EFOMP
EUROPEAN FEDERATION OF ORGANISATIONS FOR MEDICAL PHYSICS
Quarterly Newsletter

European Medical Physics News

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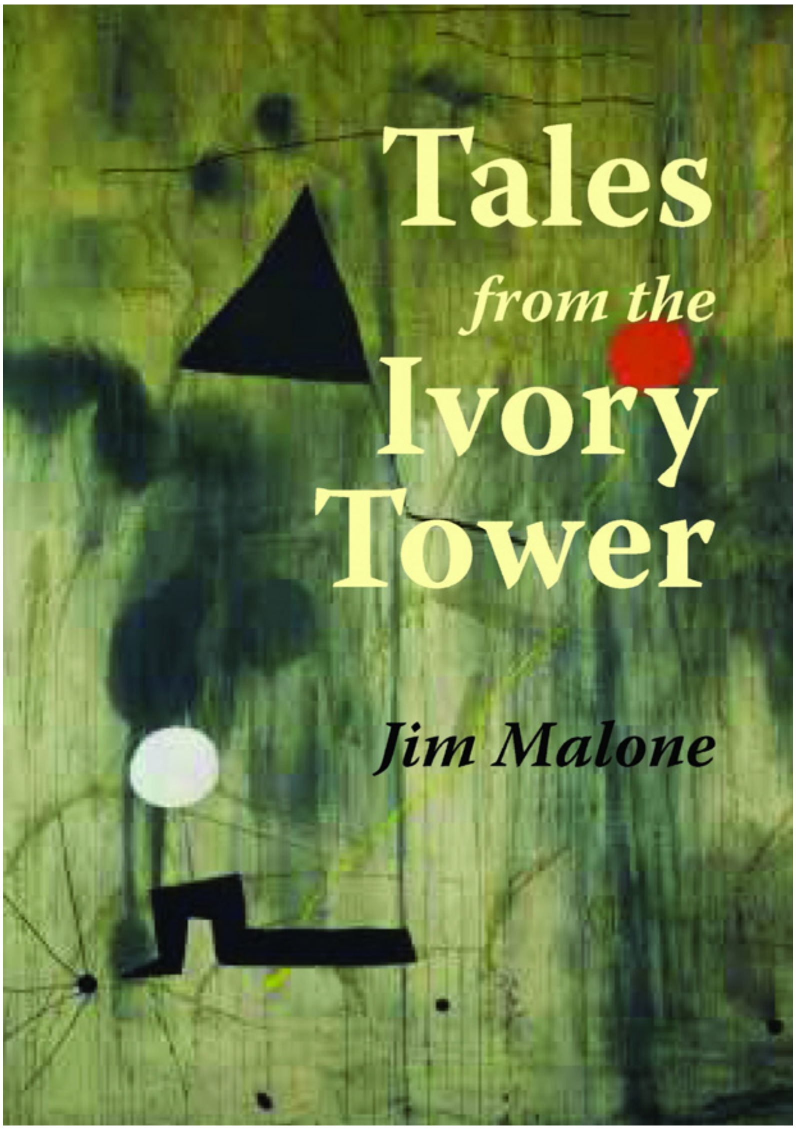

WRITING AT SUCH A HIGH CALIBRE IS ONE HOBBY THAT EUROPEAN MEDICAL PHYSICISTS PURSUE IN THEIR LEISURE TIME

Jim Malone is a 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.

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EDITORIAL

Welcome to the Autumn 2023 issue of European Medical Physics News, the quarterly newsletter of EFOMP

Autumn hues are stunning, but scientists have long puzzled why certain trees turn yellow or orange while others turn crimson or purple. Summer leaves are green because chlorophyll absorbs sunlight and converts it into building blocks for trees. Autumn sees a dramatic fall in solar energy. Most trees, with the exception of evergreen conifers, should suspend photosyna until spring. Instead of storing the extra leaves for the winter, the tree conserves its resources and discards them. The tree breaks down its chlorophyll molecules before shedding its leaves, recycling their nitrogen into the twigs. As chlorophyll depletes, other hues that have been dominated by it throughout the summer begin to emerge. When I watch the Acer tree leaves outside my window turn bright crimson, I become eager for the next few months.

Meanwhile, our schedule is no longer jam-packed with barbecues, beach trips, pool parties, and holidays, making now the ideal time to learn back about your professional community from the European Medical Physics Newsletter (EMP News), with its autumn issue now available and as close to you as your fingertip. As with previous issues, this release features articles on a wide range of topics relevant to professionals: science, education, the arts, technology, interviews, book reviews, advertisements, etc. Therefore, it warrants your full attention.

The cover of this issue is inspired by the review article of Jim Malone's latest autobiographical work, "Tales from the Ivory Tower" by EFOMP President Paddy Gilligan, which is included in this edition.

In this release, EFOMP President **Paddy Gilligan**, announced that our European Journal of Medical Physics (EJMP) (Physica Medica) has returned to Quartile 2 (rank 43/135) of Clarivate Journal Citation Reports' Radiology, Nuclear Medicine, and Medical Imaging journals, with an impact factor of 3.4. On behalf of the members of the publication and communication committee, I would like to thank and congratulate the Editorial Board, Editor-in-Chief **Iuliana Toma-Dasu**, and **Silke Guddat** from Elsevier. I also want to thank the Senior Associate Editors for helping choose the best articles, promoting the journal, highlighting our publications' excellence, promoting and training new medical physicists, and sharing research and information.

In her regular article, **Efi Koutsouveli**, Secretary General and Vice President of the EFOMP, has provided updates on the EFOMP Special Interest Groups (SIGs), Early Career Medical Physicists (SIG_FREC), EFOMP Working Groups (WG), and so on. Please read this article in full for much more information. **Eeva Boman**, the Chair of the Science Committee of the

EFOMP, has also written an overview of her professional career for the EFOMP newsletter.

For this Autumn issue of EMP News, **Danielle Dobbe-Kalkman**, Educational Advisor at EMP News, spoke with Professor **Edwin Aird**, who has had a long and inspiring career in medical physics as a director and medical physicist at Mount Vernon Hospital and at St. Bartholomew's Hospital and Newcastle General as head of radiotherapy and radiation physics.

In this release, **Iuliana Toma-Dasu**, Editor-in-Chief of the EJMP, selected four articles from the most recent issue of the journal on the following topics (i) Practical and technical key challenges in head and neck adaptive radiotherapy: The GORTEC point of view, **N. Delaby et al.**; (ii) Intraoperative CBCT imaging in endovascular abdomen aneurysm repair: optimisation of exposure parameters using a stent phantom, **P. Toroi et al.**; (iii) Geant4-DNA simulation of human cancer cells irradiation with Helium ion beams, **K. Chatzipapas et al.**; and (iv) Towards estimating the carbon footprint of external beam radiotherapy, **R. Chuter et al**.

In terms of the medical physics thesis, **Anders F. S. Mikkelsen** introduced a two-step procedure designed for the comparison of imaging protocols across different departments and manufacturers in an effort to maintain the same diagnostic quality across radiological sites. **Ieva Jogaitė** provided a summary of her MSc thesis on Re-calculation and Evaluation of Compensative Biological Effective Dose for Unscheduled Interruption in Head and Neck Cancer Radiotherapy, Supervised by Assoc. Prof. Dr. **Jurgita Laurikaitienė**.

The book review in this issue is about a book titled: "Handbook of Nuclear Medicine and Molecular Imaging for Physicists, Volume II - Modelling, Dosimetry, and Radiation Protection" - 1st Edition - Edited by **Michael Ljungberg**. This state-of-the-art handbook provides medical physicists with a comprehensive overview of the field of nuclear medicine and focuses on mathematical modelling, dosimetry, and radiation protection. You will find all the details about the book in the book review written by **Jens Kurth**.

In addition, our popular Medical Physicist's art and hobby collection includes the Images and Reflections for Medical Physics by Professor **Jim Malone**, who wrote on a cartoon image by Swiss artist **Paul Klee (1879–1940)** portraying Two Men Meet, Each Believing the Other to Be of Higher Rank (1903) and Twittering Machine (1922).

In terms of professional matters, **Pablo Mínguez Gabiña** provides regular updates on the Special Interest Group for Radionuclide Internal Dosimetry (SIG_FRID) activities. **Jesús G. Ovejero** has provided an update on the first general assembly of the Steering Committee of the Early Career EFOMP Group on June 20, 2023.

There are a good number of meeting reports, The Italian Association of Medical Physics National Congress that took place Last June, from 8th to 12th, reported by **Cinzia Talamonti**; "Beating Cancer: Turning the Tide with Medical Isotopes" (The Special Event of the European Nuclear Society on Nuclear Medicine) - Report by **Mattia Baldoni**; and Highlights of the 61st Congress of the French Medical Physics Society (The Annual Meeting of the French Medical Physics Society (SFPM)), 7-9 June 2023 in Nancy (France). Report by **Marchesi Vincent** and **Gérard Karine**

Here is a collection of recent articles written by EFOMP company members for your reading pleasure. Reading about the companies they operate and the products and services they provide is bound to be informative and entertaining. Whatever article you choose to read in this edition of European Medical Physics News, I hope you enjoy it. This is a frequent feature of the journal.

Finally, I would like to reiterate the announcement of the emergence of the EFOMP mailbase discussion list: For anyone who has not joined yet, please send a subscription request by visiting the public subscription page at the following link and following the instructions: https://lists.efomp.org/mailman/listinfo/europeanmedicalphysics then you can send your first message or messages to the group using the email address: europeanmedicalphysics@lists.efomp.org

Mohamed Metwaly, PhD, FIPEM, 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. Since 2018, he has been a medical physics expert at the Health Research Authority (HRA), which reviews and approves ionising radiation exposure for research and clinical trials. Since 2021, he has been the IPEM representative of EFOMP and the chair of the publication and communication committee. In 2022, he joined the professional matter committee in the EFOMP and the IOMP publication and communication committee, and in 2023, he joined the RPA2000 assessors' team for MPE certification in the UK.

Communications and Publications Committee

To contact the Committee, send an email to pubcommittee@efomp.org.

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President's Letter, Autumn 2023

Danube Park, Novi Sad

AUTUMN EVENING IN SERBIA

ALL the thin shadows
Have closed on the grass,
With the drone on their dark wings
The night beetles pass.
Folded her eyelids,
A maiden asleep,
Day sees in her chamber
The pallid moon peep.

From the bend of the briar
The roses are torn,
And the folds of the wood tops
Are faded and worn.
A strange bird is singing
Sweet notes of the sun,
Tho' song time is over
And Autumn begun.

Irish Poet Francis Ledwidge 1917

Dear Medical Physics friends and colleagues

A sense of industry pervades the end of summer and the beginning of autumn, which in many countries is the time of harvest. For those of us lucky enough to have taken a vacation, we arrive back at our hospitals and universities with fresh ideas and energy. Since the summer newsletter, we have more good news to report for EFOMP:

Physica Medica, Communicate, Educate, and Integrate

Firstly, our European journal of Medical Physics is now back in Quartile 2 (rank 43/135) of the journals in the category Radiology, Nuclear Medicine, and Medical Imaging, according to Clarivate Journal Citation Reports, with an increased impact factor from 3.1 to 3.4.

It should also be mentioned that while many other well-known journals in our field faced a decrease in the Impact Factor this year, Physics Medica not only had an increase, but it also had the highest rank change (up 31 positions) in this category in 2022!

This is a great achievement made possible due to the high-quality submissions we received, the continuous support of our dedicated reviewers, and, last but not least, the work of the Editorial Board, Editor in Chief Iuliana Tomas Dasu, and Silke Guddat from Elsevier. We would therefore also like to thank the Senior Associate Editors for helping select the best articles, promoting the journal, highlighting the quality of our publications, promoting and educating the young members of our community of medical physicists, and spreading science and knowledge.

EU Projects

We are starting to see the fruits of our medical physicists and NMO's work on some of our important EU projects (too many to go through in detail), with interim results and reports now beginning to be produced. These reports and the results of these surveys are very important in assessing the current state and future needs of medical physics in Europe. In the reports I have had a chance to preview, the data collection and recommendations, even from the initial data, are very strong and useful, and the input and voice of EFOMP are evident. The two projects I saw the interim data from where the recommendations around exposure data in the radiological procedure report and the EU REST data. The EU REST data will give us an idea about the distribution of medical physicists in EU member states. National member states should have this data on hand to plan medical physics workforce requirements. This is for both EU and non-EU member states. Similar data will be asked for in the RPE/RPO training requirements survey. With the project committee, we are looking at ways to make this process more efficient with respect to the collection of data so that it remains useful and relevant. However, when the NMO's see the utility and importance of the data we have generated, the value of these exercises will become evident. It is likely that the data will reflect what we are seeing across all healthcare sectors, including oncology. This is a slight increase in the average number of Medical Physics Experts compared to our earlier surveys with heterogeneous distribution, but there will need to be a significant increase to keep up with the equipment expansion base for an ageing population, develop new therapeutic and diagnostic options for patients, and make these accessible throughout Europe.

Another project in which we are partners is the SIMPLERAD project, which looks at the differences in pharmaceutical and radiological legislative requirements for molecular radiotherapy. The role of dosimetry is key to optimisation and patient safety in these treatments. I was pleased to see the work that has gone into producing Policy Statement 19: Dosimetry in Nuclear Medicine Therapy - Molecular Radiotherapy, which has gone out for voting to the NMOS at the time of writing this article. Discussions around the production of policy were key to the development of the document. Policy is different from implementation. Implementation of policy is concerned with guidelines, training, regulations, and resources. There seems to be a strong consensus that good dosimetry is necessary for the success of these treatments and that this should be EFOMP policy, but there may be differing views on the speed of implementation.

Valued relationships

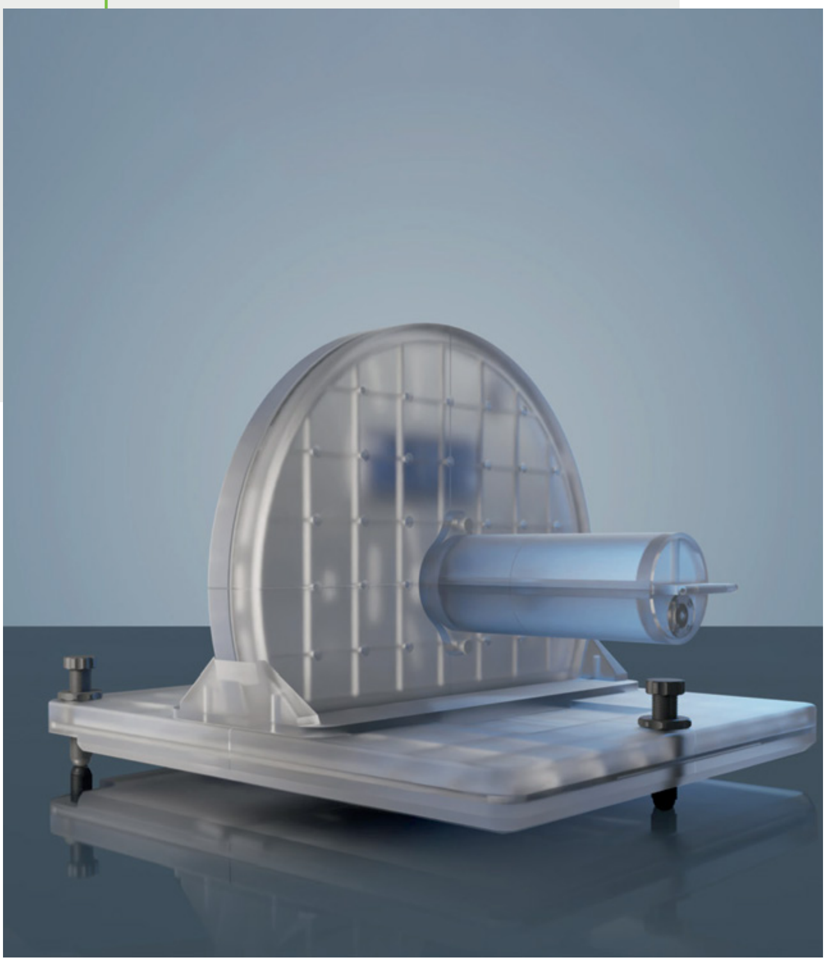
We share the values of helping patients and health care staff with many of our clinical societies, such as ESTRO, EANM, and ESR. Throughout recent years, the collaborative rather than the competitive has shone through with many successes, such as the joint curriculum, EU projects, working groups, joint education initiatives, and recent initiatives with ESTRO to help Ukrainian physicists through remote education. Many of our key officers play roles in both the clinical organisation and EFOMP. I was very happy to attend the European Parliament for the launch of the European Cancer Organisation Foundation (ECO) and my first ECO board meeting for EFOMP. The European Cancer Organisation is where members of many societies and professional associations come together to advocate for a better deal for European cancer patients. It is very reassuring to have a voice to advocate for the benefits that patients can get from medical physics in a European context. It was also very interesting to see how to communicate patients' needs to decision makers. This is very important to our mobility and identity project, which seeks mutual recognition of Medical Physics Experts qualifications in Europe. It is also important to be mindful that we need to keep the role that medical physicists play in delivering high quality care, including the EU's Beating Cancer Plan, at the top of the political agenda prior to next year's European elections.

Four corners of EFOMP

A similar approach needs to be taken for the nine non-EU EFOMP members, some of whom will be represented at the Alpe Adria conference in Novi Sad, Serbia. Where we will hold our next council meeting on the 20th of October 2023. We look forward to meeting you there as well as some NMOs with whom I have not had leadership meetings before. This will be a chance to encourage new volunteers and advocates for medical physics. The health of EFOMP is reflected in the six nominees for the position of Scientific Committee Chair, with many countries represented in the nominations. EFOMP is most grateful to you for putting your name forward. Although we can only have one chair at any one time, if you are unsuccessful in this particular instance, do not be disappointed; please put your name forward for other chairs, committees, and projects. This has been the route for many EFOMP board members, including myself.

Yours in Physics,
Mise Le Meas

Assoc. Prof. Paddy Gilligan, President of EFOMP.



EFOMP Secretary General's Report

In this article, **Efi Koutsouveli**, the EFOMP's Secretary General & Vice President, provides an update on the institutional matters of our organisation.

EFOMP Special Interest Groups (SIGs)

Radionuclide Dosimetry (SIG_FRID) – Symposium

The EFOMP Special Interest Group for Radionuclide Internal Dosimetry is organising its first Symposium on molecular radiotherapy dosimetry in Athens, Greece, 9th – 11th November 2023. The abstract review has been completed, and the final programme is available on the website. Due to the huge interest from participants, a spacious venue has been chosen in order to accommodate more interested professionals. The conference area is situated in the heart of Athens and is easily accessible by metro, bus, and trolleybus.

Website: https://smrd2023.efomp.org/

Radionuclide Dosimetry (SIG_FRID) – Webinars

The EFOMP Special Interest Group for Radionuclide Internal Dosimetry (SIG) is also organising a series of scientific and case reports. A scientific meeting usually includes 3 x 30-minute talks, followed by a general discussion (30 minutes), and a case report includes a 30-minute talk, followed by a general discussion (30 minutes). Case reports are open to everyone interested, whereas scientific meetings are restricted to SIG_FRID members. You can join SIGFRID any time by sending your application to board.sig_frid@efomp.org

Website:
https://www.efomp.org/indexphp?r=pages&id=webinars-2023

Early Career Medical Physicists (SIG_FREC)

The Early Career Medical Physicists Group had its first official meeting in June. The main goals of the SIG were defined by the chair, Leticia Irazola (Figure 1), and the members of the steering committee. The SIG_FREC aims to address the challenges faced by young professionals and to support those making their first steps in the medical physics field. You can join SIGFREC at any time by sending your application to board.sig_frec@efomp.org.

Figure 1: Dimitris Visvikis (Vice-chair of the EFOMP projects committee) and Leticia Irazola (chair of the Early Career SIG) in Budapest during the Young Generation Networks of the Nuclear Sector meeting and the 3rd Nuclear Competition for Secondary Schools organised in the frame of the ENEN2Plus project.

Website: https://efomp.org/index.php?r=pages&id=sig-frec

Dental Imaging

The Dental Imaging SIG had its kickoff meeting in June. The kickoff meeting was attended by 40 professionals involved in this radiological procedure from all over Europe and the US. A call for nominations (CV and motivation letter) to be part of the steering committee and board will be sent to all members during Autumn. The SIG was created since a need to harmonise current practises in the use of Cone Beam CT in dental imaging was identified. New technologies such as AI tools, and dental MRI will be evaluated as well.

Website: https://efomp.org/index.php?r=pages&id=sig-dental-imaging

Particle Therapy

The Particle Therapy SIG is open for applications.

Website: https://www.efomp.org/index.php?r=pages&id=sig-particle-therapy

EFOMP Working Groups (WG)

The members of the Working Group entitled EFOMP Policy Statement 19 – 'Dosimetry in Nuclear Medicine Therapy – Molecular Radiotherapy, chaired by Manuel Bardies (France) are under electronic postal ballot. The vote closes on the 6th of September. A special talk on the Policy Statement will be delivered by Glenn Flux and Katarina Sjögreen-Gleisner during the Radionuclide Symposium in Athens.

European School for Medical Physics Experts editions 2023-2024

- 'Artificial Intelligence in Medical Physics', 5th – 7th October 2023, Prague, Czech Republic & online.
- 'Out of field doses and associated risks of cancer in Radiotherapy', 19th October 2023, Novi Sad, Serbia, and online (open to Individual Associate Members of EFOMP).
- 'Statistics and Uncertainties in Medical Physics', 8th - 10th February 2024, Prague, Czech Republic, and online.
- 3 Pre-congress one-day editions during ECMP2024, 11-14 September 2024, Munich Germany.
- 'Quantitative MRI: Basic Principles, Optimisation, and Quality Assurance, October 2024, Italy (under planning).

Website: https://efomp.org/index.php?r=pages&id=esmpe-upcoming-editions

Affiliated Societies

EFOMP has endorsed the ERS/ESTS/ESTRO/ESR/ESTI/EFOMP Statement on Management of Incidental Findings from Low-Dose CT Screening for Lung Cancer (MILCa), which is in the publication phase. EFOMP joined this consortium led by the European Respiratory Society in 2021. The ERS Taskforce was formed to provide an expert consensus for the assessment and management of incidental findings during screening for lung cancer with low radiation dose computed tomography, which can be adapted and followed during implementation.

EFOMP participated in the HERCA Workshop on how to inspect optimisation and radiation safety in radiotherapy. HERCA is a voluntary association of 56 Radiation Safety Authorities in Europe with the aim of improving radiation protection in healthcare. The 3rd European Inspection Workshop on how to inspect optimisation and radiation safety in radiotherapy was held from the 7th – 9th June in Vantaa, Finland, and gathered 44 inspectors with several years' experience of in inspecting Radiotherapy facilities. The workshop provided a platform to bring together senior inspectors from Europe, to exchange practical ideas and experiences that will contribute to good practises in the inspection of radiation safety and optimisation within radiotherapy. Eeva Boman, chair of the Science Committee, represented EFOMP.

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

EFOMP met with ESTRO to discuss supportive actions for Ukrainian Medical Physicists. As a first step, a closed LinkedIn group was set up to best support Medical Physicists in Ukraine, in particular those working alone in Ukrainian centres or in hospitals where they are making major upgrades to equipment. Marianne Aznar and Catharine Clark on behalf of ESTRO, Efi Koutsouveli, and Oleksandra (Sasha) Ivashchenko on behalf of EFOMP are taking care of members' admission to this LinkedIn forum.

European Congress of Medical Physics (ECMP2024)

Together with Katia Parodi, chair of the local organising committee and co-chair of the scientific committee of ECMP2024, we conducted a site visit at the venue of the 5th ECMP, the new congress centre 'Science Congress Centre Munich' in Garching, Germany (Figure 2).

Please visit the Congress website for updated information on deadlines, scientific programmes, scientific visits at Ludwig-Maximilians-Universität laboratories and social events. Mark your calendar: 11th - 14th September 2024!

Website: https://ecmp2024.org/.

Figure 2: Congress site visit.

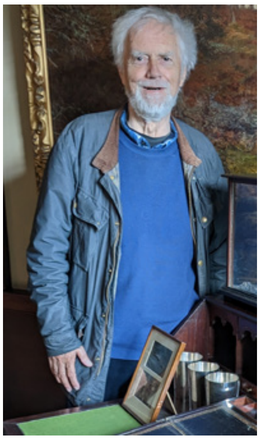
EFOMP Annual Assembly 2023 will be held in Novi Sad, Serbia, on the 20th October 2023 in conjunction with the 11th Alpe Adria Medical Physics Meeting. The venue of the Council Meeting will be the University of Novi Sad, Serbia. See you there.

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

INTERVIEW

Meet the Prof – Interview with Professor Edwin Aird

In this article, **Danielle Dobbe-Kalkman**, Educational Advisor at EMP News, interviewed **Professor Edwin Aird**, who had a long and inspiring career in medical physics as director and medical physicist at Mount Vernon Hospital and at St. Bartholomew's Hospital and Newcastle General as head of radiotherapy and radiation physics.



Professor. Edwin Aird; Hill Top, Beatrix Potter's House in the Lake District.

Dr. Aird has had a long and inspiring career in medical physics, as director and medical physicist at Mount Vernon Hospital and at St. Bartholomew's Hospital and Newcastle General as head of radiotherapy and radiation physics. For his work, he received the British Institute of Radiology (BIR) Roentgen Prize, the Silvanus Thompson Award, and the Eponymous Lecture of the same name. He has been a Chief Examiner for the Institute of Physics and Engineering in Medicine (IPEM) and has held various roles in many other associations, including BIR and the International Atomic Energy Agency (IAEA). His main research and teaching areas are radiation dosimetry, quality assurance in clinical trials, radiation protection, and bone mineral measurements. Dr. Aird was also a founding member of RTTQA and the Global Harmonisation Group, and in addition to many articles on his research, he has published two books and many book chapters. He is currently interested in the history of medical physics and will present on Marie Curie Radiological Cars and Jack Fowler's work on fractionation, which inspired John Yarnold to revolutionise radiotherapy fractionation for conservative breast treatment (to be given at the annual meeting of the International Society for the History of Radiology).

DD: Can you tell me something about your first experience as a teacher?

EA: My first teaching experience was in Malaysia, without any training, when I became an English teacher under the auspices of VSO. I taught every subject - history, geography, literature, chemistry, and math - because I spoke English. That was when I was only 19 years old. That was the beginning. When I got a job in medical physics (1967), I was also asked to teach, which was mainly clinical: radiographers and radiologists. That has developed throughout my career. First, in Newcastle, I taught radiographers Dynamic chest radiography (DCR) and later at the Universities of Carlisle and Newcastle; then at St. Bartholomew's Hospital; subsequently at Mount Vernon Hospital and the University of Hertfordshire.

I have found that teaching helps you understand your subject much better. I always tell my young colleagues to teach at least a little. It also helps your memory later, like if you get called into a conference somewhere and you have to remember a number or something. It is already there because you teach it monthly or weekly.

I taught general radiotherapy physics, radiology physics, radiation protection and some nuclear medicine to radiographers, clinical oncologists and radiologists. However, I also taught MRI classes to engineers at the University of Hertfordshire. That was harder to learn. If you don't actually use the tools you learn, it is much more difficult to explain a topic thoroughly.

Teaching clinical oncologists can also be challenging. The tools of teaching evolved from chalkboards and whiteboards to handwritten overheads, which I used before typing overheads. I vividly remember a clinical student telling me how difficult it was to read and understand dosimetry equations with my purple pen! However, what I liked about teaching the clinical oncologists for their fellowship exam was that it also included radiobiology and statistics. I also learned a lot about those topics by discussing them at the viva voce with the expert examiners.

DD: Can we come back to your initial experiences as a medical physicist?

EA: When I first started in Newcastle, I did both my MSc and a radiotherapy course. But with radiotherapy, this was self-training. I read books, trained myself, and asked other employees.

The Newcastle Department was a regional department affiliated with the university from 1967 to 1985. It had sections for radiotherapy, radiology, radiation protection, nuclear medicine, ultrasound, and physiological measurements. So, it had everything together, which had huge benefits for young physicists because you could learn from each other. I now realise that this was a period of enormous change for the world of medical physics, especially when it related to radiotherapy and radiology. CT was developed in 1971; MRI in the late 1970s; gamma cameras were first introduced in NHS hospitals in the 1970s (before that, we used recta-linear scanners); and B-mode ultrasound scans were introduced in the mid-1970s for work in obstetrics. Linear accelerators for radiotherapy had evolved from the straight waveguide to “curved beam” systems that allowed under-bench treatment and had energies as high as 15 MV and 20 MV. When I first started in Newcastle treatment planning, the outlining was digitised with a pencil (lead rubber or other device to obtain the patient's outline) on a screen to enter the data into a giant, large cabinet computer. Minicomputers entered hospitals in the 1970s (PDP8) so that computer-aided treatment planning could be performed. Brachytherapy went from manual manipulation of sources to manual afterloading to remote afterloading. It was an exciting time!

One of my first experiences was working with medical sources of radium. Perhaps I am one of the few clinical physicists still alive who personally handled radium. For example, I worked with a brilliant surgeon who inserted five needles into a tumour at the back of the tongue. After making the correct calculations based on the x-rays, I took the removal time for the needles (often 6-7 days for an implant) and went to the ward, talked to the nurse, and decided together exactly when the needles should come out, using the 24-hour clock (and checked out with mutual understanding). At the age of 24, that was quite a responsibility.

At this young age, I was also given the responsibility of looking after the radiotherapy equipment (only SXT and DXT X-ray sets at the time) and (small) nuclear medicine at the Cumberland Infirmary in Carlisle (60 miles from Newcastle). I was interested in Jack Fowler's notebooks on 'Arc Therapy with 250 kV X-rays' in that department. He had worked there as one of his first jobs. (Later director of the Gray Laboratory 1970-1988)

DD: I think you mentioned other events that shaped your early experiences in Medical physics; could you shed more light on that?

For my MSc, under the supervision of Professor Frank Farmer, I studied lung correction for calculating treatment plans in the thorax using transit dosimetry. He then said I should go out and visit other departments and find out what they are doing: for example, with in-vivo dosimetry at Hammersmith Hospital. And that set a pattern for me in an amazing way. I regularly visited other departments and looked at what they were doing. Not necessarily complex issues, even very simple things in treatment rooms, for example. Different ways of doing things.

I can link this desire to visit other centres with important work later in life: about twenty years after I started working, I started doing dosimetry audits, taking the pioneer around the country to measure a phantom. This work led to the QA audit for the CHART clinical trial, at the request of Professor Stan Dische. This was at Mount Vernon Hospital. We couldn't hire anyone, so the three of us – a radiographer, an engineer, and me—went out on weekends to do all the measurements and audits, even in Sweden and Dresden. We developed a comprehensive series of quality control tests at each centre we visited that we could perform on a single linear accelerator and simulator, as well as dose measurements in a head and neck phantom and a chest phantom. This took approximately 8 hours, including writing the report to discuss with fellow colleagues at the end of the day.

This use of QA for clinical trials, following on from the START trials, led to the formation of the Radiotherapy Clinical Trials Group (RTTQA group, centred on Mount Vernon Hospital), which now employs people to carry out QA for government-sponsored clinical trials. This isn’t just a dosimetry audit; the RTTQA staff also talk to the staff of the oncology centre taking part in a trial to make sure they understand the protocol and all the processes involved; and involve them in “participants” meetings.

DD: Were you also able to do some research in your early days in Newcastle?

Another important thing for me is research. The chief physicists from the 1950s and 1960s would say to juniors: ‘I know I’ve employed you to do routine work, but I expect you to do some research’. I think it’s really important for young physicists that, where possible, they can contribute by doing some research. I was extremely lucky to be able to do this in Newcastle.

First, I was involved with the design of the Farmer Chamber, a small chamber for making ionisation measurements, which was extraordinary to be able to do. I would love to further explore the differences between different chambers from different manufacturers using slightly different materials (Famer has not patented his chamber, and there are many different versions in use around the world). This work was very useful to me as it gave me insight into the low-energy X-ray filtration, HVL, and other aspects used for superficial therapy (70-140 kV). These energies are very similar to those of radiation, which has helped me understand the physics of this subject. I think for today's radiotherapy physicist, a really good understanding of radiology, including the detection systems, is important.

Later, I had the opportunity to work with Newcastle University's Industrial Health Department on a project to measure antimony in the lungs of workers. I developed a system that used two characteristic X-rays passing through the lungs. Using a different formula and a calibrated system, we were able to determine the milligrams content in the lungs: an astonishingly accurate technique.

Next, with the same type of equipment, I developed bone mineral measurement (for my PhD, in the 1980s, which was fantastic!). This was before industrial systems came along to measure the bone mineral content in the legs, spine, and arms.

DD: But what about returning to your teaching/examining work?

I was involved in examinations for the Medical Physics profession in Great Britain. I was a radiotherapy examiner and then chief examiner at the Institute of Physics and Engineering in Medicine.

I was also fortunate to be part of the ESTRO course. I think I did this for fifteen years. After a number of years in Leuven, we took the course abroad: to Turkey, Greece, Russia, South America and other countries, where we taught different groups of people, mainly doctors and physicists. ESTRO has developed many teaching courses, but I taught the Basic Physics Course. That was a pleasure. Being on various visits and enjoying the company of the students.

In the afternoons of the course, we did the practical session, in which physics teachers were paired with doctors. The impressive thing I found about my European medical colleagues was their excellent knowledge of the English language: It was a privilege to teach alongside those physicians.

DD: And what about now?

In retirement, which I put off for a few years after my official date, I have found myself missing the work and the people. So, I have started to research some aspects of the history of our subject. My latest interests are:

i) Marie Curie's Radiological Cars will be presented at the September 2023 meeting of the British Society for the History of Medicine in Cardiff.

ii) The work of Professor Jack Fowler and his understanding of different fractionation regimes. This work particularly improved postoperative chest radiotherapy by introducing safe hypofractionation (which was especially useful during COVID-19). Will be presented at the ISHRAD meeting in Germany in October 2023.

iii) The historic struggle to find X-ray systems that would produce higher voltages than 250 kV (for better penetration through tissues), in particular, the 1 MV X-ray tube and system developed at Barts Hospital in London in 1937.

DD: Thank you so much for your valuable insights!

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

EFOMP COMPANY MEMBER ARTICLE

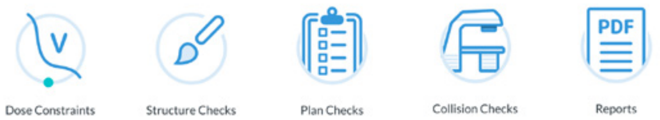
ClearCheck is Now Available for Nearly All Treatment Planning Systems!

Expanded compatibility of the flagship plan evaluation tool accommodates plans from “virtually” any treatment planning system

The time has come.

As we continue expanding our automated solutions for wider compatibility, we’ve got big news to share. We’re thrilled to announce that ClearCheck is now ready to provide industry-leading plan evaluation and reporting for nearly any plan via DICOM import/export, regardless of where it was created.

Trusted by over 1,200 clinics worldwide, ClearCheck is an automated plan verification and documentation software that ensures the highest quality treatment plans by automating dose constraints, plan checks, plan comparisons, and creating fast, thorough documentation. Until now, ClearCheck was designed for use with a single treatment planning system. The latest version of ClearCheck is now compatible with virtually any treatment planning system (TPS), including specialty machines, MR linacs, and adaptive systems.



ClearCheck simplifies plan review and documentation by automating key components of the pre-treatment workflow.

> **We are delighted to bring automation into our treatment planning workflow. ClearCheck will improve our efficiency while increasing patient care standards.**
>
> **Carles Muñoz-Montplet, PhD**
> Director of Technology, IT and Physics
> Institut Català d’Oncologia

Improving Plan Evaluation Each Step of the Way

The latest version of ClearCheck retains the essence of the original software*, performing full-featured plan evaluations via DICOM import/export. The following major features in ClearCheck are designed with safety, quality, and efficiency in mind:

Plan Sum Builder

New to ClearCheck, the Plan Sum Builder allows for the summation of multiple unique plans using either a shared frame of reference or rigid registration. Additionally, the Plan Sum Builder accepts deformable registrations created from within Radformaton’s deep-learning segmentation solution, AutoContour. Reviewing the resulting plan sum is ideal for retreatments, abutting fields, and sequential plans from different treatment planning systems.

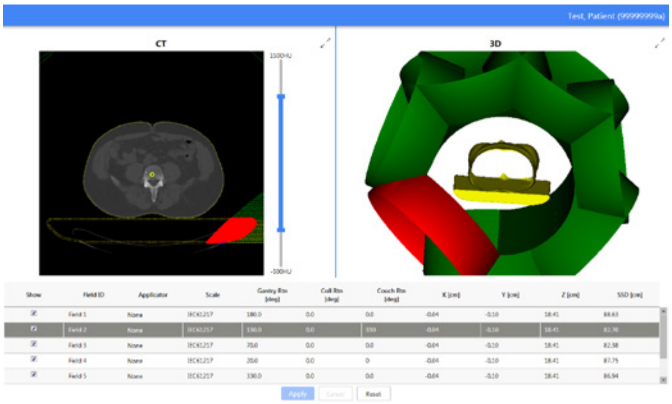
Dose Constraints, Structure Checks, and Plan Checks

Evaluating dose constraints for complicated plans can be cumbersome. ClearCheck’s ready-to-use template library automates site-specific dose evaluation metrics using the precise constraints required for various treatment scenarios, including SRS, SBRT, prostate, breast, and everything in between. Additionally, our BED and EQD2 tools provide insights into the biological effect of varying fractionation schemes.

The structure checks feature systematically evaluates each and every contour, ensuring an error-free dataset by looking for missing slices, verifying proper laterality, hunting down stray pixels, and more. What’s more, ClearCheck’s plan checks module quickly compares pertinent plan information, verifying that dozens of plan parameters such as slice thickness, calculation algorithm, grid size, and more match your clinical expectations.

Collision Check

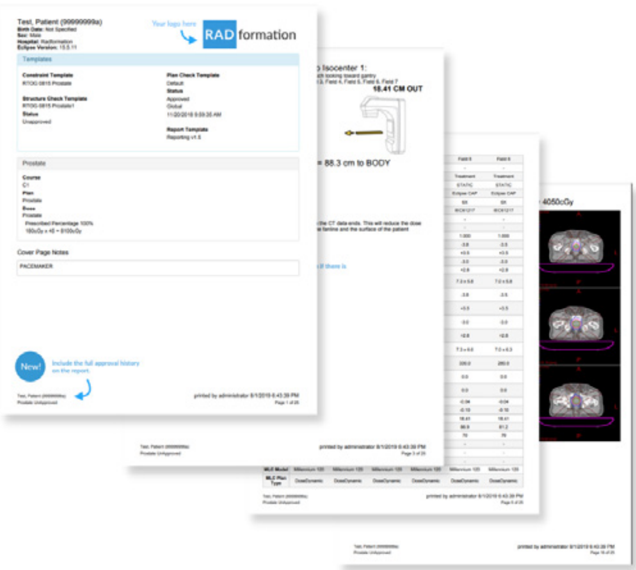
Patient safety is our utmost priority. The Collision Check module provides useful 3D renderings of the patient’s external contour, along with a simulated treatment gantry and any relevant support structures. This virtual workspace allows for a close visual inspection of the plan for potential collision risks. With models available for the gantry head, electron cones, SRS cones, and support structures, planners can make informed decisions as they plan cases with tight clearances, ensuring safe treatment delivery.



The Collision Check workspace provides key information about potential collisions and allows users to configure plan parameters and visualize changes in real time to assess risk.

Plan Reporting

We understand the importance of plan reporting. We're aware that when the hard work of crafting a high-quality plan has concluded, creating plan documentation can feel like an afterthought. Including key information, screenshots, and PDF documents can be streamlined with ClearCheck, which compiles fully customizable reports that include plan and field properties, DVH (Dose-Volume Histograms), CT slices, dose constraints, and much more. What's more, ClearCheck can do it in half the time [1].



The comprehensive plan report includes basic patient and plan information, dose constraints, CT slices, contours, and much more.

Conclusion

As you can see, ClearCheck has the features you need to make plan review and documentation more effective and efficient. Dose constraints in seconds. Automated structure and plan checks. A 3D sandbox to simulate the patient and gantry to prevent collisions. Faster, comprehensive reporting. All without compromising quality. And now with the ability for DICOM import/export, ClearCheck accepts plans from nearly any treatment planning system.

But don't take our word for it. See it in action for yourself: schedule a demo of ClearCheck to see how it can take your plan evaluations to the next level.

*Some features in the ESAPI version of ClearCheck, such as prescription verification, Chart Rounds module, and some structure/plan checks are not available with the new DICOM version.

Reference

[1] M Cornell et. al, Pre-Clinical Validation and Efficiency Analysis of Semi-Automated Plan Documentation Process, IJROBP 108, 3 (2020). https://www.redjournal.org/article/S0360-3016(20)32870-4/fulltext

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.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Introducing Eeva Boman - the Chair of the Science Committee of the EFOMP

Eeva Boman has been the Chair of the Science Committee since the beginning of the year 2023. Here she writes an overview of her professional career for the EFOMP newsletter.

Dear reader. I would like to take this opportunity to introduce myself to you. My name is Eeva Boman, and I am from Finland. I work as the Chief Physicist in the radiotherapy department at the University Hospital of Tampere. Tampere is a lovely city, 200 km north of Helsinki. Our radiotherapy clinic treats over 2,500 new patients per year with six linear accelerators and one HDR facility. I hold an associate professorship at the University of Tampere. My personal research interest has been mainly in radiotherapy treatment planning and HDR applications. I have made my MSc and PhD theses in the fields of mathematical modelling of radiotherapy dose calculation and optimisation. As a manager for eight physicists, my work consists of managing related tasks. In addition, I lead the new purchases of new radiotherapy treatment units or imaging devices. My work also includes being a Radiation Safety Officer and Radiation Safety Expert. I also did some lecturing for radiotherapy and radiation safety courses and developed training material for the clinic and students.

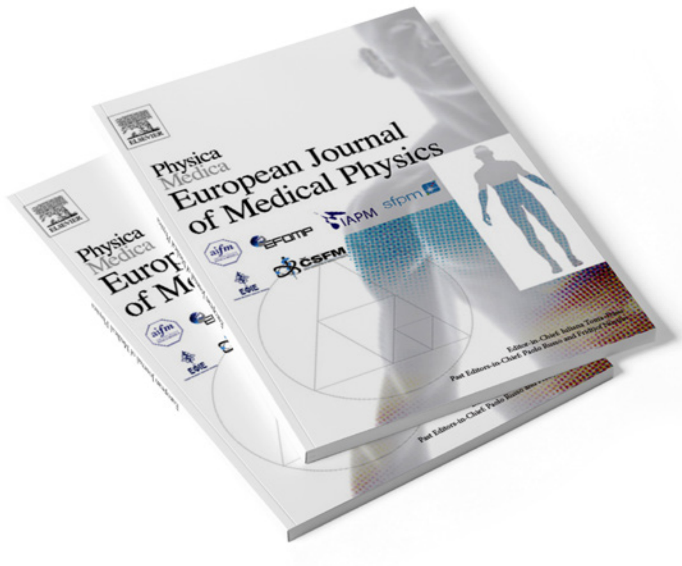
I have been the Chair of the Science Committee in EFOMP since the beginning of this year, when I stepped into the big boots of the former Chair, Brendan McClean (currently the past Chair of the Science Committee). In the previous year, I was able to follow Brendan's work closely as Vice Chair of the Science Committee, so the step was not that large. Prior to that, I was for two years the President of the Finnish Association of Hospital Physicists (FAHP), and many years before that, I was a board member of FAHP. Currently, I am also one of the two EFOMP delegates of our national member organisation (NMO) and belong to the board of the Finnish National Committee for Medical Physics and Medical Engineering.

Before coming to the position of vice chair of the EFOMP Science Committee last year, I had very little personal contact with EFOMP. Recent years have been very interesting, getting to know new people from the EFOMP and even beyond. I would like to welcome you to EFOMP activities. The Science Committee tries to promote the research needed in the medical physics community. In the science committee, the work is mainly carried out by the working groups and special interest groups, which we propose and foresee. Each NMO can nominate members for EFOMP committees. Currently, the science committee consists of fifteen members, including the chair, past chair, and secretary. Nine of our members categorise themselves as radiotherapy experts, six are more experienced in radiology and only one in nuclear medicine. If you feel you would like to be part of this, you can contact me.

Finally, I like new challenges, not only at work but also in my personal life. I have worked as a Senior Medical Physicist in the Wellington Radiotherapy Clinic in New Zealand. I and my family, including three pre-teens moved to Wellington for 1.5 years. It was an awesome time being aboard, very far from home, and finding out that the work they do there, and back home is basically the same. In my free time, I have several hobbies; the latest is being the owner of a lakeside summer house, which we have been renovating from the floor to the ceiling this summer. It might be that the sauna is not ready this summer, but hopefully will be next. :)

Eeva Boman: The Current Chair of the EFOMP's Scientific Committee

Physica Medica: Editor's Choice



The Editor of Physica Medica (EJMP), Iuliana Toma-Dasu, has chosen the following four papers from the most current issue of the EJMP to highlight in this article as they particularly piqued her interest.

N. Delaby et al **Practical and technical key challenges in head and neck adaptive radiotherapy: The GORTEC point of view** Phys. Med. 2023;109: 102568

https://doi.org/10.1016/j.ejmp.2023.102568

This is a review article accompanied by practical recommendations on the highly relevant topic of adaptive radiotherapy for head and neck cancer, reflecting the experience and opinions of the Radiotherapy Oncology Group for Head and Neck (GORTEC), representing a network of more than 100 oncology care institutions from France, Switzerland, Belgium, Tunisia, Germany, and Spain. The review has a particular structure, which makes it very valuable for the clinical community of medical physicists struggling to implement adaptive strategies: each topic covered by the review in one particular chapter is ended with a list of clear and precise recommendations paving the most important steps towards clinical implementation. The main topics were: image registration, segmentation, estimation of the delivered dose of the day, dose monitoring, offline and online workflows, and quality assurance for the implementation.

P. Toroi et al **Intraoperative CBCT imaging in endovascular abdominal aneurysm repair: Optimisation of exposure parameters using a stent phantom** Phys. Med. 2023;112: 102634

https://doi.org/10.1016/j.ejmp.2023.102634

This paper presents the work done in relation to a form of treatment mentioned rather rarely in our journal, the endovascular abdominal aneurysm repair (EVAR) operation. This procedure heavily relies on image guidance, and cone beam computed tomography (CBCT) is one of the modern choices. The use of CBCT for these procedures might, however, result in significant radiation exposure to patients if scans are not carefully optimised. This study presented the image quality requirements for intraoperative EVAR CBCT imaging as well as solutions to optimise the CBCT exposure parameters accordingly in the form of a new protocol, making it therefore very valuable in the clinic.

K. Chatzipapas et al., **Geant4-DNA simulation of human cancer cells irradiation with Helium ion beams** Phys. Med. 2023;112: 102613

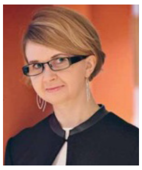
https://doi.org/10.1016/j.ejmp.2023.102613

Based on the positive outcome of the early clinical trials with therapeutic Helium ion beams at Lawrence Berkeley National Laboratory, the Heidelberg Ion-Beam Therapy Centre (HIT) became very interested in starting to treat patients with this type of beam in addition to protons and Carbon ions. In this very real clinical context, this study contributes to a better understanding of the biological effects of the Helium ions in relation to the physical properties of the beams. A computational environment for the accurate simulation of human cancer cell irradiation using Geant4-DNA employing novel cell geometrical models was developed and presented, and the irradiation with alpha particle beams to induce DNA damage was simulated. The results demonstrate the capacity of the Geant4-DNA toolkit together with the so-called "molecularDNA" to simulate the helium beam irradiation of cancer cell lines, quantify the early DNA damage, and follow the DNA damage response, thus providing the computational tools for carrying on in highly relevant simulations that could guide the development of helium ion radiotherapy.

R. Chuter et al., **Towards estimating the carbon footprint of external beam radiotherapy**, Phys. Med. 2023;112: 102652

https://doi.org/10.1016/j.ejmp.2023.102652

Last, but definitely not least, the fourth paper selected for this issue brings up to the discussion a topic that should concern us all: the environmental impact of external beam radiotherapy procedures in terms of the greenhouse gases (GHGs) it produces and its carbon dioxide equivalent (CO2e), constituting the carbon footprint of the process. Following this hot European summer, when climate change became more apparent than ever as many countries experienced severe flooding, wildfires, and heatwaves, acting responsibly, and aiming to estimate and potentially reduce the carbon footprint of various components of radiotherapy is necessary. To the best of my knowledge, this is the first paper on this topic, and its initial findings revealed that the biggest contributor to the external beam radiotherapy carbon footprint is patient travel to the treatment site, which could be mitigated using hypofractionation.



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

EFOMP COMPANY MEMBER ARTICLE

Providing Quality Assurance Solutions to the Four Corners of the World

STANDARD IMAGING

Standard Imaging has been dedicated to serving the Radiation Oncology community for more than three decades in the US market and has been expanding steadily internationally as well.

Today, international activities represent a substantial share of our activities, increasing by the day. With internationalisation comes diversity and an array of challenges, which our International Account Management team has risen to meet.

Being able to address our customers in their native language remains by far the most significant objective we have at Standard Imaging. It is a facilitator in business, obviously, but it is also a way to communicate more effectively, ensuring optimum usage of our solutions, as well as safe operation of the devices. During the course of this journey, we have worked diligently to add additional languages, including, but not limited to, Spanish, Chinese, Portuguese, Hindi, French, Italian, and Romania, to the way we can respond to our customers, and this is making a big difference!

Another major challenge throughout the international markets is the diversity of scenarios we are facing when it comes to QA solutions. Consider acquiring and using QA tools the same in a country, where there is little or no reimbursement compared to others where Quality Assurance can just be considered a percentage of the operational costs. Again, we strive to adapt and work with our distributors and customers to remain aware of the local constraints that each customer and clinic we work with faces.

Quality Assurance remains a universal language within the Radiation Therapy community, with the main difference being following AAPM or IAEA protocols.

The exciting part, especially in countries on the rise, is that a new centre is being built, and the choice that must be made about which QA is required and the most paramount to have at that particular time.

- Do I need a water phantom, or should I use an array with water-equivalent slabs?
- Should I acquire a 3D array, or do I trust EPID-type dosimetry with software?
- How will I perform In Vivo dosimetry?
- What ALARA devices are required for daily, monthly, and yearly QA?

In these situations, the exercise of listening, advising, and proposing solutions that are aligned with the expressed needs but are also sometimes disruptive and innovative is a very fulfilling yet challenging way our team works with customers to set clinics and their teams up for successful QA. Beyond the business aspect of supplying solutions, the representatives on the international team pride themselves in believing that we are helping treatment teams provide the highest possible quality treatments to their patients, no matter the challenges they face or where they are located.

Vincent Ronflé, has spent most of his career in Service and sales in the NMR, Mammography and radiation therapy fields. Having lived in many countries in his career, he holds a special place for Africa, the continent of many challenges and many smiles. He holds an engineering degree from EFREI Paris and a master's in business from Cegos France. In his current position as International Business Development Manager at Standard Imaging, Vincent strives to connect people from all corners of the world and values relationships over protocols and processes.

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SBRT phantom is an anthropomorphic 3D-printed phantom that simulates the anatomy of an abdominal case, with bone and tissue-equivalent materials. The unique advantage of having realistic bone and soft-tissue contrast in both CT and MR imaging, makes SBRT phantom an excellent tool for online adaptation of advanced SBRT techniques.

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BOOK REVIEW

Handbook of Nuclear Medicine and Molecular Imaging for Physicists, Volume II - Modelling, Dosimetry, and Radiation Protection. 1st Edition. Edited by Michael Ljungberg

This state-of-the-art handbook provides medical physicists with a comprehensive overview of the field of nuclear medicine and focuses on mathematical modelling, dosimetry, and radiation protection. The book is reviewed by **Jens Kurth**

Ljungberg M (ed.) (2022). CRC Press, 316 Pages, 141 B/W Illustrations, ISBN: 9781138593299

The book "Modelling, Dosimetry, and Radiation Protection," edited by Michael Ljungberg, Professor of Medical Radiation Physics at Lund University in Sweden, constitutes the second instalment within the three-volume compilation "Handbook of Nuclear Medicine and Molecular Imaging for Physicists". The editor, Michael Ljungberg, a widely recognised authority on the medical physics of nuclear medicine, has adeptly gathered a consortium of esteemed authors for the realisation of this second volume of the project. It successfully combines new practical research results in the field, but also explains the theoretical foundations and provides important insights into the historical developments of dosimetry in nuclear medicine.

The book begins with an introduction to biostatistics by Johan Gustafson and Markus Nilsson (Chapter 1), which presents the most important aspects of data preparation, presentation, and analysis very compactly, maybe sometimes too compactly. In my view, however, it gives the reader a good impetus to critically examine "his" data again and again and to assure himself of the robustness of the statistical methods used. Chapter 2, written by Lidia Striagari and Marta Cremonesi, which presents the basics of radiobiology, is, in my opinion, a very important and motivating section. The most important mechanisms of the effect of ionising radiation and their representations (e.g., the linear quadratic model and the BED (biologically effective dose) based on it) and important parameters (such as tumour and normal tissue control probability) are presented and at the same time put into the context of clinical application and what is known so far about the dose-response relationship in nuclear medicine therapies. It is clearly understood that a dose indication is almost worthless without knowledge of its biological effectiveness.

In the very comprehensive chapter 3 by Lennart Johansson and Martin Andersson, the concepts for dose calculation in the application of diagnostic radiopharmaceuticals are presented. Based on the dose definition, the fundamentals of the biokinetic and dosimetric models used are presented. The tables, pamphlets, and recommendations published on this basis by MIRD (Medical Internal Radiation Dosimetry Committee of the Society of Nuclear Medicine) and ICRP (International Commission on Radiological Protection) and their practical application are given wide space. The subsequent chapters 4 by Gerhard Glatting and 5, prepared by Mark Lubberink and Michele Koole, on curve fitting and the adequate selection of pharmacokinetic models and kinetic modelling, respectively, comprehensively explain the basics and the application of compartmental models. At the same time, both chapters give a good overview of the current literature and show, in my view, the enormous amount of information inherent in nuclear medical imaging, which can be used to describe the behaviour of drugs themselves but also to describe the tissue and thus, for example, to describe disease and disease models.

The following Chapter 6 by Sören Mattson gives an overview of the existing system of radiation protection according to the ICRP recommendations and places dosimetric procedures in nuclear medicine in their context. An equally exciting and important chapter follows directly. Chapter 7, written by Michael G. Stabin, deals with the various controversies about the application of dosimetry in radionuclide therapies and encourages critical thinking, e.g. about the uncritical application of the LNT (linear no-threshold) model.

Chapter 8, authored by José Fernández-Varea, takes us back to theory and deals with the Monte Carlo simulations of photon and electron interactions with matter, which are indispensable nowadays. It is clear that, given the complexity of the subject, this section can only provide an initial overview. However, it succeeds well, and the reader receives many suggestions for further and more in-depth reading.

Starting from Chapter 9, again written by Michael G. Stabin, which comprehensively presents the developments and current status of the patient models used for nuclear medicine dosimetry, chapters 10 to 14 then take up further aspects of the clinical application of dosimetry in radionuclide therapies. Chapter 10 by Manuel Bardiès, Naomi Clayton, Gunjan Kayal, and Alex Vergara Gil describes the aspects to be considered in the transition from model-based to patient-specific dosimetry. Chapter 11, compiled by Jonathan Gear, on whole-body dosimetry comprehensively shows the clinical application for determining the absorbed whole-body dose. Possible pitfalls and sources of errors are pointed out very comprehensively, and the clinical benefit of this comparatively simple method is worked out very impressively using numerous examples.

Furthermore, Chapter 12 by Remco Bastiaanet and Hugo W.A.M. de Jong is dedicated to the aspects of personalised dosimetry of SIRT (Selective Internal radiotherapy) in liver tumours. The advantages and disadvantages of the various calculation methods currently used clinically are described in great detail, as are developments in the use of methods established in external radiation therapy, such as the analysis of spatial dose information by means of DVH (Dose Volume Histogram) or the EUBED (Equivalent Uniform Biologically Effective Dose). In the following chapter 13 by Michael Lassmann and Heribert Hänscheid, almost all aspects of dosimetry in radioiodine therapy of benign and malignant thyroid diseases are highlighted. This ranges from the selection and adequate calibration of the measuring instruments to dosimetric concepts and blood-based therapy optimisation in the therapy of thyroid carcinomas. Finally, chapter 14, authored by Cecilia Hindorf,describes the different options for performing bone marrow dosimetry in the clinical context and concludes with a comprehensive overview of the potential bone marrow toxicities of different established radionuclide therapies.

Often, clinical responses to radionuclide therapies are related to the macroscopic absorbed dose, implicitly assuming a uniform distribution of energy deposition. However, the biological response between cells within a tumour or organ can vary significantly depending on the spatial non-uniformities of these distributions at the multicellular and cellular levels. Chapter 15 by Roger W. Howell therefore deals in great detail with the presentation of the concepts of cell dosimetry. The close relationship to practical application makes the chapter very valuable. Chapter 16, written by Stig Palm, complements this with particular aspects of the dosimetry of alpha-emitting radionuclides, a class of emitters we will increasingly see in clinical use.

The book concludes with two chapters dealing with the establishment of adequate radiation protection measures and safety culture in everyday clinical practice (chapter 17 by Lena Jönsson) and an overview of the possible support on the part of the IAEA (International Atomic Energy Agency) in the implementation of nuclear medicine methods, written by Gian Luca Poli.

The chapters are not always arranged in a linear progression, a reflection of the expansive nature of the subject matter. While occasional instances of repetition exist, they enhance the reading experience rather than impede it. On the whole, the scope of this book spans wide, casting light on nearly every facet of nuclear medicine dosimetry, resulting in a comprehensive resource.

This book also diverges from the conventional textbook format, typically blending textual content with exercises. Instead, it offers both medical physicists engaged in advanced learning and seasoned professionals a superb overview of contemporary dosimetry advancements. It interlaces these with the realm of biokinetic modelling, underscoring their intrinsic interconnectedness. Hence, I endorse this book for every medical physicist actively involved in the realm of nuclear medicine. Furthermore, it holds equal value for physicians who aspire to attain a profound comprehension of the intricacies underlying modelling and dosimetry within diagnostic and therapeutic interventions. In fact, it warrants a place within the collection of resources in every well-equipped library associated with nuclear medicine departments.

In the preface, Professor Ljungberg formulates his vision of producing a handbook that not only meticulously illuminates the theoretical foundations but also gives due consideration to the specific practical facets. It is fair to say that this goal has been fully achieved, both in the context of the second part discussed here and in the other two parts of this trilogy. Hats off to this remarkable achievement!

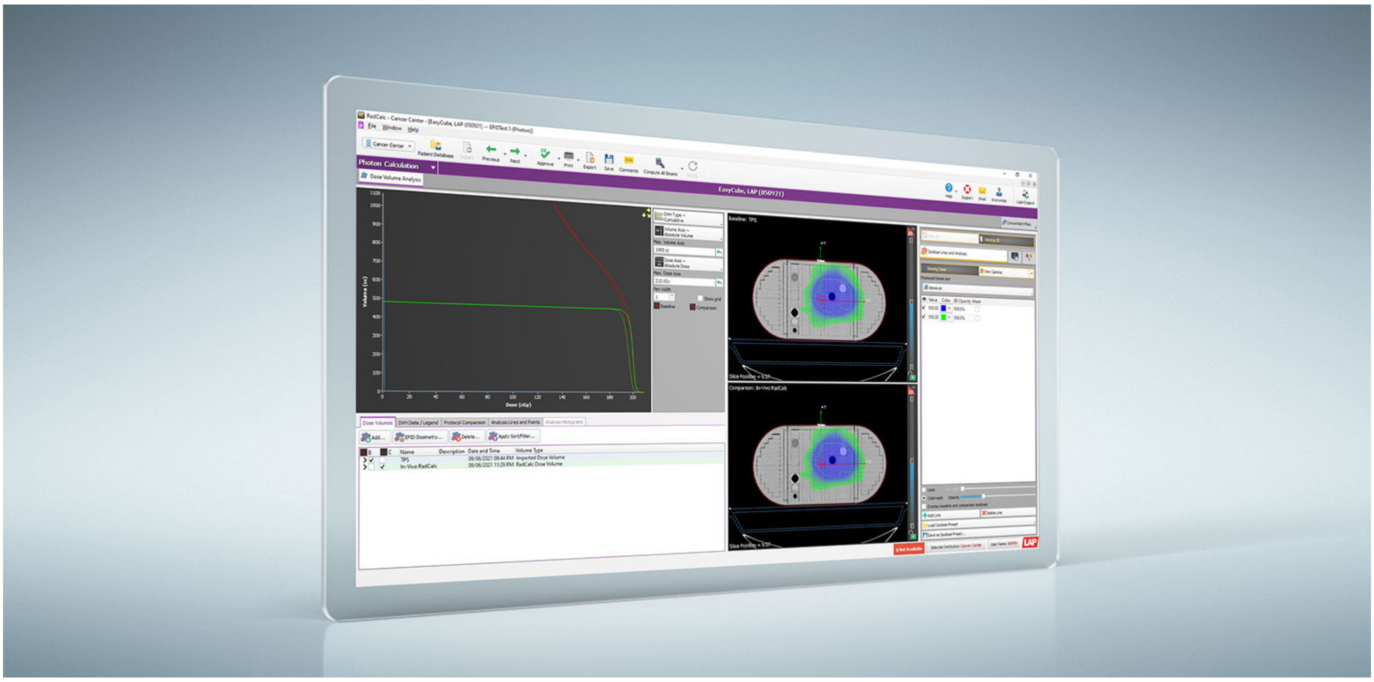
Dr.-Ing. Jens Kurth, Rostock University Hospital, Germany. Jens Kurth has been working as a medical physicist in nuclear medicine at Rostock University Hospital in inpatient care as well as in research and teaching since 2006. He has headed the Department of Medical Physics since 2012. His work focuses, among other things, on the clinical implementation and dosimetry of theranostic treatment approaches. He has been a member of the working group "Radiation Protection in Medicine" of the German Commission on Radiation Protection since 2020 and chair of the EANM Radiation Protection Committee since 2023.

EFOMP COMPANY MEMBER ARTICLE

The AAPM Task Group 307 report and the new standard in quality for radiotherapy treatments

LAP

After much anticipation, on June 29, 2023, the AAPM released the report on the "Use of electronic portal imaging devices for pre-treatment and in vivo dosimetry patient-specific IMRT and VMAT QA" [1].



The AAPM Task Group 307 report follows a long history of research and slow clinical adoption of EPID technology for dosimetry. EPID technology for dosimetry was first used commercially over 20 years ago. One of the earliest papers mentioning the use of commercial products was in 2001 from Anne Van Esch et al. [2], whom many Varian users know and are grateful for their ongoing work in helping provide valuable guidance in the commissioning of Varian's Portal Dosimetry, a two dimensional forward predicted grayscale-based system [1, 3]. Not long after, in 2008, Van Elmpt et al. [4] published a review of the case studies available with the only two commercial systems around long enough to collect such data. The second system was revolutionary because instead of comparing a predicted 2-dimensional image, it utilised an indirect back-projection method. It uses the actual measurement on the calibrated EPID, which then produces the original incident fluence by deconvolving and back-projecting these measurements, which allows it to be forward calculated with any dose calculation algorithm.

This second commercial system was called the Dosimetry Check. Originally built using a pencil beam algorithm for the dose calculation process, it has since evolved. Dosimetry Check is now part of the RadCalc family of products and is built on a single platform. RadCalc EPID Dosimetry, which utilises the RadCalc 3D Collapsed Cone algorithm and RadCalc's 3D Monte Carlo, using the BEAMnrc code line, known worldwide as the gold standard in modelling complicated radiation emitting and measurement hardware, is set to lead the medical physics community to take on the challenges of ensuring quality treatments with ever more complex treatment deliveries and Adaptive Radiation Therapy (ART).

Adaptive Radiotherapy and EPID Dosimetry: Enhancing Treatment Quality

Adaptive radiotherapy represents a significant leap forward in the field of oncology, offering the ability to adjust and fine-tune treatment plans based on real-time patient data. This dynamic approach ensures that treatment delivery remains optimised throughout the course of therapy, addressing anatomical changes and other uncertainties that may arise. With technological advancements, integrating adaptive strategies has become more feasible and practical, promising a paradigm shift in patient care. EPID dosimetry has been proven to be the most effective measurement Quality Assurance method [5], and this new paradigm shift necessitates our Radiation Oncology community to evolve and include EPID dosimetry as a standard in Quality Assurance. This need is known worldwide as trends in literature publications have risen, and surveys show an increase in technology implementation [6,7].

RadCalc EPID Dosimetry: A Crucial Component of Adaptive Radiotherapy

RadCalc EPID Dosimetry is a pivotal tool in the realm of adaptive radiotherapy. By leveraging the only commercial indirect back projection technology available so far, clinicians can capture portal images during treatment delivery, facilitating offline verification and comparison with the intended treatment plan. This process enables swift identification of discrepancies and adjustments to optimise dose delivery, ensuring that treatment aligns with the patient's evolving anatomy—comparing actual treatment delivery with the intended plan. Studies have shown its efficacy in detecting deviations due to factors such as patient anatomy changes, weight loss, setup errors, immobilisation uncertainties, errors in treatment planning and commissioning, and treatment transfer errors (8, 9, 10). EPID dosimetry's integration into clinical practice has been hailed for its ability to catch errors that might otherwise go unnoticed. The vigilance in scrutinising each fraction enables timely intervention and promptly addresses deviations.

A New Era in Radiotherapy Quality Assurance

In conclusion, innovation in radiotherapy technology, safeguarded by tools like RadCalc EPID, marks a transformative era in oncology. By seamlessly integrating EPID dosimetry, clinicians are empowered to fine-tune treatment courses and maintain optimal dose delivery. This synergy between technology and clinical expertise enhances patient care and underscores the potential for continued advancement in adaptive radiotherapy. As this field evolves, collaboration among experts and utilising available resources will play a pivotal role in shaping the future of radiotherapy treatment quality.

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Carlos Bohorquez, MS, D.A.B.R, is the Product Manager for RadCalc at LifeLine Software, Inc., a part of the LAP Group. An experienced board-certified Clinical Physicist with a proven history of working in the clinic and medical device industry, Carlos' passion for clinical quality assurance is demonstrated in the research and development of RadCalc into the future.

ART AND SCIENCE

Art to Challenge and Inspire: Images and Reflections for Medical Physics (9)

Professor **Jim Malone** writes on a cartoon image by Swiss artist Paul Klee. Its long title belies the immediate clarity of its message.

Paul Klee (1879 - 1940) was born into a Swiss - German musical family. He spent much of his adult life in Germany but departed when the Nazi regime, which viewed him as a degenerate, came to power. He returned to Switzerland, which later created a purpose-built museum devoted to his life and work. He is an important figure in modern art, leaving a total of over 9,000 works and extensive writings on colour. The examples presented here are memorable and cartoon-like, but not typical of his later output. Feedback: jifmal@gmail.com

Two Men Meet, Each Believing the Other to Be of Higher Rank

(See next page.)

Comment is confined to Two Men ----- (could they be women?). The Twittering Machine could be a comment on Twitter today.

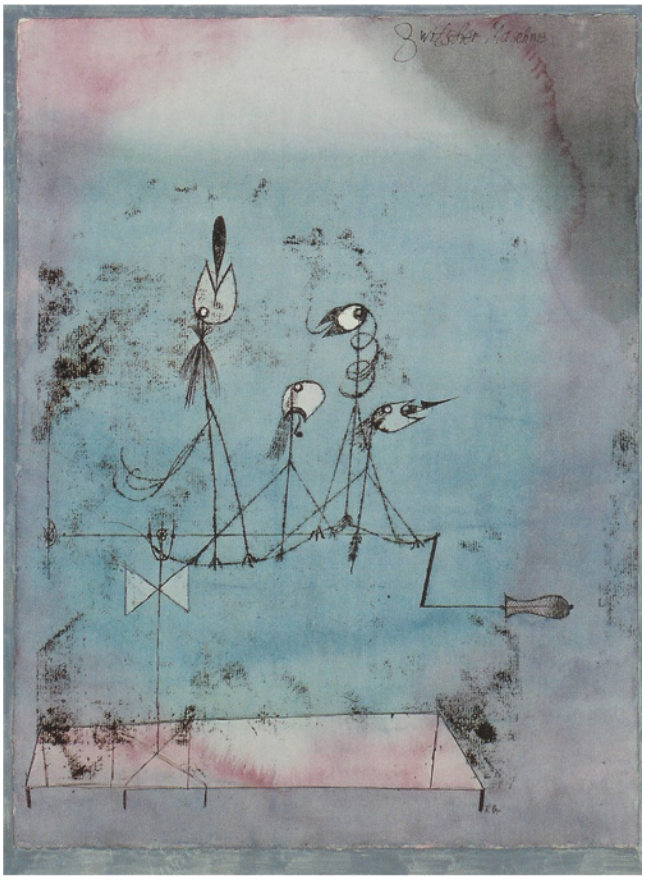
The Two Men ----- is one of many etchings from Klee's early 20s. Its satirical observation is worthy of Jonathan Swift's Modest Proposal. Each man hopes the other is of similar rank. One has a studied smile with the warmth of a wet fish. The other reeks of grim self-satisfaction. Each surreptitiously weighs up the competition.

It could be heads of department about to exchange views in a turf battle. Or a senior radiation regulator visiting a hospital RPA or MPE (or management or medical staff). Either way, the hospital is about to be challenged. They greet each other with a deep, obedient curtsy. Both are uneasy, and each suspects a hidden trump card that may give them a decisive advantage. Have you seen or been in such a situation?

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.

Two Men Meet, Each Believing the Other to Be of Higher Rank (1903) and Twittering Machine (1922) by Paul Klee (1879 – 1940)

(See previous page).



Larger Image. (Two Men --) Digital copy of the original etching on zinc. Original digital file: 4 × 2.3 k pixels. Courtesy of the National Gallery of Art, Washington, DC Made available under Creative Commons.

Smaller Image (Twittering Machine) Original watercolour and ink transferred to paper on cardboard Wikimedia Commons, courtesy of MoMA, New York

MEDICAL PHYSICS THESIS

Initial Image Quality Comparison of CT Scanners Under Clinical Scan Settings

Anders F. S. Mikkelsen introduces a two-step procedure designed for the comparison of imaging protocols across different departments and manufacturers in an effort to maintain the same diagnostic quality across radiological sites.

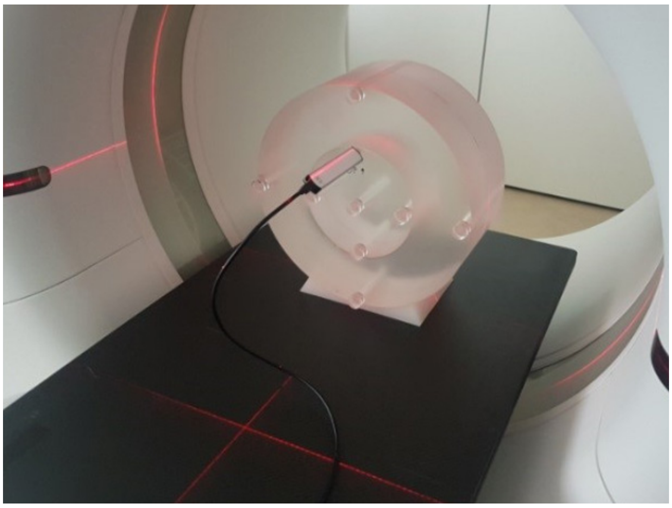


Figure 1. myQA® iON dose evaluation provides an overview of dose per structure, DVH, clinical goal comparison between TPS calculation, Monte Carlo second check, and Monte Carlo calculated from treatment system log files.

The Danish National Act on Ionising Radiation and Radiation Protection and associated executive orders [1,2] based on COUNCIL DIRECTIVE 2013/59/EURATOM [3] address the national standards for protection against exposure to ionising radiation. Inspection of the quality assurance system for protocols is mandatory, but what the quality assurance system should include is not specified, i.e., there is no legal demand making CT protocol review mandatory, how it should transpire, or what it should include. The development of new technology (e.g., tube current modulation (TCM), automatic exposure control (AEC), iterative reconstruction (IR) algorithms, and the introduction of AI in pre- and post-processing) for optimising image quality in various manners between CT scanners with different technical characteristics makes standardisation of quality metrics cumbersome for a clinical department housing two or more different scanners [4-8]. Technology advances are driven by providing the best quality images at the lowest dose achievable.

In this work, a two-step process is used as an introductory characterization of systems when comparing protocols from the various departments (1): Assessing a dose-depth curve to evaluate the CT system's performance in dose when using the same scanning parameters; (2) assessing Hounsfield values and hence Noise (mean, Mix, Min, SD) in a pre-defined ROI when using a clinical protocol on a CIRS male body phantom where inter-scanner results are compared via analysis of variance (ANOVA) testing for the imposed hypothesis of equal values.

Two phantoms were utilised during the investigation: (1) a two-piece 32 cm adult head and body CTDI phantom (Raysafe, Sweden), and (2) A whole-body anthropomorphic, cross-sectional dosimetry phantom (ATOM, CIRS, Tissue simulation, and Phantom Technology) were imaged across five different radiological departments. The CTDI phantom was scanned on seven different CT scanner models with a consistent scanning protocol in line with recommendations from the national governing office for inspecting dose behaviour across the Field-of-View (FOV). CTDI values were measured with an ionisation chamber (Raysafe Xi CT detector, Raysafe). The anthropomorphic phantom was scanned with a local scanning protocol based on tumour control scanning or clinical indications of unknown primary origin and based on a triple-phase chest-abdomen-pelvis sequence. CT images from nine different measurements were analysed in a Dicom Viewer (IntelliSpace 9, Philips Healthcare), where CT mean, SD, Min, and Max number values in the anatomical region of interest (ROI) were gathered and plotted against the noise distribution as a quantitative measure for image quality. ANOVA and post hoc tests were used to test for significant inter-scanner differences.

Dose measurements showed variance in measured tube output from seven different models at different depths in the phantom. The noise distribution from measurements of the CIRS phantom from seven different ROIs showed a degree of variance between nine CT scanners, while a post hoc test for mean HU showed a significant inter-scanner difference between some models depending on the measuring area of the phantom.

A key performance indicator for CT systems is monitoring CT Hounsfield values for water and the associated variance of this value, e.g., noise. Both metrics are measured annually with our acceptance test in conjunction with weekly or monthly consistency control for the system. Husby et al. show a large degree of reproducibility for these metrics [9], but issues with the random nature of noise fluctuations are not to be omitted [10]. Reproducibility conveys the general

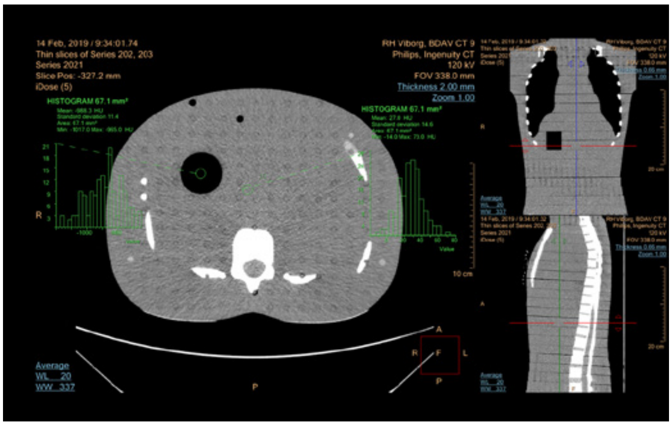


Figure 2: Reading HU mean, maximum, and minimum values on an air insert from a CIRS adult male anthropomorphic phantom ROI. Sizes were defined and transposed between five adjacent slices, after which readings were averaged. Readings were done in IntelliSpace 9 by Philips.

trend seen in our multicenter quality assurance programme for acceptance testing and consistency control. Choosing different reconstruction kernels shows variance within CT-numbers [11], and inter-variability between different scanners is seen as measurable [12, 13]. In our study, we chose to look at CT numbers and noise with a protocol rooted in a clinical indication and evaluated the outcome. For a deeper dive into the intertwined relationship between protocol setup and image performance, evaluation of the protocols based on TCM and Noise-Power-Spectrum should also be included for benchmarking in future endeavours.

The next step is to create anthropomorphic phantoms with organs that have the same texture as human tissue, maybe 3D printed from patient data. This will allow us to compare relevant clinical task-related performance between CT-scanners.

In an effort to maintain the same diagnostic quality across radiological sites, a more direct comparison between clinical protocols for other scanning parameters must be addressed, and the effect of different Iterative Reconstruction methods and different Automatic Tube Modulation technologies must be inspected in order to highlight inter-scanner model or manufacturer- variability. When a thorough investigation of our phantom studies has been carried out, including a detectability test, our procedure should be tested in a double-blind manner, whereby a qualified consultant radiologist would score clinical images.

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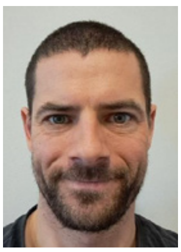

Anders Frodo Stegmann Mikkelsen is an early-career medical physicist at the Dept. for Clinical Engineering, Central Denmark Region, Denmark. Besides a newly acquired degree as a Medical-Physics Expert and Radiation Protection Expert within Radiology, Anders has worked with MR Cardiology Research and Nuclear Medicine as a Physicist.

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Re-calculation and Evaluation of Compensative Biological Effective Dose for Unscheduled Interruption in Head and Neck Cancer Radiotherapy

In June 2023, **Ieva Jogaitė** graduated from the Medical Physics MSc programme at the Kaunas University of Technology, Lithuania. Here is a brief overview of her thesis, Supervised by Assoc. Prof. Dr. Jurgita Laurikaitienė.

The biological effects of radiation therapy have been extensively studied over the past three decades. The development of the linear quadratic (LQ) model has provided the most medical insights into cell survival and the radiobiological effects of ionising radiation. This model incorporates the α/β ratio, based on two parameters that are adjusted to represent individual biological characteristics, and therefore contributes to the establishment of personalised radiation therapy [1].

Head and neck cancer is classified as a rapidly proliferating tumour [2]. Therefore, a one-day gap in treatment delivery can reduce local control by approximately 1.4%, while a week-long break results in 10-12% deterioration. It is known that within four weeks, the cancer can grow significantly and invade nearby tissues [3]. For this reason, any interruptions in radiation therapy are undesirable and should be prevented. In 2019, during the global pandemic caused by COVID-19, many patients experienced disruptions that lasted from several days to weeks [4]. The aim of the work was to develop an acceptable compensative model for unplanned radiotherapy interruptions for head and neck cancer. The Royal College of Radiologists first proposed these recommendations in 1996 [5], and the most recent guidelines followed in 2019 [6].

Materials and methods

This scientific project was completed at the Kaunas University of Technology in cooperation with the Lithuanian University of Health Sciences Hospital (LSMUH), Kaunas Clinics, and Oncology Hospital as part of a master's thesis. 14 patients were selected by random sampling. Applying the previously developed LQ model in order to perform BED calculations (for the tumour and organs at risk), new values for dose per fraction were obtained in a set of test cases. The determined values were evaluated using the treatment planning system "Eclipse" and the dose distribution planning technique volumetric arc therapy (VMAT). Its accuracy is ensured by regular testing of the gamma index, which has a clinical reference of 2 mm/ 2%. The main criterion was compliance with the limits of organs at risk. Restrictions were used following the QUANTEC protocol [7].

Results and discussion

Interruption of radiation therapy is common in everyday practice. According to the national audit performed in Great Britain: 63% of the population has missed a part of treatment at least once [8]. An analysis of different interruption scenarios presented mixed results (Table 1). The radiobiological data calculations were chosen instead of those from other compensatory methods: bi-fractionation or application of radiotherapy on weekends and public holidays. This method was selected expressly to estimate the average dose and overall duration when other strategies cannot ensure adequate recovery of lost radiation courses. The main variable was the interruption interval, which ranged from 7 to 14 days. An additional factor, the late tissue effects, and organs at risk complications were evaluated after the introduction of the new fractional dose.

Simulating different interruption cases for head and neck patients showed that 14 days of interruption can still be compensated using the radiobiological model and can be considered as a possible alternative after a missed radiotherapy treatment. Regarding the analysis of the 14-day break, it was noticed that discontinuation occurred at the end of the course of the radiotherapy. The final plan exceeded only one week (from 46 to 53 days). However, there was not enough time to complete the entire course. Therefore, five fractions were lost and compensated with an increased dose of 3.2 Gy. The

Situations	Gap (days)	T modified	n applied	n residual	x (Gy)	BED3 modified (Gy)	%
1.	14	53	20	10	3.2	132.8	13.8
2.	14	60	20	15	2.6	139.5	19.5
3.	12	53	20	10	3.2	132.8	13.8
4.	10	53	20	12	2.8	131.6	12.8
5.	10	58	20	15	2.5	135.4	16.1
6.	8	53	20	14	2.43	128.2	9.9
7.	8	56	20	15	2.42	132.2	13.4
8.	7	53	20	15	2.29	127.2	9.1

Table 1. Results of the different interruption scenarios and BED3 for late normal tissue complications following the compensative strategy

most extreme (14-day break, Table 1, Situation 1) of the simulated cases was analysed based on the 3D treatment planning system. Results of the analysis showed that the re-calculated dose per fraction increased from 2 Gy/fr. to 3.2 Gy/fr. applied to 14 head and neck cancer patients exceeded the radiation dose limit (> 25 Gy) to the left and right (Figure 1) parotid glands in only five of them. However, satisfactory results were obtained after reducing the dose to the remaining fractions of the specific plans.

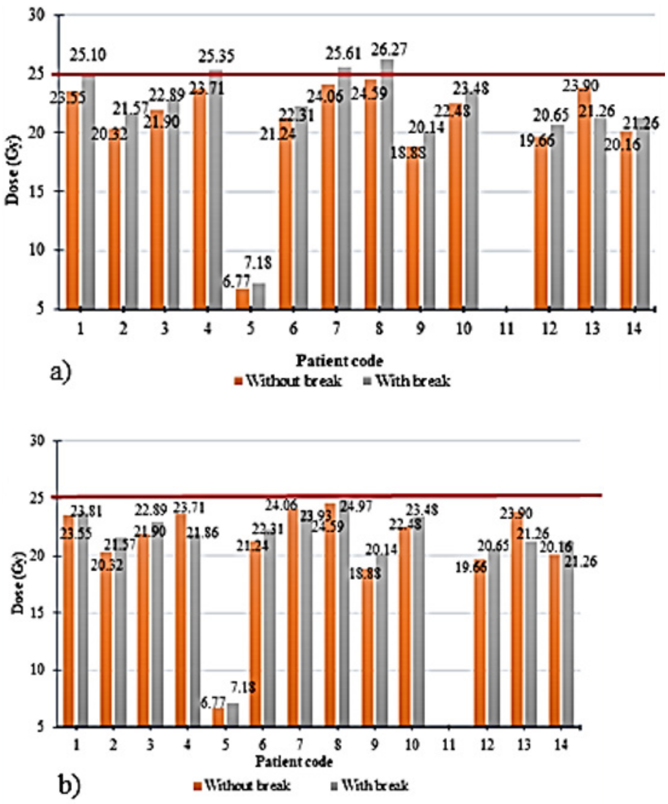

Figure 1: Comparison of dose (Gy) to the right parotid gland before and after compensation ((a) before and (b) after optimisations).

However, missing fractions should not have a great impact on the overall treatment. This can be considered to have been validated by the Vasiliadou et al. [9] study performed during the COVID-19 pandemic when malignant tumours were completely cured using a total dose of 65 Gy. It should be considered that the dose for late complications exceeds the initial value by 13.8%, as any increase in dose is unfavourable.

Some medical cases were re-evaluated due to dose escalation after a break. As a result, after the optimisation, none of the 14 patients evaluated in the first situation exceeded the spinal cord and parotid gland (Figure 1 b) dose limits. Nevertheless, the calculation of the biological dose for the missed treatment should not be considered beneficial in every clinical situation, and only a qualified specialist can make a final decision on the treatment modification. Late tissue complications remain the most significant.

The strategy of missed treatment correction includes the selection of the appropriate compensative method, such as fractional dose escalation, irradiation twice a day, adding weekends to the altered plan, etc. (Figure 2). The ASARA ("As short as reasonably achievable") principle should be applied to minimise any interference where possible. Although some components of radiotherapy compensation are unquestionably better than others, practical considerations (the available equipment and hospital funding) seem to have an impact on the choice of a missed treatment control strategy. To find a consensus plan that assists the patient and the medical staff, it is important to consider more than one of the potential solutions.

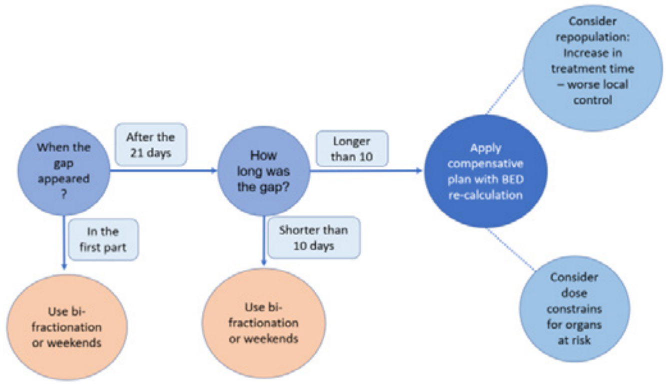

Figure 2: An algorithm designed for undesirable interruptions in radiation therapy management.

Conclusions

The compensation "model" in clinical practice was implemented according to international guidelines. In the first part of radiotherapy, the gap can be managed by using the bi-fractionation method and including weekends in the therapy. However, after approximately 21 days of treatment, the radiobiological effect should be recalculated according to the biologically effective dose. Concordantly, we recommend that healthcare centres maintain databases in which patient treatment is tracked and implement protocols for missed radiotherapy courses.

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Ieva Jogaitė defended her master’s thesis at the Kaunas University of Technology, Lithuania, in 2023. She works as a medical physicist in the Hospital of Lithuanian University of Health Sciences (LSMUL) Kaunas Clinics, Nuclear Medicine department.

EFOMP COMPANY MEMBER ARTICLE

PTW microDiamond® - A Decade of Measuring Small Fields

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On August 30th, 2013, PTW introduced its famous microDiamond detector (T60019) to the market. Within no time, the new diamond detector developed into one of the most successful and popular PTW detectors. This year, we are celebrating its tenth anniversary.

It all began with a "Contact" button

In July 2007, Professor Marco Marinelli from Tor Vergata University of Rome hit the "Contact" button on our website, asking us if we were interested in a CVD diamond detector developed by his working group. Our interest was sparked, and we decided to learn more.

In the following years, a lot of microDiamond prototypes changed hands between PTW in Freiburg and Marco Marinelli and Gianluca Verona Rinati from Tor Vergata University in Rome. Over time, the prototypes became more refined and improved from quite good to excellent. Finally, after five years of development and testing, they were ready to go into serial production. The microDiamond was born.

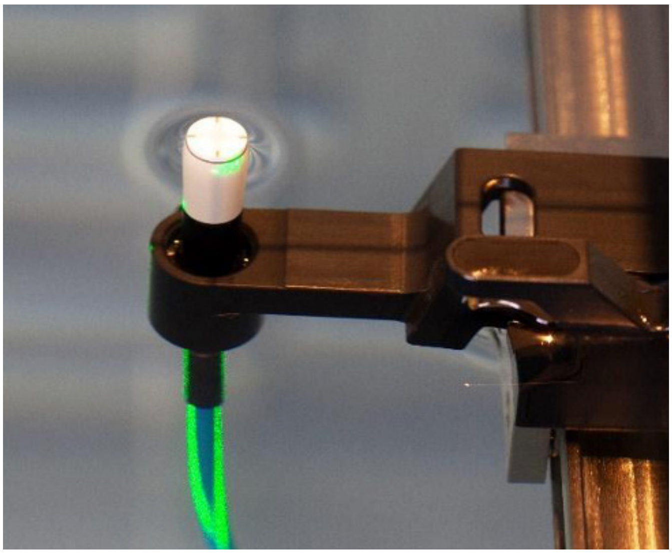

Figure 1: Stable as a diamond, sensitive as a diode – the microDiamond detector is the ideal detector for a broad range of radiotherapy applications.

What makes the microDiamond so special?

You might be wondering what makes the microDiamond such a successful detector. It is a combination of its unique properties:

It is water-equivalent: The atomic number of carbon, Z=6, is very close to the effective atomic number of water (combination of 2x hydrogen, Z=1, and oxygen, Z=8).

It is versatile: In contrast to silicon detectors, no shielding is required for measurements in large photon fields. The microDiamond can be used in all photon field sizes, basically under any condition and at any position within the water phantom. In addition, it can be used for the dosimetry of electron, proton, and carbon ion beams, and for many brachytherapy measurements. And according to the latest results, it even seems to be suitable for proton FLASH beams.

Its response is fully stable with accumulated dose: There is no need for repeated cross-calibration.

Its dose-rate dependence is negligible: For classical and FFF photon beams, it is smaller than the measurement uncertainty.

It is for small fields: The microDiamond detector has correction factors very close to 1.0 for small-field measurements (see small-field correction factors published in IAEA TRS-483, Fig. 2).

It is well designed: Due to the 2.2 mm diameter of the sensitive volume, the microDiamond exhibits a weak dose-volume effect. This is important because it also features a high density of 3.5 g/cm³. Volume effects and density perturbations compensate each other almost perfectly. This is the reason why the small-field correction factors are so close to 1.0 (see Fig. 2), and why the microDiamond can be used down to the smallest field size defined in IAEA TRS-483 (0.4 cm). [1]

It is well characterized: The microDiamond is one of the most studied small-field detectors. The Journal Medical Physics alone lists 145 articles that contain the keywords "microDiamond" and "PTW" [checked at https://aapm.onlinelibrary.wiley.com/journal/24734209 on 2023-07-21].

Until today, the microDiamond detector has been used for virtually any dosimetry task you can imagine, ranging from linac commissioning, giving quite accurate penumbras, to the dosimetry of electrons [2], protons [3], and carbon ions [4], or orthovoltage dosimetry [5]. It has even been used for electronic [6] and classical brachytherapy applications [7].

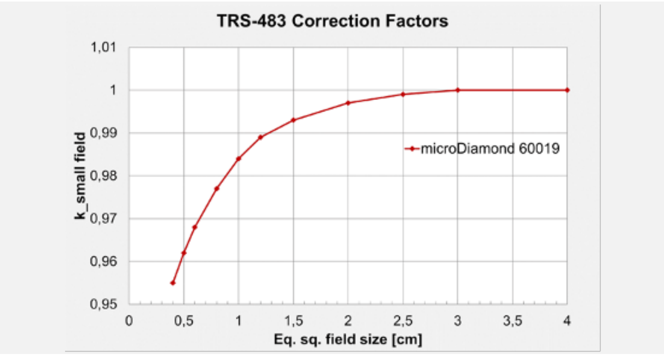

Figure 2: With correction factors very close to 1.0, the microDiamond is suitable for accurate small-field dosimetry down to the smallest field size defined in IAEA TRS-483

After ten successful years, the microDiamond has now paved the way for the flashDiamond. Look out for this new detector, specially designed for the tough conditions of electron FLASH dosimetry.

Happy birthday and congratulations, microDiamond! You have become one of the most popular small-field detectors of all time worldwide. May your success continue to grow for the next decades.

For more information on microDiamond visit https://www.ptwdosimetry.com/en/products/microdiamond.

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Jan Würfel studied physics at Karlsruhe Institute of Technology (KIT) and holds a PhD in molecular electronics. He works as a research scientist at PTW Freiburg, focusing on the development of dosimetry equipment and detector physics. In addition, Jan serves as a speaker at international conferences and is involved in the national and international standardisation of dosimetry.

MEETING REPORT

"Beating Cancer - Turning the Tide with Medical Isotopes"

The Special Event of the European Nuclear Society on Nuclear Medicine - Report by **Mattia Baldoni**

"Beating Cancer - Turning the Tide with Medical Isotopes" April 17, 2023, Antwerp

The European Nuclear Society (ENS), in collaboration with the Euratom Supply Agency (ESA), organised a special event dedicated to benefits, challenges, and advances in the field of nuclear medicine. The session took place in a hybrid format in Antwerp (Belgium) on April 17, 2023. The event registered a high attendance both onsite and online, and it has particularly been appreciated by the audience. Together with a two-month engaging communication campaign focusing on nuclear medicine basics and techniques, the remarkable participation rate proves an increasing interest in what developments nuclear research and applications can bring to the medical sector while also considering the challenges ahead.

The event, chaired by Remigiusz Baranczyk (ESA) and moderated by Cora Blankendaal (NRG), hosted international experts, who shared presentations that touched upon several key points related to nuclear medicine. Dr. Wouter Vogel (Antoni Van Leeuwenhoek - Dutch Cancer Institute), presenting "Medical isotopes for molecular diagnostics and treatment of cancer", gave insight from a hospital on diagnosis and therapy using medical isotopes, while Prof. Michel Koole (European Association of Nuclear Medicine - EANM) offered a comprehensive overview of nuclear medicine in Europe in "Nuclear Medicine Today, Recent Developments, and New Challenges.". Sven Van den Berghe (Pantera), in cooperation with Richard Zimmermann (MEDraysintell), focused on exciting developments in radiotherapeutics and their contribution to personalised medicine while taking into account the challenges affecting the medical isotopes' production and supply chain.

From left to right – The Chair of the Event, Remigiusz Baranczyk (ESA), Prof. Michel Koole (EANM), Dr. Wouter Vogel (Antoni Van Leeuwenhoek - Dutch Cancer Institute), Charlotte Rosenbaum (RIVM) and Sven Van den Berghe (Pantera)

Charlotte Rosenbaum (National Institute for Public Health and the Environment - RIVM, The Netherlands) concluded by exploring the different complementary production methods of radioisotopes in her presentation “Production and supply of medical isotopes - Are accelerators accelerating development?”.

The Q&A session and the following exchanges have been very active and engaging, both onsite and online. Speakers answered several questions regarding the potential use of radioisotopes, the financial challenges, and the need for new infrastructure and stable production and supply chains. All speakers agreed that further steps are crucial and urgent to cope with the increasing demand and to ensure that all patients receive adequate and timely treatment so as to fully benefit from the advances in nuclear medicine.

The discussion on the security of the supply of medical isotopes continued during the Official Opening of the European Research Reactor Conference (RRFM) 2023, which followed the special event. Speakers from NRG|PALLAS, SCK CEN, and the Paul Scherrer Institute (PSI) then presented innovative initiatives for medical isotope applications.

“The RRFM conference can offer a showcase [...] to create awareness on the importance but also the vulnerability of the essential contribution that research reactors and other actors are making in the chain towards the patients,” said Steven Van Dyck, Chair of the RRFM Programme Committee.

Following the great success of the event and the high level of the debate, the European Nuclear Society also published the special newsletter “ENS Event, Beating Cancer - Turning the Tide with Medical Isotopes – Follow-up”, which includes the recording of the session, speakers’ presentations and further bonus content.

Mattia Baldoni is the Communications Officer at the European Nuclear Society, which promotes the development of nuclear science and technology and the understanding of peaceful nuclear applications. Based in Brussels, ENS brings together more than 12,000 professionals from the academic world, research centres, industry, and authorities.

RTsafe

Press Release

RTsafe Facilitates ISRS Certification

A leading provider of quality assurance products and services announces a new service to help radiosurgery departments meet quality assurance and patient safety standards

Ian Paddick, Chair of the ISRS Certification Committee.

[**Athens, June 8, 2023**] Radiosurgery departments aiming to achieve ISRS (International Stereotactic Radiosurgery Society) certification can now streamline their preparation process with the help of RTsafe. As a leading provider of End-to-End Stereotactic Radiosurgery products and services, RTsafe has launched a dedicated consulting service to help applicants achieve the stringent quality assurance and patient safety requirements of ISRS.

The ISRS Certification Service mandates that radiosurgery departments demonstrate proficiency in their processes and procedures through a comprehensive review and documentation. To ensure a successful dosimetry audit, centres can now draw on RTsafe's expertise, which employs the same equipment and methodology used by ISRS auditors.

RTsafe's consulting services provide guidance and support to identify areas for improvement and develop strategies to meet the exacting standards established by ISRS. By enlisting RTsafe's assistance, centres gain access to a comprehensive package comprising a Prime Phantom combined with Remote Dosimetry Services. RTsafe's Prime provides comprehensive dosimetry in a true-to-life human anatomy phantom, while the company's Remote Dosimetry Services are fully outsourced quality control processes for radiation oncology, verifying Point, 2D, and 3D dosimetric and geometric accuracy through independent measurements. Thus, ISRS certification candidates are supported every step of the way, enabling them to achieve the required level of accuracy for their treatment objectives.

The results of RTsafe's evaluation are reported using carefully selected gamma passing rates, specifically designed for SRS (Stereotactic Radiosurgery) plan analysis. These passing rates are in accordance with the tolerance limits proposed by ISRS, ensuring that centres are well-prepared for the certification process.

"Collaborating with RTsafe will help prepare the department for the ISRS Certification Service and demonstrate a commitment to the highest quality patient care," stated Evangelos Pappas, Chief Scientific Officer and Founder of RTsafe. "We are proud to offer our expert services to radiosurgery departments, enabling them to navigate the certification process with confidence and excellence."

"By partnering with RTsafe, radiosurgery departments can proactively enhance their practices, ensuring the utmost precision and safety in patient treatments," stated Ian Paddick, Chair of the ISRS Certification Committee. "RTsafe's extensive experience in external dosimetry evaluation and adherence to ISRS guidelines make them the ideal choice for centres aspiring to attain ISRS certification."

For more information on RTsafe's consulting services and the preparation process for ISRS certification, please visit https://rt-safe.com/preparation-for-isrs-certification/ or contact info@rt-safe.com.

About RTsafe

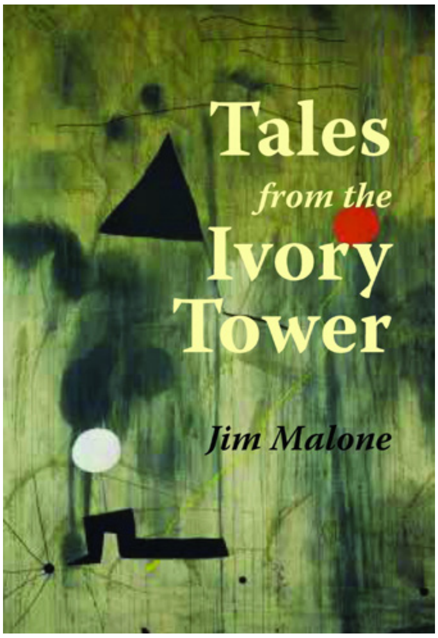
RTsafe is a medical technology company that has developed a unique approach to quality assurance that is making a contribution to the safety and accuracy of radiotherapy for cancer and other medical conditions. It combines proven expertise in medical physics with highly accurate 3D printing technology to create pseudo-in-vivo dosimetry phantoms for use in end-to-end commissioning, benchmarking, and patient-specific quality assurance in stereotactic radiotherapy. The anatomically accurate effigies enable medical professionals to simulate therapeutic interventions for each patient ahead of actual treatment and help radiotherapy technology innovators to verify the performance of their products. See www.rt-safe.com.

For further information please contact:
Gareth Zundel, Marketing Director, RTsafe
gzundel@rt-safe.com +44 7967 678309

WHAT MEDICAL PHYSICISTS DO IN THEIR FREE TIME

Review of "Tales from the Ivory Tower" - Written by Jim Malone

In this article, **Paddy Gilligan** reviews Jim Malone's recent autobiographical work "Tales from the Ivory Tower".



Liffey Press, October 2022, ISBN-13 978-1739789251

I have known Jim Malone (EFOMP Medal Winner, 2020) for all of my medical physics career as a mentor, colleague, and friend. Throughout this time, Jim has been full of surprises and inspiration. He has combined a passion for spirituality, science, and art that is always blended in well-honed articles and lectures. Naturally, I jumped at the opportunity to review his recent autobiographical work "Tales from the Ivory Tower". There are a number of surprises in this book. A book that works on many levels. The book is not a medical physics textbook but a book about a medical physicist's life and origins. His narrative begins before Irish independence and traces the post-colonial Irish journey from a clerical to a secular state. This is contrasted with tales from countries where the state and religion are still fully intertwined. Similar observations are available on the social mores of evolving academia in the 17th century, when Trinity College Dublin's Medical School was founded. "Tales from the Ivory Tower "is a very accessible read and has a definite warm glow.

For those of us in medical physics, empathy is a key motivator. We need to see through the eyes of the patient to achieve that empathy. The primary importance of family and friends and the interrelationships of many generations feed this empathy. We can also gain the perspective of others through art, literature, and music. There is a section on how the physicist deals with their own illness, even at times of great success.

There are plenty of lessons to be learned from the book for leaders in medical physics. The power of reflection and isolation (in the ivory tower) when that's needed, and in contrast, the power of networking through art and social events. The section on the highest occupational radiation dose in Ireland (from a dental practice) shows again the power of social networks in finding information that ultimately leads to significant benefits for the health service The role of absence in transformational leadership is expressed quite nicely in the book.

One could argue that the book would have benefited as a historically useful document from using actual names and dates of events; however, that might have led to the narrative being compromised. However, it does not diminish it as a read that has proven highly popular with my medical physics colleagues in Ireland. The book has finally become available on Amazon this week, and I would recommend it as both a most enjoyable read and a resource for those involved in dealing with the multiple strands that form our health care, social, and academic systems.

Assoc. Prof. Paddy Gilligan, President of EFOMP.

MEDICAL PHYSICS CAREER

Pioneering Pathways: Forging my Path and Crafting my Journey for the Next Generations

In this article, **Pratiksha Shahi** narrates her journey as Nepal's first female medical physicist after returning from a two-year MSc study at the International Centre for Theoretical Physics (ICTP) in Italy, which gave her great pride and responsibility.

Pratiksha Shahi, MS, MSc, at B.P. Koirala Memorial Cancer Hospital in Nepal, in a radiotherapy treatment room that was recently equipped with a Varian TrueBeam.

Growing up in Nepal, I developed a strong passion for physics and a realisation of the demand for skilled medical physicists in my country. This awareness drove me to envision the potential of utilising my scientific expertise to directly improve the lives of patients. The prospect of bridging the gap between scientific theory and its practical application in healthcare ignited my determination. So, I aspire to pursue a fulfilling career in medical physics, particularly in healthcare.

Having explored diverse opportunities, I secured a position at ICTP in Italy in 2021, marking the beginning of my career as a medical physicist. After successfully completing my studies in December 2022, I enthusiastically returned to Nepal, equipped with invaluable knowledge and skills from my intensive two-year course at ICTP, and embarked on this new chapter of my professional journey.

During this time, I collaborated with numerous medical physicists working in Nepal and in neighbouring South Asian countries, some of whom held senior positions. However, the scenario was quite different in Nepal. I observed that Nepalese medical physicists, along with physicists from India, including women, were fulfilling the medical needs of the Nepalese people. When I returned to Nepal, I became the first female medical physicist in the country, which filled me with immense pride and a sense of responsibility.

As the first female medical physicist to return to Nepal, I felt overwhelming joy and anticipation, expecting warm wishes and celebrations. However, the reality I faced upon my arrival was different than what I had imagined. Being the only female medical physicist in the country presented its own unique challenges. In Nepal, where there is a significant need for qualified medical physicists, I encountered difficulties in securing a position for approximately three months. Despite the challenges I faced, I persevered and eventually created an opportunity to work as a clinical medical physicist at B.P. Koirala Memorial Cancer Hospital, one of the largest cancer hospitals in Nepal.

Nepal, a developing nation, is home to a diverse and compassionate population, yet it deals with biases and challenges. Gender inequality, dominance, and limited healthcare access persist as pressing concerns. On top of that, the medical field is multidisciplinary. Within a medical team, disparities in career stages, authority, expertise, and mindset are common, and gender disparities are an additional challenge for women. Unfortunately, some individuals exhibit biases and a penchant for dominance. My experience was not different; I personally encountered instances of dominance and gender bias where the acceptance of women as equals or in higher positions was a struggle for some people. The lack of female representation and relatable role models can make it difficult to find support and mentorship within the organisation. Male voices often take precedence in social dynamics, making it hard for women to be heard, acknowledged, and credited for their contributions. Coping with these attitudes is disheartening and demotivating, but I'm fortunate to have some kind colleagues who consistently support and motivate me. I want to take this opportunity to thank them for their belief in me. Their unwavering support empowers me to excel despite challenges and has been a source of strength and inspiration on my professional journey. Nevertheless, I'm resolute in overcoming these obstacles and refusing to let others undermine my capabilities.

While the struggles are real, I view them as an opportunity and a responsibility to be a catalyst for positive change in the field of medical physics. The field of medical physics is in high demand in our country, yet many young individuals remain unaware of the promising opportunities it offers. Unfortunately, due to the lack of available courses and specialisations in Nepal, aspiring medical physicists often miss out on the chance to explore this rewarding career path. As someone passionate about the potential of medical physics and its impact on healthcare, I am determined to bridge this knowledge gap and motivate the young generation towards this field. As a female medical physicist, I also embrace the chance to inspire, break barriers, and pave the way for aspiring female professionals. Through perseverance, resilience, and continuous learning, even in a very short time, I have overcome obstacles and created a path for myself in a field where women are underrepresented. My journey has not been without its difficulties, but I have grown stronger, both professionally and personally, through those experiences.

As I embraced my journey and the fact that I was the first female medical physicist in Nepal when I returned, it gave me a tremendous sense of pride and duty. I was in a unique position, determined to take advantage of it and help my nation's medical physics advances. I became acutely aware of my responsibilities towards the future of this profession, the profound significance of my personal journey, and the challenges I faced along the way. It is my duty to serve as a role model, advocate for gender equality, and create opportunities for aspiring female professionals. I am committed to supporting and mentoring future generations of medical physicists, especially females, encouraging them to embrace their passion, pursue their dreams, and contribute to the advancement of medical physics in Nepal and beyond. Together, we can build a more inclusive and diverse field where gender is no longer a barrier to success.

Pratiksha Shahi, MS, MSc, works as a medical physicist at B.P. Koirala Memorial Cancer Hospital, one of the largest cancer hospitals in Nepal. After completing her studies at ICTP in Italy in December 2022, she eagerly returned to Nepal, armed with essential information and skills from her gruelling two-year study at ICTP, to begin this new chapter of her professional path.

EFOMP COMPANY MEMBER ARTICLE

When No News is Good News: A Large Centre's Experience with an Automated In Vivo Dosimetry System

SUN NUCLEAR
A MIRION MEDICAL COMPANY

SunCHECK supports the busy and motivated Clatterbridge Cancer Centre with added efficiencies through a web-based integrated Patient and Machine Quality Assurance Platform, and the SunCHECK Platform

In vivo dosimetry (IVD) in radiotherapy is a strong safety recommendation within the UK (Dept. of Health 2006 [1]) and a legal requirement in many European countries. Despite this, large-scale implementation and deployment of a service-wide IVD programme is challenging in terms of the required heavy lifting from physics associated with calibration and maintenance of dosimetry equipment, and troubleshooting out-of-tolerance results.

Motivations and Requirements

The team at Clatterbridge Cancer Centre is responsible for treatments in three centres across the Merseyside region in the UK, and implementation of an effective IVD service required automation, standardization and an interface that would support a team working both remotely and across multiple sites. SunCHECK supports these motivations through a web-based integrated Patient and Machine Quality Assurance Platform, and the SunCHECK Platform was the choice to bring these important safety checks to this busy centre with added efficiencies.

Finding the right criteria to apply

A guiding principle was to implement IVD as a safety check as opposed to a quality check, with the aim of catching gross errors in delivery, without spending too many hours analysing results. The IVD touchpoint is at the end of a tightly controlled chain, including daily image guidance for all patients, and the team was looking to prevent 'alert fatigue' where large numbers of false positives might lead to de-sensitization to any genuinely significant adverse events. As such, measurements are subject to relatively wide gamma pass criteria of 10% and 5mm at the panel.

SunCHECK transit dosimetry calculates the expected dose to be delivered at the MV panel and then automatically retrieves and compares, via gamma analysis, the measurement acquired during treatment before presenting the results to the end user.

A process was established to review and approve results, with an escalation pathway for anomalous results to senior physics members following first-line troubleshooting. (Figure 1)

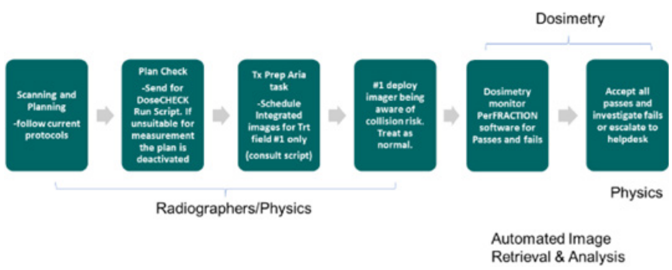


Figure 1: Process overview for patient measurements at Clatterbridge

A nearly invisible safety check

Between July 2019 and October 2022, 9440 patients and over 22,000 treatment beams had automated IVD at Clatterbridge using SunCHECK. A recent study (Caines and Gilmore, 2023 [2]) showed that 1724 beams generated alerts in this period (~7% of patients). Using the established process and the automation within SunCHECK, first-line dosimetry review required approximately only 0.5-1 person-hours per day.

Common failure modes included off-axis panel placement, beam interruptions, and calibration drift. These failure modes were easily identified and corrected with a follow-up measurement. As noted in Figure 2, a large majority of the failures were breast treatments. (These patients are treated in voluntary breath hold with static-gantry tangential pair techniques; notably, Doolan et al. (2021 [3]) previously demonstrated that SunCHECK IVD can be more sensitive to small positional errors for static beams compared to VMAT.)

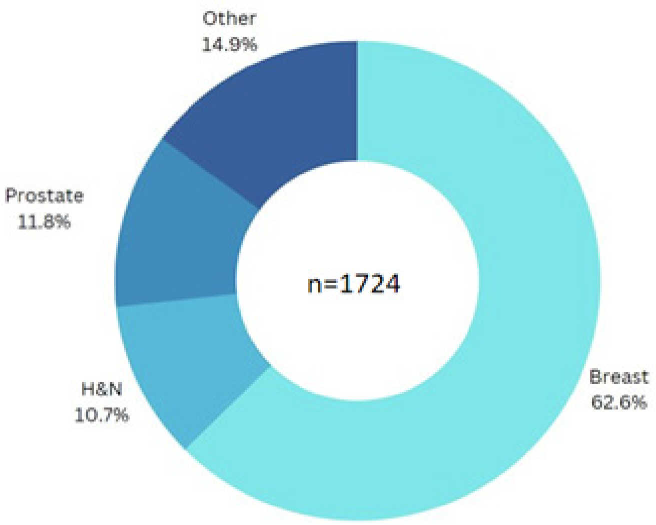


Figure 2: Distribution of failed beam measurements by treatment site

Escalation of failures and troubleshooting activity, inclusive of Medical Physics Expert Review, typically comprises only one person-hour per month. A handful of patients required investigation beyond routine troubleshooting, but no significant treatment errors were detected.

SunCHECK in vivo dosimetry has been implemented as a safety check within the broader context of patient and machine quality assurance. Our resource-constrained environment has allowed us to scale our in vivo dosimetry provision across our clinics, even as it remains largely invisible to end users.

For more information on this study, please see the following from ESTRO 2023: PO-1665, "When no news is good news: commercial automated EPID in vivo dosimetry deployed as a safety check", R. Caines, M. Gilmore, The Clatterbridge Cancer Centre NHS Foundation Trust, Medical Physics, Liverpool, United Kingdom

About the Clatterbridge Cancer Centre

As a specialist oncology NHS Foundation Trust, the Clatterbridge Cancer Centre provides Radiotherapy Services to a catchment population of 2.4 million in Merseyside, UK, across three locations, generating approximately 100-120 new radiotherapy treatment plans per week and delivering 300-350 fractions per day across 10 linear accelerators.

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Rhydian Caines, M.Sc., is a principal radiotherapy physicist at Clatterbridge with ten years of clinical experience. Rhydian takes a lead role in all aspects of the SunCHECK Patient platform, including secondary dose calculation and automated in vivo dosimetry, supporting the delivery of high-quality patient treatments across the centre's three sites. He can be reached at https://www.linkedin.com/in/rhydiancaines/.

MEETING REPORT

The 34th Congress of the Romanian Society of Radiotherapy and Medical Oncology and the 9th Congress of the Federation of Romanian Cancer Societies

In this article, **Bălan Cristina, Costache Florin and Daniela Martin** announce the multidisciplinary scientific events that will take place between November 2-5, 2023 in Cluj-Napoca, Romania

Figure 1: The Event poster

Each Autumn, in different sites in Romania, there is a story about a multidisciplinary meeting that fights together to face a strong and fearless villain: cancer. Each chapter is written once per year in the beautiful country of storytelling, with incredible views at every step. Even if you are a mountain lover or an old city hunter passionate about nature or traditions, Romania is the perfect destination for you this Autumn.

Going back to science and leaving the adventure taste behind, this year's Annual Congress of the Romanian Society for Radiotherapy and Medical Oncology (RSRMO) will bring together specialists to share their knowledge and skills to create a powerful tool to defeat cancer. Founded in 1991, the society aims to maintain a high quality of medical services in radiotherapy and medical oncology. For four days, from the 2nd until the 5th of November, Cluj-Napoca, the biggest city in Transylvania, Romania, will organise a meeting that will blend an impressive number of participants from all over the world with the same motivation. Medical doctors, residents, medical physicists, biologists, chemists, clinicians, or researchers can attend exciting lectures about the latest discoveries related to cancer treatment, prevention, or management of the disease. With an impressive contribution from the international community, the 34th edition of the Congress will focus on the experiences shared between research and daily practice.

During the Congress, dedicated sections for medical physics are organised. With 11 years of experience, the Romanian Society of Medical Physics (SRFM) encourages young professionals and works hard to highlight the importance of the medical physicist in radiotherapy, but not only. This conference marked the biggest event in medical physics in our country, organised by the RSRMO, where the members of the SRFM reunited to share their thoughts. Two symposiums will offer the opportunity for experienced medical physicists to present their work on different topics like treatment planning systems in radiotherapy (dose calculation algorithms, irradiation techniques, etc.), beam commissioning, new horizons in radiotherapy, research and developments, radiation protection, and early career experiences for young and devoted medical physicists.

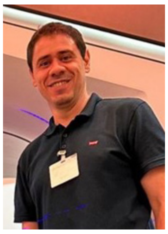
If you think that the topics previously presented suit you or that you wish to discover more, update your knowledge regarding the hot topics in radiotherapy. If you want to connect with other people with whom you share the same topics or ideas, feel free to register for our conference and join us for a beautiful experience in the heart of Transylvania.

Please access the event's website at https://srrom.ro/ for registration and more information.

We hope to see you in Cluj!

Bălan Cristina is a medical physicist from the Oncology Institute ("Prof. Dr. Ion Chiricuta") and a PhD candidate from Cluj-Napoca, Romania. Combining interests regarding beam commissioning and treatment plans for external radiotherapy, Cristina chooses to extend her knowledge by enrolling in a PhD programme about particles physics in FLASH beams.

Daniela Martin, MD, Senior Radiation Oncologist, is the President of RSRMO 2023 and Head of Radiotherapy Department at the Oncology Institute "Prof. Dr. I. Chiricuta", Cluj-Napoca, Romania. She is a trainer, lecturer, and moderator for radiotherapy sections and a member of the scientific and organising committees of several congresses, national conferences, and postgraduate courses in radiation oncology. In her area of research interest, she is actively involved in the personalised multidisciplinary diagnosis and treatment of breast cancer.



Costache Florin is a medical physicist expert from the Radiotherapy Centre “Sf. Nectarie” Craiova, Romania. His experience covers remarkable activities in the design of radiotherapy departments, beam commissioning, and the implementation in Romania of modern radiotherapy techniques. Florin is also involved in the professional education of medical physicists in Romania. He is also a lecturer for the radiotherapy courses organised within the University of Craiova, Faculty of Physics, and responsible for the student's clinical practice. At the same time, Florin is a founding member and president of the Romanian Society of Medical Physics (SRFM).

EFOMP COMPANY MEMBER ARTICLE

Elevating Quality, Efficiency and Standardisation Through Advanced Oncology Solutions

varian
A Siemens Healthineers Company

Advanced Oncology Solutions (AOS) partners with cancer care centres to provide physics and dosimetry services with highly experienced clinical experts and exceptional processes to improve clinical quality and comply with local and national standards.

Cancer care landscape:

By 2030, it is estimated that there will be 26 million new cancer cases per year [1].

To this end, the combination of new technologies, new modalities for cancer treatment, and massive staff shortages in radiotherapy makes it very challenging.

Looking across the EU, there is a very significant variation across countries in the availability of specialist staff such as medical physicists, dosimetrists, and RTTs [2].

Staff Shortage in Medical Physics:

As radiation treatments become increasingly complex, delivered in fewer sessions, and with greater intensity, the medical physicist's role becomes more critical to the quality of the treatment, necessitating heightened precision and quality assurance. [3].

Shortages of medical physicists have knock-on effects on clinic workflows, resource allocation, patient care, and reimbursement for the department.

This can create pockets of untapped capacity that can further exacerbate the shortage elsewhere.

If we can make workflows more efficient and find other ways to save time-saving on routine tasks, we can save time and enable staff to take on new roles and adopt new technologies to improve patient care.

Varian's Advanced Oncology Solutions:

Advanced Oncology Solutions' technology-enabled Clinical Services are designed to optimise the human resources of a cancer care provider. By partnering with cancer care centres, AOS can support physics and dosimetry services.

These tailored solutions provide clinics with access to highly experienced clinical experts and exemplary processes to improve clinical quality—and ensure compliance with local and national regulations.

With Advanced Treatment Planning services, providers can access sophisticated tools that facilitate precise and personalised treatment plans. Clinical service line enablement ensures that healthcare providers have the necessary resources, training, and support to deliver high-quality care across various oncology disciplines, fostering a comprehensive approach to cancer management. Rapid commissioning of existing and upgraded technology allows providers to swiftly adopt and implement state-of-the-art solutions, minimising downtime and enhancing patient access to innovative treatments. By focusing on Technology utilisation, Advanced Oncology Solutions enables healthcare providers to maximise the potential of their investments, ensuring that they are leveraging the latest advancements to their fullest capacity.

For more information, please visit our website:
https://www.varian.com/en-gb/products/oncology-services/advanced-oncology-solutions

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Niall McAndrew, BSc., MSc. Medical Physics, MBA, is the director of Clinical Services at Advanced Oncology Solutions EMEA. Niall joined Varian's Advanced Oncology Solutions a year ago. He has worked and commissioned new treatment centres in Ireland, the UK, Spain, Australia and the Caribbean in both the public and private sectors and has more than 20 years of experience in healthcare. He has extensive experience in setting up new treatment centres, Linac commissioning, and implementing new technology to benefit patients. He led the implementation of a number of technically challenging and innovative projects across a European network, including adaptive treatment delivery. The opportunity for Niall to join the AOS team allowed him to focus his efforts on ensuring more patients have access to high-quality treatment in a timely manner that will result in the best possible outcomes and drive innovation in the RT space.

Co-Author: Sayantani Dasgupta, Senior Product Marketing Manager, Advanced Oncology Solutions, EMEA (BSC, PGDMM, MBA) joined Varian recently. She has worked in the life sciences industry for more than 20 years at several large healthcare companies across Germany, Switzerland, India and Japan. Her passion is to achieve excellence in all aspects of oncology by offering the broad portfolio of services that AOS offers.

MEETING REPORT

YGN-cross activities Budapest

A special meeting of European societies working in the nuclear sector - Report by **Leticia Irazola**

"From left to right: Sylvain Andresz from the Young Generation Network of IRPA group, Emilia Janisz from the European Nuclear Society, Leticia Irazola from the Early Career SIG of the EFOMP, Jan Čečrdle from FUSENET young section, Andrea Kozlowski and Paco Suarez from the young section of the European Nuclear Society, Luyten Jakob from SCK CEN " July 5th, 2023, Budapest

The European Nuclear Society (ENS), within the framework of the ENEN2+ project, organised a special event dedicated to early career professionals working in the nuclear field in Europe. It was held at the Budapest University of Technology and Economics, during the 3rd edition of the "Nuclear Competition and Science Camp" that took place from July 3 to 7 and was entirely dedicated to European high school students.

During these days, the 15 finalist teams of the European video competition, together with their teachers, were invited to assist in various presentations by different experts in the different nuclear sectors such as fusion, industry and medicine, along with various technical and tourist visits. The representatives of the Early Career Groups (FUSENET, ENS and EFOMP) were invited by the organizers to give a short presentation to the participants. We then had the opportunity to interact with students, giving them an idea not only of the upcoming challenges and progress in the nuclear sector, but also of our experience and career. With this we wanted to give them an idea of how different the backgrounds (educational and professional) are of the people currently working in this field, and also give them an idea of what the daily routine is like for young people involved in the nuclear energy sector. However, from my point of view, the most interesting thing we gave them was our motivational message. With this we not only wanted to involve them in the 'nuclear side', but also to remove the fear that students would have to dedicate their career to science and more specifically to the nuclear field. This was done by giving us life examples and humanising our careers.

We then had the opportunity to communicate not only with the students, but also with their teachers to encourage them to promote these types of activities that involve young people in this field.

During the special YNG cross event we had a brainstorm between all representations of early careers and young groups. I had the chance to share this great day with Sylvain Andresz from the Young Generation Network of IRPA, Emilia Janisz (then) from the European Nuclear Society, Jan Čečrdle from the student council of FUSENET, Andrea Kozlowski and Paco Suarez from the young section of the European Nuclear Association ENS YGN and Luyten Jakob from SCK CEN. The early careers presented their young parts of the participating associations and the ongoing activities and collected ideas that could be considered in our own group (social media, meetings, working groups on e.g. mentorship, etc.). We came together during a social media competition to engage young professionals, scientists and students in Europe, and I hope I can talk to you about that later. A possible collaboration e.g. on innovation and a workshop on cross-sectoral activities were also discussed. We were also informed about the existing European grants and mentoring programs in the nuclear sector that can support mobility and about the possibility of creating a link between Europe and other early career associations focusing on this area.

The ultimate goal was not only to get to know each other's societies, but to plant the seed that will hopefully mark the beginning of a great cooperation from the "nuclear site" in Europe, which includes not only the research and industry, but also the medical sector. Curious about this new synergy? Stay tuned because we've already started working together and great things are coming soon...

Leticia Irazola is a Medical Physics from Spain. She made her studies in Physics in Logroño (Spain) and then dedicated to the Medical Physics field with her MSc in Medical Physics in Rennes (France), PhD thesis in Sevilla (Spain), PostDoc in Santiago de Chile (Chile), and Medical Physics residency at the Clinica Universidad de Navarra (Spain). She is currently secretary of the Communications and Publications Committee and chair of the Early Career SIG of the EFOMP. Based in La Rioja, she works as a medical physicist and combines this with university teaching and research.

EFOMP COMPANY MEMBER ARTICLE

RTI Group: Why Excel Is Not Enough for X-ray Testing and Quality Assurance?

INDEPENDENT X-RAY QUALITY ASSURANCE

"What used to take us 4 hours now takes 25 minutes!". A Case study with Maastricht UMC+: How switching from Excel to RTI Ocean software improves efficiency and traceability for X-ray testing and Quality Assurance, saving physicists valuable time.

The 'Piranha Multi' metre from RTI Group, together with Ocean software, is an all-in-one solution for X-ray testing and Quality Assurance (QA), covering all application needs (Rad/Fluoro, Dental, Mammo, CT, and more) and the broadest range of kV, dose, and X-ray beam qualities.

As a non-invasive and completely wireless metre, the Piranha Multi can be placed into the X-ray beam while the user makes exposures in the control room and sees measurement results appear directly on a tablet or computer. No wires or separate display devices are needed as intermediaries, maximising efficiency.

The Piranha Multi with Ocean software can be used for the full range of X-ray QA needs, from simple measurement display (kVp, dose, dose rate, exposure time, HVL (half-value layer), total filtration, and waveform display) to routine tests and more complex analysis, such as kV accuracy, reproducibility, mA linearity, HVL tests, CT dose index, and much more.

To perform analysis, many users have traditionally exported data to Excel. However, as the team at

Maastricht experienced, Excel has its drawbacks. One significant issue is that exporting to Excel breaks the chain of traceability. Users lose the ability to validate critical information such as when, where, who, and with what device the X-ray exposures were performed.

Another big problem with relying on Excel for X-ray reporting is the risk of transcription errors (typing in the wrong values), referencing the wrong cell for analysis, or manually manipulating reporting. The more manual entry is required, the greater the risk of inaccurate reports and, therefore, unsafe equipment.

The team of physicists and engineers at Maastricht UMC+, together with their lead biomedical engineer, Ralph Gielen, needed a more efficient solution. That's where Ocean software from RTI Group comes in. With Ocean software, the whole process is traceable from X-ray exposure through analysis, data storage, system pass/fail, and reporting. There is no possibility for transcription errors, like with Excel.

Ralph Gielen, Biomedical Engineer

By adopting Ocean templates, Ralph and his team were able to create their own streamlined protocols based on national guidelines, specifically those provided by the Dutch Society for Clinical Physics (NVKF). The team at MUMC+ is responsible for QA on X-ray systems throughout the hospital, covering all departments and modalities, meaning both compliance and efficiency are key.

With Ocean software, the analysis is already built-in, enabling engineers to focus solely on capturing the correct exposures. The software automates the rest of the process, including analysis, pass-fail and report generation, eliminating complexities and potential errors while increasing standardisation.

What used to take us 3-4 hours now takes 25 minutes!

Ralph commented on testing their new cardiovascular Bi-Plane system: "What previously took 3-4 hours to complete could now be done in just 25 minutes", showcasing the remarkable efficiency achieved through RTI Group's premium wireless QA solution; the Piranha Multi with Ocean software.

The team at Maastricht UMC+ takes advantage of Ocean templates. Ocean templates are pre-defined workflow routines, that can be customised to any specific system. Images of the correct setup can be added, to appear at the right time in the workflow, reducing training time for new physicists and engineers, while also eliminating set-up errors.

Ocean templates are used globally by X-ray manufacturers and hospitals, to ensure the correct procedure is always performed on the specific system being tested, becoming invaluable assets for physicists. The RTI solution ensures data security, traceability, efficiency, and adherence to regulation.

Wireless QA.

Recognising the value of Ocean software, the team at Maastricht UMC+ made the full transition from using Excel to RTI Ocean software. They were also the first beta testers for RTI Group's innovative new cloud functionality. In addition to increased efficiency and traceability, all data can be securely backed up to the cloud, ensuring that valuable information is never lost, and templates can be shared directly with colleagues. The latest template versions are always available to the entire team, eliminating admin time and further increasing efficiency.

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 SPECIAL INTEREST GROUP UPDATE

Special Interest Group (SIG) for Early Career Medical Physicists

The Steering Committee from the Early Career EFOMP Group reports that the Early Career SIG's first general assembly on June 20, 2023, allowed all attendees to contribute and offer innovative ideas as they created the SIG's goals and working groups. Report by **Jesús G. Ovejero**

The recently created Early Career SIG celebrated its first general meeting on the 20th June 2023. The steering committee presented the initial goals of the SIG and the working groups already established, inviting all the members to join and collaborate with proposals and new ideas.

The Early Career Medical Physicist Special Interest Group of EFOMP was created in December 2022 to support EFOMP's members at the beginning of their careers and establish a proper environment for networking and professional development. The steering committee elected after the kick-off meeting has been working on defining the initial goals of the SIG and the working groups to achieve them. In this meeting, the outcomes of this initial work were presented to the - SIG members, asking for participation and collaboration with new ideas.

General Outlines

After a brief presentation of the SIG and the steering board, the convener, Leticia Irazola, presented the working groups together with the main goals assigned to each of them (Figure 1). Nefeli Tzoumi explained the aim of Working Group 1 and how the initiatives of the SIG will be posted in the social media of EFOMP and also in Early Career Medical Physicists SIG media recently created on YouTube and TikTok. Anna-Maria Fanou presented the goals of Working Group 2 and the Erasmus+ voluntary traineeship for early-career physicists. Agnese Katlapa talked about Working Group 3 and the dedicated early career session that will take place at the upcoming ECMP Congress. Antonio Jreij highlighted the purpose of Working Group 4 and gave information about the monthly newsletter. Katryna Vella presented the preliminary results of a survey that was distributed to the members of the SIG and it will be published once completed and analysed. Jesús G. Ovejero gave an overview of the main goals of Working Group 5.

WORKING GROUP 1: SOCIAL MEDIA

Goal: Promote the diffusion of SIG as well as news about its members initiatives on EFOMPs official accounts (Instagram, Facebook, Twitter) and new EC SIG Official accounts that are under construction (YouTube, TikTok)

WORKING GROUP 2: EUROPEAN EC

Goal: Establish a European network for young professionals within existing NMOs EC Groups and help on the creation of new EC Groups.

WORKING GROUP 3: CONGRESSES & EVENTS

Goal: Organize periodic webinars and prepare a specific event for Early Career Medical Physicist at ECMP Congress (Munich 2024).

WORKING GROUP 4: JOURNAL & MAILING

Goal: Publish articles related to Early Career topics on EMP issues. Update the SIG members with monthly emails.

WORKING GROUP 5: SCIENTIFIC ISSUES

Goal: Bring together senior and junior researchers to facilitate the collaboration. Organize specific webinars on different scientific topics related to Medical Physics.

Feedback from members

The Early Career Medical Physicist SIG has been conceptualised as a collective effort to join professionals all around Europe and beyond. Therefore, involving all the members of the SIG in the working groups is a priority for the committee. For this reason, a general survey was sent to the members of the SIG, asking about their professional perspectives and principal needs. The preliminary results revealed that limited job opportunities and limited guidance or mentorship opportunities are the biggest challenges for early career professionals in the medical physics field.

Networking and traineeships

The initiatives carried out to identify the European landscape for young professionals by detecting the weaknesses and opportunities of Early Career groups of different NMOs were also explained. The Erasmus+ voluntary traineeship was highlighted as a pioneering example of the European mobility of medical physicists and engineering students.

Call to action

The meeting was concluded with an invitation to all the SIG members and the rest of the European medical physicists to actively join the working groups and provide their own ideas by writing to mailto:board.sig.frec@gmail.com.

Dr. Jesús G. Ovejero has been working as a Medical Physics Trainee at the Hospital General Universitario Gregorio Marañon in Madrid (Spain) since 2021. He obtained his PhD in 2017 from the University Complutense of Madrid, investigating biomedical applications of magnetoplasmonic nanoparticles. He continued his postdoctoral research at King's College London and the Institute of Materials Science in Madrid. He is the deputy of the Spanish Society of Medical Physics (SEFM) to the EFOMP and a member of the steering board of the Early Carrer Special Interest Group of the EFOMP.

MEETING REPORT

The Italian Association of Medical Physics National Congress

Cinzia Talamonti observes that, in addition to traditional academic activities, Congress placed a strong emphasis on young people, as these individuals represent the future of medical physics in our country. This was the first in-person gathering following five years of pandemic-related remote events.

Last June, from 8th to 12th, Florence hosted the first in-person AIFM National Congress after five long years of online meetings due to the pandemic. Participants totaled more than 700. It was an event that allowed us to exchange ideas, share experiences and projects, and update each other on the scientific and professional topics we are passionate about. The Italian National Congress gathered a large community together and provided so many opportunities to meet and discuss cutting-edge issues, representing an invaluable moment in the life of AIFM.

The Florence congress, therefore, was a truly crucial step, an unmissable opportunity to lay the foundations of AIFM's future developments in medical physics and to "look far ahead," as the motto of the congress read. Looking far ahead: never more than now in all fields, medical physics included, is it necessary to rise above the great daily afflictions and the worries that the difficult national and international environment never ceases to fuel.

Special attention, perhaps more than usual, was paid to young people, the future of medical physics in our country, in the search for that constant confrontation between different experiences and generations that is traditionally the basis of the Association's educational activities. In preparation for the National Congress, an initiative has been promoted to raise awareness of Medical Physics in primary and secondary schools in Florence.

The project aimed to introduce our discipline and explain to children the complex and fascinating world of radiation and its application to human health, through meetings in schools, with presentations and videos, followed by time for questions.

Contextually, students, individually or in groups, were invited to create a report consisting of drawings, Lego realizations, PowerPoint presentations, or videos illustrating an aspect of the Medical Physicist's work that particularly interested them. About 700 students in 10 schools, including 2 classes from an elementary school, 14 classes from 4 middle schools, 14 classes from 3 science high schools and 1 classical high school have joined the project. All students actively participated in classroom activities with interesting questions, and I believe that the goal we had set to introduce the figure of the medical physicist to the Florentine community was largely achieved. The winning reports for each school system were awarded prizes during the opening day of the Congress by the President Dr. Carlo Cavedon together with the city councillor for education of Florence Dr. Sara Funaro.

Cinzia Talamonti is a professor of Medical Physics at the University of Florence and the president of the Radiographer degree course. Since 1999, she has been active at the National Health Service Medical Physics Unit of the Careggi University Hospital of Florence, with research interests in advanced treatment techniques both from a dosimetric and imaging point of view. She carried out many research projects in strict collaboration and synergy with radiotherapy oncologists, with an emphasis on medical applications and interdisciplinary aspects. She is the author of more than 130 research papers https://orcid.org/0000-0003-2955-6451. She is a member of the AIFM (Associazione Italiana Fisica Medica) Scientific Committee and an AIFM consultant for the EFOMP Working Group "Medical Physics Education for the non-physics Health Care Professions."

MEETING REPORT

19th Nordic-Baltic Conference on Biomedical Engineering and Medical Physics

Katrina Caikovska gives her feedback on the recent event that was organised by the Latvian Medical Engineering and Physics Society and was held in Liepaja, Latvia.

The opening ceremony of NBC 2023

The Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC) is organised every 3 years under the umbrella of the International Federation for Medical and Biological Engineering (IFMBE) and was held in Latvia for the second time. The first time it was organised in Latvia was in 2008, which was the 14th time. This year it was held from June 12th to June 14th in Liepaja, which is the 3rd largest city in Latvia and has a population of around 70,000 people. Liepaja is located near the Baltic Sea and is a modern, up-and-coming city.

The conference was focused on different topics, including medical physics and radiation protection. There were around 100 participants in the conference, and 81 abstracts were accepted. During the session dedicated to education, training, safety, and medical technologies, the president of EFOMP, Assoc. Prof. Paddy Gilligan gave a talk about training and education for medical physicists in Europe. Assoc. Prof. Paddy Gilligan's presentation included legal requirements for medical physicists and medical physics experts, criteria for EFOMP National Registration Schemes approval, the core curriculum for Medical Physics Experts, and other similar topics.

On NBC, there was a medical physics workshop organised called "Clinical Medical Physics in the Baltic States", The moderator was a medical physics expert from Lithuania, Kirill Skovorodko. During the workshop representatives from Latvia, Lithuania and Estonia shared their current situation in their countries related to medical physics – education, training, number of physicists, number of equipment, requirements for certification, etc. During the workshop, possible future cooperation was discussed between professional societies of the Baltic States countries, and a meeting will be organised in the autumn of 2023 to strengthen future relations between medical physicists in the Baltic States.

The get-together event on the first day of the conference

During the conference, the IFMBE Young Investigator Competition (YIC) took place to encourage young early-career researchers. The YIC award committee selected finalists on the basis of submitted papers, and the winner was announced during the closing ceremony. During the closing ceremony, the next venue for NBC was announced, and it will be organised in Warsaw, Poland, in 2026.

More information and the published abstract book can be found on the conference website https://nbc2023.lmifb.lv/. The proceedings of the conference are published by Springer.

Katrina Caikovska is a medical physicist at Riga East University Hospital and Children's Clinical University Hospital in Riga, Latvia. She is a board member of the Latvian Society of Medical Engineering and Physics. Her main focus is interventional radiology and CT examinations.

MEETING REPORT

Highlights of the 61st Congress of the French Medical Physics Society

The annual meeting of the French Medical Physics Society (SFPM), 7-9 June 2023, in Nancy (France). Report by **Marchesi Vincent** and **Gérard Karine**

During the session in the plenary room

The city of Nancy, located in the northeast part of France, in the Lorraine region, hosted the 61st edition of the annual meeting of the French Medical Physics Society (SFPM) from June 7 to 9, 2023.

Almost 500 attendees, including around 50 students, came to the major annual scientific event of the French Medical Physics (MP) society. The audience was mainly composed of medical physicists as well as dosimetrists, radiotherapy technologists, technicians, and clinicians.

The scientific committee has put together an attractive programme that combines innovative themes with daily practical issues. Approximately one hundred abstracts were received for oral or electronic poster presentations.

Topics of interest were covered in the three main areas of expertise of medical physicists: radiation therapy, nuclear medicine, and radiology/medical imaging. Sessions included talented international invited speakers who have kindly accepted to contribute to the conference, followed by proffered presentations.

On the first and second days, the radiotherapy sessions were held in the plenary room, in parallel with the imaging and nuclear medicine sessions.

Every two years, in the parallel room, the first day is dedicated either to medical imaging or nuclear medicine. This year, the theme of medical imaging was 'The Scanner of Today and Tomorrow.

On day two, the radiotherapy sessions continued, along with a nuclear medicine session and an imaging session. The last day focused on more general topics relating to the three areas of activity (cybersecurity and a round table discussion on the diverse ways the medical physicists work in radiotherapy, medical imaging, and nuclear medicine) and ended with ten proffered papers on dosimetric planning, especially for dosimetrists and medical physicists working in radiation therapy.

The first radiotherapy track focused on movement management, where Dr. Malin Kügele (Lund, Sweden), with ten years of experience in the field of surface guided radiotherapy (SGRT), presented a summary of the recent international guidelines (ESTRO-ACROP and AAPM) for SGRT.

During the sessions dedicated to the process and metrology of quality assurance in radiation therapy, Dr. Hugo Palmans (National Physical Laboratory, Teddington, UK) gave an overview of the update of the TRS-398 IAEA code of practice.

Three sessions were devoted to the delineation of new challenges in treatment planning and innovative techniques, such as FLASH therapy, stereotactic radioablation in cardiac arrhythmias. Dr. Vicki Taasti, (Maastricht, NL) presented innovations in CT imaging for radiotherapy, especially the advantage of dual-energy imaging.

Traditionally, a joint SFPM-SFRO (French Society for Radiotherapy) session is organised. This year the chosen theme was logically brought therapy, as Nancy is a historical site of this specialty in France. Dr. Stephanie Corradini (Munich, Germany) gave a presentation on imaging technologies for in-room brachytherapy, and Dr. Pascal Pommier (Angers, France) spoke about the future of prostate brachytherapy in the era of SBRT development.

In the nuclear medicine track, the topics focused on new technologies and therapeutic applications. The first session discussed the contribution of 3D printing tools to nuclear medicine applications. pr. Stefan Vandenberghe (Ghent, Belgium) presented the design of a Total Body PET system. The second session was dedicated to therapy applications, and Dr. Thomas Carlier (Nantes, France) presented guidelines for contact precautions after vectorized internal radiotherapy.

Artificial intelligence and spectral CT make up the majority of the medical imaging track. Dr. Djamel Dabli (Nîmes, France) and Pr. Pedro Texeira (Nancy, France) presented the views of medical physicists and physicians on the use of artificial intelligence in CT. Then Nicolas Villani (Nancy, France), Prs. Mickael Ohanao (Strasbourg, France), and Salim Si Mohamed (Lyon, France) talked about spectral CT and photon counting. Image quality in CT and in digital imaging technology has been discussed in lectures by M. Justin Salomon (Durham, USA), Virginia Tsapaki (IAEA, Vienna, Austria), and Anaïs Viry (Lausanne, Switzerland).

More general topics regarding cybersecurity, roles and responsibilities of medical physicists in both clinical research and daily practise were discussed. The cybersecurity session was a new interesting topic for medical physicists. This was a highlight when a physics team whose hospital had fallen victim to a cyber attack gave a clear account of what happened, during and after the crisis. How do I deal with it and recover from it?

The round table on how a physicist can work in the different fields (radiation therapy, nuclear medicine, and medical imaging) was a moment of friendly competition between three super medical physicists who described their work and 'defended' their specialties (see photo). Exchanges with the meeting followed their presentations. The winner? Medical physics!

The three "super medical physicists" after the round table dealing with the roles and responsibilities of medical physicists in the three areas of activity (from left to right: Arnaud Dieudonné for nuclear medicine, Vincent Marchesi, chairman, Caroline Lafond for radiotherapy, and Didier Defez for radiology).

The traditional social evening took place in Nancy's most iconic venue, the famous Place Stanislas. The aperitif cocktail was organised in the main lobby of the National Opera of Lorraine, and the dinner took place in the Grand Salon of the Town Hall (built in 1755). It was a wonderful moment of friendly and festive relaxation in a prestigious setting, and the participants enjoyed the culinary specialties from the region.

In parallel with the scientific sessions, the general meeting of SFPM was allowed to elect the new board of the association. Ms. Laure Parent has been elected president of the SFPM after the mandate of Dr. Arnaud Dieudonne. All SFPM members wish her the best of luck with her new responsibilities!

The SFPM associate members (commercial companies or institutional entities) had a 1,200 m^2 space in the exhibition hall and could rent one of the five symposiums organised during the lunch break to create a convivial environment where they could present their products, latest developments and meet their customers.

Like every year, the meeting's scientific committee has awarded awards to young physicists (students and under 3 years of professional experience), with one award for the best oral presentation and one award for the best e-poster. A third prize is discernible for the best "senior" physicist's oral presentation. The best young physicist poster award has been given to Mrs. Saafa Tahri for her poster entitled: "A generic deep learning model for synthetic CT generation in MRI-only prostate radiotherapy". The best young physicist oral presentation was awarded to Lucien LEMAIRE for his presentation called "Dosimetric impact of cardiac motions for CyberKnife stereotactic arrhythmia radioablation". The best oral presentation award was attributed to Mathieu Pavoine for his work on "Methodology and clinical application of a population-based input function (PBIF) in whole-body dynamic PET-FDG of metastatic melanomas treated by immunotherapy". Congratulations to all of them!

Save the date for 2024!

The 6^{2nd} Congress of SFPM will be held in Dijon, capital of Burgundy, a famous area in the centre east of France, known world-wide for its mustard and wonderful wines, from June 12 to 14, 2024.

Marchesi Vincent, PhD, is the chairman of the 61^{st} SFPM Congress organisation committee. He graduated with his clinical professional certification in 2001 and obtained his PhD in 2003. Since January 2020, he is the head of the Medical Physics department of the Institut de Cancérologie de Lorraine, Nancy, France. He is also an associate professor at the French National Nuclear Sciences and Techniques Institute.

Gérard Karine, PhD, is the chairwoman of the scientific committee of the 61st SFPM congress. After completing a PhD in 2008, she obtained her clinical professional certification in December 2009. She is working in the Medical Physics department of the Institut de Cancérologie de Lorraine, Nancy, France.

EFOMP SPECIAL INTEREST GROUP UPDATE

Special Interest Group for Radionuclide Internal Dosimetry (SIG_FRID)

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

The number of SIG_FRID members is currently 173. New applications are always welcome (see below for how to become a SIG member).

Last term, the Steering Committee (SC) had virtual meetings on June 5th, July 3rd and August 7th. A General Meeting of the SIG_FRID was held on June 30th with the attendance of more than 40 people. The next general meeting of SIG_FRID will be held in October.

The SIG_FRID SC priorities are

- Priority 1. Scientific meetings
- Priority 2. Workgroup 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 agenda for the next Scientific meeting in 2023 is as follows:

- Wednesday, 20/09, 3:00-5:00 pm CEST
- Wednesday, 13/12, 3:00-5:00 pm CET

You are kindly invited to propose topics for the Scientific meetings. As a reminder, a Scientific meeting usually includes 3 x 30-minute talks, followed by a general discussion (30 minutes). Please send your proposals to: ernesto.amato@unime.it and steffie.peters@radboudumc.nl.

The agenda for the next Case Report Meetings in 2023 is as follows:

- Tuesday, 24/10 12:00-1:00 pm CEST

You are kindly invited to propose interesting cases of clinical internal dosimetry to be reported and discussed during the Case Report meetings.

Please send your proposals to: ernesto.amato@unime.it and steffie.peters@radboudumc.nl.

Please use the following link to subscribe to the SIG_FRID Scientific and Case Report meetings: https://www.efomp.org/index.php?r=pages&id=webinars-2023.

Priority 2. Work-group management and follow-up

The updated WGs and leaders are as follows:

- WG0 Survey
  Caroline Stokke/Steffie Peters
- WG1 Time activity curve fitting
  Gerhard Glatting
- WG2 Treatment planning system
  Lidia Strigari
- WG3 Absorbed dose-effect relationship
  Lidia Strigari
- WG4 Voxel S values
  Julia Brosch-Lenz/Marta Cremonesi

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

Priority 3. Teaching/Education/Dissemination

Among the plans for 2023 is arranging an EFOMP webinar series on Dosimetry in Targeted Radionuclide Therapy. Any volunteer to participate in this is welcome. Please contact Priority 3 responsible SC members (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 twelve newsletters and four 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 SIG_FRID members.

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

Priority 5. Professional/Regulatory/Economic matters

The group working 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).

Incoming meetings

- 10th International Symposium on the Physical, Molecular, Cellular, and Medical Aspects of Auger Electron Processes. (September 6-8). Montpellier, France. https://auger-symposium.com/
- 36th EANM Annual Congress. (September 9-13). Vienna, Austria. https://www.eanm.org/congresses-events/future-congress/
- 1st Symposium on Molecular Radiotherapy Dosimetry: The Future of Theragnostics. (November 9-11). Athens, Greece. This is the first EFOMP event of its kind. The SIG_FRID is very proud to have been chosen to test the formula! The first announcement was posted on Dec 19th: https://smrd2023.efomp.org/

The list of invited speakers includes Irène Buvat, Mark Gaze, Caroline Stokke, Jan Tapproge, Manuel Bardiès, Carlo Chiesa, Gerhard Glatting, Marta Cremonesi, Glenn Flux and Katarina Sjogreen-Gleisner.

Around 80 abstracts have been received.

A provisional programme structure is presented here: https://smrd2023.efomp.org/topics/

How to become a SIG_FRID member:

The SIG_FRID 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 SIG_FRID pages of the EFOMP website: https://www.efomp.org/index.php?r=pages&id=sigs

The application form and a brief CV should be sent to the SIG_FRID 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.

Symposium on Molecular Radiotherapy Dosimetry: The future of theragnostics

November 9th -11th 2023, Athens, Greece

Registrations are now open again, with a new maximum of 170 participants

Preliminary Program has been announced

The objective of the **EFOMP Special Interest Group for Radionuclide Internal Dosimetry** (SIG) is to establish a network of medical physicists working in radionuclide dosimetry. The SIG aims to fulfil the need for networking, education, research and professional exchanges in this field. To fulfil these aims, EFOMP SIG_FRID will organise a **Symposium on molecular radiotherapy dosimetry** in Athens, Greece.

The Symposium will give the opportunity:

- to review and share ongoing developments in radionuclide imaging and dosimetry;
- to consider how personalised treatments may improve effectiveness at a time of rapid expansion of theragnostics and molecular radiotherapy
- to discuss networking and synergies within a muti-disciplinary community at a time of challenge and opportunity.

Organised by EFOMP — European Federation of Organisations for Medical Physics

Hosted by The Hellenic Association of Medical Physicists (HAMP)

Acreditation from EBAMP (pending) — European Board For Accreditation in Medical Physics (EBAMP)

National and Kapodistrian University of Athens Medical School, "Attikon" University Hospital, 2nd Department of Radiology, Medical Physics Unit

Medical Physics Laboratory, National and Kapodistrian University of Athens, EST. 1837

Register to the symposium

Sponsors

DOSIsoft · Full-Life Technologies · Hermes Medical Solutions · itm · Karvonis Ant. & Co EE Scientific Equipment · MIM Software · GE HealthCare · mediray · Voximetry · RayzeBio

COMPANY MEMBER ARTICLE

DOSIsoft PLANET® From Its Francophone Customers' Point of View

On April 14, 2023, **DOSIsoft** gathered its PLANET® French-speaking customers for the first time after the COVID period in Paris La Bourdonnais Hotel to listen to their product feedback and share qualified scientific studies and presentations, following more than 10 years of clinical routine experience in European hospital centres.

This one-day seminar covered the key topics of ^{90}Yttrium-SIRT dosimetry, ^{177}Lutetium - MRT as well as Oncology medical imaging management. The French-speaking users were excited to get together and share their best clinical practises to show how they benefit the most from PLANET® – a patient-specific theranostics solution that is greatly appreciated, thanks to:

- its end-to-end platform for patient diagnostics, treatment planning and disease follow-up
- its versatile 3D personalised Molecular Radiotherapy Dosimetry, in particular pre/post-implementation dosimetry, automatic structure propagation, calculation of residence time and dose comparison, and validation control dose maps.
- its vendor-neutral capability and adaptability to clinical workflow to ensure a seamless integration.

Clinical value: One of the studies showed that the post ^{177}Lutetium dosimetric analysis via the PLANET® tool could predict treatment response and overall patient survival. With the latest improvements provided (e.g. 2D/3D hybrid workflow, improved MRI support, clinical reporting, ...), PLANET® represents a real added value in routine voxel-based internal dosimetry workflow to optimise therapy for tumour control & safety, monitor patient treatment, and improve traceability.

Product evolution: A new PLANET® release is expected soon by the current users to bring forth a multitude of technological advances in multi-radionuclide-based Cancer Therapies. In addition to ^{90}Ytrrium and ^{177}Lutetium, the new platform will be open to supporting new isotopes, like ^{131}Iodine and ^{166}Holmium, and will integrate multiple-time and single-time-point workflows. A global improvement in software performance and robustness will enhance treatment effectiveness and outcomes.

AI-based perspective: An introduction to the radiomics topic has raised huge interest among the attendees. A data-driven medical image analysis shows promise and may provide, in the future, local characterization at the voxel level, decision maps, and interpretability, and eventually help predict treatment response.

"We are starting to accumulate enough experience to exchange. With 100% positive feedback, it was a nice opportunity to meet PLANET®

customers, attend a clinical relevance presentation, and have in-person conversations. Creating such a PLANET® community helps to share new SIRT and MRT trends in the field of nuclear medicine (regulations compliance, reimbursement schemes, physician and physicist responsibility), build an information channel, and leverage clinical insights to drive our product roadmap." concluded Marc Uszynski CEO of DOSIsoft, "We will do that on a more regular basis, as it's very inspiring to know what everyone is doing in their institute and how they handle different problems and take up challenges."

DOSIsoft will be present at upcoming shows: EANM booth #213, DGMP booth #15, and MRT Symposium. Visit us and attend a live product demo of PLANET, a patient-specific, multi-radionuclide theranostics platform dedicated to Molecular Imaging and 3D Molecular Radiotherapy Dosimetry (MRT).

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 Institute Curie, DOSIsoft constantly innovates in partnership with major cancer institutes and research centres around 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.

COMPANY MEMBER ARTICLE

Targeted Radionuclide Therapy: A Race Against the Clock

ITM is tackling the short half-lives of radiopharmaceuticals that pose a hurdle for supply chain management issues while developing its pipeline to serve partners, healthcare professionals, and patients globally.

Targeted Radionuclide Therapy (TRT) has the potential to transform the fight against cancer. However, the short half-lives of radiopharmaceuticals pose a hurdle for supply chain management, creating a race against the clock to get therapeutics to patients quickly while preserving their potency. Companies must rise to this challenge as the global demand for radiopharmaceuticals skyrockets. ITM is tackling these issues while developing its pipeline to serve partners, healthcare professionals, and patients globally.

Time is of the Essence

Radiopharmaceuticals are distinguished by their short half- and shelf-lives. They cannot be pre-produced and stored, as each dose is filled with a specifically ordered amount of activity needed for one treatment. Once the dose is ready for dispatch, it begins losing its potency as time passes, which makes a sophisticated supply chain essential.

ITM is the globally leading producer of non-carrier-added (n.c.a.) Lutetium-177 (^{177}Lu), is the dominant medical isotope used in TRT. N.c.a. ^{177}Lu releases highly targeted medical radiation (ionising beta-radiation) with a maximum radius of 1.7 mm, which destroys tumour tissue while leaving healthy surrounding tissue minimally affected. ITM's n.c.a. ^{177}Lu has a high level of purity, which cuts storage and logistical costs otherwise associated with handling contaminated waste. It also enables its global use in areas adhering to strict radiation protection regulations.

Numerous steps have to be coordinated in order for ITM to obtain n.c.a. ^{177}Lu for cancer treatment.

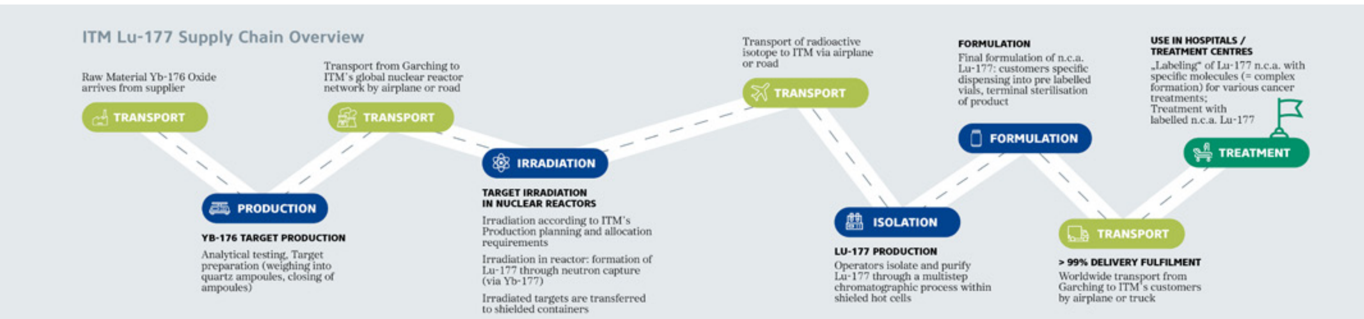
At ITM's IAZ production facility in Garching near Munich, Germany, heavy metal ytterbium-176 (^{176}Yb), is filled as an oxide into quartz ampoules and treated with helium gas. From there, the vials are transported to a nuclear reactor, where a small amount of ^{177}Lu is formed from the ^{176}Yb by neutron irradiation. The vial with the resulting ^{177}Lu, which has a half-life of just under a week, must be transported back to one of ITM's production facilities, where it is isolated, purified and formulated into the final product: highly pure n.c.a. ^{177}Lu and shipped as quickly as possible to its destination.

Delivering on Rising Demand: The World's Largest Lutetium-177 Production Facility

Having successfully mastered the production of superior grade n.c.a. ^{177}Lu, ITM is working on addressing the growing demand for radioisotopes by proactively expanding its manufacturing and supply capacities.

As such, ITM opened the world's largest Lutetium-177 production facility. The new site, NOVA, is located in Neufahrn, near Munich, and will operate at an industry 4.0 technical level, covering around 7,000 m2 and featuring a high degree of automation in the production process and internal logistics. Its connection to Munich Airport will enable the prompt dispatch of isotopes and radiopharmaceuticals worldwide (~24-48 hours within Europe and a ~72 hours for the rest of the world).

Importantly, NOVA increases ITM supply capacity tenfold, not only for its partners and global supply network but also for its own pipeline.



Source: ITM Isotope Technologies Munich SE

Delivering Value for Patients: ITM's Radiopharmaceutical Pipeline

ITM is as committed to expanding its production capacities as it is to advancing its proprietary TRT pipeline and clinical studies by combining its radioisotopes with targeting molecules capable of addressing a broad range of tumours.

The company is validating its approach with its lead candidate, ITM-11 (n.c.a. ^{177}Lu-edotreotide) in two Phase III clinical trials, COMPETE and COMPOSE, by evaluating its efficacy, safety, and patient-reported outcomes compared to standard therapy in patients with gastroenteropancreatic neuroendocrine tumours (GEP-NETs).

The company is expanding its pipeline to address cancer indications with a high unmet need, including its novel phase 1 candidate for the treatment of prostate cancer, glioblastoma multiforme, and ovarian cancer.
Dosimetry is an important part of radiopharmaceutical clinical development. For example, in the COMPETE trial, dosimetry measurements were obtained for all the patients in the ITM-11 treatment arm (200 patients) in order to potentially assess the association between absorbed dose and response to treatment.

A Path Forward

With its ability to selectively destroy cancer cells and even bulky tumours while giving patients an improved quality of life during treatment, TRT holds great promise. Increasing global production measures, expanding the use of TRT across indications, and exploring the potential of new radioisotopes such as Actinium-225 and Terbium-161 will be essential to serving a growing patient population.

TRT is ushering in a new era of precision oncology, and ITM is dedicated to ensuring its supply, production, and pipeline capabilities are ready to meet the challenge of providing new therapeutic approaches to patients with cancer who otherwise have limited options.

Steffen Schuster, the CEO of ITM, transitioned the company from operating purely as a radioisotope manufacturer/supplier to a global radiopharmaceutical company developing its own pipeline of first-class radioisotopes for use in precision oncology. He has led critical strategic partnerships, secured notable financing, and established new sites in Germany, China, and America.

COMPANY MEMBER ARTICLE

On the Horizon of Theranostics

GE HealthCare

Why Theranostics?

Theranostics is the combination of specific, targeted diagnostic radiopharmaceuticals followed by a targeted therapeutic treatment. This combination allows for diagnosis, treatment, and monitoring of disease progression using patient-centred personalised medicine. These emerging procedures use tumour-specific compounds tagged with an isotope to find and diagnose the disease. These tagged compounds bind to specific tumour cell receptors. Once the tumour sites are identified, targeted therapeutic doses of radioisotopes are introduced to kill the cells.

Why are Theranostics important?

In 2020, approximately 1.8 million individuals were diagnosed with invasive cancer in the US [1]. Patients with metastatic prostate cancer have less than a 1 in 6 chance of surviving five years. These patients need new treatment options [2]. Theranostics offers the right treatment for the right patient, at the right time, with the right dose, providing a more targeted, efficient pharmacotherapy [3]. Theranostics can improve patient outcomes for later-stage disease that is resistant to other treatments, therefore improving outcomes and quality of life [4].

Dosimetry and Quantitation

Dosimetry offers specific patient information that is used to optimise treatment for each patient. Personalised dosimetry can deliver therapeutically effective absorbed doses to tumors while keeping doses to organs at risk below the threshold levels for adverse effects [5]. The safety and efficacy of targeted radionuclide therapies can be improved with patient-specific dosimetry, which may guide successful tumour dosing and act as an early indicator of organ toxicity [6].

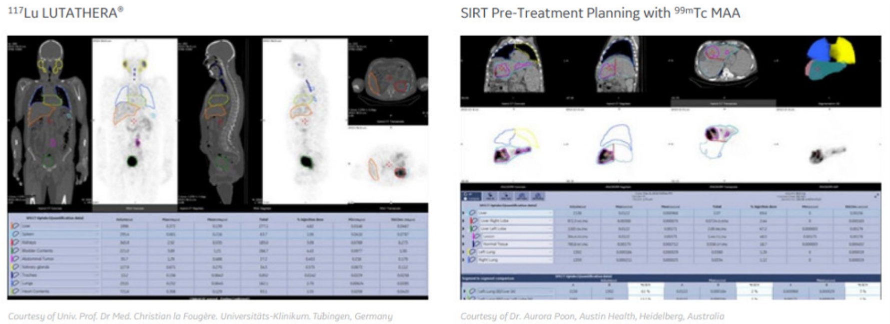


Figure 1. Q.Volumetrix AI software platform for quantification of 117Lu LUTATHERA® SIRT Pre-Treatment Planning with 99mTc MAA – Images Courtesy of Univ. Prof. Dr Med. Christian la Fougère. Universitäts-Klinikum. Tübingen, Germany and Dr. Aurora Poon, Austin Health, Heidelberg, Australia

SPECT/CT & Theranostics

Visualisation of potential targets can help predict if a patient will benefit from a particular treatment [7]. Imaging is pivotal in the evaluation of activity distribution and the calculation of dose distribution [4]. SPECT data (when compared to planar imaging) can avoid issues of superimposed activity and allow estimates to be made even in the presence of metastatic disease [6]. A majority of absorbed dose estimates are based on planar imaging, which is known to have inherent limitations regarding the accuracy of activity quantitation. As a result, an increasing number of clinical dosimetry protocols currently include SPECT/CT due to its superior accuracy [8]. State-of-the-art SPECT/CT systems are able to provide accurate estimates of in vivo radioactivity for use in biodistribution and radionuclide dosimetry calculations [9].

Indication	Diagnosis, Assessment, Pre-treatment	Treatment	Follow-Up Imaging
Thyroid cancer Hyperthyroidism	^{123}I or ^{131}I	^{131}I ablation	^{123}I or ^{131}I
Metastatic Neuroblastomas Pheochromocytomas Paragangliomas Medullary thyroid cancer	^{123}I MIBG	^{131}I MIBG	^{131}I MIBG
Neuroendocrine tumors	^{68}Ga or ^{64}Cu dotatate	^{117}Lu LUTATHERA®	^{177}Lu scan ^{68}Ga or ^{64}Cu dotatate
Neuroendocrine tumors	^{111}In octreotide	^{117}Lu LUTATHERA®	^{177}Lu scan and/or ^{111}In octreotide
Hepatocellular Carcinoma	^{99m}Tc MAA shunting study	^{90}Y spheres	Bremsstrahlung scan
Bone metastases from prostate cancer	^{99m}Tc MDP Bone scan	^{223}Ra Xofigo®	Follow-up scans

Figure 2. Theranostic applications

How can Theranostics impact your clinical practice?

Earlier detection leads to improved patient outcomes, which leads to improved patient satisfaction. When identified early, cancer is more likely to respond to treatment and can result in a greater probability of survival and less morbidity, as well as less expensive treatment [10]. One of the big implications for patient care is that theranostics represents a transition from conventional medicine to personalised medicine. Theranostics plays a significant economic role, resulting in costeffective treatment plans and highly efficient and specific protocols [11]. Imaging in theranostics typically involves multi-day and multiFOV SPECT/CT exams, all of which fall under CPT code 78832, one of the nuclear medicine CPT codes with the highest available reimbursement [12].

On the Horizon

Theranostic compounds are likely to impact many cancers in the near future, not only in terms of quality of life but also in terms of survival [1]. Theranostics have unprecedented value in diagnosing and treating cancer. Many novel theranostics are under development and expected to enter clinical trials and care in the near future [13]. Key factors that are driving market growth include increased applications of nuclear medicine in diagnosis, imaging, and treatment. There is a growing need for early and accurate diagnosis and an increased number of research studies pertaining to radiopharmaceuticals for the treatment and diagnosis of bone, respiratory, and digestive tract diseases [14]. Theranostics can be described as "P4 medicine," meaning that it is predictive, preventive, personalised, and participatory. It all adds up to better clinical care, with the promise of further developments to come [15].

Radiotherapeutics represented 20% of the global nuclear medicine market in 2019 and are expected to reach ~70% by 2030 [16]. The global nuclear medicine market was valued at $6.4 billion in 2016 and is expected to exhibit a growth rate of 10.1% per year over the forecast period (2018-2025) [16]. The market is expected to reach $30 billion in 2030 [16].

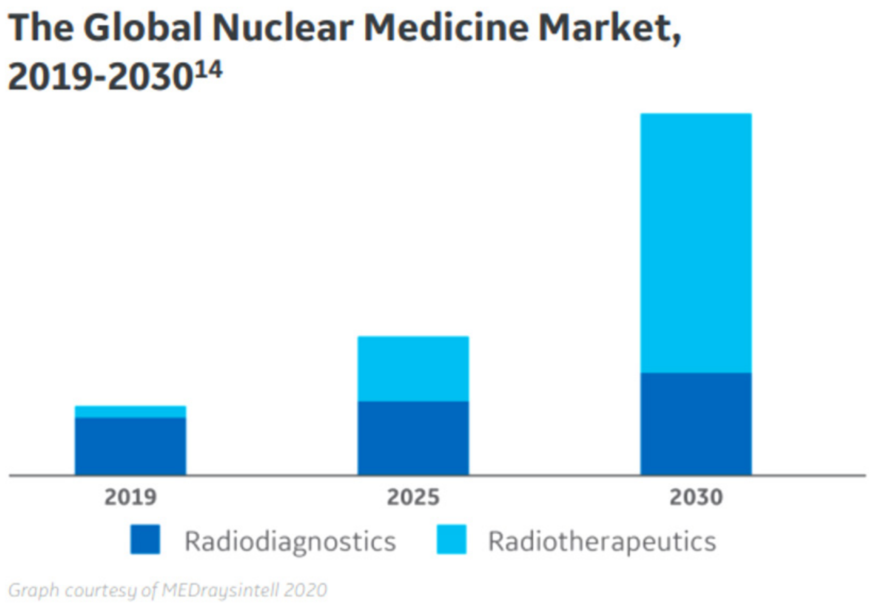


Figure 3. The Global Nuclear Medicine Market, 2019-2030

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Courtesy of Univ. Prof. Dr Med. Christian la Fougère. Universitäts-Klinikum. Tübingen, Germany Courtesy of Dr. Aurora Poon, Austin Health, Heidelberg, Australia

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COMPANY MEMBER ARTICLE

Hermia Voxel Dosimetry Brings Personalised Theranostics to Good Clinical Practice in Targeted Radionuclide Therapy

HERMES MEDICAL SOLUTIONS

The advancement of theranostic dosimetry software has experienced significant improvement in recent years. The implementation of our advanced dosimetry software has the potential to mitigate the additional labour associated with patient-specific dosimetry.

"Theranostic dosimetry software has progressed in leaps and bounds in recent years. Once the preserve of researchers with complicated spreadsheets requiring hours of processing time per patient, dosimetry can, and must, now enter the clinical mainstream. We owe it to the patients to optimise this powerful tool in the fight against cancer." Tom Francke, Assoc. Prof, CEO of Hermes Medical Solutions

Calculating a patient-specific dose means not only protecting the organs at risk but also delivering the maximum therapeutic radiation dose a patient can safely tolerate. Only by doing so can the treating physicians achieve the best outcome possible with a given radiopharmaceutical. Together with the EU requirements to perform dosimetry for radionuclide therapy [1-3] this provides strong motivation to perform personalised dosimetry for each patient. The extra labour involved with patient-specific dosimetry can be reduced with the help of our advanced dosimetry software.

Get started with accurate and fast quantitative reconstruction for all your existing SPECT/CT cameras

Hermia SUV SPECT Reconstruction is optimised for speed and works with a wide range of procedures, radiopharmaceuticals and collimators, making it possible to improve image quality while reducing activity and acquisition time with virtually any camera manufacturer. Reconstructed SPECT datasets have voxel units Bq/ml or SUV.

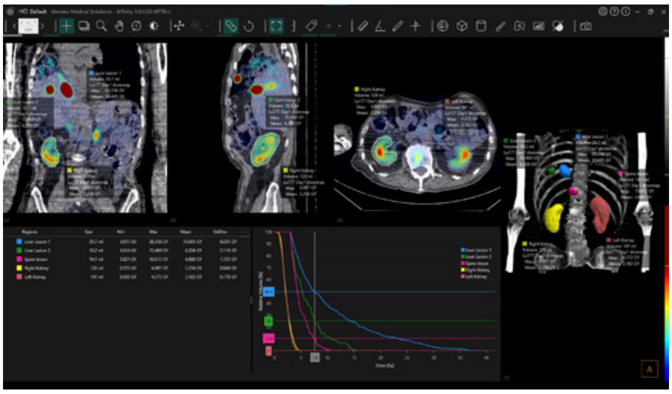
Together with attenuation and Monte Carlo-based scatter correction, our novel resolution recovery collimator correction achieves excellent image quality even for the most challenging radionuclides, including ^{131}I, ^{123}I, ^{90}Y, and ^{166}Ho. Septal penetration, Compton scattering, and photoelectric absorption in the collimator septa are modelled to produce the highest accuracy activity distribution for confident therapy dosimetry and follow-up [4].

Rely on ONE workflow to handle multiple time points from your existing PET and SPECT scanners and calculate absorbed dose distribution with a validated Monte Carlo algorithm

- Automatic alignment of multiple quantitative SPECT/CT or PET/CT time points
- The cumulative activity in each voxel is calculated, and a clinically validated and accurate Monte Carlo algorithm [5-9] simulates photon absorption and scatter through the patient's CT to calculate dose distribution over the entire field of view.
- After the dose simulation, the user can delineate volumes of interest (VOIs) using versatile manual drawing tools or automated methods. As a final step, the user can visualise the calculated total absorbed dose distribution, dose volume histograms, and a table of VOI statistics.
- Save simulated 3D voxel level dosemap as RTDOSE DICOM format with DICOM SEG or RTSRUCT format regions.

Speed up the process with single timepoint dosimetry

The Hänscheid method, effective half-life, and physical half-life assumptions are available to facilitate dosimetry from a single image time point, improving the patient experience and simplifying departmental logistics. The novel Hänscheid method calculates doses for Lu-177 PRRT and needs only one imaging time point, four- or five days post-therapy. Hänscheid and colleagues have validated their method vs. multiple timepoint imaging to within 90% accuracy [9].



Review of the results for each VOI with dose-volume histogram analysis and a 3D dose map in the Hermia software.

Plan and verify dose distribution with full flexibility in imaging and therapy radionuclides*

Hermia Voxel dosimetryTM is regulatory cleared in Europe, Canada and the US* for a wide range of therapy and imaging isotopes: ^{68}Ga; =Ho; ^{111}In; ^{123}I; ^{131}I; ^{177}Lu; ^{223}Ra; ^{99}mTc; ^{90}Y; ^{89}Zr; soon adding ^{225}Ac; ^{18}F; ^{124}I; ^{203}Pb; ^{212}Pb - and many more of your own isotopes for research purposes. Mapping from imaging to therapy isotopes enables a true theranostics approach for dose prediction for target volumes and organs at risk for best practice legislative compliance.

Review and share your dosimetry results efficiently

Dose-volume histogram analysis and 3D dose map are available to provide a detailed understanding of dose distribution in volumes of interest and facilitate communication with the referring physicians and patients. Dosemaps can be stored as DICOM for further and future analysis.

** Only intended for calculating doses for FDA-approved radiopharmaceuticals for any clinical purpose, and calculation of unapproved drugs can only be used for research purposes.*

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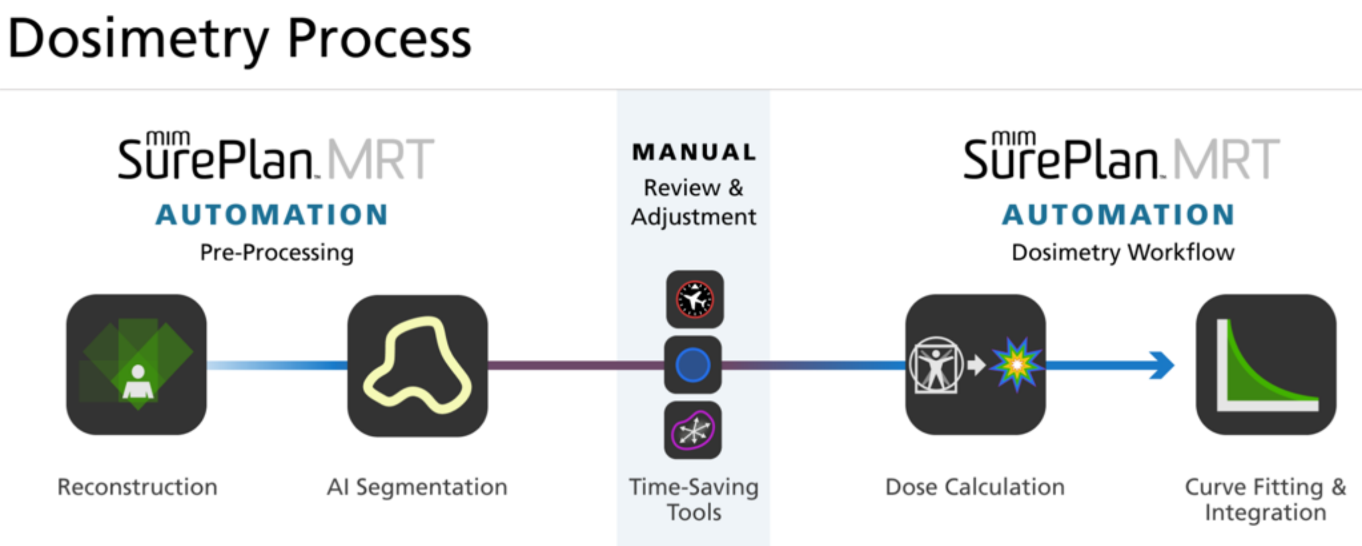
Dr Markus Diemling, Vice President Sales Europe, Global Director Product Management, Hermes Medical Solutions. Markus has been working with Hermes Medical Solutions since 2000 in various positions. Originally educated as a nuclear and medical physicist, Markus also holds a guest professorship at a University in Wiener Neustadt.

COMPANY MEMBER ARTICLE

How Will You Handle the Rise in MRT Patient Volumes?

With **MIM**, the dosimetry process can start without you having to do anything manually: quantitative SPECT reconstruction and organ segmentation are performed with zero clicks. With the newest update to our AI-based organ segmentations, you'll be able to spend significantly less time reviewing and adjusting.



MIM SurePlan MRT automates the entire dosimetry process from reconstruction to curve fitting and integration.

Novartis' Pluvicto (^{177}Lu-PSMA-617) received EMA approval in 2022 as a late line of defence against aggressive prostate cancer. Patients treated with Pluvicto were shown to live healthier for longer, on average. A supply shortage of the drug severely reduced access throughout much of 2023, but things are improving, and the upward trajectory of Pluvicto and similar PSMA-targeted therapies seems unstoppable. Both the PSMAfore and PSMAddition trials investigate the use of the drug in earlier-stage metastatic prostate cancers, potentially opening access to a vast population of patients.

If your NM department's staffing remains constant, an increase in the number of potential PSMA-targeted therapies will require rationing, reduced care quality, or increased efficiency. MIM Software's goal is to help you increase efficiency while maintaining or even increasing the quality of your care.

Quantitative Theranostics Made Easy

We are believers in the idea that patient-specific treatment guided by radiation dosimetry is the future of molecular radiotherapies, including Pluvicto. Even today, dosimetry can help justify re-treatments or the treatment of high-risk patients. But traditional dosimetry techniques have had to make a trade-off between tedium and inaccuracy. With MIM SurePlan MRT™, you don't have to compromise.

With MIM, the dosimetry process can start without you having to do anything manually: quantitative SPECT reconstruction and organ segmentation are performed with zero clicks. With the newest update to our AI-based organ segmentations, you'll be able to spend significantly less time reviewing and adjusting.

Tumour segmentation is another challenge, as Pluvicto patients can have over 100 tumours. Enter LesionID® Pro*, a brand-new AI-powered tool that can quickly segment all of those tumours on either PET or SPECT. Simply do a quick review and click to accept. In a published study, two experienced PSMA PET readers were able to reduce their contouring time by 45% with LesionID Pro for patients with exceptionally high tumour burdens (average total tumour burden was >1000 mL for 23 PET/CT scans) [1]. In addition, LesionID Pro automatically produced a Total Tumour Burden SUVmean within 0.5 SUV of the physician-approved gold standard tumour segmentation on over 85% of scans with at least 100 mL of disease for a dataset of > 400 PSMA PET/T and SPECT/CT scans [2]. This easy tumour segmentation can be useful for dosimetry, treatment response quantification, and discordance analysis between pre-therapy PSMA and FDG PET/CTs. The rest of the dosimetry process is automated, as is treatment response quantification. All this information can be packaged in a streamlined interface that can be sent to your physician for review.

Automation as a Tool

In the end, all this automation is just a tool. It's still your work, and you have plenty of opportunities to interact with the process or customise the automation. But current patient volumes won't stay constant, and getting ready to automate now will ensure you're ready for the increase.

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David Mirando is a Product Manager at MIM Software. David has worked on many dosimetry-related projects throughout his career. His deep technical knowledge has made him an invaluable resource for MIM Software's efforts to reduce the burden of patient-specific dosimetry and advance clinical dosimetry through automation and standardisation.

COMPANY MEMBER ARTICLE

VOXIMETRY

Advanced Dosimetry Software Will Move RPT to a New Era of Imaging Biomarker Guidance and Improved Patient Outcomes - If Only We Embrace It!

Leading the pursuit of an easy-to-access, accurate biomarker for RPT, Torch® Dose Assessment software from Voximetry provides lightning-fast, extremely accurate Monte Carlo absorbed dose assessments based on patient-specific imaging inputs.

Patients are individuals and have varying pharmacokinetics and radiation-absorbed doses (ADs) from radiopharmaceutical therapies. The most sophisticated AD analyses include Monte Carlo estimates on a voxel basis. Leading the pursuit of an easy-to-access, accurate biomarker for RPT, Torch® Dose Assessment software from Voximetry provides lightning-fast, extremely accurate Monte Carlo absorbed dose assessments based on patient-specific imaging inputs. Torch provides a quantitative AD biomarker for tumours and Regions of Interest that have the potential to select only those patients who stand to benefit from RPT and to allow for treatment at safe and effective dose levels.

Benefits of Radiopharmaceutical Therapy (RPT)

A unique and beneficial characteristic of RPT is the possibility to quantify the radiation energy deposited in tumours and normal tissues for an individual patient based on the analysis of positron emission tomography (PET) or single photon emission tomography (SPECT) image data. This information can be used to tailor the amount of RPT for each patient for optimal outcomes while remaining at safe levels. From experience with external beam radiation therapy (EBRT), patient-specific prescriptions based on absorbed doses led to better patient outcomes [1-2].

Challenging the current paradigm

Today's standard of care (SOC) often involves administering the same activity to all patients, as shown in Table 1. Since patient pharmacokinetics vary, current therapies not based on dosimetry must systematically underdose a substantial number of patients.

Administered Activity	Cycles	Radionuclide
200 mCi		I-131 for thyroid therapy
200 mCi	x4	Y-90 DOTATATE for neuroendocrine tumors
200 mCi	x4	Lu-177 DOTATATE for neuroendocrine tumors
200 mCi	x6	Lu-177 PSMA for prostate cancers

Table 1: Common protocols for RPT treatments

There are now an increasing number of studies that show that standard dosing does not accurately consider interpatient variability. Notable examples include Sandström et al. [3], whose paper showed that the kidney absorbed dose of 177Lu-Dotatate patients varied over 4-fold based on the same administered activity, and Wahl et al. [4], where liver uptake per administered activity by 90Y-Zevalin® patients varied over 3-fold.

Personalisation can have a direct impact on survival, as noted by Garska-Román et al., [5] from their prospective study of 200 patients with neuroendocrine tumours – ***"Median overall survival (OS) was 43 months in all patients, 54 months in those in whom the absorbed dose to the kidneys reached 23 Gy, and 25 months in those in whom it did not"***. Similar promising results in survival were shown by Sundlöv et al. [6] in their work in 2022 with dosimetry-based 177Lu-DOTATATE treatment in NET patients, which led them to challenge the current paradigm… "Is it still justifiable to treat according to the currently approved, non-individualized regime?" These studies highlight the rising awareness fueling the debate around personalisation.

Dosimetry as an imaging biomarker

Advanced Dosimetry Guidance for RPT (DG-RPT) offers a real possibility of realising the full potential of RPT for personalised care [7]. DG-RPT uses patient-specific information to personalise the treatment and increase the therapeutic index for each patient. The dosimetry process itself is straightforward: after the acquisition of multi-timepoint images, the Integrated Time Activity in a region of interest (ROI) is modelled, and the absorbed dose to the ROI is calculated. By estimating the absorbed dose in these ROIs after each cycle of therapy, the physician can monitor the accumulated absorbed dose delivered to that region and potentially adjust the injected activity, the time between cycles, or the number of cycles, enabling the maximum tumour absorbed dose while staying below dose tolerance limits for the organs at risk.

Until recently, the dosimetry software available has been limited and cumbersome. Modern methods are proving to be more robust and easier to use, which may allow more dosimetry to be performed. Automation and AI, combined with improved quantitation and accuracy, will enable clinicians outside academia to adopt dosimetry systematically and use AD as a reliable biomarker for continuous monitoring of changing pharmacokinetics and tumour expression throughout the treatment.

Enabling routine clinical dosimetry with Torch®

Torch® Dose Assessment from Voximetry [8] is designed to bring dosimetry as an imaging biomarker to every clinic by focusing on getting the fundamentals right – easy-to-use software that provides patient-specific results underpinned by gold-standard accuracy.

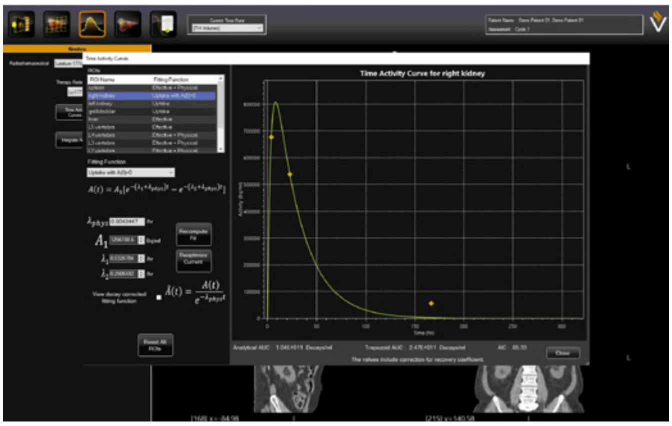

Figure 1 Patient Specific activity in Torch

Torch is the only Dosimetry Guided RPT software that incorporates patient-specific pharmacokinetics accounting for patient-specific density and geometry (Figure 1) and full Monte Carlo dose calculation (Figure 2) for all approved radiopharmaceuticals, including density correction at the voxel level without truncating radiation

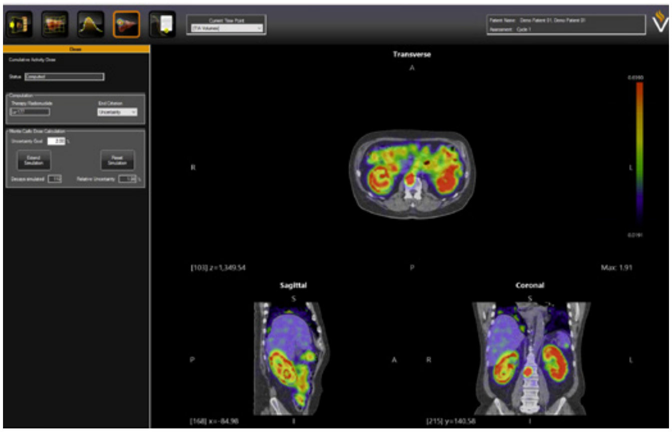

Figure 2 Monte Carlo dose map in Torch

transport. This compute-intensive calculation is accelerated to near real-time with lightning-fast GPU technology. A guided workflow (Figure 3) walks the user through each step along the assessment journey, making it easy even for the novice user.

Figure 3 Guided workflow in Torch

Torch is approved for clinical use in some markets and is rapidly expanding to new geographies. Continuous support from an increasing list of global collaborators will ensure that, beyond the growing range of capabilities, practicability and ease of use remain at the forefront of our priorities for making it an essential tool for routine clinical dosimetry.

References:

[1] Grégoire V, Guckenberger M, Haustermans K, et al., Image guidance in radiation therapy for better cure of cancer. Mol Oncol. 2020;14:1470-1491. DOI: https://pubmed.ncbi.nlm.nih.gov/32536001/

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[5] Garske-Román, Sandström, Fröss Baron et al. Prospective observational study of 177Lu-DOTA-octreotate therapy in 200 patients with advanced metastasized neuroendocrine tumours (NETs): feasibility and impact of a dosimetry-guided study protocol on outcome and toxicity. Eur J Nucl Med Mol Imaging (2018) 45:970–988. DOI: 10.1007/s00259-018-3945-z

[6] Sundlöv et al. Phase II trial demonstrates the efficacy and safety of individualized, dosimetry-based ^{177}Lu-DOTATATE treatment of NET patients. Eur J Nucl Med Mol Imaging (2022) 49:3830–3840 https://link.springer.com/article/10.1007/s00259-022-05786-w

[7] Xiao et al. Toward Individualized Voxel-Level Dosimetry for Radiopharmaceutical Therapy. Int. J Rad Onc Biol Phys (2021), 109:4 DOI: 10.1016/j.ijrobp.2020.08.026

[8] Grudzinski et al. GPU-Accelerated Full Monte Carlo Affords Accurate Voxel-Based Dosimetry for Radiopharmaceutical Therapy. J of Nuclear Medicine (2023), June 1, 64 (supplement 1), 989 https://jnm.snmjournals.org/content/64/supplement_1/P989

Abhi Chakrabarti, PhD, is the Chief Operating Officer at Voximetry. With over 25 years' experience in Philips Healthcare, Elekta and Radionics he has held multiple leadership positions in support, training, sales, marketing and product management in the areas of functional neurosurgery, stereotactic radiosurgery, and treatment planning.

ESMPE

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 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.

The school 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.

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

Registration Online registration is open www.efomp.org

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Upcoming Conferences and Educational Activities

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

Jan 1st, 2023 - Oct 31st, 2023
European School for Medical Physics Experts (ESMPE) | Artificial Intelligence in Medical Physics 2023
Prague, Czech Republic and online

Mar 17th, 2023 - Oct 15th, 2023
SynthRAD2023 Grand Challenge announcement
The Netherlands

Aug 28th, 2023 - Oct 16th, 2023
EUTEMPE: Undertaking and understanding quantitative measurements in digital radiography
Guildford, UK or Online only

Aug 28th, 2023 - Sep 22nd, 2023
5th Summer School in Medical Physics 2023: Data Science and Machine Learning in Radiotherapy
Online or online& on site in Heidelberg/ Germany

Sep 5th, 2023 - Dec 12th, 2023
EuroSafe Imaging 2023 webinar series in collaboration with the European School of Radiology (ESOR)
On-line

Sep 21st, 2023 - Sep 23rd, 2023
Data Analysis with Python for Medical Physicists
Online

Sep 26th, 2023 - Sep 28th, 2023
Targeted Radiopharmaceuticals Manufacturing and Supply Chain Summit
Hilton Boston Back Bay 40 Dalton St, Boston, MA 02115, United States

Sep 27th, 2023 - Sep 30th, 2023
54. Jahrestagung der Deutschen Gesellschaft für Medizinische Physik
Magdeburg, Germany

Oct 4th, 2023 - Oct 7th, 2023
ESMRMB Congress 2023
Basel, Switzerland

Oct 9th, 2023 - Nov 25th, 2023
Courses in the Field of Particle Therapy 2023
Online only OR online & in Heidelberg / Germany

Oct 9th, 2023 - Oct 13th, 2023
European Radiation Protection Week 2023
University College Dublin, Ireland

Oct 16th, 2023 - Dec 15th, 2023
EHybrid Summer School in Medical Physics 2023 in Chile: The role of imaging in the radiotherapy process
Online only OR online & in Santiago de Chile

Oct 19th, 2023 - Oct 22nd, 2023
Joint EFOMP/EURADOS dosimetry school and 11th Alpe Adria Medical Physics Meeting
Novi Sad, Serbia

Nov 2nd, 2023 - Nov 5th, 2023
34th Annual Congress of the Romanian Society for Radiotherapy and Medical Oncology / 9th National Congress of the Romanian Cancer Societies Federation | "From Research to Daily Clinical Practice - Sharing Experience"
Cluj-Napoca, Romania

Nov 9th, 2023 - Nov 10th, 2023
6th Proton Physics Research and Implementation Group (PPRIG) workshop
Teddington, United Kingdom

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**

Nov 9th, 2023 - Nov 11th, 2023
16th International Conference & Workshop "Medical Physics in the Baltic States 2023"
Kaunas University of Technology, Kaunas

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

Nov 13th – Nov 15th, 2023
EUTEMPE-RX
MP06: The development of advanced QA protocols for testing radiological devices
Luven, Belgium

Nov 15th, 2023
New for 2023: Oesophagus Masterclass
Holiday Inn Manchester City Centre, 25 Aytoun Street, Manchester, M1 3DT

Nov 20th, 2023 - Nov 24th, 2023
Joint ICTP-IAEA Workshop on Artificial Intelligence in Ionizing Radiation for Medical Physicists
Trieste, Italy

Dec 6th, 2023 - Dec 9th, 2023
International Conference on Medical Physics - 2023 (ICMP-2023)
Mumbai, India

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

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

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

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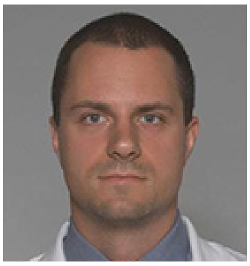

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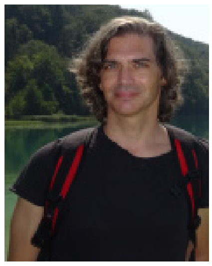

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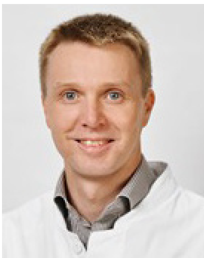

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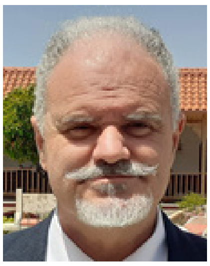

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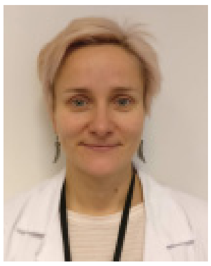

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EFOMP
P.O. Box 8003
3503 RA Utrecht
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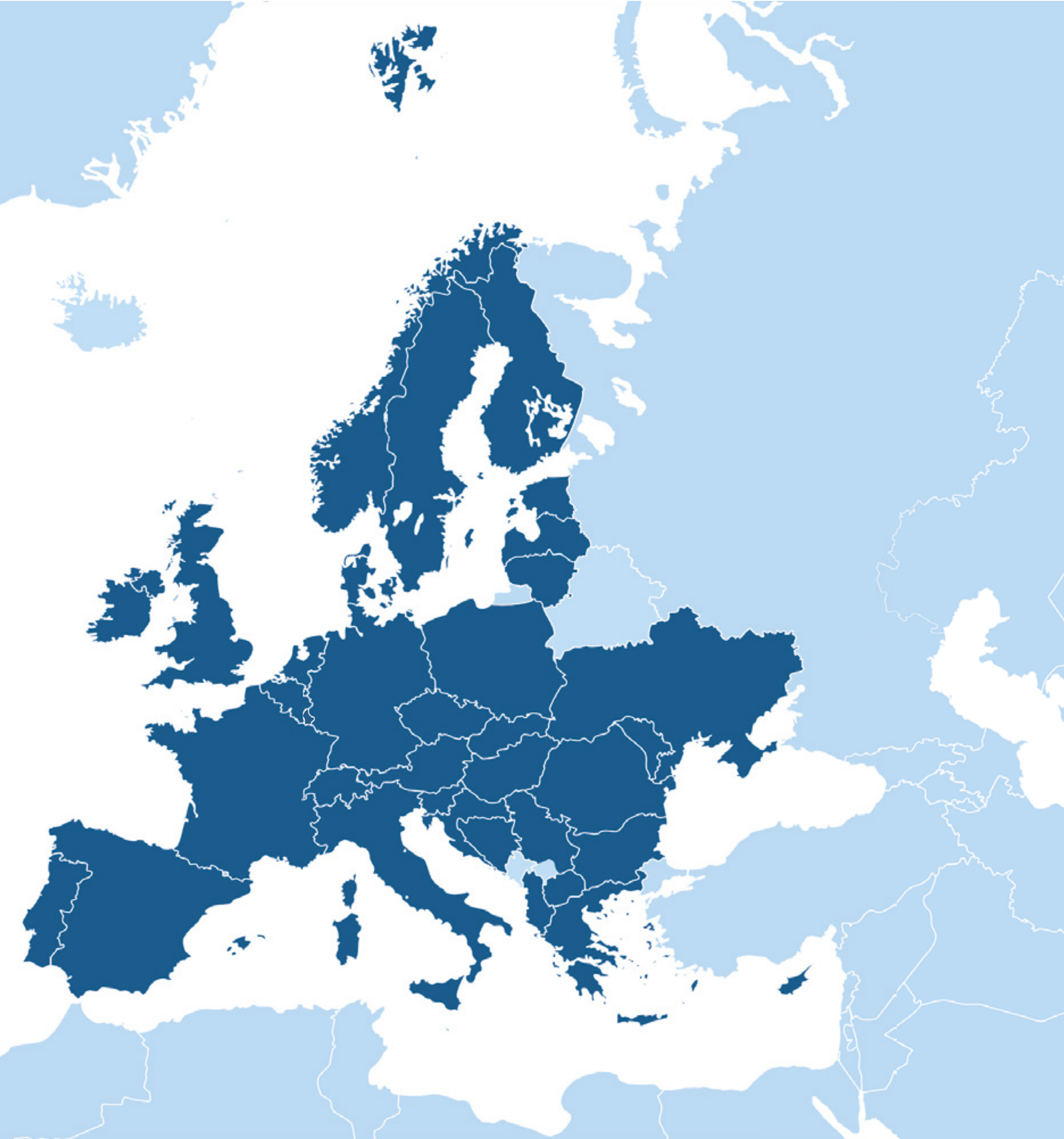

EFOMP

EUROPEAN FEDERATION
OF ORGANIZATIONS
FOR MEDICAL PHYSICS

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

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

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