ECMP 2018 welcomes Germany

23 - 25 August 2018
Copenhagen · Denmark

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European Medical Physics News
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THE EUROPEAN MEDICAL PHYSICS NEWS A BIANNUAL PUBLICATION OF THE EUROPEAN FEDERATION OF MEDICAL PHYSICS ORGANIZATIONS
December 2017

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Dear Readers,

As edited by EFOMP’s Communications and Publications Committee, here is your copy of EMP News, Autumn Issue. This follows the Summer Issue published on last August this year.

Announcements and reports for conferences and congresses find their place in EMP News, and I encourage to send us such articles (pubcommittee@efomp.org).

This issue of EMP News is opened by an article (on page 4) by EFOMP President, Prof. John Damilakis, who illustrates the aim and structure of EEB, the recently established EFOMP Examination Board for facilitating “… the harmonization of Medical Physics education and training standards throughout Europe”.

On page 7, Efi Koutsouveli, EFOMP Internet Manager and member of the editorial board of EMP News, describes the new EFOMP website, inaugurated on last September, as well as the new outline of EFOMP presence in the social media (LinkedIn, Twitter, Facebook).

Marco Brambilla, EFOMP Vice President, in his article on page 10 introduces the 2nd European congress of medical physics (ECMP), to be held in Copenhagen (Denmark) from 23 to 25 August, 2018. On page 13, Jens Edmund, Chairperson of the Local Organizing Committee of ECMP2018, shows the organization of the Congress and invites us to meet in Copenhagen on next August, for this important scientific meeting of the international community of medical physicists.

A brief report of the last EFOMP Council meeting (hosted by IPEM in York, UK, on 10-12 September 2017) is provided by Fiona McKeown, EFOMP Company Secretary, in her nice article on page 17.

If you have such a news you want to share with your international colleagues, please send your short article (600 words, plus a 50-word bio and your photo to pubcommittee@efomp.org). Both solicited and unsolicited articles will be hosted in EMP News, upon decision by the Editorial Board.

The Editorial Board of EMP News hopes you will find this Issue of your interest!

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Paolo Russo & Your editorial team (pubcommittee@efomp.org)

European Medical Physics News, Autumn 2017
EFOMP’s Examination Board (EEB) has been established to facilitate the harmonization of Medical Physics education and training standards throughout Europe. EEB has introduced the European Diploma of Medical Physics (EDMP) and the European Attestation Certificate to those Medical Physicists that have reached the Medical Physics Expert level (EACMPE). EEB examinations are tests of excellence in Medical Physics. They are designed to assess the knowledge, skills and competences requisite for the delivery of high standard Medical Physics services.

Currently medical physicists in European countries face difficulties in providing the necessary qualification evidence when they seek employment in other EU Member States or other countries. The EDMP will facilitate mobility of medical physicists in Europe and beyond. Furthermore, EEB provides an attestation certificate to those medical physicists that have reached the Medical Physics Expert level to be recognized by the relevant competent authorities of the EU according to the EU Directive 2013/59/EURATOM laying down the basic safety standards for protection against the dangers arising from exposure to ionising radiation (EU BSS). EEB examinations are voluntary. EEB diplomas will not replace any national certificates. However, they will be a common European qualification for medical physicists and will help to standardise training and expertise in Medical Physics across Europe.

All Medical Physicists certified in one or more sub-disciplines of Medical Physics (diagnostic and interventional radiology, nuclear medicine and/or radiation oncology) by a national competent authority are eligible to sit for the EDMP exams. All Medical Physicists certified in one or more sub-disciplines of Medical Physics (diagnostic and interventional radiology, nuclear medicine and/or radiation oncology) by a national competent authority and have at least full time 2 years equivalent of advanced, structured experience and continuous professional development (CPD) are eligible to sit for the EACMPE exams. Eligibility criteria for non-certified medical physicists as well as detailed information about EDMP and EACMPE required documents, examination structure, fees etc can be found at EEB structure.

EFOMP and the three main clinical societies concerned with the application of radiation to medicine, namely the European Society of Therapeutic Radiation Oncology (ESTRO), the European Society of Radiology (ESR) and the European Association of Nuclear Medicine (EANM) have agreed on the syllabi for the training and education of
medical physicists. Moreover, the European Commission has published the European Guidelines on Medical Physics Expert (MPE), Radiation Protection 174, which specifies the requirements for an individual to be recognised as an MPE by the relevant national competent authorities. EEB exams are based in these documents that can be found at the EEB website https://www.efomp.org/index.php?r=fc&id=eeb-documents.

The 1st EEB exams in the field of 'Diagnostic and Interventional Radiology' were organized successfully in Prague, Czech Republic, on the 6th and 7th of July, 2017. Twenty one (21) applications were submitted by the deadline. The number of eligible applications were 18 i.e. 14 for the EACMPE and 4 for the EDMP. Nine (9) candidates passed the EACMPE exams and three (3) candidates passed the EDMP exams. The 2nd EEB exams in all 3 sub-fields of Medical Physics (Diagnostic and Interventional Radiology, Nuclear Medicine, Radiation Oncology) will be held in Copenhagen before the European Congress of Medical Physics (August 2018).

EFOMP will grant all EDMP and EACMPE applicants registered in the European Congress of Medical Physics (ECMP) 2018 (Copenhagen, August 23-25, 2018) a 20% discount on the normal fee. Applicants registered in the Congress must submit proof of registration together with their application form.

John Damilakis
EFOMP President

John Damilakis is full professor and chairman at the Faculty of Medicine of the University of Crete and director of the Medical Physics department of the University Hospital of Heraklion, Crete, Greece. He is coordinator or an active research member of several European projects. He has more than 200 publications concerning research topics of embryo/fetal dosimetry, CT dosimetry and medical radiation protection. He has been awarded several Prizes in recognition of his work in the field of Medical Physics.
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New EFOMP website and social media accounts

The Company website serves as one of the organisation’s main communication channel to share information about its scientific, educational, professional activities and to facilitate the exchange of knowledge between the organisation and the affiliated international societies. There was a need for a professional, modern, visual appealing, simple, functional, content-rich online presence that would enhance the organisation’s image. A brand new website was created in cooperation among EFOMP’s Communications -Publications Committee and Dr. Christos Alexakos, Computer engineer, and was launched on the 4th of September 2017.

In the EFOMP new website all the content is accessible from the Home Page that is the most visited page of a website (Fig1). The Main menu is located on the top of the page and it is separated in 7 sections: EFOMP, Science, Education, Publications, Professional Matters, EU & International Matters, Contact information. The subsections comprise information on EFOMP structure and National Members Organisations (NMOs), the event calendar - where activities organised by NMOs and affiliated societies are hosted, career opportunities, medical physicist training, Memoranda of understanding and special subsections devoted to the European School for Medical Physics Experts and the European Examination Board. Under the main menu an animated banner links to important activities of EFOMP. The content of the banner will be periodically updated. On the right top of the page, the second layer menu contains 4 sections with information for the Companies, Public, Media and the EFOMP manual. Both menus are presented in all the pages of the website. On the top right section of the page there are links to EFOMP social media accounts (Facebook, LinkedIn and Twitter) and on the left icons/boxes with EFOMP main activities drive the user to the relevant content of these sections & subsections. In the middle, EFOMP most important news are placed in 3 separated columns and below there is a list of the latest announcements. On the right middle, Company members are displayed. The website is easy to
use and accessible from both desktop and mobile devices (smartphones and tablets).

EFOMP has also a presence on social and professional networking with a Facebook, Twitter and LinkedIn account (Fig2). Social media provide the organization with tools to liaise with the NMOs and affiliated societies, to interact with colleagues and to rapidly share and access important announcements. All EFOMP digital channels are linked together and through these channels EFOMP activities are being constantly presented; the European Examination Board (EEB), the European School for Medical Physics Experts (ESMPE), the biennial European Congress of Medical Physics (ECMP), EFOMP publications (European Journal of Medical Physics, electronic European Medical Physics News, Protocols, Policies, Guidelines) and EFOMP involvement in projects.

In Twitter, concise information combined with photos and videos are tweeted daily. Facebook is a place to post photos, updates, events and general news with those who follow or «like» the organisation. Although posts on the European Congress of Medical Physics Facebook page are mainly related to the upcoming congress in Copenhagen in August 2018, important EFOMP announcements, such as EEB examinations dates in all subspecialties, ESMPE future editions, publications in the European Journal of Medical Physics and EMPnews are also shared. In the Facebook page, followers will be able to also find all events that will be organised during the ECMP2018 and will take place at the Niels Bohr Institute (Fig3):

- Summer school on imaging modalities in Medical Physics
- ESMPE general: Statistics in Medical Physics
- ESMPE_RT: IMRT & VMAT planning in practice (endorsed by ESTRO)
- ESMPE_NM: Fundamentals of Nuclear Medicine Dosimetry

Fig. 2: EFOMP Facebook and Twitter accounts

Fig. 3: Events during the ECMP2018
DR: Patient specific dosimetry for cardiac perfusion imaging

LinkedIn is designed for business and professionals and it is an important platform for developing relationships with companies, organisations and for exchanging job experience and scientific information (Fig.4).

The new website will continue to evolve, more features and services will be added and the public area will be enriched. The website along with the EFOMP social media accounts (LinkedIn, Twitter, Facebook), will further help the organisation to communicate the role of the medical physics profession, become a reliable source of scientific research to a bigger audience, connect and engage with health professionals, scientists, companies, decision makers, trainees, students, and general public.

The feedback and contribution from all 34 National Member Organisations is valuable. You may visit EFOMP website and follow EFOMP social media accounts. Queries, comments, requests for upload should be addressed to:

Pubcommittee@efomp.org
Webmaster@efomp.org

EFOMP Website: www.efomp.org
LinkedIn: https://www.linkedin.com/company/efomp
Twitter: @EFOMP_org
Facebook: https://www.facebook.com/ECMP2018/

Detailed information about the European Congress of Medical Physics can be found at ECMP2018 Website: www.ecmp2018.org

Fig. 4: EFOMP LinkedIn company page

EFOMP Internet manager
Medical Physicist, Hygeia hospital
Athens, Greece
The planning process for the scientific program of the 2nd ECMP has started! The program will have a number of sessions related to the scientific, professional and educational activities of our profession. Specifically, the program will include a) Refresher Courses (1-2 invited talks, total duration 60 minutes), b) Scientific Sessions (1-2 invited talks + oral presentations, total duration 90 minutes), c) Joint Sessions (for example joined EFOMP/COCIR meeting, 3 invited talks, 60 minutes), and d) Industry-supported Symposia (60 minutes during lunch break).

The complete program for the RCS has been published on ECMP 2018 website. Overall, there will be 12 RCs in four parallel sessions from 8.00-9.00 each day of the congress. The topics selected will cover all the spectrum of medical physics activities. The venue of ECMP2018 will be the H.C. Ørsted Institute which is part of the greater Niels Bohr Institute of Copenhagen University in the beautiful city of Copenhagen.

Radiotherapy Track - ECMP welcomes Germany
Risk management in Radiotherapy – 23 August
Moderator: Prof. Katia Parodi - LMU-University of Munchen -Germany
Lecturers: Dr. Uwe Wolff, AKH Vienna, Austria and Prof. Markus Buchgeister, Beuth University of Applied Sciences Berlin, Germany
Learning objectives: Understanding the role and chances for medical physicists in designing and performing risk management in radiotherapy. Practical examples of risk analysis will illustrate methods employed like FMEA and FTA.

Radiotherapy Track
Proton radiotherapy planning – 23 August
Moderator: Ass. Prof. Jens Edmund - Niels Bohr Institute, Copenhagen University, Denmark.
Lecturer: Marco Schwartz, Trento Hospital, Italy
Learning objectives: To introduce the audience to the treatment planning techniques and procedures used in proton therapy. Methods to address uncertainties in proton therapy and uncertainty mitigation to generate robust treatment plans will be presented.
Radiotherapy Track

Motion management: from imaging to treatment and viceversa – 24 August
Moderator: Dr. Pawel Kukolowicz - Institute of Oncology, Warsaw, Poland
Lecturers: Dr. Marianne Aznar, University of Oxford, United Kingdom and Dr. Jan Jakob Sonke, NKI - Netherlands Cancer Institute, Amsterdam - The Netherlands

*Learning objectives.* To discuss the needs of radiation treatment for mobile targets. To know the state of the art of clinically applied motion management techniques. To become familiar with imaging methods and techniques that fulfill RT requirements.

Radiotherapy Track

The future of personalised radiotherapy from a radiobiological perspective— 24 August
Moderator: Dr Lidia Strigari - National Cancer Institute. Regina Elena, Rome, Italy
Lecturers: Prof. Loredana Marcu - Oradea University, Romania and Dr. Iuliana Toma-Dasu - Karolinska Institutet, Sweden.

*Learning objectives.* To revisit the radiobiology behind radiotherapy looking at factors that contribute to personalised therapy (hypoxia, cancer stem cells, cellular phenotype, cell kinetics, etc) using tools such as radiomics and mathematical/computational modelling.

Radiotherapy Track

Dose painting: Why and how – 25 August
Moderator: Prof. Brendan McClean- Saint Luke's Hospital, Dublin. Ireland
Lecturers: Prof. Ivan Vogelius, Rigshospitalet - Copenhagen - Denmark, and Prof. Daniela Torwarth University of Tubingen – Germany.

*Learning objectives.* Understand the rationale behind dose painting strategies currently tested in clinical trials. Obtain knowledge of quality assurance issues pertaining to non-uniform dose prescription situations.

Radiotherapy Track

Fundamentals on radiomics– 25 August
Moderator: Prof. Kari Tanderup - Aarhus University, Denmark
Lecturers: Dr. Koen Van Leemput, DTU-Technical University of Denmark, Copenhagen, Denmark, and Dr Philippe Lambin, Maastricht University, The Netherlands.

*Learning objectives.* To understand basic principles of image analysis involving multidimensional data; The impact of radiomic on personalized radiotetaapy

Nuclear Medicine Track

Clinical alpha-particle dosimetry: What do we do and what should we do?– 23 August
Moderator: Dr. Manuel Bardiès- INSERM -Toulouse – France.
Lecturers: Prof. Stig Palm, Goteborg University, Sweden, and Dr. Marta Cremonesi Istituto Europeo di Oncologia, Milan, Italy.

*Learning objectives.* Understand the principles of alpha-particle dosimetry. Obtain knowledge on how to calibrate the gamma cameras to perform alpha-particle dosimetry

Nuclear Medicine Track

Quantitative molecular imaging : can we trust the SUV? – 24 August
Moderator: Dr. Marco Brambilla- University Hospital of Novara – Italy
Lecturers: Dr. Ronald Boellaard, University Medical Centre Groningen, The Netherlands

*Learning objectives:* To understand the metrics used in quantification and their limitations; to learn about their application as a prognostic factor and in radiation therapy.
Diffusion-Weighted MRI: Techniques, applications and challenges in Oncology—23 August
Moderator: Prof. Lars Hanson- Technical University of Denmark, Copenhagen, Denmark
Lecturers: Prof. David Lurie, School of Medicine, Medical Sciences & Nutrition College of Life Sciences & Medicine University of Aberdeen, Scotland, UK and dr. Gisela Hagberg, Max Planck Institute for Biological Cybernetics, Tübingen, Germany
Learning objectives: To understand the basic principles of diffusion MRI. To learn about diffusion MRI pulse sequences used in oncology. To learn about diffusion MRI pulse sequences used in oncology. To describe the specific methodology needed to perform quality control for diffusion MRI.

Image quality in CT: From physical measurements to model observers—24 August
Moderator: Dr. Sue Edyvean- CRCE- Public Health England, Chilton, United Kingdom
Lecturers: Prof. Francis Verdun, University of Lausanne, Switzerland and dr. Irene Hernandez Giron, Leiden University Medical Center, The Netherlands
Learning objectives: To describe the paradigm shift in image quality assessment: from physical measurements to model observers. To explain how model observers works in practice.

Breast Tomosynthesis. Technology, quality controls and dosimetry—25 August
Moderator: Prof Magnus Bath- Sahlgrenska Universitetssjukhuset Goteborg, Sweden
Lecturers: Dr. Anders Tingberg, Skåne University Hospital. Malmo, Sweden and dr. Ioannis Sechopoulos, Radboud University Medical Centre, Nijmegen, The Netherlands
Learning objectives: To understand the physics, technology, QC and dosimetry of breast tomosynthesis.

Safety of Laser and electrosurgical units in healthcare—25 August
Moderator: Dr. Maurice Janssen- Zuyderland Medisch Centrum, Eindhoven, The Netherlands
Lecturers: Dr. Alex Rem, University Medical Center, Utrecht, The Netherlands and dr. Sanne Vaartjes, ZGT Hospital, The Netherlands
Learning objectives: To understand the technology and safety of Lasers and electrosurgical units in healthcare.

Marco Brambilla
President of ECMP 2018
Head of Medical Physics Dept. University Hospital
“Maggiore della Carità”, Novara, Italy.
The 2nd European congress of medical physics (ECMP) is picking up the torch from the 1st of its kind held in Athens, Greece in 2016. Although the name is the same, there are some notable differences between the Athens congress and the 2nd ECMP to take place August 23-25 2018 in Copenhagen, Denmark. The 1st ECMP marked a transition between the old format where EFOMP would typically tag along to a national organized conference and the new format where the congress itself is organized by EFOMP and hosted by a national member organization (NMO). The 2nd ECMP has finalized the implementation of this new format.

The idea of a European society having its own congress is not new and many of the scientific societies with which EFOMP shares a memorandum of understanding have had such congresses established for decades. Traditionally, medical physicists will attend the congress of the European society representing the clinical medical specialty within which they work, typically ESTRO (radiation oncology), EANM (nuclear medicine) or ECR (diagnostic and interventional radiology). Why, one could ask, do we need to add yet another congress to the many already existing ones? I believe a number of arguments for the ECMP can be put forward. First, although congresses such as ESTRO, EANM and ECR contain an element of physics, their main focus is clinical diagnosis and treatment of patients from a physician’s point of view. Medical physics will always be a secondary objective for congresses organized by clinical specialties. Second, many challenges in medical physics, e.g. image analysis or patient dose estimates, cross the borders between the different subspecialties and a common forum to share and discuss these matters from a physicist’s point of view on a European scale seems well justified (figure 1, left). Third, although EFOMP organizes multiple events such as the council meeting, officer’s meetings, the European School of Medical Physics, CPC = Congress Program Committee, LOC = Local Organization Committee, SC = Scientific Committee, PCO = Professional Congress Organizer, EFOMP = European Federation of Organizations for Medical Physics, NMO = National Member Organization.
Physics Experts (ESMPE) and, more recently, the examinations by the EFOMP Examination Board (EEB), there is no single event that provides an opportunity for all EFOMPs members to join together on a regular basis. Fourth, when (hopefully) well established and successful, the ECMP could provide some financial muscle to support many of the EFOMP scientific, educational and strategic initiatives to strengthen and improve medical physics in Europe and beyond.

**Fig. 2:** Week schedule for Scientific and social events. Scientific events in blue (top) and social events in orange (bottom). Summer school: The Niels Bohr Institute is organizing a summer school on Imaging Modalities in Medical Physics. EEB examinations: The EEB will organize examinations in all subspecialties (RT, NM and DR) in connection with ECMP. EFOMP will grant EEB applicants registered for the ECMP 2018 a 20% discount on the normal fee. Pre-meetings: 3 of the 4 CPD accredited pre-meeting are organized by the European School of Medical Physics Experts (ESMPE). ECMP Congress: The main event with educational, joint and scientific sessions.

**Fig. 3:** Social events. The figure shows photographs from the planned social events. (A) Past EFOMP president, Dr. Peter Sharp, resides in the original office of Niels Bohr at his institute. The site is part of the guided tours at the original institute. (B) The Main Ceremonial Halls of Copenhagen University central building. The halls contain large historical wall paintings and will be venue for the after-dinner congress party. (C1) The Copenhagen town hall where sport stars are celebrated (C2, 1992 European football Championship). The town hall reception will take place in main hall where traditional pancakes are served (C3).
The 2nd ECMP follow the new format which is mainly realized through two bodies; the congress program committee (CPC) and the local organizing committee (LOC). The EFOMP based CPC establishes a scientific committee and is responsible for the scientific program and abstract reviewing. The NMO based LOC establishes a congress secretary (typically in cooperation with a professional congress organizer) and is responsible for most practical issues related to the congress such as congress venue, website, sponsors, publication production and social events. For the 2nd ECMP, the Danish and Swedish NMOs have joined forces for this task and further (physically) placed their annual meetings in connection with the ECMP in 2018 to secure a maximum amount of attention and a minimum amount of participants from these countries. Several issues, e.g. electronic poster options and costs, have elements which fall under the responsibility of both the CPC and LOC, why EFOMP and NMO members are represented in both committees (figure 1, right).

**How the ECMP is organized.**

The 2nd ECMP follow the new format which is mainly realized through two bodies; the congress program committee (CPC) and the local organizing committee (LOC). The EFOMP based CPC establishes a scientific committee and is responsible for the scientific program and abstract reviewing. The NMO based LOC establishes a congress secretary (typically in cooperation with a professional congress organizer) and is responsible for most practical issues related to the congress such as congress venue, website, sponsors, publication production and social events. For the 2nd ECMP, the Danish and Swedish NMOs have joined forces for this task and further (physically) placed their annual meetings in connection with the ECMP in 2018 to secure a maximum amount of attention and a minimum amount of participants from these countries. Several issues, e.g. electronic poster options and costs, have elements which fall under the responsibility of both the CPC and LOC, why EFOMP and NMO members are represented in both committees (figure 1, right).

**Congress content.**

The congress will offer morning refresher course sessions, joint sessions in cooperation with sister societies (such as ESTRO, EANM and ECR), proffered papers and invited talks. Further, a supplement of the congress abstract contributions will be published in EFOMPs journal Physica Medica: European Journal of Medical Physics together with a special issue of full length articles from selected abstracts. Prior to the congress itself, a number of activities have been established. In the beginning of the week, the Niels Bohr Institute (which is the congress venue) is organizing a summer school on imaging modalities in medical physics. The day before the congress, EFOMP is organizing CPD accredited pre-meeting under the ESMPE umbrella and the EEB will carry out exams in all three subspecialties (figure 2, top).
The fun stuff.

A number of social events have been planned. On the evening of the pre-meetings, a reception at the Copenhagen Town hall will take place. This is also the where Danish sports stars are celebrated whenever they (rarely) win something extraordinary, e.g. the European football championship in 1992. Ending the first day of the congress, a more traditional welcome reception will take place in the exhibition area of the University which is also the congress venue. On the second evening of the congress, an after-dinner party with jazz music in the Main Ceremonial Halls of the University will take place. Further, if you want to walk in the footsteps of famous physicist like Hevesy, Heisenberg, Einstein and Bohr, guided tours at the original Niels Bohr Institute are organized during the congress (figure 2, bottom and figure 3).

Lessons learned.

Together with a dear colleague of mine, Dr. Eva Samsøe who currently joins me in the LOC, we took the initiative to bring the 2nd ECMP to Copenhagen after clearance with the scientific society and our employer to whom we are both very grateful. After creating the bid material in cooperation with the interest organization Wonderful Copenhagen, inspecting different venues with past EFOMP president Dr. Peter Sharp and the Swedes, agreeing on a logo (figure 4), setting up the website in cooperation with the professional congress organizer, and finally being heavily involved in the international and multidisciplinary work of organizing the actual congress and the affiliated activities, this is a decision that we have not regretted. In a way, it is a bit like research; at times it is challenging and stressful but it is also fun, insightful and fruitful. Being part of such a big event, you soon realize that it is a lot easier to criticize a congress than to organize one. That being said, we try to focus on issues such as registration, catering and clear organization at the venue since we know from past congresses all over the world that these issues can be a pain. It is therefore a pleasure to be part of a team in the LOC and CPC where everyone involved is interested in creating a congress with high scientific and organizational ambitions. A special thanks to the congress president, Dr. Marco Brambilla, with whom I have a very fruitful, constructive and joyful cooperation. Lastly, I am grateful to Maria for her indulgence and support in stressful times and our children, Elias and Alma, for putting (work) life in the right perspective.

Please visit the congress website, www.ecmp2018.org, for details on the program, abstract submission and registration.

I hope to see you as many of you in Copenhagen for the 2nd ECMP in late August 2018!

Jens Edmund
Chairman ECMP local organization committee

VDr. Jens M. Edmund is chair of the ECMP local organization committee. He received his master’s degree in biophysics in 2003 and PhD in radiation dosimetry in 2007. He became diplomate of the American board of radiology in 2011 and medical physics expert in 2014. He currently shares his time equally between Herlev Hospital as a medical physicist and as associated professor at the Niels Bohr Institute.
Friends and colleagues from across Europe met in York, UK, for council meeting as IPEM hosts the EFOMP council and board meeting for the very first time

MEDICAL physicists from across Europe arrived in York for the annual council and board meeting of the European Federation of Organisations for Medical Physics (EFOMP).

The Institute of Physics and Engineering in Medicine, as one of the 34 National Member Organisations of EFOMP, hosted this year’s event in York. National Member organisations from 19 countries across Europe were represented as detailed.

This was the first time the meeting has been hosted by IPEM and is only the second time the meeting has been held in the UK. The board meeting was held in central York, with the council meeting being held at IPEM’s National Office in the city.

Professor David Brettle, IPEM President, also in attendance, welcomed the delegates to York. He said: ‘I’m delighted IPEM has been able to host the EFOMP board and council meeting in York for the very first time and it has been fantastic to see so many friends and colleagues from across Europe attend.’

Following the council and board meeting in York, the EFOMP delegates headed down to Sandown Park to the MEIBioeng/MPEC 2017 conference, where a whole programme was dedicated to the work of EFOMP.

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<td>Ingvild Dalehaug</td>
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<td>Slovakia</td>
<td>SMPB</td>
<td>Pawel Kukolowicz</td>
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<tr>
<td>Spain</td>
<td>SEFM</td>
<td>Jorge Miguel Sousa Isidoro</td>
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<td>Sweden</td>
<td>SSFF</td>
<td>Gabriel Kralik</td>
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<td>Switzerland</td>
<td>SGSMP-SSRMP-SSRFM</td>
<td>Josep Pixeu</td>
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<td>UK</td>
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<td>Anja Almen</td>
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<td>Graham Hart</td>
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<td>Hugh Wilkens</td>
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</table>
The IPEM External and International Services Manager and EFOMP Company Secretary – Mrs Fiona McKeown
EBAMP
European Board for Accreditation in Medical Physics
www.ebamp.eu

EBAMP Annual Report 2017
Summary of activities 2016-2017

Introduction
The European Board for Accreditation in Medical Physics (EBAMP) has been set up by medical physics societies across Europe represented by the European Federation of Organizations for Medical Physics (EFOMP) as an independent organization that accredits medical physics education and training events. This task is carried out by allocating Continuous Professional Development (CPD) credits depending on appropriate policies and protocols developed to perform it. The European Federation of Organizations for Medical Physics (EFOMP) decided to set up such independent European Board for Accreditation in Medical Physics (EBAMP) at its Athens Council meeting held on the 13th of September 2014.

EBAMP is mainly aimed to improve the education of health professionals involved in the practice of medical physics by accrediting medical physics education and training events, such as workshops, conferences, hand-on training and courses. Mainly, its work is to accredit and assign continuous professional development points based on quality and quantity criteria in order to ensure the effectiveness and usefulness of the education provided. EBAMP accredits educational events by means of an assessment of planning, promotion, staff, teaching methods, facilities and design of the educational activity being provided, through appropriate policies and protocols developed for that purpose.

It is not intended to replace any local accreditation scheme. EBAMP will work to set European standards for education and training event accreditation for any training provider and offering an accreditation process to those EFOMP national members organizations (NMOs), consortia, entities and international education events provider that do not have one at present. EBAMP aims to set the standard for accreditation systems for education and training in medical physics in Europe.

EBAMP firmly believes that an accurate well-designed Continuous Professional Development programme and training is essential for any professional and more specifically for health professionals as medical physicists to improve knowledge, competence, skills, quality and safety within the performance of their professional activities.

EBAMP encourages to NMOs and any other institution to participate in an accreditation process for any educational event as an external assessment of quality.

History
EBAMP was set up on June 2016 with the election of Board members by EFOMP among those proposed by NMOs. EBAMP activities for accreditation started on November 7th, 2016.

Board members approved a Quality Manual, CPD points criteria to be assigned once the assessment of the educational event is completed and the accreditation fee is duly paid.

A specific website was outlined to handle and manage completely the accreditation process to be used by applicants and board members and currently it is working properly.
Accreditation policies and protocols
Quality Manual and Continuous Professional Development points criteria based on quality and quantity criteria can be found in the EBAMP website.

Two main topics have been considered:
A restriction for total training hours scheduled including assessment time has been established applying educational criteria: a maximum of 7 hours per day and a maximum of 35 hours per week.
For those courses with examination scheduled, two different schemes for CPD credit points could be assigned and included in the EBAMP Certificate of Accreditation: with assessment for those participants who pass the examination and without assessment for those participants who do not sit for or do not pass the examination.

Flow Chart for the accreditation process:

Receive
Application Form and Payment of fees

Review documentation by Secretary-General
Appointment of 3 assessors

Assessment report to Secretary-General

Letter of accreditation to applicant

Overall time on receiving complete documentation and payment

At least 3 months prior to the activity
If not complete or if there is any doubt on it
By lead assessor

2 weeks
3 weeks
1 week
6 weeks
Accredited Events
This summary refers to the educational events accredited up to November 30th, 2017. Detailed information can be found in the EBAMP website.
Number of total educational events accredited: 24
Course: 17 Congress/Conference: 5 Workshop: 2
International: 20 National (local): 4

International Institution as applicant:
IAEA: 1 ESTRO: 4 EFOMP: 1 EUTEMPE Project/EFOMP: 8

Event Venue Countries:
Austria: 3 Belgium: 1 Bulgaria: 1 Czech Republic: 2
Germany: 2 Ireland: 3 Italy: 1 Poland: 1
Romania: 1 Serbia: 1 Spain: 2 Sweden: 1

Acknowledgment
Board members are grateful to the EBAMP steering group as the main promoters of the project, for their significant contribution to set EBAMP up and for designing documents at this early stage. Their contribution made the starting process of EBAMP activities easier. And to EFOMP for providing their support for the EBAMP be able to start its activities at this stage.
December 2017

Pedro Galan Montenegro, PhD
President of the EBAMP
Born in Álora (Spain), Currently is head of the Medical Physics Department at the Regional Hospital in Málaga (Spain). Obtained his PhD in Physics at the University of Málaga in 1992. Professor in Master’s Degrees at University of Granada (Spain) and University of La Frontera (Chile).
Specialization in medical physics is one of the longest in Finland. To become a medical physics resident, a Master’s degree in physics, medical physics, technical physics, biophysics or biomedical engineering is required. In addition, the candidate is required to be accepted in education and training position supervised by the qualified chief Physicist. The minimum criteria to become clinically qualified medical physicist in Finland are: Academic postgraduate Licentiate or Doctoral degree in Philosophy, Science or Technology and four years practical training of which minimum three years in hospital covering all main areas of medical physics: radiotherapy and oncology, nuclear medicine, diagnostic radiology, clinical physiology and neurophysiology. In addition, a resident is required to pass Examination for Radiation Safety Officer and the Final examination on medical physics in hospital environment.

Finnish Education Committee (in Finnish Valtakunnallinen yliopistojen sairaalafysikoiden erikoistumista koordinoiva neuvottelukunta) for medical physicists is a council, which coordinates the medical physicist education in Finland. It is appointed by the Ministry of Education and Culture in Finland. The Committee has established

![Fig. 1: Education and Training system of Clinically Qualified Medical Physicists in Finland](image)

**Education and Training of Clinically Qualified Medical Physicist In Finland**

*Education Committee for Medical Physicists coordinates the Clinically Qualified Medical Physicist education in Finland*

**Basic Education**
- Master’s degree (240 ECTS/≈ 4-5 years) in physics, medical physics, technical physics, biophysics or biomedical engineering

**University**
- Licentiate degree (90 - 120 ECTS/≈ 2 years)
- Doctoral degree (≈ 240 ECTS/≈ 4 years)

**Hospital**
- Minimum three (3) years training in hospital
- No more than one (1) year other training (e.g. academic research)
- Radiation Safety Officer Examination “Use of Ionizing Radiation in Medicine in General”

**Qualification**
1. The practical training is individually approved by Education Committee of Medical Physicists
2. The Clinically Qualified Medical Physicist (CQMP) degree is officially conferred by the local university
3. Official authorization for CQMP professional title from the Finnish National Supervisory Authority for Welfare and Health (Valvira)
national requirements for medical physics education. It controls, that the content and quality of medical physics specialization programs are uniform between different Finnish universities. The Education Committee approves each individual practical training period and organizes and grades the final examination in medical physics. The current chairman of the committee is prof. Mika Teräs.

Medical physicist in practice

Medical physicists in Finland are mainly concerned with three areas of activities: clinical service and consultation, research and development, and teaching. Close collaboration with other medical professionals is usually essential, but the skills and knowledge of medical physicist is often indispensable.

Most of the Finnish medical physicist, currently around 100, are working in Finnish public hospitals. They work typically in radiation oncology, nuclear medicine, radiology, clinical physiology or clinical neurophysiology departments. Finnish medical physicists have a broad know-how, which can also be utilized but universities and research centers, companies in the field of medical technology, international radiation safety organizations and the Radiation and Nuclear Safety Authority (STUK) that supervises radiation and nuclear safety in Finland. Currently about 20 Finnish medical physicists are working in such activities.

<table>
<thead>
<tr>
<th>Year</th>
<th>1950</th>
<th>1970</th>
<th>1990</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of physicists</td>
<td>2</td>
<td>21</td>
<td>66</td>
<td>99</td>
</tr>
<tr>
<td>Inhabitants (millions)</td>
<td>3.9</td>
<td>4.6</td>
<td>5.0</td>
<td>5.3</td>
</tr>
<tr>
<td>Physicists/100 000 inh</td>
<td>0.05</td>
<td>0.46</td>
<td>1.36</td>
<td>1.87</td>
</tr>
</tbody>
</table>

Fig. 2: The number of medical physicists in Finland has been rising every decade and that trend seems to continue.
Finnish Association of Medical Physicists

Finnish Association of Medical Physicists (in Finnish, Sairaalafyysikot ry, SFry) is the labor union of medical physicists in Finland. The association is involved in professional, educational and social matters related to work, employment and the careers of its members at national and international levels.

Currently there are 130 active members in the SFry which covers almost all medical physicists in Finland. It is an affiliated association of the professional and labor market organization to Academic Engineers and Architects in Finland – TEK. The association has been operating since 1986, but its predecessor, the Finnish mathematician and physicist League (SMFL) Hospital Physicist Division started to operate already in 1965.

SFry is a member of several international associations for medical physics such as Nordic Association for Clinical Physics (NACP), The European Federation of Organizations for Medical Physics (EFOMP), The International Organization for Medical Physics (IOMP), and International Union for Physical and Engineering Sciences in Medicine (IUPESM).

SFry has appointed a CPD Registration Council (in Finnish Kirjauslautakunta) which is responsible for maintenance and development of the CPD system in Finland. CPD Registration Council sets up the requirements for the qualification of medical physics expert in Finland and processes the applications. The current chairman of the council is prof. Simo Hyödynmaa.

More information about the association and the medical physicists’ activities in Finland: www.sairaalafyysikot.fi.

---

Tommi Noponen
President of Finnish Association of Medical Physicists
Tommi.Noponen@tyks.fi

I work as a medical physics expert in the Department of nuclear medicine in Turku University Hospital. I received my doctoral degree in 2009 and medical physicist qualification in 2010. My hobbies are junior soccer and floor ball training activities and a research in medical physics. I am married and a father of 14- and two 11-years old sons.

---

Jani Saunavaara
Secretary and treasurer of Finnish Association of Medical Physicists

I am a medical physicist working in Turku University Hospital. I received my PhD in 2009 and medical physicist qualification in 2010. I am working in the field of diagnostic imaging, mainly with MRI scanners. Participating in MRI related research is my most time-consuming hobby.
Medical Physics in Norway

Norwegian Association for Medical Physics (NFMF) celebrated 40 years in 2016. The association is a professional association of interest for individuals working in the field of medical physics. The association works towards high professional standards and for a professional practice. A medical physicist has an important role in medical diagnostics and therapy, and is part of an interdisciplinary team for the best of the patient. A medical physicist participates in clinical practice, research, teaching, and in the development of the profession. The association consists of about 190 members, and they contribute mainly in diagnostics and radiotherapy in Norwegian hospitals. In addition we have members working within radiation protection.

The association participates in a formalized Nordic cooperation through the umbrella organization Nordic Association for Clinical Physics (NACP) and is affiliated with the international organizations for medical physics: European Federation of Organizations for Medical Physics (EFOMP) and International Organization for Medical Physics (IOMP).

NFMF has arranged a yearly national conference, “MedFys-days” since 1993. Since 2012 MedFys-days have been arranged at Kvitfjell (ski resort). It is obvious that the members, exhibitors and lecturers do appreciate a national medical physics conference, since it has been growing for each year.
What does a medical physicist do?

Medical physics includes development and usage of advanced physical methods for diagnostics and therapy of patients. In addition to excellent understanding of physical principles, medical physicists should have good insight into medical issues and physiology.

Most medical physicists have their work in health services and may have tasks within the disciplines; radiotherapy, radiology, nuclear medicine, MR and radiation protection. The medical physicist have a central role to assure proper, recognized and effective use of radiation. The medical physicist’s main tasks can be summarized to:

- Participation in daily operations in patient diagnostics and therapy
- Method development and introduction of new techniques and new technology
- Quality assurance and quality control
- Optimization of medical use of radiation
- Expertise in estimation, calculation and measurement of radiation dose
- Participation in procurement processes of medical equipment
- Run own research projects or contribute to others projects
- Teaching and training of students and personnel working in healthcare

Medical physics in the future

Medical physics do develop at high speed both within diagnostics and therapy, and medical physicists participate increasingly in this development. Medical physicists participate in multidisciplinary cooperation, which asks for good and effective communication with other professions/disciplines and show the importance of speaking the same language.

Several centres with PET cyclotron and production of radiopharmaceuticals are planned and build. During 2018 you will find these PET centres in all four health regions. Centres for proton therapy are also in progress in all four health regions. In this process medical physicists have key roles. Within hybrid modalities a rapid development is happening - SPECT/CT, PET/CT, SPECT/MR and PET/MR. Simultaneous CT/MR is also under development and is predicted to be the next chapter within multimodal imaging. Important areas of priority in radiotherapy are: particle therapy, adaptive radiotherapy, radiobiological customization by dose-painting, and use of PET/MR/SPECT for dose planning. The first MR-linacs are already installed in international clinical environments.

In collaboration with Danish Society for Medical Physics and Icelandic Society of Biomedical Engineering and Medical Physics we will organize NACP symposium 2020 in Reykjavik.

Bente Konst
President of NFMF
Chairman ECMP local organization committee

Bente Konst is a medical physicist expert at Vestfold Hospital trust, Norway, within radiology (all equipment delivering x-rays). She is also radiation protection officer at the hospital. She got her civil engineer diploma from NTNU, 2000, and has experience with both nuclear medicine and radiology. She is the president of NFMF since 2016.
Medical Physics in Denmark

Medical physics in Denmark has a long tradition. Already in February 1896, a Danish physicist acquired the first diagnostic x-ray in Copenhagen, and experimentation with radiation therapy soon followed. In 1913, the first of several radium treatment centres opened, and in 1921 one of these centres initiated collaboration with a physicist from the nearby Niels Bohr Institute. The Danish Society for Medical Physics (acronyemed DSMF in Danish) was founded in November 1981 and became a member of both EFOMP and IOMP in 1982.

Medical physics in Denmark is divided into three branches: 1) Radiotherapy, 2) Diagnostic radiology, and 3) Nuclear medicine, and with currently 200 members, DSMF is a well-established national organization for medical physics with a long tradition for organizing educational courses and scientific symposia.

The largest member’s branch is Radiotherapy, constituting more than 60 percent of the society’s members. A national cancer plan from 2000 resulted in a massive capacity upgrade of Danish radiotherapy, and the 2014 ESTRO-HERO project documented that Denmark now has the largest number of treatment linear accelerators per capita in Europe.

This also resulted in a large increase in medical physics staffing, and with the national Danish Centre for Particle Therapy currently under construction, and MRI-linacs being bought by photon centres, the radiotherapy branch is facing further expansion. The two other branches are similarly implementing state-of-art technology with e.g. brand new CT-, PET/CT- and MRI-scanners all over the country.

An important area of interest has always been education. In Denmark, there is no formalized medical physics education at universities or other educational institutions. Instead, the education is based on a Master’s Degree in physics, or similar, and managed locally at hospital departments, with the Educational Council of the society coordinating and defining the curriculum that the local departments have to offer their physicists. The individual education plans are subsequently reviewed and approved by the Council, and physicists who have completed their education are registered with the Danish Health Authority.

However, the medical physics title is still not a protected title in Denmark, even though the society has lobbied for this since the 1980s. This basically means that departments can hire people without a physics background for medical physics work, and they are not even obliged to offer new staff members the medical physics education, though most chief physicists choose to do so anyway.

Klaus Seiersen obtained his PhD in atomic and molecular physics from the University of Aarhus in 2003. After working three years with teaching and outreach activities, including travelling Europe and Asia with a “physics show”, he switched in 2006 to medical physics at the Department of Oncology, Aarhus University Hospital. He has been working extensively with linac-based cranial radiosurgery, paediatric treatment, and also teaching and educational programmes in radiotherapy. In 2017 he switched to proton therapy and is currently part of the physics team implementing the Danish Centre for Particle Therapy. He is a certified Medical Physics Expert and a member of the Executive Committee of the Paediatric Radiation Oncology Society. He has been President of DSMF since 2015.

Klaus Seiersen, President DSMF
Medical Physics in the Netherlands

Mission statement of the NVKF
The Society for Medical Physics of the Netherlands (NVKF) aims at promoting medical physics knowledge and methods, scientific and clinical research and their clinical implementation and application. The Society also aims at monitoring their quality for assuring safe and high quality patient care. In collaboration with physicians, nurses and paramedical specialists the Society dedicates its expertise to achieve the optimal diagnosis and treatment for patients in a safe environment according to the latest insights and standards and tailored to the individual patient’s needs.

Members
Total number of members: 596
MPE-members: 377
MP trainee members: 86

Hospitals
University Hospitals: 8
General Hospitals: 80
Miscellaneous HCO: ±50

Training and education
The NVKF gives active support to the education and training of Medical Physics Experts (MPE) in collaboration with the Medical Physics Foundation (OKF). The 4-year training program consist of a general program and a specialization in the field of Radiotherapy, Radiology & Nuclear Medicine, Clinical Audiology or Hospital Physics. Thematical circles organize colloquia to facilitate continuous education and expertise development of the members. The thematical circles are organized according to the specializations: Radiotherapy, Radiology & Nuclear Medicine, Clinical Audiology and Hospital Physics.

National healthcare
The NVKF collaborates with patient advocacy groups, medical scientific societies of the Federation of Medical Specialists, the umbrella organisation for Medical Technology, several government organisations and other stakeholders.

Regular meetings with the Dutch Health Care Authority (IGz) are part of the NVKF activities. As a member of the Federation of Medical Specialist, government policy regarding healthcare, medical technology and patient safety can be influenced indirectly.
Development of national guidelines is regarded as an important tool to assure optimal and safe use of medical physics knowledge and expertise and application of medical technology.

European affiliations

The NVKF supports the development of the profession of Medical Physics Expert towards an European level together with the European Federation of Organisations for Medical Physics (EFOMP) and its NMO’s.

Board members NVKF

President  Dr. ir. L. (Lieke) Poot
Secretary  Dr. P.J.M. (Paul) Rietveld
Treasurer  Dr. ir. B.J. (Ben) ten Voorde
EFOMP, radiation protection Dr. J.B. (Jeroen) van de Kamer
Quality matters  Ir. J.J. (Bunna) Damink
Communication  Dr. A.C. (Anette) Houweling
Research & Innovation Dr. M.H.P. (Martin) Stollman
Education  dr. H.W. (Erwin) Baas
Representing MP trainees D.L.J. (Danique) Barten

Board Members Medical Physics Foundation (OKF)

President  dr.ir. C.F.P.(Christiaan) van Swol
Vice president  dr. S.Heukelom

Lieke Poot graduated in applied physics at TU Delft (1995) and obtained a PhD at Rijksuniversiteit Groningen (1999). In the Universitair Medisch Centrum Groningen she was educated to be a medical physicist, with a specialization in Nuclear Medicine (2003). Since 2003 she is working at Isala Klinieken in Zwolle, where she obtained her second specialization in Hospital Physics. In Isala she set up the medical physics department and medical physics consultancy for other hospitals. At this moment she is head of the department of medical physics and medical technology. Lieke Poot has been member of the medical board of Isala, and a member of the board of the Netherlands society for nuclear medicine. Since 2015 she is president of the Society of medical physics of the Netherlands. Lieke Poot is married, has two children, and likes cycling and horseback riding.
Medical Physics in Malta

Medical Physics is a relatively new profession in Malta. It initially started some 25 years ago with the previous Radiotherapy Department at Sir Paul Boffa Hospital. However, its importance was strongly felt over the last 10 years with two important health landmarks in Maltese history.

Mater Dei Hospital (MDH) opened on 29 June 2007 replacing the older St. Luke's Hospital as the main public general hospital. This new and larger hospital was intended to deliver all the state-of-the-art healthcare services to patients. Amongst others, it included all the ionizing and non-ionising imaging modalities used in diagnostic and interventional radiology and nuclear medicine. Consequently, the role of the medical physicist was pivotal during all phases of this migration period, namely: planning and design, acceptance testing, commissioning, optimization and introduction of this equipment into clinical use.

An equally important event was when the Sir Anthony Mamo Oncology Hospital (SAMOC) replaced Sir Paul Boffa Hospital in August 2015. This dedicated oncology centre offers more advanced radiotherapy and superior quality of care to oncology patients with improved outcomes. Then again, radiotherapy medical physicists had the vital role to make this herculean task possible and facilitate the whole migration process.

To date, MDH and SAMOC are continually updating the radiological and radio-therapeutic equipment to maintain the high-quality standards and keep up with the evolving healthcare needs. For instance, the installation of a 3T MRI scanner, a digital mammography unit with tomosynthesis, a new bi-plane angiography system, a 256-slice CT scanner and a PET-CT scanner. At SAMOC, new linear accelerators for external beam radiotherapy include Elekta Versa HD with filter free delivery mode for Volumetric Modulated Arc Radiotherapy and kV 3D Image Guided Radiotherapy facilities.

From a professional perspective, the Malta Association of Medical Physics (MAMP) was set up in 2007 following the completion of education and clinical training of 2 Medical Physicists specialised in Diagnostic & Interventional Radiology and Radiation Oncology respectively bringing the number of Maltese Qualified Medical Physicists to a total of three. The primary objectives of MAMP was to promote and safeguard the Medical Physics profession in Malta while participating on a national level with regards to the introduction of new national legislation for radiation safety related to medical and occupational exposures. MAMP is affiliated to EFOMP and has now a total of 16 members.
Over the years, MAMP worked incessantly for the recognition of the medical physics profession in Malta. At the end of 2014, the Maltese Government, through a legal notice, included Medical Physics as a regulated profession within the Council of Professions Complementary to Medicine (CPCM). This milestone is considered a huge achievement for MAMP and the profession whereby all practicing Medical Physics locally within healthcare are required to be in possession of Medical Physics Registration. Moreover, Medical Physics Experts in Malta are also legally recognised and certified; all organisations making use of ionising radiation require the formal appointment of a Medical Physics Expert in order to be licensed. Medical Physics is a rapidly evolving profession, striving for excellence to keep up with the reputable and advancing healthcare system in Malta.

Dr. Mark Borg
President
Malta Association of Medical Physics
Medical Physics in Ireland (1)

The Irish Association of Physicists in Medicine (https://www.theiapm.ie/ and @TheIAPM) is the premier organisation and recognised leader for medical physics in Ireland whose mission is to promote and support the medical physics profession; provide opportunities for education and professional development; to be a forum for professional interactions; to be the voice and thought leader for medical physicists in Ireland while promoting excellence in the profession to achieve the highest standard of patient care.

Amongst the IAPM’s core values are:
- Having high standards for the profession
- Providing a central repository for medical physics related issues in Ireland
- Open communication and discussion on relevant topics in medical physics
- Proactive in providing expert medical physics advice to third parties
- Support the development of professional standards
- Support medical physicists in furthering their skills and qualifications
- Support IAPM members

The organisation currently has over 200 members working in healthcare and academia in Ireland (as well as a small number outside of Ireland). Most of Ireland’s Medical Physicists are members of the IAPM, with 80% of its members achieving professional status, 13% being students or trainees and the remainder having retired and/or working as allied professionals.

The IAPM is a relatively young organisation having been established in 2010 by the merger of the Association of Physical Scientists in Medicine and the Irish Radiotherapy Physics Group. There is an approximately 50:50 split between the number of radiotherapy and diagnostic/non-ionising radiation physicists in the IAPM membership with a very healthy relationship existing between all medical physics disciplines. The merger between the two organisations has been pivotal in providing a supportive and collaborative environment for medical physicists; increasing visibility and recognition of the medical physicist, advancing and advocating medical physics and encouraging and fostering a multidisciplinary approach to healthcare in Ireland.
The IAPM is a voluntary organisation and its activities are managed by the voluntary efforts of a council comprising of 5 officers (President, Vice President, Secretary, Treasurer and Editor), 3 ordinary council. The IAPM provides a gateway for Ireland’s Medical Physicists to interact not only with each other but also with external third party organisations such as local and national government agencies as well as other national, European and international organisations and institutes. Special Interest Groups in Radiotherapy, Radiation Protection, Non-Ionising Radiation, MRI and Ionising Imaging together with various task forces play a vital role in directing the scientific activity of the medical physics profession. They also provide a pool from which can be sought expert medical physics advice from the various medical physics disciplines. Importantly, these SIGs and task forces provide a forum for focussed discussion which enables consensus for developing specific areas in medical physics that impact on Ireland’s healthcare system.

Healthcare in Ireland is delivered through a combined public and a private sector model. In some cases, private hospitals are co-located with public hospitals. Almost 60% of IAPM members work in the public healthcare sector, 20% in the private health care sector, 10% in academic institutes and the remainder in private industry. As a result of the Medical Physics community in Ireland being relatively small there is extensive collaboration between medical physicists working in Ireland’s public and private healthcare with each sector’s physicists being closely connected and networking to ensure a free flow of information so that high quality Medical Physics Services can be delivered across the board. Collaboration between these groups is essential as many public patients are treated in private hospitals through a scheme known as the National Treatment Purchase Fund.

The IAPM is continuing to grow and strengthen. Its members work hard in the hospitals and clinics around the country to deliver quality Medical Physics Services. They also work hard through voluntary effort to support the mission, core values and goals of the IAPM thereby paving the way to a bright future for Medical Physics and Medical Physicists in Ireland.

Dr. Amanda Barry, IAPM President
president@theiapm.ie
members and five Special Interest Group (SIG) Convenors
Medical Physics in Ireland (2)

Training and Education in Medical Physics in Ireland

By Dr. Christoph Kleefeld, Clinical Course Director

MSc in Medical Physics

School of Physics, NUI, Galway

The BSS Directive 2013 lays out a comprehensive Qualification Framework for the Medical Physics Expert in Europe where education to BSc and Msc levels in Medical Physics as well as clinical training in a Medical Physics Speciality represent important pillars. The educational landscape in the Republic of Ireland offers BSc in Physics with Medical Physics programmes at the Dublin Institute of Technology and the National University of Ireland, Galway (NUIG), an MSc in Physical Sciences in Medicine at Trinity College Dublin, and a Master of Science programme in Medical Physics in Galway. Clinical certification in radiotherapy physics is provided through a National Radiation Oncology Physics Residency Programme, based at the St Luke’s Radiation Oncology Network in Dublin, with an additional training site at University Hospital Galway (UHG). Education and training are further supported by the NMO through the organisation of scientific conferences, special interest groups, and the organisation of an annual research grant awarded to early career researchers. As early as 1984, the first MSc in Physical Sciences in Medicine was established at Trinity College Dublin. This programme, accredited by the Institute of Physics and Engineering in Medicine (IPEM), UK evolved from an initial three year part-time course into a one-year course in 2007.

In 2002, the late Prof Wil van der Putten initiated an MSc in Medical Physics programme in Galway. The establishment of the programme was motivated by an anticipated increase in need for medical physicists due to the expansion of radiotherapy and diagnostic services in the Republic. The programme is a full-time one-year taught master course (90 ECTS credits) delivered in close collaboration between the Medical Physics Research Cluster, School of Physics, NUIG, and the Department of Medical Physics and Bioengineering, UHG, with hospital based medical physics staff playing an active role in teaching individual modules. Students are encouraged to pursue their required four-month research projects on clinically relevant subjects, which are not only conducted at UHG but also in cooperation with radiotherapy and diagnostic departments outside of Galway, thus contributing to an active Irish research landscape.

Initially accredited by IPEM, in 2015 the programme received accreditation by the Commission on Accreditation of Medical Physics Education Programs (CAMPEP), being one out of only two CAMPEP approved graduate programmes outside North America (the other one being in Seoul, Republic of Korea). The accreditation increases opportunities for the MSc graduates, but also allows the recruitment of applicants from North America. Over 20 students are enrolled in the current academic year 2017/18, among them three North American students.

As required by the Qualification Framework for the Medical Physics Expert, graduates are provided with an opportunity to progress into a two-year clinical training scheme, currently for the radiotherapy physics speciality only, facilitated through the National Radiation Oncology Physics Residency Programme. The programme was founded in 2007 and is funded by the National Cancer Control Programme (NCCP) which is part of the national health service. In 2009 the residency programme received accreditation by CAMPEP. Since the training programme formally commenced in 2008, 14 residents have successfully completed the scheme with another 5 residents being admitted this year.

Dr. Christoph Kleefeld, Clinical Course Director

MSc in Medical Physics

School of Physics, NUI, Galway
Automated and wireless, the all-new BEAMSCAN™ cuts commissioning time in half. Enjoy a new level of simplicity and outstanding performance in beam data acquisition.

BEAMSCAN™ The New Water Phantom.
With Wi-Fi and Patented TRUELEVEL Technology.
The Irish College of Physicists in Medicine was founded in 2010 to provide a professional body to maintain a voluntary register of experienced and competent medical physicists working in clinical environments in healthcare in Ireland. No statutory registration scheme exists for Medical Physicists employed in Ireland. There are three objectives of the ICPM namely:

1 To maintain a Register of individuals who are deemed to be competent to perform work which demands scientific knowledge and expertise in the application of physics and applied physics to problems of healthcare delivery and development

2 To establish and maintain standards of training and professional performance for medical physicists where this application has a direct bearing on individual patient care and safety or on the health and well-being of the general public

3 To promote knowledge and to disseminate information relating to developments of the physical sciences in the medical field

The ICPM was accredited by EFOMP from 2010 to 2015 and its Board members are actively working on updating and reviewing the ICPM Constitution to reflect changes in the professional landscape of Medical Physics in a European context since 2010. The transposition process of the Basic Safety Standard (2013/59/EURATOM) legislation into Irish Law has a significant impact in that it provides the definition of Medical Physics Expert and clearly outlines roles and responsibilities within the context of ionising radiation. The publication of RP174 guidelines and the significant EFOMP publications Policy Statements 6.1 (registration schemes), 10.1 (CPD) and 11 (Professional conduct) all provide guidance on how best to supplement and refresh the current ICPM constitution and obtain re-accreditation with EFOMP as the National Registration Scheme for Medical Physicists in Ireland. The ICPM holds a register of Medical Physicists across all specialisations not just those working with ionising radiation.

The core values of the ICPM are to engage in the professional matters of the Medical Physics profession by being an independent body with integrated oversight from IoP, EFOMP and representatives of organisations concerned with public and patient safety. The core professional matters are i) Professional Registration ii) CPD scheme for maintenance of skills, knowledge and competence iii) Training and Education schemes by means of building the structures and frameworks needed for the advancement of the profession.
**Professional Register:** Currently the register is voluntary and applications can be made by medical physicists who have (i) a postgraduate degree in Medical Physics, (ii) completed a training scheme or equivalent process to obtain clinical competence in their area of speciality, (iii) have at least three years experience employed as a medical physicist with responsibility for patient care and (iv) are able to provide evidence of their level of competency as a trained experienced Medical Physicist. This mirrors closely the level of Medical Physics Expert as per RP174. Medical Physicists who have obtained their training and/or have been registered in other EU countries are eligible to be a member of ICPM once they are employed as a Medical Physicist in Ireland.

**Education and Training:** Ireland has a national training scheme in place for radiotherapy physicists accredited by CAMPEP in North America. However, there is no national formalised training scheme in place for diagnostic imaging, nuclear medicine, non-ionising imaging/treatment or other specialities within Medical Physics as yet. A challenge for the ICPM will be to promote and work on behalf of its members to put a framework in place to address this, possibly engaging with the EUTEMPE programme and European Examinations Board as well as incorporating national expertise and promoting collaboration.

**CPD:** The ICPM has a CPD scheme. Many ICPM members are also members of the IAPM which provides the vehicle for opportunities for ICPM members to enhance their continual professional development through the IAPM SIGs, Annual Scientific Meeting, workshops and task groups. The ICPM and IAPM are separate organisations with different roles but they are mutually supportive of each other and are there to benefit the Medical Physics Expert in Ireland to continue to be a competent, safe and skilful professional who provides high quality expertise to their specialised area of healthcare to patients and public alike.

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**Dr. Margaret Moore**  
ICPM President  

IRISH COLLEGE OF PHYSICISTS IN MEDICINE
Medical Physics in Hungary

The Hungarian Society of Biophysics was founded in 1974 and became a member of IOMP in the same year. In 1982 it became a member of the recently founded EFOMP (1980). In 1995, the medical physicists established their own section in the society and in 2008 founded their independent society. More about the past of our society may be found in the European Medical Physics News, Winter 2013/14 issue.

Membership has risen to its peak in recent years. Currently our membership mostly consists of professionals from radiotherapy, having 76% of them working in this field, but nuclear medicine (6%) and diagnostic and Interventional radiology experts (3%) are also representing their fields. The rest of the members exhibit diverse expertise, such as medical radiation protection, medical imaging, MRI or ultrasound.

The developments of the past few years have helped to expand our society. Now we accept junior members, whom have graduated as BSc. students, with reduced membership due. Indeed this was necessary as in 2010, at the Budapest University of Technology and Economics, a medical physics Master’s course was started. There are about 8 to 10 graduates from this M.Sc. course each year, while only the hospitals with radiotherapy centres would need about 15 physicists each year to fill up their ranks. Clinical radiation physicists (an equivalent of CQMPs according to the EBAMP manual #ref?) have been trained since 2008 and altogether 13 have graduated while 10 more are still doing their studies.

The recognition of medical physics experts (MPEs), may be seen as a challenge and an opportunity. In order to facilitate the implementation of the BSS, medical physicists, CQMPs and MPEs, the HSMP has set up a committee of the most notable of its members and issued a position statement on the recognition of medical physicists. This serves as a sound basis for the recognition and was welcome by the authorities.

The HSMP is participating in scientific activities, organises meetings on an annual basis, takes its part in standardisation and patronises its young members to partake in training courses.

Richard Elek graduated in 2012 as a medical physicist at the Budapest University of Technology and Economics. Ever since his introduction to the society it is his mission to enhance the recognition of medical physics. His interests cover a wide area from instrumentation to radiation protection and diagnostic radiology physics.

Richard Elek, President of the Hungarian Society of Medical Physicists
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The Association has grown a lot in recent years, and today with more than 1100 members it represents almost all Italian medical physicists. The 10th National Congress comes at a particularly moment for our profession: the transposition of Directive 59/2013 into Italian law will bring new tasks and responsibilities that our community must be ready to face. Therefore, if every two years the National Congress is an opportunity to meet, discuss and show the excellent level reached by Italian Medical Physics, this year will be particularly important as an opportunity for a first comparison on the novelties introduced in our profession since the transposition of the Directive.

The Congress’s program is available from AIFM website by clicking on the banner. It is structured on an inaugural day and on three working days organized on four parallel sessions dealing with the main scientific fields of medical physics: Radiotherapy, Radiodiagnostics, RMN, Nuclear Medicine, Radioprotection, Non-Ionizing Radiation. For each day, as is our tradition, we have scheduled a morning summary course, a series of invited papers and free presentations; to give all colleagues the opportunity to illustrate their work, we allocate time for over 110 free presentations selected by the Scientific Committee from all the abstracts presented. For each day there will be a unified session on three particularly topical subjects (radiotherapy with Linac Rm - Radiomics - transposition of the Directive).

On Sunday it will be awarded the Adele Rinaldi prize, established by the Association in memory of our colleague and friend Adele prematurely disappeared. Five prizes of 800 € each will be awarded to the best work presented by a young colleague (under 35) in the various disciplinary fields.

As already happened in the 9th AIFM Congress in Perugia, a Physica Medica focal issue will be published, containing a selection of articles choosen among the oral presentations.

The Congress will also be the occasion for the General Assembly and the renewal of AIFM board. As has been the case for years now, voting will take place electronically and the proclamation of elected will take place before the end of the Congress. The Assembly will be an important occasion in which members can bring to the attention of the board their comments on the association’s activities in the last two years.

The Scientific Committee of the Congress believes that the proposed scientific program is of the highest level, with a balanced set of reports on advanced topics and a summary of the current status of already consolidated techniques and topics. The space for free presentations is important and will allow all members to illustrate their work; for proposals that could not find space as oral relations, a digital poster session is planned.

A few words about the venue of the Congress, which will be extremely prestigious: the Fiera del Levante in Bari is home to many events of national and international relevance and will therefore give considerable visibility to our Congress. The social programme of course includes social dinner, and other events are being organised.

The AIFM Board, the Scientific Committee of the Congress and the Local Organizing Committee invite all members to present their work and to participate in the Congress, as has always been the case in past years. The digital platform for abstract presentation is already open, accessible from AIFM website by clicking on the Congress banner, and it will be possible to present your work until 30th November. We look forward to meet all you in Bari!

Dr. Fabrizio Banci Buonamici
Chair, Scientific Committee, Bari 2018

Fabrizio Banci Buonamici is the head of Medical Physics in Siena University Hospital (Italy) and Professor of Physics in Siena University Medical School. He is the Chair of the Scientific Committee of the 10th AIFM National Congress.
The very first MRI Edition of the European School for Medical Physics Experts (ESMPE) was held in Prague, Czech Republic from 6-8 July, 2017. This was the 8th Edition of the ESMPE overall, and had the title “Magnetic Resonance Imaging: Advanced clinical applications, safety aspects and quality controls”. It took place within the scholarly surroundings of the Faculty of Nuclear Sciences and Physical Engineering at the Czech Technical University, not far from the River Vltava and close to the city’s many and varied attractions. Forty-seven participants from 22 different countries attended the School, which took place over two-and-a-half days.

The teaching faculty comprised experts in MRI from around Europe, including Marcello Alecci (L’Aquila, Italy), Gisela Hagburg (Tübingen, Germany), Thomas Maris (Iraklion, Greece), Ioannis Seimenis (Thrace, Greece) and Michela Tosetti (Pisa, Italy). David Lurie (Aberdeen, UK) was the scientific chair while Alberto Torresin (Milano, Italy) was the overall chairperson of the School.

A broad range of topics was covered in the lectures, ranging from MRI fundamentals and details of commonly-used pulse sequences, to explanations of more complex methods such as diffusion and functional MRI. Quantitative measurement of MRI parameters was covered, as were common MRI artefacts and strategies for their mitigation. Several lectures were devoted to safety and regulatory issues, discussing how these impact on the clinical use of MRI (for patients and staff) and outlining the role of the MPE in interpreting and implementing the multitude of guidelines and regulations.

A key aspect of the School was the real-time demonstration of MRI-related instrumentation and monitoring equipment, in the lecture room. In order to facilitate this, Marcello Alecci brought with him electronic components with which he illustrated the construction of surface radiofrequency receiver coils, including tuning and matching networks. He also demonstrated the use of a portable network analyser in order to set up the radiofrequency coils.
and showed the attendees how to measure coil performance parameters, including resonant frequency, coil matching and Q-factor. In a similar fashion, Ioannis Seimenis and Thomas Maris showed how environmental electromagnetic fields could be measured in real time, their demonstration dovetailing neatly with lectures on MRI installation design and the assessment and limits of magnetic field and RF exposure. These highly-interactive practical elements of the School, which proved very popular with participants, helped the lecturers to explain important concepts and also stimulated discussion.

Throughout the School plentiful refreshments were provided, including tea/coffee breaks (with cake!) and lunches at a local restaurant; these not only provided sustenance but also enabled informal interactions and impromptu tutorials to take place between attendees and faculty members. A social dinner took place on the Thursday evening, where local beer and food were consumed in an extremely convivial atmosphere.

At the end of the School, participants had the opportunity to take a multiple-choice examination, with the award of 1.5 MP credits to those who achieved a pass.

Overall, the School was judged to have been a great success, with participants’ feedback containing many positive comments, as well as some useful suggestions for improvements. Last but not least, mention must be made of the excellent organisational support from Jaroslav Ptáček and Tereza Hanušová, without whom the School could not have run so smoothly.

Fig. 3: ESMPE MRI School participants and faculty.

David J. Lurie, PhD, FIPEM, FInstP
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David Lurie has researched and taught MRI physics at Aberdeen University for 33 years. He leads a research team working on MRI technology and applications, and is coordinator of the 9-partner Horizon-2020 project “IDENTIFY”, on Fast Field-Cycling MRI. He is currently EFOMP’s representative on the programme planning committee of ECR.
**Roberta goes to Glasgow**  
News from San Raffaele Hospital, Milan, Italy

EMP News interview with Roberta Castriconi, M.Sc. (Phys)

**EMP News:** Roberta, we know you prepared your meeting presentation at the *1st ESTRO Physics workshop: Science in development* (17-18 November 2017, Glasgow, UK) (see the text of the contribution below, “Intra-Institutional stepping validation of Knowledge-based optimization models”): tell us about this Workshop and how you knew of it.

**Roberta:** This is my first year as a medical physicist in training at the San Raffaele Scientific Institute, Milan. My supervisor Dr. Claudio Fiorino immediately encouraged me to take an active part in scientific community and to became an ESTRO member, in addition to being a member of the Italian Association of Medical Physics (AIFM), affiliated to EFOMP. The ESTRO Physics Committee announced the first edition of a new concept for scientific exchange: “1st ESTRO Physics Workshop: Science in development”, in the city of Glasgow, 17-19 November. This workshop aims at facilitating scientific and professional networking opportunities within ESTRO physics membership, physicists working in other areas and furthermore, create close interaction with developers in companies.

**EMP News:** Why did you decide to apply for attending this Workshop?

**Roberta:** I am very interested in research. During the last six months, I was involved in a project concerning the implementation and validation of knowledge-based (KB) planning optimization strategies for external radiotherapy under the guidance of Dr. C. Fiorino, using a commercial KB system for VMAT planning optimization. Given my interest on this topic and the currently running project at my Institute, I think that joining the automation session of the 1st ESTRO Physics workshop will be a great opportunity for me to broaden my horizons and develop my skills in this exciting field of research and emerging clinical practice.

**EMP News:** After coming back from Glasgow workshop, please tell us about this experience.

**Roberta:** It was my first experience of a project presentation, so I was very anxious and excited, but at the end, it was great! My workshop section aimed at joining professionals in the field of radiotherapy that are active or have a high interest in automation of different aspects in radiotherapy workflow. The idea was to provide a discussion platform on current initiatives and evaluate possibilities in combining these efforts into a standardized approach. The workshop also touched upon topics such as the tension field between automation, the future role of the medical physics expert and responsibilities. It was a big opportunity for me to take part of the community, to know people involved in the field and to share my work.
Intra-Institutional stepping validation of Knowledge-based optimization models

R. Castriconi, M. G. Cattaneo, C. Fiorino
Department of Medical Physics, San Raffaele Scientific Institute, Milan, Italy

Purpose
External beam radiotherapy treatments require individually optimized planning. Despite the use of specific protocols, the final result of the optimization process largely remains planner dependent and time consuming. In order to reduce the inter-operator variability and improve the quality of plans, knowledge-based (KB) planning system were developed. This approach is based on existing plans representative of the center’s clinical experience. RapidPlan is a commercially available KB planning tool (Varian Inc.), implemented into the Eclipse planning system. Based on previously modelled data referred to real patients, the tool generates an estimated DHV range suggesting where the DVH of a structure will most likely land: the operator may automatically optimize the plan based on the KB optimized constraints. The aim of current project is to develop and apply a step-validation approach for KB-optimization models, starting from the clinically relevant example of the concomitant treatment of pelvic nodes and prostatic+seminal vesicles bed in post-prostatectomy patients.

Material and methods
Fifty-two previously delivered clinical plans were selected to generate our KB model. In our protocol three PTVs are treated in two sequential phase. The OARs were rectum, bladder, bowel, femoral heads and penile bulb. We focused in generating the KB-model for the first phase, concomitantly delivering 52.5/60Gy to pelvic nodes/prostate+seminal vesicles bed. All plans were optimized by the two planners responsible of the protocol. We proceeded with a step validation involving different patient sets:
- Close-loop: 20 randomly chosen plans used to generate the model;
- Open-loop: 10 not used for training, previously planned by the same two operators;
- Wide-loop: 20 patients not used for the training model, planned by four additional planners.

While the third step is in progress, for the two first steps, two KB-optimized planning were generated: RapidPlan plus operator intervention (RP) and fully-automatic RapidPlan (full-RP), without any interaction with the planner. All plans were compared against the original plan (RA) to validate the model. Two-tails paired t-test were performed to assess statistically significant differences. We evaluated: V95%, Dmean, Dmax and D1% for PTVs; and V30Gy, V40Gy, V50Gy, Dmean, Dmax and D1% for OARs. We also evaluated OARs differences in terms of generalized equivalent uniform dose (gEUD). Values of a (describing the volume effect) were set to: for rectum a=1 (faecal incontinence) and a=8 (bleeding); for bladder a=8 and a=40 (severe urinary toxicity, urinary incontinence); for bowel a=10 (acute diarrhea); for femoral heads a=12 (fracture).

Current Status
For both steps, when comparing RP vs RA, PTVs coverage was comparable and the average differences were not statistically significant. Concerning OARs, RP was always better with most of the improvements statistically significant. When
comparing full-RP vs RA, PTVs coverage was always better. Concerning OARs, full-RP was better (with differences significant only in few cases). When looking to gEUD-evaluation, RP average values were always better than RA. In particular for rectum, bladder and bowel toxicities the differences were >1Gy in 90% of the cases. For full-RP vs. RA, the average differences in gEUD were not significant: despite this, an improvement >1Gy was found in 50% of patients for rectum/bladder gEUD-values; and in 70% for bowel and femoral heads.

The wide-loop validation is currently on-going as well as the collection of a clinical “plan scoring” obtained by asking 3 clinicians to assess the quality of the plans in a blind manner. The suggested stepping-validation procedure assessed the potentialities of KB-planning optimization in supporting/partly replacing manual optimization in a quite complex clinically situation. A robust KB-model was found to be able to generate high-quality plans, at least comparable to the original ones. A further interaction of a planner improved planning performances. The gradual validation approach here followed seems to be able to increase the confidence in using KB-optimization in a clinical environment and to better understand limits and potentials of this promising approach. It will be applied to other models currently under preparation.

Roberta Castriconi (castriconi.roberta@hsr.it) is 27 year old. In 2013 she earned her B.Sc. degree in Physics with special mention discussing a thesis on phase contrast mammography, and in 2016 her M.Sc. degree in Physics magna cum laude, at Federico II University, Naples, Italy, with a thesis on Radiochromic film dosimetry for hadron therapy. She is currently a student of the first year of the three-year post-graduate School of Medical Physics at Milan University, Italy. In January 2017, she started her residency in radiotherapy physics at San Raffaele Scientific Institute, Milan. She is highly motivated and optimistic about her future career as a qualified medical physicist. Moreover, she is a swing dancer in particular lindy hop, shag, charleston, solo jazz and balboa. She loves music and enjoys all sports in particular horse riding, bicycle riding and skiing. She loves travel, camping holiday and music festival.
At the 102nd National Congress of the Italian Physical Society (SIF, website: en.sif.it/) in Padua, Italy, on 26th September 2016, I had the possibility to present the results of my undergraduate thesis work in medical physics, carried out at Federico II University, Naples, Italy, where I discussed my thesis on March 2016. There, my oral presentation was selected as the second best presentation in the section “Biophysics and Medical Physics”. The award—consisting of a certificate and the possibility to publish a gold open access full paper in the journal “Il Nuovo Cimento – Colloquia and Communications in Physics”—was officially assigned this year, at the 103rd Congress of SIF in Trento, on 11th September 2017, by SIF President, Prof. Luisa Cifarelli (see Fig. 1). In this work—carried out within the activities of INFN, Italy, for technological and interdisciplinary research—I measured the 3D dose distribution in a breast phantom in a digital breast tomosynthesis (DBT) scan using XR-QA2 radiochromic films, to validate Monte Carlo calculations for dosimetry in DBT. The work is described in the article just published [1].

I am so honored to have received this unexpected award. I believe it is a demonstration that passion and dedication to medical physics can bring every young student to great goals.

Reference

Fig. 1: a) Award ceremony in Trento where I received the certificate by the President of the Italian Physical Society (SIF), Prof. Luisa Cifarelli. b) My certificate!

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I am 26 year old. I have a BSc degree in Physics (2016), I am now a graduate student at Federico II University in Naples, and my MSc thesis in medical physics is on a new technique of breast cancer rotational radiotherapy with synchrotron radiation. My plan is to take the three-year post-graduate university Diploma to become a Medical Physics Expert. My hobby is drawing using a charcoal pencil.
PhD research in proton therapy: news from Catania, Italy

**Geant4 Monte Carlo toolkit for radiobiological calculation with clinical proton and ion beams**

My thesis work is focused on the upgrade of Hadrontherapy toolkit by inserting new beam line geometries and new classes devoted to the LET (Linear Energy Transfer) and RBE (Relative Biological Effectiveness) calculations. Specifically, the toolkit has been upgraded simulating two additional beam lines geometry: the TIFPA (Trento Institute for Fundamentals Physics Applications) beamline, dedicated exclusively to the radiobiological studies with energies between 70 and 230 MeV and the "zero-degree" beamline placed at LNS-INFN in Catania and dedicated to irradiation studies with 62 AMeV light ions (from alphas to Neon). In Figure 1 a sketch of the simulated CATANA and “zero-degree” beamlines geometry, is reported.

The CATANA (Centro di AdroTerapia e Applicazioni Nucleari Avanzate) protontherapy center of LNS-INFN (Laboratori Nazionali del Sud – Instituto Nazionale di Fisica Nucleare) was the first Italian clinical facility making use of energetic (62 MeV) proton beams for the solid tumours treatment [1]. Nowadays, 294 patients have been successful treated whose majority was affected by choroidal and iris melanomas [2]. The CATANA beamline is entirely simulated inside an open source application, named Hadrontherapy, currently available inside the public released of the Geant4 toolkit [3,4]. The Hadrontherapy application allows for the activation of more than one physics lists including many different physics models, specifically combined for each specific need. I have recently inserted inside the code a recommended physics list named HADRONTHERAPY. It was implemented to address simulation cases, like the medical applications, where high accuracy is required. In order to reconstruct depth dose, LET and RBE distributions in tissues, a voxelized water phantom is simulated and located at the end of each beam line. A reliable prediction of the spatial LET distribution in a biological tissue is a crucial point for the estimation of the radiobiological parameters. One of the main results of my work consists in the implementation and test of a new algorithm to calculate the averaged track-LET and absorbed averaged dose-LET.

The developed algorithm shows a very low dependence on the transport parameters (as voxel dimension and production threshold of secondary electrons). The new method has been tested using different ion beams (from Z=1 to Z=8) and has shown a good reproducibility in accordance with the attendance values. This algorithm allows to compute the LET both considering in the computation just the primary particles of the incident beam (LET-Primary) and also the contribution due to secondary particles produced from inelastic nuclear interactions (LET-Total). One of the important novelty that I have inserted into the code is a new class devoted to the RBE-weighted dose calculation. Specifically, RBE is calculated by using two different approaches: a hybrid method allowing the calculation of the cell survival and RBE-weighted dose from the coupling of Geant4 and LEM model; a pure analytical method, based on a parametrized approach of the Linear-Quadratic model developed for proton radiations specifically [6].

In the last years, Monte Carlo simulations are becoming increasingly valuable in radiation therapy but only a limited number of authors deeply discussed the possibility to evaluate average RBE distributions using Monte Carlo approaches [5,6]. The main result of my thesis work consists into the demonstrating the capability of Geant4 code in to LET calculation and radiobiological estimations for therapeutic proton beams. The good reproducibility of the experimental data with the simulation results allows Hadrontherapy as the first open source Monte Carlo toolkit able to calculate the first two main biological parameters used to the study the effect of the ionizing particle into a biological sample. My PhD work will be finished at the end of 2018. The last part of my work will consist of the inserting, inside the Hadrontherapy application, of a part dedicated exclusively to the radiobiological calculation at nanometer scale by using the precompiled physics lists of Geant4-DNA packages. Hadrontherapy will be a toolkit able to calculate the effect due to different particle type with high-LET and low-LET at the dimension of the cell nucleus.
Fig. 1: (top) Sketch of the Hadrontherapy application with the complete simulation of the CATANA, and (bottom) zero-degree beamline.

References


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Giada Petringa is a PhD Student at the Laboratori Nazionali del Sud (LNS-INFN) in Catania. Her research activity focuses on the simulation performed by using Geant4 code. She's working on the development of new Monte Carlo calculation methods applied to medical physics and radiobiological studies.
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The EFOMP and COCIR (The European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry) in collaboration with the Czech Association of Medical Physicists and the Department of Dosimetry and Application of Ionizing Radiation of Faculty of Nuclear Sciences and Physical Engineering, Czech Technical University in Prague would like to invite you to the next ESMPE CT 2018.

The school will be aimed at advanced tasks connected with Computed Tomography. The school will cover the main physics aspects of the CT technology, Dosimetry and Optimization.

This edition is jointly organized by EFOMP and COCIR. Lecturers identified by COCIR will give insights on the technical solution adopted by manufacturers in the relevant fields of CT dose reduction and optimization.

This two-and-half day event will be accredited by EBAMP (European Board of Accreditation for Medical Physics) and is intended for practicing clinical Medical Physicists who are involved in Computed Tomography. As in last year’s school, there will be an optional examination at the end for those seeking a higher level of certification beyond attendance.

Content

State of the Art of CT Imaging - Image quality parameters in modern CT imaging - Image reconstruction in CT - from traditional FBP to iterative methods

Tube Current Modulation - Automatic kV Selection - Iterative Reconstructions - How it is implemented in different makes and model of state of the art scanners. How to configure the relevant parameters during acquisition. Future perspectives

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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 34 national organisations which together represent more than 8000 medical physicists and clinical engineers working in the field of medical physics. The moto 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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