulation techniques.

Kyveli Zourari is focused on developing a comprehensive dosimetry audit programme dedicated to SRS and SBRT applications. Prior to RTsafe, she gained experience in computational and experimental dosimetry, as well as dosimetry audits in radiotherapy as a scientific associate at the Medical Physics Laboratory of Medical School, National and Kapodistrian University of Athens and medical physics at the Greek Atomic Energy Commission. She has a PhD in Medical Physics from the Medical School of the University of Athens.

MEETING ANNOUNCING

ECMP 2024, “Bridging the Future: From Research to New Clinical Practices "Munich, Germany, from the 11th to the 14th of September 2024

Katia Parodi and **Yolanda Prezado** are pleased to announce the 5th European Congress of Medical Physics (ECMP2024) that will integrate for the first time the Joint Conference of the German (DGMP), Austrian (ÖGMP) and Swiss (SGSMP) Medical Physics Societies

Medical Physics is a domain in constant evolution and we are all witnessing the start of a new era marked by many important discoveries and developments that will radically change our clinical practice in the near future. Translational research into novel radiobiology concepts, artificial intelligence, new medical imaging techniques, and others are the main drivers of these strong winds of change. Bringing new technologies and treatment schemes to reliable and standardised clinical practice has always been one of the core missions of medical physicists. Correspondingly, the theme of this congress, “Bridging the Future: From Research to New Clinical Practises," was inspired by this idea.

We are working to make ECMP2024 a forum to foster discussions and reflections on how to change our mindset to optimally adapt to this rapidly varying environment, including the increase of interdisciplinarity and European communication, improvements to our education programmes, and further strengthening the bridge between research and clinical practice. ECMP 2024 will be an excellent opportunity for us to share ideas and experiences, as well as to further enhance our collaboration with industrial vendors and our sister organisations to deliver this vision.

With the support of an international scientific committee, we are preparing an exciting programme with seven different tracks: clinical radiotherapy, clinical imaging, innovative radiotherapy, innovative imaging techniques, artificial intelligence, non-ionizing radiation, radioprotection, and an early career section. The presentations will range from clinical subjects in imaging and therapy, through novel ways to use ionising radiation to treat cancer, to more futuristic topics such as quantum computing in Medical Physics. We will also host dedicated sessions devoted to "Intersect Aspects in Medical Physics”, which we are convinced will foster interdisciplinary. You can already enjoy a first taste of one of the tracks geared around artificial intelligence in another article in this same Newsletter.

While attending ECMP 2024, you would be able to choose from 12 refresher courses ranging from radiobiology to boron neutron capture therapy or how to propose a working group.

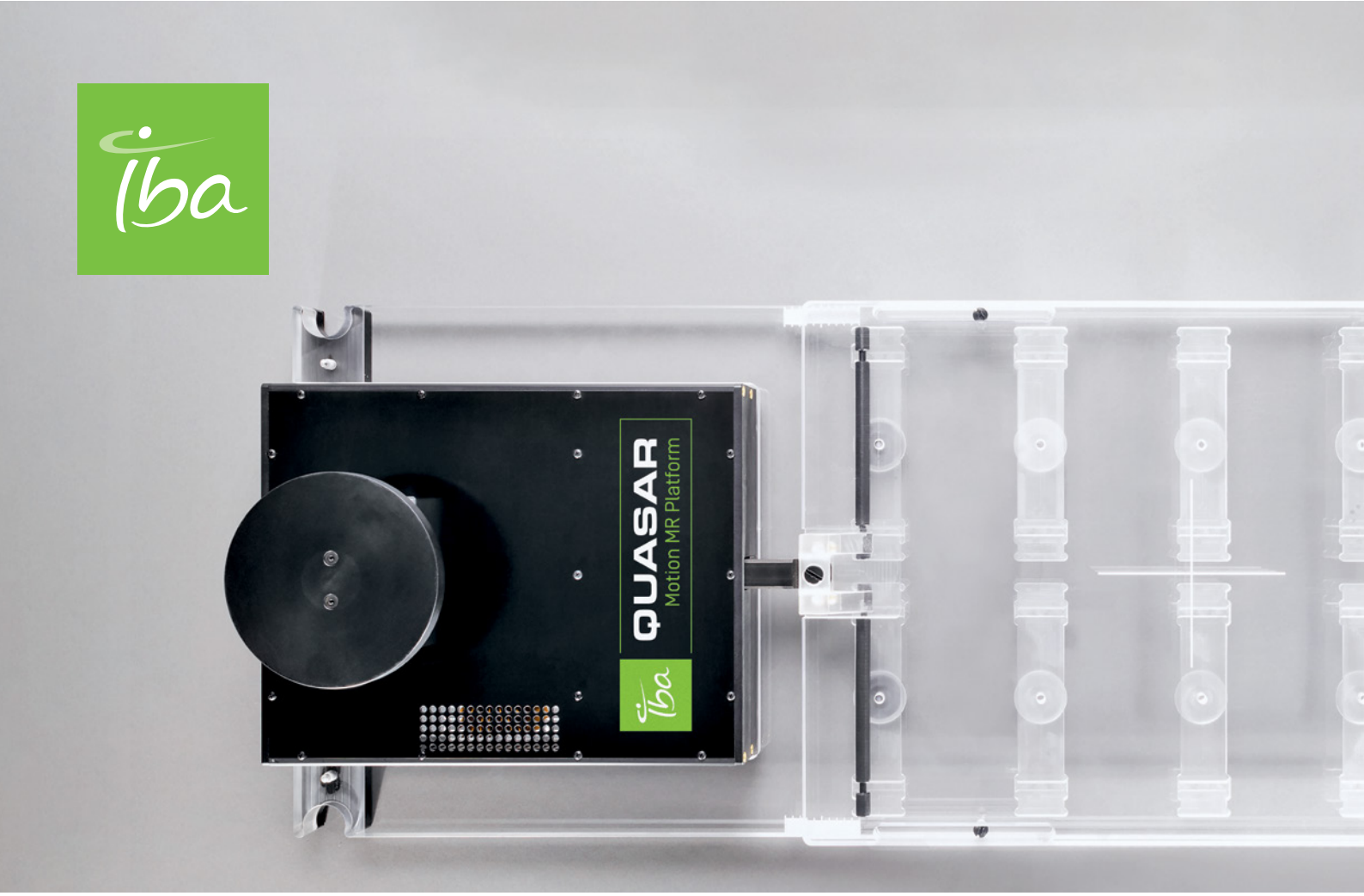
Additionally, visits to cutting-edge research facilities, such as the Centre for Advanced Laser Applications on the Research campus of Garching will be offered.

More details about the congress can be found on our website, https://ecmp2024.org

We look forward to welcoming you to ECMP 2024.

Katia Parodi
Joint DGMP, ÖGMP, SGSMP Congress President

Yolanda Prezado
ECMP2024 Congress president



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EFOMP ARTICLE

Working Group introduction: Volumetric Modulated Arc Therapy - Breast

In this article, **Tuomas Koivumäki**, the chair of the VMAT Breast Working Group, gives an insight into the working group

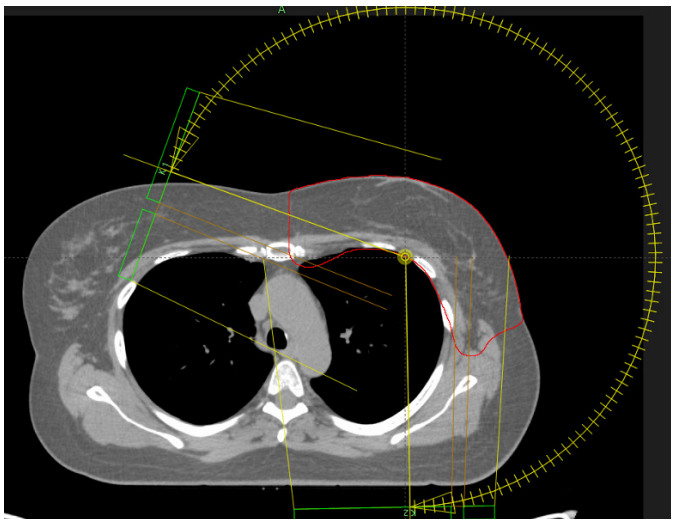
The aim of this working group is to identify widely used practices, publications, and technical solutions for using volumetric modulated arc therapy (VMAT) for breast irradiation.

The inspiration for forming the working group stems from the diverse range of VMAT techniques utilised for breast irradiation across different centres. Additionally, we have a limited understanding of how widespread the use of VMAT techniques for breast irradiation is in Europe. Consequently, we are curious to investigate the current utilisation of VMAT in breast treatments at the European level. We hope that the work of this group will not only offer new insights to current VMAT users for refining their implementation of the technique but also provide a practical overview, along with possible hints and tips, for those contemplating the initiation of VMAT in breast treatments.

The group was established during the EFOMP Annual Council in September 2022, and the call for participants was open in the fall of the same year. This working group falls under the EFOMP category of "State of Art," signifying that the topic involves codes of practice, protocols, recommendations, or guidelines expected to become enduring practices. Nominations for the working group were accepted in the spring of 2023, and they can be found on the EFOMP website. The first online meeting took place in early May, with some members also meeting during the ESTRO conference in Vienna in May 2023. The working group members have been developing a questionnaire to be distributed across Europe to understand the current ways of implementing VMAT for breast radiotherapy. Additionally, participants in the group conducted a case planning study aimed at identifying various planning approaches to achieve high-quality VMAT plans for breast irradiation.

It has been a great pleasure to witness the enthusiastic commitment of working group members as they contribute to the creation of the questionnaire. Invaluable input has also been received from consultants and observers of the working group. Currently, the questionnaire is in the final stages of preparation.

The questionnaire is scheduled for publication in early 2024. We hope that many of our readers will participate by sharing their experiences and practices through the questionnaire.



VMAT breast

Tuomas Koivumäki serves as the chair of the VMAT - Breast Working Group and holds the position of Chief Physicist at Hospital Nova of Central Finland, within the Wellbeing Services County of Central Finland, Jyväskylä, Finland.

EFOMP COMPANY MEMBER ARTICLE

Radiation Therapy QA Essentials from Standard Imaging

Standard Imaging introduces their new in-class QA solution

Standard Imaging offers unique, in-class solutions that are essential to ensuring your clinic delivers the highest quality treatments every day for every patient. Whether you're due for a QA equipment upgrade or laying the foundation for a new QA programme, quality and robust QA essentials are important to pave the way for accuracy and efficiency in your clinic and to create a reliable foundation for your routine QA practices, including daily, monthly, and annual QA. There are key QA tools that every clinic should have in their essential QA toolbox: high-quality ion chambers, versatile electrometers, a quick-set-up 1D water tank and a fully automated daily QA device to ensure your radiotherapy clinic meets or exceeds industry quality standards.

The Essentials of Ion Chambers

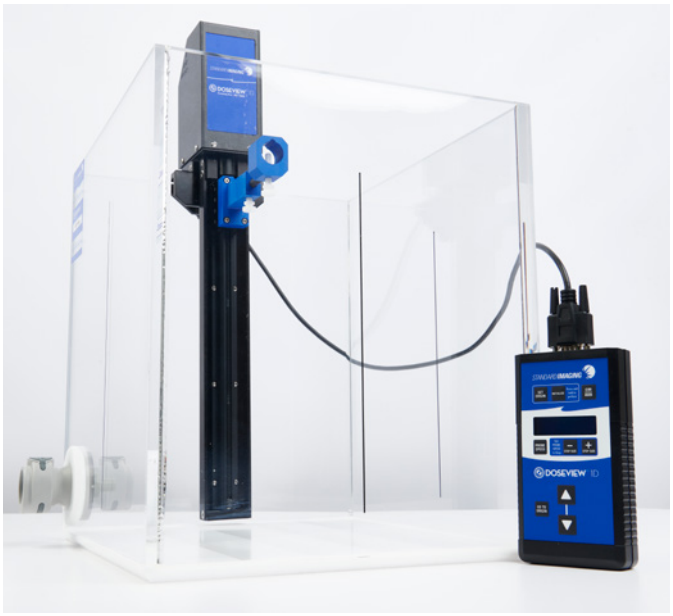
Knowing that your radiation therapy device is accurately calibrated is the ultimate foundation for a quality control programme. The standard can be set with the Exradin® A19 or A12 ion chambers, which are characterised by TG51 or TRS398 and offer superior stability and durability. The advanced protection design creates a consistent collection volume with uniform electric field lines, ensuring a stable, repeatable signal, fast settling times, and a collection efficiency of 99.9% or greater. Exradin ion chambers stabilize immediately upon application of a bias voltage and have minimal to no polarity effects or leakage currents (+/- 10x10-15 A). To add even more functionality to your QA toolbox, both the Exradin A19 and A12 are available in MR-compatible versions.

Electrometer Essentials

The SuperMAX™ Electrometer is designed to exceed the expectations of a reference electrometer, making it the perfect addition to your essential QA toolbox. Superior accuracy and stability enable measurements after just one minute of warm-up time, enabling seamless integration into your QA workflow. The colour touchscreen interface provides easy operation and the versatility of two measurement channels with independent control over the range (0.001 pA to 500.00 nA, 0.001 pC to 999.9 µC), bias and applied factors. This makes the SuperMAX electrometer ideal for a spectrum of applications including IMRT, brachytherapy, and stereotactic radiotherapy QA, as well as cross-calibration between two chambers, isocenter versus off-axis comparisons, and in-air versus in-water comparisons.

DoseView™ 1D Tank

Designed for positional accuracy, streamlined installation, versatility and interoperability, the DoseView 1D tank is a perfect addition to your TG-51 or TRS-398 calibration workflow. Engraved vertical lines and an easy-to-use handheld controller speed up phantom alignment with room lasers and two fill lines accommodate depth measurements of 20 cm and 25 cm for quick and easy installation of a range of detectors. Fully automate your depth dose scans with 0.05 mm accuracy and enable remote control and detector position display with DoseView 1D software. Seamlessly control your SuperMAX Plus or MAX 4000 electrometers and display speed/charge data in real-time, set range and bias, and perform charge collection and automatic data recording using all modes (timed, repetitive, continuous, and triggered).



The DoseView 1D water phantom allows for more accurate scans in less time.

QA BeamChecker™ Plus

The QA BeamChecker Plus Daily QA Device rounds out your essential QA toolbox by providing a reliable, versatile, and automated tool for your extensive daily QA tasks. Save time and money with multi-modality suitability (Co60-25MV photons, FFF photons, and

6MeV-25MeV electrons) and delivery systems that enable QA standardization and workflow consistency. The standalone wireless operation, the patented energy detection without the need for additional build-up and the fully shielded electronics ensure fewer errors in your daily routine, a faster start to your treatment day and less potential damage to your QA device.

The QA BeamChecker Plus allows for reliable, uncomplicated Daily QA.

A Foundation for Continuous Innovation

These essential image quality requirements provide a foundation for continued innovation to ensure your clinic is ready to meet the ever-evolving QA demands in light of today's rapid technological advancements. From the basics to beyond, Standard Imaging has the QA tools for success.

Vicky Howard, MS, MBA, DABR, is a certified medical physicist and management professional with more than twenty years of experience as an ABR certified Radiation Oncology Physicist, departmental leader, and, in recent years, a corporate physicist and product manager in the Radiation Therapy medical device sector. Her rewarding clinical and corporate career has provided the opportunity to witness and contribute to great advancements in the field of Radiation Therapy.

MEETING ANNOUNCEMENT

Embrace the Future of Medical Physics: Contribute to the AI Track at the 5th European Congress of Medical Physics

Discover, Discuss, and Define the Role of AI in Medical Physics
As the medical landscape evolves, artificial intelligence (AI) is increasingly becoming an integral tool in both research and clinical applications. The integration of AI into clinics brings enormous opportunities but also requires a new level of knowledge and expertise from medical physicists. The 5th European Congress of Medical Physics, organised by the European Federation of Organisations for Medical Physics (EFOMP), invites you to participate in a track entirely dedicated to AI in all medical physics disciplines.

Why Should You Submit an Abstract?

Cutting-Edge Research
AI is not just an adjunct to current practices in healthcare; it is driving the most innovative research in medical physics today. By submitting an abstract to this track, you will join a community of thought leaders who are defining the future of the field.

Skill Development
Mastering the fundamentals of AI is becoming a valuable asset in the work of a medical physicist. The Congress provides an excellent platform to understand how AI algorithms work and how they are practically applied in clinical settings.

Quality Assurance & Safety
AI is being rapidly implemented for clinical use in many areas of medicine. It becomes apparent that one of the key roles of the medical physicist in this landscape is to ensure its safe and effective implementation and use in clinical practice. Through keynotes and presentations, you'll learn about AI implementation guidelines, QA protocols, and more.

Ethical Considerations
As we advance in our capabilities, ethical considerations around AI in healthcare are increasingly pressing. This is an opportunity to engage in essential discussions on responsible AI use in patient care.

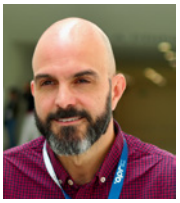
Keynote Highlights
1. **Getting Started with AI**: This talk will provide a roadmap for data preparation, selection of tools, and best practices for those who are new to AI in medical physics.
2. **Practical Tips for Daily Patient Care**: This session is a must-attend for those already working with AI tools in clinical practice. Learn how to ensure the tools you use meet safety and effectiveness standards.
3. **Ethical Implications of AI in Healthcare**: This keynote aims to initiate a dialogue on the ethical concerns surrounding the use of AI in radiation oncology and healthcare, setting the stage for community guidelines and policies.

Call for Abstracts
We encourage submissions for oral and poster presentations ranging from novel methods and applications of AI in medical physics to practical and ethical considerations in its clinical use.

Don't miss your opportunity to contribute to this crucial conversation and help shape the future of medical physics. Submit your abstracts now for the AI Track at the 5th European Congress of Medical Physics.

Let's come together to explore the full potential of AI in improving the quality, safety and efficacy of patient care in radiotherapy. See you all in Munich!

For submission guidelines and deadlines, please visit the ECMP2024 website.
***** Submit your abstracts and be part of the future of medical physics! *****



Oliver Díaz. Associate professor at the Mathematics and Computer Science department of the University of Barcelona (Spain). His current research interests include the development and validation of AI applications for cancer diagnosis. He is a past member of EFOMP Working Group on AI and EFOMP Working Group on Digital Breast Tomosynthesis QC and Working Group on breast tomosynthesis of the Spanish Society of Medical Physics (SEFM). He is current member of AAPM/EFOMP task group No. 282, ESR European Imaging Biomarkers Alliance Subcommittee (EIBALL), board member at large of the European Society of Medical Imaging Informatics (EuSoMII) and member of the Scientific Board of ECMP 2024 (AI-track).

Gerd Heilemann, Ph.D., is a senior postdoctoral researcher and head of the "Artificial Intelligence in Radiation Oncology" group at the Medical University of Vienna (Austria). He has served as a research fellow at multiple international institutions. In his research, Gerd currently focuses on developing and implementing AI applications to improve processes in radiation oncology, aiming for greater efficiency and safety. He is a member of the Scientific Board of the ECMP 2024 meeting and serves as the track leader for the AI track.

EFOMP COMPANY MEMBER ARTICLE

Two Days of Continuing Education and Networking — QA and Dosimetry Symposium (QADS) 2024

Enhancing Safety and Advancing Quality Assurance in Radiation Therapy

The QA and Dosimetry Symposium (QADS) is set to return in 2024 with its 14th instalment. Hosted by Sun Nuclear, QADS is a premier educational event focused on strategies for continuous improvements in quality and patient safety in radiation therapy. Over two days in Lisbon, Portugal, attendees will learn from industry experts and practitioners, gaining valuable insights on best practices while earning continuing education credits.

Sessions will cover a wide variety of topics, including:

- Challenges in Safety & Quality Control
- EPID-Based In-Vivo Dosimetry
- The Era of AI & Innovation
- QA & Dosimetry for New Treatment Modalities
- Novel QA Methods for SRS/SBRT and SIMT

These sessions will provide a comprehensive overview of the latest advancements and challenges in the field, offering attendees practical knowledge and tools to enhance safety in their own departments.

QADS speakers will present practical, clinically relevant insights.

Day 1 Agenda

Day one will be focused on challenges in Quality Assurance and EPID-based In-Vivo Dosimetry. The event will kick off with a keynote presentation by Nuria Jornet, PhD, from the Hospital de la Santa Creu I Sant Pau in Spain, who will discuss ESTRO initiatives to improve safety and quality throughout the patient treatment course. Other presentations will cover topics such as cybersecurity risks, standardisation of machine QA, radiotherapy QA using statistical process control, and a full session on the use of EPIDs for in vivo dosimetry, including for SRS.

Day 2 Agenda

The second day of the symposium will begin with a focus on AI and innovation in radiation therapy and its potential impact on patient care, including applications of AI in contouring, pre-treatment QA, and enhanced online imaging. Discussions will also delve into how AI can be used by medical professionals to write more personalised prescriptions and care plans.

Another key focus of the symposium will be a discussion of new treatment modalities. Experts will share their experiences and insights on topics such as theranostics, transitioning to MR-Sim, the latest developments and clinical uses for SGRT, a novel platform for Synchrony QA, and QA in MRI-LINAC systems. These sessions will provide attendees with a comprehensive understanding of the challenges and best practices associated with emerging treatment modalities.

QADS will conclude with a session focused on QA for stereotactic treatment deliveries. Wesley Culberson from the University of Wisconsin-Madison (USA) will present on understanding solid-state dosimeters and their increasing role in medical physics QA measurements for SRS. Other presentations in this session will cover topics including a hybrid method for patient-specific SRS/SBRT QA, a systematic evaluation of spatial resolution and gamma criteria for QA using detector arrays, gyroscopic radiosurgery QA, and individual target dose evaluation for SIMT using measurements and Monte Carlo calculations.

Connecting with Peers in Medical Physics

Beyond the informative sessions, QADS attendees will have the chance to connect with colleagues from around the world, exchange ideas, and build professional relationships. The symposium aims to foster a collaborative environment where participants can learn from each other's experiences and contribute to the advancement of quality assurance in radiation therapy.

Medical physicists and dosimetrists from around the world convene to take a break from day-to-day clinical work and gain fresh perspectives on best practises for patient safety.

Visit qasymposium.com to learn more.

Jennifer Hamilton, M.E., DABR
Sun Nuclear Medical Physicist

Jennifer Hamilton, ME, DABR graduated from the University of Florida with a master's in biomedical engineering imaging. She worked clinically for 8 years in the Indianapolis and Philadelphia areas and then worked for a year on a full-time commissioning team. In 2011, she brought this experience to Sun Nuclear and has thoroughly enjoyed working with Sales, Marketing, and R&D there for the last 12 years.

MEETING REPORT

The German Society for Medical Physics (DGMP) Annual Congress 2023 at Magdeburg, Germany

Prof. Dr. **Markus Buchgeister** provides feedback on the 54th Annual Conference of the German Society for Medical Physics, September 27–30, 2023.

Fig. 1: Employees of the historic Otto von Guerike Foundation in historic clothing carried a balloon split in the middle of the opening ceremony, preparing for the famous experiment of 1657 at Magdeburg. (Hannah Theile, Magdeburg)

This year, DGMP congress president Prof. Dr. rer. nat. Christoph Hoeschen, Institute for Medical Technology, Otto-von-Guericke University Magdeburg, and Dr. rer. nat. Kerstin Jungnickel, Institute for Diagnostic and Interventional Radiology, Magdeburg Hospital, prepared a first highlight directly at the opening ceremony when an "experimental surprise" was announced: Employees of the Otto von Guerike Foundation in historic clothing carried a balloon split in the middle into the centre of the congress hall. Such a split balloon was also recognisable on this year's congress logo. To the delight of the congress participants, the famous natural scientist's spectacular hemisphere experiment on the power of air pressure on the evacuated sphere was performed - live and in front of everyone as a hands-on experiment. Instead of the power of the 24 horses, which Otto von Guerike used in 1657 with great publicity to pull the two hemispheres apart, the DGMP board was asked to try their hand at tug-of-war. Since more help was needed, they were supported subsequently by the advisory board, more and more members of the Young Medical Physics working group, and other congress participants. The balloon finally burst apart with a loud bang during the collective trial of strength, accompanied by the rapturous applause of the spectators - an impressive start to the congress!

Fig. 2: Finally, the evacuated hemispheres burst apart (secured by chains!) as in the historic experiment of 1657 at Magdeburg when the DGMP board members had called for enough helping hands from the audience. (Hannah Theile, Magdeburg)

Prof. John Damilakis, President of the International Organisation for Medical Physics (IOMP), emphasized the growing importance of Medical Physics and the exchange of its scientific progress at meetings in his welcome address. "It's great to meet so many colleagues and friends", he said given the good mood in the circle of experts present. Prof. Jens Stockeljan, Rector of the Otto von Guerike University, especially noted the increasing proportion of women reaching up to 50 per cent in the field of Medical Physics. Prof. Dr. Martin Fiebich, President of the DGMP, gave an enthusiastic eulogy for Dr. Georg Stamm, Göttingen, this year's winner of the DGMP Expert Award and the first out of the field of Medical Physics in radiology.

Focus on radiological imaging

In a total of 51 scientific sessions, 287 lectures, over 80 poster presentations, and 9 industry symposia, about 840 participants received an up-to-date overview of the latest research in Medical Physics over the four congress days. From ultra-high-field MRI to molecular imaging and diagnostics to the physics of audiology - the spectrum of the programme at the annual DGMP congress was again

Fig. 3: The industry exhibition located in the crossway of the lecture rooms was the place of not only many intensive discussions with exhibitors but also among the congress participants. (Hannah Theile, Magdeburg)

broad. An important focus was on research in Medical Physics in the fields of interventional radiology, nuclear medical imaging, and molecular techniques to further improve personalised medicine. The congress of this year benefited from the fact that both congress presidents represented two different poles: university research with Christoph Hoeschen and clinical practise with Kerstin Jungnickel in the spectrum of sessions at the congress. For Medical Physicists who work together with doctors and MTRs, the annual congress thus also served as a training event, not only about the practical implementation of, e.g., radiation protection but also about what is possible with new radiology techniques such as spectral CT and others, too. A very interesting session was organised by the “DGMP goes green” initiative of DGMP, informing the participants on possibilities to estimate and reduce the power consumption of big electrical machines such as CTs or linacs in their departments. On top of that, this congress was also CO2-compensated concerning the travel of the participants, and the catering was organised to avoid the use of plastic, etc. as much as possible.

Focus on artificial intelligence

Nowadays, artificial intelligence is of increasing importance in many fields, so this was naturally also a focus of this congress. As an example, it was shown how the image quality of magnetic resonance imaging could be further improved over the already good contrast in the soft tissue area, especially in the brain. Nevertheless, the validation and QA of the results of such AI tools will be an important area of future research since not every good-looking image processed by AI may represent the true physiological tissue reality.

Another development in this field is that AI is used to attempt convergence between imaging and radiotherapy by directly transferring information from imaging to more accurately adjust the dose distribution of radiation. "Such adaptive radiotherapy procedures are becoming more and more common, in various combinations with an MRI or with CT systems," said Christoph Hoeschen. "The implementation of these procedures and the best possible application is possibly experiencing a significant boost through AI."

A special highlight at the conference was the guided tour to the 7 Tesla Connectome, with which the Otto von Guericke University has now one of the most powerful MRI in Europe and is now among the leading locations for image-based brain research.

At the Magdeburg exhibition centre congress participants were also able to get in touch with each other in an uncomplicated way on the fringes of the sessions. Kerstin Jungnickel emphasised the special importance of Medical Physicists in the practical field of radiology: "In the clinics and practices we are "gold dust" at the moment. There are simply far too few of us; we can hardly save ourselves from work. We definitely need new blood!"

Young Medical physics students are strongly represented

Fig. 4a: Members of the Young Medical Physicist working group introduce the “beer pong” competition. (Hannah Theile, Magdeburg)

Fig. 4b: The "beer pong" competition took place in the open space in between the exhibition centre halls of the congress. (Hannah Theile, Magdeburg)

Well, this “young blood” was represented by the Young Medical Physicists working group of DGMP (jMP), who also contributed to a great extent to the good atmosphere at the congress. They were again intensively involved in the programme with special sessions. Starting with the already famous “beer pong” competition, which helped the young and also the not-so-young medical physicists to get in touch with each other. A highlight was the session with the personal reports of three young Medical Physicists from the clinical, industrial, and academic fields on their experiences with qualifications and entering the job market.

Additionally, jMP organised the offer for individual coaching by an expert in a special session or on an individual demand.

At the successful and fun pupils' day, which was once again led by Markus Buchgeister from Berlin, pupils of a physics course at a local high school were able to get to know the professional field of Medical Physics with an introductory presentation and participated in small groups led by experienced Medical Physicists at scientific sessions and the industry exhibition.

Outlook for the Medical Physics Congress 2024

The continuation of the exciting discussions in the entire field of medical physics with participants from all over Europe can be expected from September 11 to 14, 2024: Then the conference presidents Ph. D. Katia Parodi (president of the 3-country congress of the DGMP, ÖGMP and SGSMP) and Ph. D. Yolanda Prezado (congress president of the EFOMP) invite the European Congress of Medical Physics in conjunction with the 3-country congress of the German-speaking medical physics societies at Munich.

Acknowledgement:

I greatly acknowledge the support provided by Kerstin Aldenhoff (Conventus Congress Management & Marketing GmbH).

Prof. Dr. Markus Buchgeister, Berliner Hochschule für Technik Berlin, Germany. Markus entered the field of medical physics in radiation therapy at the university clinic in Tübingen in 1995. In 2010, he received a call for a position as a professor of medical radiation physics at the Berliner Hochschule für Technik (University of Applied Sciences and Technology) in Berlin. Since 2003, he has been engaged as a co-opted DGMP board member for public relations and communications of the German Society for Medical Physics. Parallel, he served as chairman of the EFOMP Communication and Publications Committee from 2003-2009 and from 2009-2015 as a German EFOMP delegate. In 2017-2018 he was chairman of the EFOMP Education and Training Committee and is now a German EFOMP delegate again.

MEETING REPORT

European Radiation Protection Week 2023 Comes to Ireland

University College Dublin hosted the 7th European Radiation Protection Week (ERPW) on October 9th - 13th 2023. Report by **Áine Matthews**

O'Reilly Hall, UCD, Dublin, Ireland.

This year's ERPW was held in O'Reilly Hall of the leafy green UCD Belfield campus, Dublin, Ireland. Jonathan McNulty, chair of the ERPW 2023 Local Organising Committee, commenced the week with a warm welcome to delegates from across Europe, North America, Asia and Australia.

The opening plenary set the scene for the week with motivating talks on the 'Future of Radiation Protection Research'. Werner Rühm, chair of the ICRP, outlined the ICRP framework, which is in place to continuously update and improve recommendations for radiological protection. The 'Vancouver call for action to strengthen expertise in radiological protection worldwide' which launched in November 2022 was also discussed.

The first scientific session of the week got underway after a bustling coffee break, covering a range of topics from spectral biomarkers of normal tissue toxicity to radiation protection considerations in digital PET. After a delicious lunch, we returned to the Röntgen Room for an excellent set of talks on the topic of communicating radiation benefits and risks. Radiation risk communication is a key component of good practice in the medical environment and valuable insights were provided in this plenary. The remainder of the afternoon was split into three sessions, catering for all professions in attendance: industry, academia and healthcare. Day 1 was brought to a close with a dedicated EURAMED plenary on 'Advancing Medical Radiation Protection and Patient Care: The Latest on European Collaborative Effort'.

Day 2 commenced with a plenary on 'Public and Patient Involvement in Radiation Protection Research'. We received eye-opening talks on the role of patient advocates in healthcare and the need to encourage patients to engage in research. Erik Briers and Siobhan Freeney told us of their journey as cancer patients and their important contribution to research through patient advocacy. The next scientific session was devoted to 'Medical Radiation Protection', and we enjoyed many superb talks, including 'Overall Risk of Cancer Incidence Attributable to Adult CT Examinations: Impact of a 7-Year Dose Optimization Program', from Natalie Heracleous and Federica Zanca. This contribution took home EURAMED's award for outstanding research in medical radiation protection. We heard from a range of expert speakers during the afternoon plenaries on day 2, including topics on 'Variability of Individual Response to Exposure to Ionising Radiation', 'Medical Applications of Radiation Protection' and 'Innovative Approaches to Radiation Protection Training and Education'. This brought day 2 to a close, and delegates were transported into Dublin City for an evening of Irish food, dance and music.

The final day of the core ERPW programme opened with 'Post-Accident Management', followed by an update on PIANOFORTE activities, including a reminder of the available travel grants and funding for research projects. After lunch, we were treated to a thought-provoking session on the applications of artificial intelligence (AI) in medical radiation protection, which generated much

There were many opportunities throughout the week to catch up with colleagues and to form new connections with professionals from a range of disciplines.

discussion leading into the scientific poster presentations.

The poster exhibition showcased a multitude of research projects and offered another networking opportunity for attendees to interact with peers and exchange ideas and experiences. The final plenary of the week covered important topics on equality, diversity, and inclusion in radiation protection, highlighting the need to have minorities represented in research and raising awareness of the radiation protection considerations for transgender patients.

As the core programme for 2023 European Radiation Protection Week was brought to a close on Thursday evening, we reflected on a week that had a strong focus on the applications of radiation protection in healthcare and the future of radiation protection research. Throughout the week, we heard from experts across healthcare, industry, academia, and patient involvement, sharing their insights and best practices. Well done to all who contributed to ERPW 2023, including the presenters, moderators, sponsors, and the local organising committee. We look forward to the 8th European Radiation Protection Week.

Áine Matthews works as a senior medical physicist in diagnostic radiology and nuclear medicine at Beaumont Hospital, Dublin, Ireland.

MEETING REPORT

Symposium on Molecular Radiotherapy Dosimetry: The Future of Theragnostics, November 9th - 11th 2023, Athens, Greece

Pablo Mínguez Gabiña reports on the Special Interest Group for Radionuclide internally arranged Dosimetry (SIGRID) Symposium in Athens on November 2023

The symposium was a component of a banquet in ancient Greece that included drinking for pleasure along with libations to the gods, hymns, music, dancing, recitals, or conversation.

In August 2022, Manuel Bardiès and Glenn Flux, respectively, Chair of the SIGRID and member of the steering committee of the SIGRID, met at the ECMP held in Dublin. While sharing some beers, they came up with the idea of celebrating a symposium on molecular radiotherapy dosimetry. In this case, they were not thinking of the appealing meaning of the word symposium in ancient Greece but of a conference to discuss molecular radiotherapy dosimetry.

No sooner said than done, the Board of the EFOMP agreed to the symposium, and the organising and scientific committees were set. As it could not be otherwise, Athens was chosen as the place to hold the symposium. The local organisers chose Athens University to celebrate the event with a maximum number of 110 attendees. The number of people registered was increasing so quickly that a new place had to be chosen. Now, the Titania Hotel offered the possibility of taking in up to 180 enthusiastic medical physicists, and that was chosen as the place to celebrate the symposium.

The symposium started on November 9th, Wednesday, and was a great success. The room was full of eager medical physicists of dosimetry talks. On the first day, there were invited talks, oral presentations, e-posters, and a session for sponsors. On the second day, there were invited talks, oral presentations, e-posters, a CPD session, and a round table to discuss the use of dosimetry to individualise molecular radiotherapy. Lastly, on the third day, there were invited talks, oral presentations, and a CPD session, and the best presentations were awarded (Fig. 1).

The symposium was a complete success, and the countdown for the second symposium of molecular radiotherapy dosimetry in 2025 has already started!

For more information on “Symposium on Molecular Radiotherapy Dosimetry: The Future of Theragnostics”, please take a view at https://smrd2023.efomp.org/.

Pablo Mínguez Gabiña (PhD Lund University) has been a senior medical physicist at the Gurutzeta/Cruces University Hospital in Barakaldo, Spain, since 2005. He has also been a part-time professor at the faculty of engineering of the University of the Basque Country in Bilbao since 2011. He has been a member of the Dosimetry Committee of the European Association of Nuclear Medicine since 2019. He is also a member of the Steering Committee of SIG_FRID.

PROFESSIONAL MATTERS

An Historical Overview of the Development of the Qualifications Framework for Medical Physics in Europe

Overview of qualifications in medical physics in Europe by **Carmel J. Caruana**

Recently, I attended the EFOMP Council in Novy Sad, Serbia, where I noticed that there were many young representatives among the NMO delegates. This is a very positive development, as it ensures that a young group of emerging leaders are prepared to take on leadership roles and help develop the profession in the future. However, such leaders must read past documents and policy statements so that they can inform themselves and make wise decisions. This article provides an overview of the historical development of the medical physics qualification framework in Europe, focusing on the two most important documents: the 'European Guidelines on the Medical Physics Expert (RP174)' and 'EFOMP Policy Statement 12.1 Recommendations on Medical Physics Education and Training in Europe 2014'. Of course, the only way to appreciate these two documents is to read them in their entirety and think deeply about their contents. In this article, I summarise the most important facets that are relevant to current issues and discussions.

Terminology

We'll start with the terminology, because there are quite a few misconceptions

Medical Physics Professionals (MPP): the profession has different titles in Europe, for example, medical physicist, clinical physicist, radiological physicist, and medical physicist. That's why we use this generic term to encompass everything.

Specialities of Medical Physics: Now these include both the Traditional Diagnostic and Interventional Radiology, Radiation Oncology, and Nuclear Medicine but also newer specialties such as Physiological Measurement, Audiology, General Hospital Physicist, and Neurophysiology.

European Qualifications Framework: a scale of education and training levels to be used for qualifications in Europe. Bachelor's programmes must be at EQF level 6, master's programmes must be at EQF level 7, and specialist education and training programmes of the higher professions (such as medical physics and the medical specialties) must be at level 8.

Medical Physics Core KSC (Knowledge, Skills, and Competencies): the KSC expected of all MPPs, regardless of their speciality. Although largely based on radiation physics, a list of these can be found in RP174. These core KSC need to be extended to include also core KSC from the non-ionizing specialties.

Core Curriculum for a Specialty: The minimum KSC required to be recognised as an MPE in any speciality of medical physics. (The double use of the term 'core' is somewhat unfortunate but is a result of historical circumstances.)

The European Guidelines on the Medical Physics Expert (RP174)

The European Guidelines for the MPE was an EU-funded project involving MPPs from across Europe. The focus of the project, as specified by the European Commission, was the Medical Physics Expert (MPE). The most important results from the project were:

(a) The MPE was defined as a professional in medical physics who has achieved EQF level 8 (the highest EQF level) in any speciality of medical physics. Since RP174 focuses on ionising radiation, this means diagnostic and interventional radiology, radiotherapy, and nuclear medicine. An MPP can become an MPE in more than one speciality, provided he/she reaches level 8 in each speciality. However, the consortium did emphasise that, given the exponential increase in the number, complexity, and sophistication of medical devices used in each speciality, becoming an MPE in more than one speciality would necessarily require a significantly longer training period than that for a single speciality.

(b) A specification of the curriculum content for the MPE in terms of KSC as required by the EQF, as opposed to simple lists of topics or hours of teaching and practice.

(c) A well-defined qualifications framework that, while proposing a well-defined unitary framework essential for harmonisation, also took into account the diversity of frameworks that exist nationally in Europe.

Below you will find the qualification framework for the MPE (Fig. 1), together with a table of selected explanatory notes.

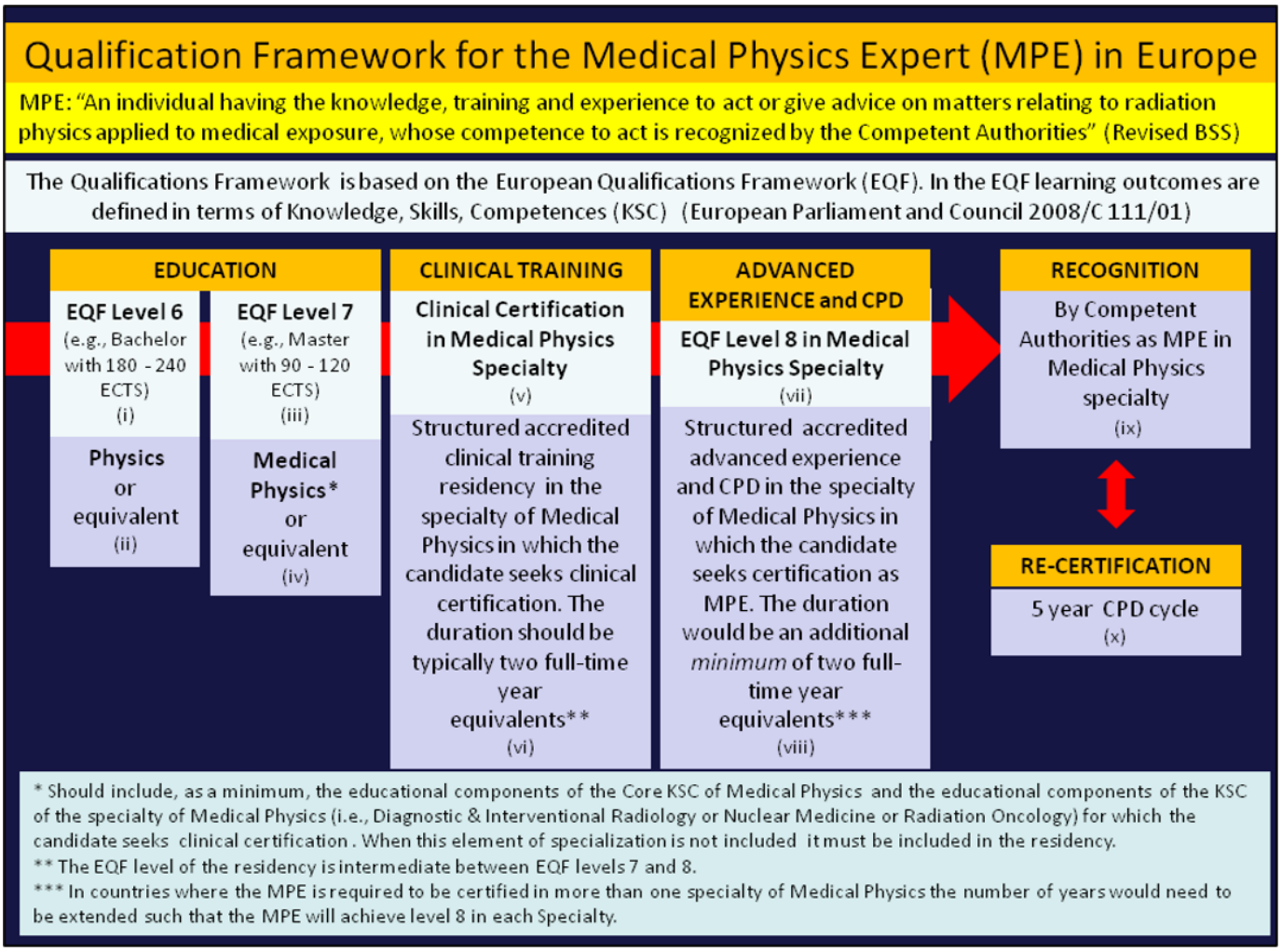


Figure 1. The Qualifications Framework for the MPE in Europe as per RP174

Table 1. Explanatory notes attached to the Qualifications Framework from RP174

	Note	Rationale
(ii)	'Equivalent' here means EQF level 6 with a high level of physics and mathematics content.	This will make it possible for graduates from other Level 6 programmes that include a high level of physics and mathematics (e.g., engineering, biophysics) to enter the field.
(iv)	'Equivalent' here means EQF level 7 with a high level of physics and mathematics content plus the educational component of the core KSC of medical physics and the educational component of the KSC specific to the speciality of medical physics for which the candidate would be seeking clinical certification (as specified in this document). This additional education can be concurrent with the training.	This will make it possible for candidates with a Master´s in physics, biophysics, engineering, etc. to enter the field; however, such candidates need to undertake an additional educational programme that includes the educational component of the core KSC of medical physics and the educational component of the KSC specific to the specialty of medical physics for which the candidate would be seeking clinical certification.
(viii)	This means that to reach MPE status (Level 8) in the speciality area requires a minimum total of four years equivalent clinical training (2 years equivalent of foundation training in the speciality area to clinical certification and a further two years equivalent of advanced, structured experience and CPD in the specialty).	It should be emphasised that the further 2 years to reach MPE status must consist of advanced, structured experience and CPD, not simply CPD designed to maintain competence.

The explanation in Table 1 is an intrinsic part of the framework and can also be found in the RP174 document. The framework and explanatory notes are intended to enable persons with a degree other than BSc Physics (e.g., engineering, biophysics) and MSc Medical Physics (e.g., physics, biophysics, engineering) to enter the profession, provided, of course, that they still acquire the KSC necessary to act as an independent and safe professional, as specified in the document.

The four years of clinical training to reach the MPE level were divided into two periods of two years each. It was suggested that trainees would receive initial clinical certification after two years of training. This was intended to enable trainees to contribute to clinical services (particularly important for the many states in Europe with low numbers of MPPs) and to receive a salary for doing so (to attract more young professionals to this profession). This recommended qualifications is of course not mandatory, but a recommendation; NMOs can opt for a single training period of four years.

EFOMP Policy Statement 12.1

RP174 focused on the specialisations involving ionising radiation, as this was a condition set by the European Commission. Yet we had to find a way to also involve the other specialties of medical physics. In fact, to maintain harmony with the framework proposed in RP174, EFOMP Policy Statement 12.1 simply extended the above framework to all specialties of medical physics (i.e., not just ionising radiation medical devices, but all medical devices and not just ionising radiation but all physical agents). In addition, we wanted to add a designation for the trainees who had completed the initial two-year training period. For lack of a better name, the title 'Medical Physicist' was chosen, because this is a title that is recognized worldwide. A Medical Physics Expert (4 years of training) was henceforth a Medical Physicist (2 years of training at level 7) who chooses to follow two additional years of advanced training in his own specialty to reach level 8, i.e. the level of the Medical Physics Expert. The changes to the framework are underlined in red below.

Conclusion

In this article, I have outlined the historical development of the present recommended qualifications for Medical Physics professionals in Europe. RP174 is a powerful tool as it is an EU-funded project that is recognised by lawmakers. PS 12.1 is simply an extension of this framework to specialties outside ionising radiation and makes a distinction between professionals having only 2 years of training (Medical Physicists) and those having 4-years of training (Medical Physics Experts) for those NMOs who choose to do so. The critical thing to keep in mind is that if we want to have a harmonious and strong profession IN THE FUTURE every NMO should strive towards achieving the recommendations of these documents. We cannot look back; we have no other options; times change; those professions that adapt will survive and thrive; those who don't will falter.

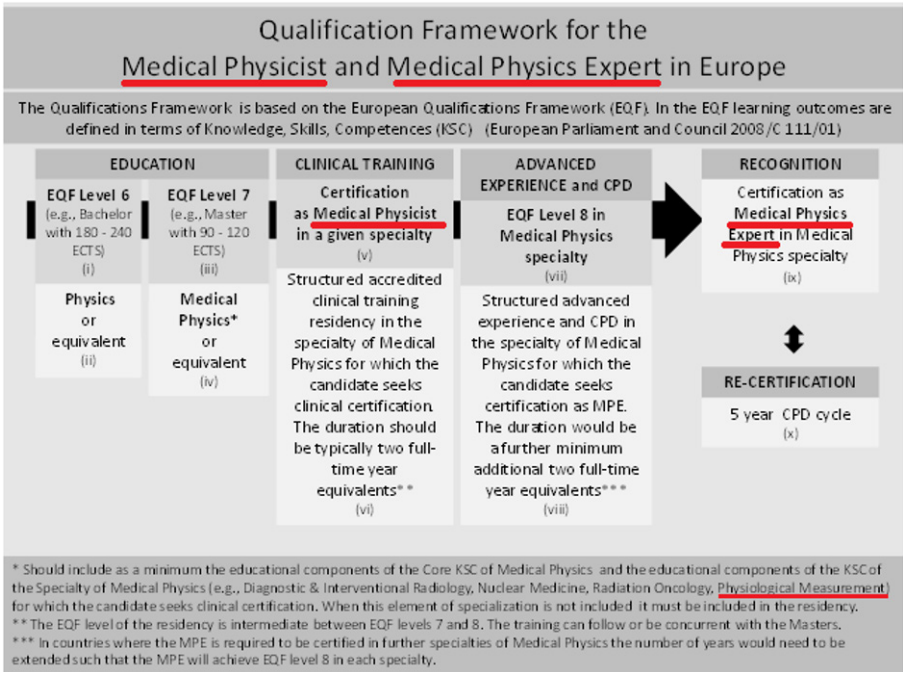


Figure 2. The Qualifications Framework for the MP and MPE in Europe.

Carmel J. Caruana is a former Chairperson. He is presently a member of the following EFOMP committees: Education and Training Committee, Professional Matters Committee, European and International Matters Committee, Communications and Publications Committee.

COMPANY MEMBER ARTICLE

varian
A Siemens Healthineers Company

Embracing Innovation and Enhancing Outcomes: Working to Enable Comprehensive Cancer Care

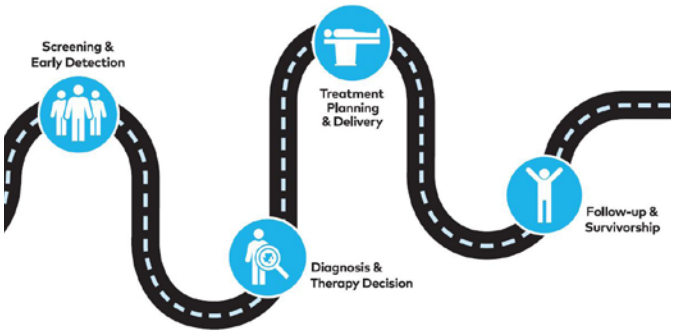
For 75 years, Varian has embraced innovation and pioneered technologies that have the power to make a difference for cancer patients and their families. Read about their journey.

The value of radiation therapy may be one of the best-kept secrets in medicine... but it's no secret to Varian and the global healthcare teams we've worked with for decades. For 75 years, Varian has embraced innovation and pioneered technologies that have the power to make a difference—to enhance outcomes—for cancer patients and their families. Radiotherapy has been at the core of this approach, and for good reason.

Radiotherapy is a vital part of the majority of cancer patients' treatment, and it has advanced significantly over the past couple of decades—from image-guided and adaptive to stereotactic approaches. And the pace of progress is not letting up. Recent and upcoming innovations in the field are creating new possibilities to enable ever more accurate, precise, and effective treatments for cancer.

While advances in the field of radiation oncology are exciting, an effective treatment experience begins long before a patient encounters a radiotherapy system. As we know, when cancer is caught early, it is more likely to be treated more successfully. That means improvements at the start of the cancer journey—at the screening and diagnosis stages—can have tremendous impacts on clinical decision making and outcomes for patients.

This year, in its annual insert in the ASTRO supplement of the International Journal of Radiation Oncology, Biology, Physics (the Red Journal), Varian outlines how, as a Siemens Healthineers company, it is looking beyond the treatment room to see how we can work with our colleagues in imaging, diagnostics, healthcare IT, interventional radiology, and other specialties to transform the entire cancer care pathway.



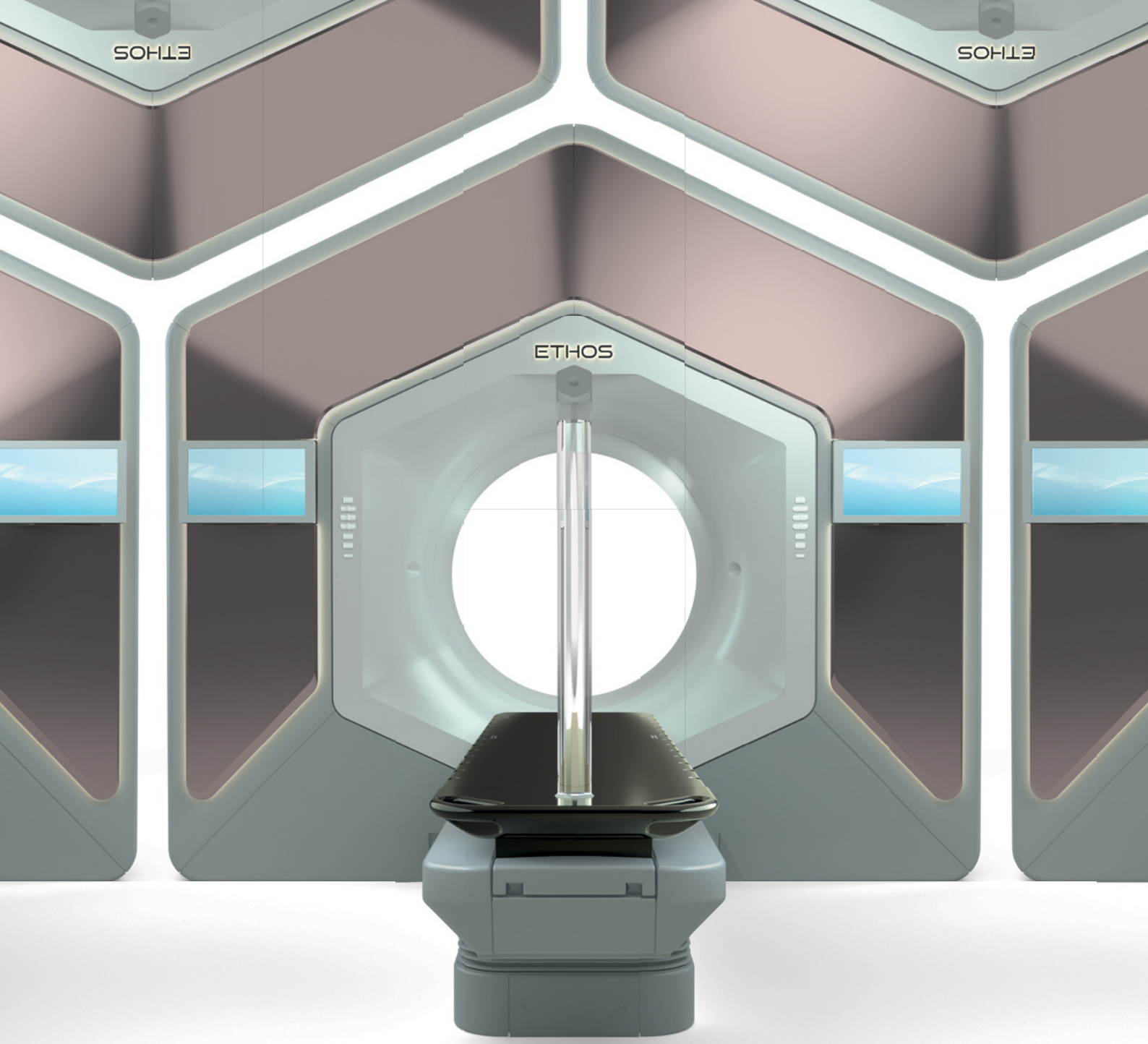
The Comprehensive Cancer Care Journey

In other words, we are evolving to enable comprehensive cancer care. We apply our unique capabilities and broad scope to develop breakthrough solutions that anticipate future needs, connect workflows to break down silos and ultimately help optimise patient care so that the time between diagnosis and treatment can be minimised. By embracing innovation and taking a holistic approach to supporting healthcare teams, our goal is to help physicians accelerate their care decisions.

This year's insert highlights how Varian is collaborating with colleagues across the whole of Siemens Healthineers to add value along the entire cancer care pathway.

Read the Red Journal insert

Meryl Ginsberg, MBA, is Director of Communication Initiatives at Varian Medical Systems, a Siemens Healthineers Company.



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With Ethos™ therapy, you can adapt treatment plans daily while transforming your cancer fight completely.

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MEDICAL PHYSICS EDUCATION

Medical Physics at the Abdus Salam International Centre for Theoretical Physics: A Hub for International Scientific Cooperation

In 2024, the Abdus Salam International Centre for Theoretical Physics (ICTP) in Triesteis poised to celebrate its 60th anniversary and the first decade of the Master of Advanced Studies in Medical Physics. **Marco Esposito** reports

The Graduation ceremony of the VIII cycle of the Master in Advanced Studies in Medical Physics in December 2022

The ICTP was established based on the visionary idea of Pakistani Nobel laureate Abdus Salam, who believed that science is the common heritage of humanity and that scientific cooperation plays a crucial role in fostering peaceful relationships between nations. Since its inception, ICTP has evolved into an international scientific hub of excellence, connecting scientists from developing countries with their counterparts worldwide, thus overcoming intellectual isolation and contributing to the development of a robust scientific foundation globally. This enables all nations to fulfil their rightful roles in the global scientific community and the family of nations.

ICTP's involvement in the field of Medical Physics spans three decades. It began with the College of Medical Physics, a three-week workshop dedicated to imaging and radiation protection. More than a thousand medical physicists from developing countries attended this

workshop, and for many, it was their first opportunity to meet colleagues and lecturers from some of the world's most advanced universities and hospitals. In response to the growing demand for education in medical physics in the developing world, ICTP initiated joint activities with the IAEA. An associate programme in medical physics was also established, offering scholars from low and middle-income countries the chance to spend several months each year at the institute. Additionally, the STEP programme was implemented to support PhD students in the field of medical physics.

The development of medical physics activities at ICTP was driven by the passion and vision of Luciano Bertocchi, a former ICTP director and a professor of nuclear physics at the University of Trieste, who coordinated all medical physics activities over the past thirty years. A decade ago, the first edition of the two-year master's programme was established, thanks to additional support from Renata Longo, a professor at the University of Trieste and the Master Director, and Renato Padovani, who coordinated the Master's activities from the ICTP side. Over the past ten years, more than 200 physicists have graduated from this programme. In many countries around the world, these graduates became the first-ever trained medical physicists in their respective regions.

For the upcoming master's cycle in 2024/2025, 26 students from 21 countries across four continents have been selected.

Six months ago, I joined ICTP as the first full-time Medical Physicist employed by the institute. My mission is to enhance medical physics programmes by initiating research activities. One of our initial research projects involved a partnership between the BPKM Cancer Hospital in Bharatpur, Nepal, and a multicentric study in Italy about automatic planning optimization under the direction of Claudio Fiorino from San Raffaele Hospital in Milan. In Bharatpur, Surendra Chandra, a former graduate of the ICTP Master's programme and current associate, heads the Medical Physics department.

This project has two primary objectives. The first is to provide BPKM Cancer Hospital with the expertise to effectively utilise advanced technology for treatment planning. The second objective is purely scientific, aimed at enhancing our understanding of model validation and generalizability beyond European countries. This is crucial, as the clinical problems medical physicists encounter in other regions can be even more complex. We anticipate that everyone will benefit from this collaboration.

In the upcoming year, ICTP will host five medical physics-related activities:

1. In April, the School of Hadron Therapy, in collaboration with the SEEIIST collaboration,
2. In May, the Joint ICTP-IAEA Workshop on Quantitative Imaging and Analysis Methods in Modern Nuclear Medicine
3. In September, the traditional College of Medical Physics
4. In October, the Joint ICTP-IAEA Workshop on Radiation Protection in Image-Guided Radiotherapy (IGRT)
5. In November, the Joint ICTP-IAEA Workshop on Monte Carlo Radiation Transport and Associated Data Needs for Medical Applications

For all the physicists participating in our workshops and programmes, ICTP is a place where no one feels like a foreigner. ICTP is the scientific home for scientists from all over the world.

Marco Esposito is a full-time Research Scientist in Medical Physics at the Abdus Salam International Centre for Theoretical Physics.

MEETING REPORT

The 11th Alpe Adria Medical Physics Meeting, 19-22 October 2023 Novi Sad, Serbia

After six years, the medical physicists meeting, led by physicists from the Alpe-Adria region (AAMPM), has returned to Novi Sad, Serbia for this remarkable event - **Stevan Vrbaški**, the CEO of Vinaver Medical, reports

The conference brought together over 150 medical physicists from 27 different countries, serving as a testament to the enduring spirit of cross-border collaboration in the field of medical physics. The meeting was welcomed by the Serbian Minister of Health, Prof. Danica Grujičić, who pledged to improve the status of medical physicists in the Serbian health system, and the dean of the Faculty of Sciences at the University of Novi Sad, Prof. Milica Pavkov Hrvojević, who emphasised the importance of collaboration between this institution and health centres in the region.

The four-day event began with a comprehensive 14 CPD credit course that provided an education in out-of-field doses in radiotherapy and the associated risks of cancer, setting the stage for the meeting that was followed by 23 CPD for the conference. Over the subsequent three days, attendees were treated to a diverse array of presentations on topics spanning medical imaging, radiotherapy, nuclear medicine, and dosimetry, providing valuable insights and fostering lively discussions. Some of my highlights were talks on deep learning reconstruction algorithms and photon-counting CT systems by Signoriello, Hollý, and Chmelk; the radiobiological challenges of personalised radiotherapy by Marcu; the myocardial perfusion imaging optimisation in nuclear medicine by Debeljuh; the CT-ED calibration curve assessment in paediatric patients by Peterlin; the assessment of CBCT imaging protocols on linear accelerators for head and neck patients by Marjanović; and many others.

The strong support for AAMPM from EFOMP was reflected in Prof. Paddy Giligan's, EFOMP president, opening speech, which reiterated the importance of cross-border collaboration and stressed the objective of aligning the standards of practice and certification across the European region. A special emphasis was placed on nurturing and empowering the next generation of medical physicists. They were presented with opportunities for funding through ENEN and ICTP grants designed to support their growth and contributions to the field. Furthermore, to acknowledge the outstanding achievements of young medical physicists, the organisers introduced the Alpe-Adria Prize competition, reserved for a young medical physicist presenting his or her excellent accomplishments in the field. I was honoured to be selected for first prize, with Dr. Michele Signoriello in second place and Ms. Milana Marjanović in third place.

Prof. Borislava Petrović demonstrated her exceptional skill in balancing high-quality scientific discourse with enjoyable activities, which further fostered connections and facilitated lasting bonds among the participants. Beyond the lecture halls and presentations, attendees savoured the delectable flavours of Serbian cuisine, relishing local delicacies like "ćevapčići" and "pljeskavice" alongside the majestic Danube River. The sense of cosiness and the sound of good music created a memorable atmosphere that transcended mere professional networking. The participants had the opportunity to unveil their hidden showman talents during a spirited karaoke night.

In a world where the rapid pace of technological advancements continues to shape the landscape of physics in medicine, events like the Alpe Adria Medical Physics Meeting play a pivotal role in ensuring that the knowledge and expertise of medical physicists remain at the forefront. It's not merely a platform for knowledge dissemination; it's a testament to the bonds that transcend borders and generations. Novi Sad's rich history and warm hospitality added a layer of enchantment to the event, making it a cherished memory for all who attended.

Stevan Vrbaški is the CEO of a newly founded startup Vinaver Medical (https://vinavermedical.com/), exploring the application of AI technology in medical imaging and particle therapy. He submitted his PhD thesis on quantitative material characterization in spectral X-ray computed tomography at the University of Trieste and Elettra Sincrotrone Trieste in Italy. Stevan works on developing a platform for virtual imaging trials at Duke University, USA, as an external collaborator to Prof. Ehsan Samei's group inside the Centre for Virtual Imaging Trials. He is also a collaborator on INFN's MEDIPIX-4 project and part of the ICTP network, which awarded him a TRIL Fellowship.

EFOMP ARTICLE

Advancing Together: The Exciting Growth of EFOMP's Early Career SIG

In this article, **Katryna Vella** will look at the recent events that have catapulted SIG_FREC to new heights, as well as how the organisation intends to give chances and resources to its ever-expanding membership base.

The Special Interest Group for Early Career Medical Physicists (SIG_FREC) is a thriving community that is experiencing remarkable growth and gearing up to provide several opportunities for its members. In this article, we will explore the recent developments that have propelled SIG_FREC to new heights and how it aims to provide opportunities and resources for its ever-growing membership base.

SIG_FREC Surpasses 100 Members

As a significant milestone, SIG_FREC has exceeded 100 members from various European countries and work experiences in different streams, marking a diverse community of early career medical physicists. This milestone underlines the growing interest in medical physics and the crucial role our SIG plays in nurturing the next generation of medical physicists.

Member Meetings and Focus Groups

Our SIG recognises the importance of member involvement and has established 5 focus groups (FG) to address the needs and interests of its members. Convener Leticia Irazola is responsible for all 5 FGs, Agnese Katlapa and Nefeli Tzoumi are responsible for FG1 and FG2, Anna-Maria Fanou and Jesus Ovejero are responsible for FG3, Katryna Vella and Antonio Jreije are responsible for FG4 and all members of the steering committee are responsible for FG5. Meetings for the individual FGs are currently being held with their respective members, upon the selection made by each member regarding their preferred FG/s.

- *FG1: Social Media*

  FG1 is working to enhance SIG_FREC's online presence. This effort involves promoting our SIG on EFOMP's official social media accounts (Instagram, Facebook, Twitter, LinkedIn) and the upcoming official SIG_FREC accounts (YouTube, TikTok). This initiative ensures members are always updated on the latest developments.

- *FG2: European Early Career*

  FG2 is focused on creating a European network that provides opportunities such as Erasmus exchanges and establishes contact with existing NMO early career groups. This collaborative effort aims to address the specific needs and interests of early career medical physicists working in Europe.

- *FG3: Congresses and Events*

  FG3 focuses on organising conferences and events relevant to SIG_FREC. The group is currently working on drafting webinars and events for 2024. And this brings us to our exciting announcement (refer to section **ECMP Congress 2024**)!

- *FG4: Journal and Mailing*

  FG4 ensures that early career medical physicists have a dedicated space in each EFOMP issue to share their advances and research. Additionally, we ensure members are consistently updated through monthly emails.

- *FG5: Scientific*

  FG5 brings members and established professionals together for collaboration. This includes organising webinars on various scientific topics to encourage the exchange of ideas and resources among early career medical physicists and established professionals.

Member Feedback and Statistical Analysis

SIG_FREC values member feedback as an integral part of its growth. In a testament to this commitment, an article on statistical analysis is currently being drafted for publication in Physica Medica. The importance of feedback gives rise to informed decision-making, building a collaborative community and ensuring relevance. This study addresses the specific needs of the SIG members by underlining the general background of our members, involving their professional status, years of experience,

any challenges as an early career medical physicist, work-life balance, focus groups, any areas within Medical Physics that would like to be explored further and more.

New SIG_FREC Logo

As our community continues to evolve and grow, we are proud to unveil our new SIG logo which we have started using recently in our emails and posts:

SIG_FREC's First Webinar

SIG_FREC hosted its very first webinar on 16th October 2023, on "International Opportunities for Medical Physicists: ERASMUS Programme and ENEN Grants" by Carmel J. Caruana and Csilla Pesznyák. This webinar delved into the vast potential available for early careerists.

ECMP Congress 2024

ECMP Congress 2024, scheduled for 11 – 14th September in Munich, is a significant event in the world of medical physics. We are thrilled to announce that our SIG will actively participate by having a dedicated section at the congress.

What to expect at our section at the ECMP

- *Cutting-edge Presentations and Discussions*

  SIG_FREC members will have the opportunity to present their research to an international audience. This is a chance to showcase your work and gain insights and feedback from peers and experts. We will also have discussions about hot topics such as work-life balance, the work of physicists outside the hospital and more.

- *Networking Opportunities*

  ECMP Congress 2024 will bring together medical physicists from across the globe. Our section will offer networking sessions, allowing you to connect with fellow early career professionals and established experts in the field.

- *Interactive Workshops*

  Our section at ECMP will feature workshops and sessions focused on career growth, job opportunities, and skill development.

- *Scientific Collaboration*

  Our SIG's commitment to fostering collaboration extends to the congress. Look out for special sessions dedicated to scientific collaboration and partnerships.

May we remind you that if you are not a member of this SIG but would like to join, then you must send a professional CV, fill in the member application form (accessed here) and send it to board.sig.frec@gmail.com.

As SIG_FREC continues to expand and innovate, our participation in ECMP Congress 2024 represents a significant milestone in our journey. We look forward to seeing you there!

Katryna Vella is a Medical Physics Trainee in the area of Diagnostic and Interventional Radiology, practising within the Medical Imaging Department at Mater Dei Hospital, Msida, 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. Katryna's key achievements in medical physics so far are presenting her Master's dissertation at the European Congress of Medical Physics (ECMP) in Dublin and the MAMP conference in 2022, and publishing her first paper in the IOMP Medical Physics International Journal regarding strategic planning for a Diagnostic Radiology constancy testing programme in Malta. Katryna is also a novelist and poet, a critique partner, and a beta reader for writers and authors.

QADS14

2024 QA & DOSIMETRY SYMPOSIUM

Presented by Sun Nuclear

2 Days of Continuing Education. Practical Insights for your Department.

The 14th installment of QADS returns in 2024, with a new European destination — Lisbon, Portugal. QADS is a dedicated event for the Medical Physics community to gather and explore best practices and techniques.

Join peers from departments around the world to gain fresh perspectives on:

- Challenges in Safety & Quality Control
- EPID-Based In-Vivo Dosimetry
- Era of AI & Innovation
- QA & Dosimetry for New Treatment Modalities
- Novel QA Methods for SRS/SBRT and SIMT

See the schedule and register now: qasymposium.com

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EFOMP ARTICLE

Special Interest Group for Radionuclide Internal Dosimetry (SIGRID)

The name of the SIG has been changed from SIG_FRID to SIGRID! with a new logo **Pablo Mínguez Gabiña** announces and provides an update on the SIG's regular meeting

This is the new logo of the SIGRID!
In addition, the name of the SIG has been changed from SIG_FRID to SIGRID!

The objective of SIGRID is to establish a network of medical physicists working in radionuclide dosimetry. The SIGRID aims to fulfil the need for networking, education, research, and professional exchanges in this field.

The number of SIGRID members is currently 184. New applications are always welcome (see below how to become a SIG member).

Last term, the Steering Committee (SC) had virtual meetings on September 4th, October 10th and November 6th. The Symposium on Molecular Radiotherapy Dosimetry: The Future of Theragnostics organised by the SIGRID, was held in Athens from November 9th until November 11th. A report of this symposium is given in this issue of the EMP news.

The SIGRID 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

A summary of the last activities performed on those priorities is provided below. Note that some priorities may not be mentioned when there is no recent advance.

Priority 1. Scientific meetings
The last scientific meeting of the year will be held on December 13th from 15:00 to 17:00. The topics and the lecturers will be announced soon.

SIGRID 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 usually includes three 30-minute talks, followed by a general discussion (30 min), and a case report is a 30-minute presentation, followed by a general discussion (30 min). Please send your proposals to ernesto.amato@unime.it and steffie.peters@radboudumc.nl.

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

The updated FGs and leaders are as follows:

- FG0 Survey - Caroline Stokke/Steffie Peters
- FG1 Time activity curve fitting - Gerhard Glatting
- FG2 Treatment planning system - Lidia Strigari
- FG3 Absorbed dose-effect relationship - Lidia Strigari
- FG4 Voxel S values - Julia Brosch-Lenz/Marta Cremonesi

You are welcome to propose new work groups. Any request for information, etc., should be addressed to Manuel Bardiès (manuel.bardies@inserm.fr) and Gerhard Glatting (gerhard.glatting@uniklinik-ulm.de).

Priority 3. Teaching/Education/Dissemination.

A proposal for educational courses in nuclear medicine dosimetry has been proposed to the EFOMP board and is currently under consideration. This includes a series of webinars on the basics of dosimetry to be organised throughout 2024, followed by an in-person ESMPE School course on the practical uses of clinical dosimetry in 2025. Any volunteer willing to participate in this priority is welcome. Please contact Ana Denis-Bacelar (ana.denisbacelar@npl.co.uk) and Caroline Stokke (carsto@ous-hf.no).

Priority 4. Communication

In the last year, we have generated 12 newsletters and 4 contributions to EMP News.

Please send your suggested contributions to the EMP News to Pablo Mínguez (pablo.minguezgabina@osakidetza.eus) or Gerhard Glatting (gerhard.glatting@uniklinik-ulm.de).

Slack has been implemented as a communication tool among SIGRID members.

Leticia Irazola, secretary of the Communications and Publications committee and member of the SIGRID, is the link between that committee and the SIGRID regarding SIGRID communication-related activities.

Priority 5. Professional/Regulatory/Economic Matters

The Focus Group on the Communication of the Role of Physics in Therapies with Radionuclides is seeking members. If you are interested in telling the world what you do, please contact Glenn Flux (Glenn.Flux@icr.ac.uk) or Carlo Chiesa (Carlo.Chiesa@istitutotumori.mi.it).

How to become a SIGRID member:

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

Pablo Mínguez Gabiña (PhD Lund University) has been a senior medical physicist at the Gurutzeta/Cruces University Hospital in Barakaldo, Spain, since 2005. He has also been a part-time professor at the faculty of engineering of the University of the Basque Country in Bilbao since 2011. He has been a member of the Dosimetry Committee of the European Association of Nuclear Medicine since 2019. He is also a member of the Steering Committee of SIG_FRID.

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**

Oct 3rd, 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

Feb 6th, 2024 - Feb 10th, 2024
European School for Medical Physics Experts (ESMPE) | Uncertainty analyses and Statistical methods in Medical Physics
Prague, Czech Republic & online

Feb 16th, 2024 - Feb 17th, 2024
QA & Dosimetry Symposium
Lisbon, Portugal

Mar 15th, 2024 - Mar 16th, 2024
Breathing control for motion management in radiotherapy and imaging
Amsterdam, Netherlands

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

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

Jun 17th, 2024 - Jun 21st, 2024
The Twelfth International Conference on Radiation, Natural Sciences, Medicine, Engineering, Technology and Ecology (RAD 2024 Conference)
Hungest Hotel Sun Resort, Herceg Novi, Montenegro

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 28th, 2024 - Oct 29th, 2024
4th European Congress on Cancer and Oncology Research
Rome, Italy

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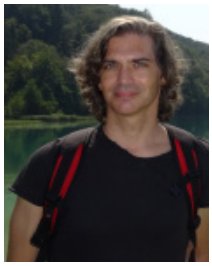

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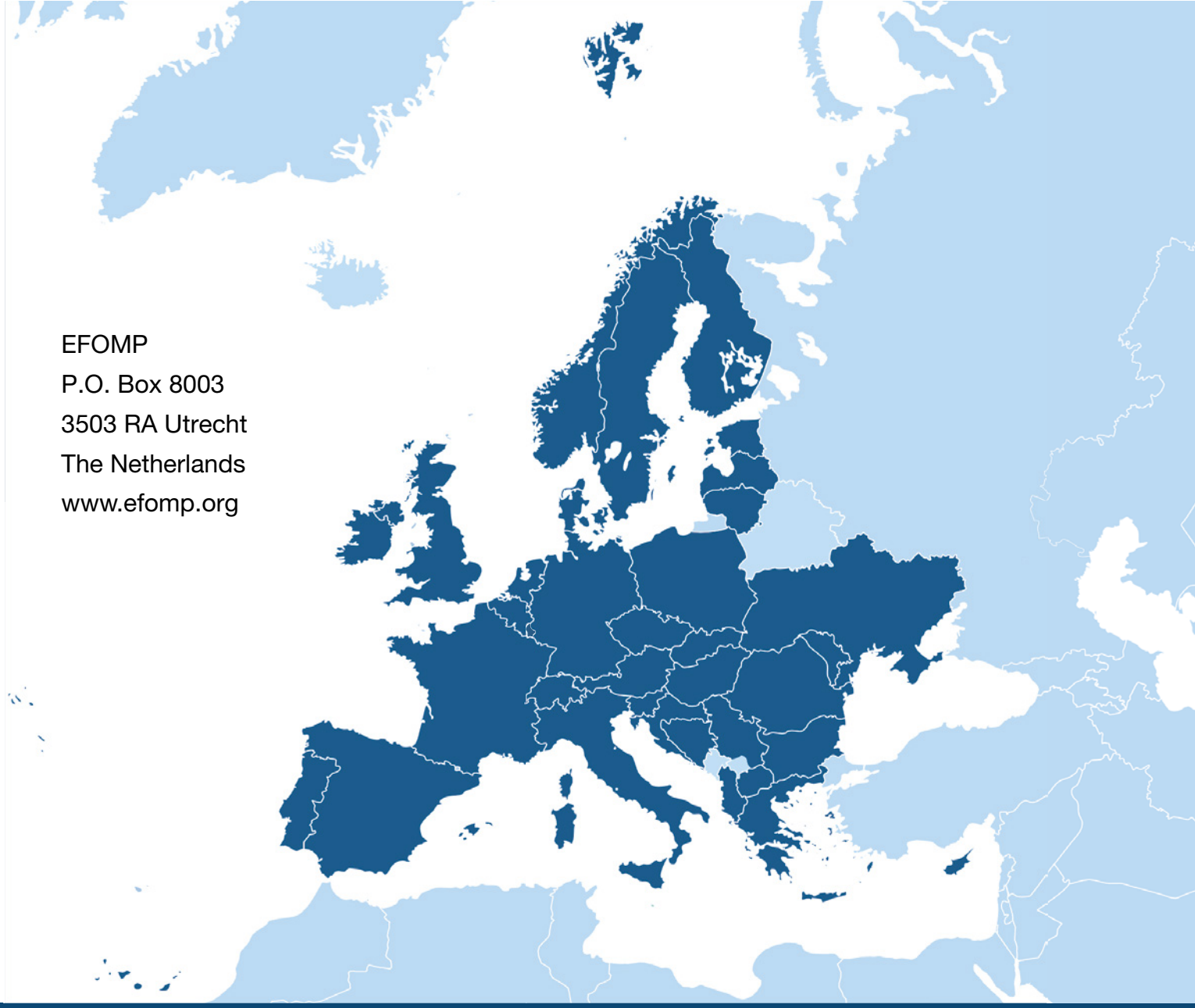

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EFOMP

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”.

For more news and information about EFOMP activities please follow us on social networks or visit our website

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