



# European Medical Physics News

Summer 2007

## Contents:

Editorial	2
Letter from the President	4
News from Member Countries	5
Country Profile—Poland	8
Teaching Radiation Oncology	11
Statistical QC for IMRT	13
Exchange for clinical physicists	20
ESMRB Lectures	21
Congress Calendar	22

## News from EFOMP:

Due to expiring terms there were some changes in the EFOMP officers board: Alberto del Guerra became past president and Renato Padovani's term as secretary general started, both at the beginning of 2006. Marta Wasilewska-Radwanska from Krakow/Poland was elected as the new chairman of the "Education, Training and Professional affairs committee" and Eduardo Guibel-alde from Madrid/Spain was elected as the new chairman of the "committee on European Union Matters", both starting in 2007. The position of the honorary treasurer (Peter Sharp) was con-firmed by the council in Malaga and prolonged for another 3 year term.

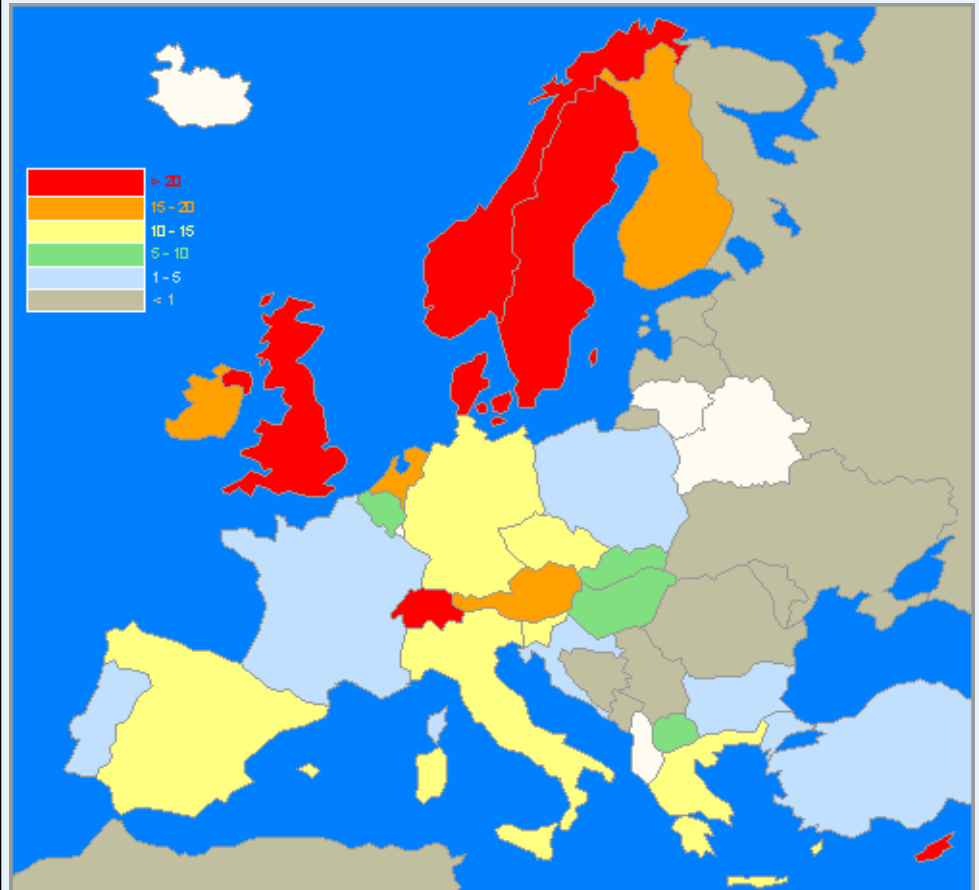
Don't miss the **EFOMP Congress** at Pisa in September 2007. See: <http://efomp-2007.df.unipi.it>



Member of the IBA Group

## EFOMP Membership across Europe

The European Federation of Organisations in Medical Physics (EFOMP) was founded in 1980. The current membership covers 35 national organisations which together represent more than 6,600 physicists and engineers in the field of Medical Physics.



*Medical Physicists per million population  
(data from EFOMP membership statistics 2007)*

The countries which are members of EFOMP have a combined population of 870 million people, and the average number of medical physicists in these countries is currently 7.6 per million.

However, there is a very wide range, from well below 1 per million, to over 30.

Did you know this?

## Editorial

Welcome to the second edition of this re-launched newsletter.

In this issue we introduce a regular column containing news from member countries. There are currently 35 countries which have national member organisations (NMOs) which are members of EFOMP. We welcome news items relating to developments in any area of medical physics, especially good ideas which can be shared and implemented elsewhere.

We also introduce an occasional series of "country profiles", describing medical physics past and present within an NMO. The series begins with the history and current status of medical physics in Poland.

### **How can EFOMP and the NMOs raise the profile of medical physics, making clear our contribution to the health of the people of Europe?**

Do you have ideas, or have you been involved in local activities which can raise our profile? Why not share these with colleagues across Europe. All contributions (which can be in your national language, with an English abstract) in electronic form, including a photo of the author if possible, should be sent to either of the editors.

**Chris Gibson**

**Markus Buchgeister**

## Correspondence

European Medical Physics News made it!



Dear Markus Buchgeister and Chris Gibson

Congratulations to your first issue! It looks very interesting to me and a little big: 18 pages – and all online. As I am one of the editors of the members newsletter

"Bulletin" for the Swiss Society of Radiation Biology and Medical Physics I prefer printed paper to read. So I would suggest implementing also a printer friendly version.

In fact I like that you publish articles in different languages – as we do within our "Bulletin" we have only contributions in German, French and English – I still wait for some issue in Italian. But doing this helps all of us – I am surprised that I even understood something from the Spanish article: "Dosimetría de haces pequeños de electrones mediante un método sencillo basado en película radiográfica".

One thing you could improve is the quality of some of your photographs – I am sure you will find out how to do this for most cases!

My general and closing remark concerns the role of advertisements within such papers – do we really need this here?

So I hope we will improve our connections throughout Europe together!

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Send material for publication to either of the editors. The editors reserve the right to edit the text when appropriate.

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Advertisements for relevant products and services are welcomed, price list available on request. Discounts are available for EFOMP industrial members.

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# Letter from the EFOMP President



Dear Colleagues,

The first year of my term as president of the European Federation of Organisations in Medical Physics is just over and I would like to give a summary on the year 2006 and an outlook to the future work and important dates in 2007.

I would like to thank the new members of the officers board for their readiness to take over these important and work filled positions, and especially the leaving officers, Teresa Eudaldo and Jose Hernandez-Armas, for their excellent work as committee-chairmen, for their co-operation in the committees, in the officers board and in the council. They contributed very much to the friendly and fruitful working atmosphere in the EFOMP officers board.

## **“The present status of Medical Physics Education and Training in Europe. New Perspectives and EFOMP recommendations”**

This report was drafted under the leadership of Teresa Eudaldo (former chairman of the ETP committee) and Kjeld Olsen (chairman of the registration committee). It gives a comprehensive overview and summary on education and training programs and schemes in Medical Physics in European countries. The report was developed on the basis of two fact-finding inquiries, as a result of which 19 NMOs described the current level of education and training in their individual countries. The report is resulting in EFOMP recommendations with the view to the new European perspectives taking into account the Bologna declaration from 1999 and the EC-directive 2005/36 on the recognition of professional qualifications. It is our intention, to publish this recommendations as the EFOMP policy statement #12, making the old policy statement #1 obsolete. The full report can be downloaded from the EFOMP website. The recommendations of the report will be formed into a policy statement for approval at the 2007 council meeting.

## **The “Malaga declaration”**

A further important milestone in 2006 was a statement called the “Malaga declaration” which was presented to the EFOMP council by the chairman on “European Union Matters”, Jose Hernandez Armas. The Malaga declaration is a statement with Efomp’s position on Medical Physics in Europe, with the aim “to establish Medical Physics as a regulated profession” and as “a health care profession” in all member states in Europe. These 2 statements have been

positively voted on electronically by the delegates of the NMOs after post council text editions, while a 3rd statement, saying “that radiation protection in hospitals, involving patients, working staff and members of the public, must be performed by Medical Physics Experts”, has already been agreed upon in the council meeting.

## **European Medical Physics News**

An important result of work in the communication and publication committee was the production of the “European Medical Physics News”, an electronic magazine, which will be published two or three times per year by EFOMP, edited by Markus Buchgeister and Chris Gibson. This magazine will not only be the platform for news from EFOMP, but also for scientific and technical contributions and reports in national languages. All NMO members are invited to subscribe to the magazine without cost at the EFOMP website [www.efomp.org](http://www.efomp.org).

## **European Journal of Medical Physics**

Another project, which kept the officers board quite busy in 2006 was the re-launch of the Journal “Physica Medica” as the new official scientific journal of EFOMP with the sub-title “European Journal of Medical Physics”. Starting in the first quarter of 2007, the journal will now be published by Elsevier with 4 issues per year. The scope of the journal has been redefined with the subfields of Medical Physics in Radiotherapy, Radiology, Radiation Protection, Measurements and Education. A completely new editorial board has been established with 30 board members and 5 associate editors representing the subfields of Medical Physics. The journal will also serve as the official journal of the Italian Medical Physics organisation AIFM, some other countries are considering to follow this example. In principle, all members of EFOMP-NMO have the possibility to subscribe at a very reduced rate (e.g. only 18 € / year for the electronic version), provided that an agreement between Elsevier and the society has been signed. Any societies wishing to form such an agreement should either contact me or directly our the contact person at Elsevier company ([Ru.beer@elsevier.com](mailto:Ru.beer@elsevier.com)). I would like to ask you all to support this new journal of EFOMP, not only by subscribing, but also by submitting suited scientific contributions to the editor in chief (in 2007 still Alberto del Guerra).

## **European Network of Medical Physics Training Schools (ENMPS)**

The officers of EFOMP have been considering the establishment of a process for coordinating across Europe CPD courses for Medical Physicists, so that these are harmonized and offer the same level of

education. In order to achieve this goal, EFOMP is going to propose the creation of a European Network of Medical Physics training schools (ENMPS). The EFOMP NMOs will be asked for their support, so that the EFOMP officers can proceed with this proposal.

#### EFOMP conference in Pisa, 2007

In 2007 the Xth EFOMP congress will be organized by Alberto del Guerra in conjunction with the Italian Association of Medical Physics (AIFM) in "Il Ciocco" in the vicinity of Pisa, Italy. The event is scheduled for 20-22 of September. The goal is to present a state-of-the-art of Medical Physics in its various specialties: from Radiotherapy to Diagnostic Radiology, from Nuclear Medicine to Medical Imaging, from Radioprotection to Physiological Measurement Techniques. One of the main tasks of EFOMP is to promote and to harmonize the best practice of Medical Physics in Europe. Hence there will be special sessions on training and education in Medical Physics.

I am very much looking forward to welcome you at the EFOMP PISA 2007 Congress.

Wolfgang Schlegel  
President of EFOMP

## Perhaps our youngest reader ?



*If you have a nice photo of one of our readers NOT belonging to the Medical Physics Community, please, sent it to us! If we receive enough, we might open a photo contest!*

# News from Member Countries

## France

In November 2004, a law text has been released to define the education, missions, and intervention conditions of the specialized person in medical radiophysics (SPMR).

The missions are defined as follows:

The SPMR ensures that equipment, calculation data and process to determine and deliver doses and activities to the patient in any process of ionising radiation exposition are appropriate... in radiotherapy, assures the dose received by tissue correspond to the prescribed one... estimates the dose received by the patient during diagnostic procedures... contributes to the set up of quality assurance, including quality control of medical equipment... contributes to technique and material developments, use and choice... gives advices to restrict exposition of the patients, relatives, public and the environment... participate to the medical physics education of the medical and paramedical staff.

This text states that the hospital director shall set up and evaluate a medical physics organization plan so that in radiotherapy and brachytherapy, the SPMRs shall be in sufficient number and presence so as to ensure their missions as previously defined; in radiotherapy a SPMR shall be present during the delivery of the dose to the patient; in nuclear medicine and in interventional radiology, a SPMR shall be available. It is then specified that this plan determines the organization and the necessary staff level with regard to medical practices, number of patients, special techniques, existing competence in dosimetry and measures implemented for maintenance, internal and external quality control. Those activities can be provisioned by a SPMR not working for the hospital, a contract is then needed.

This MP organization plan is a new notion that has been implemented to ensure the MPs will be able to ensure their missions. The Nuclear Security Authority audit the departments concerned and now make sure this MP plan is released or about to be; one of the main problem being recruiting MPs in diagnostic radiology, as there are never been full time MPs in this area in France. MP staffs are thus required to propose a plan to their director.

The French MP Association (SFPM) has decided to start a reflection on this subject. A consultancy firm interviewed decisional personalities so as to get an external view of the MP problematic and presented their analyse back to the Association. A work meeting involving MPs from different regional chapters will take place end of March, guided by the consultants. An overview of existing plans will be presented but more important propositions on the profession

with regard to new regulations and organisation of health care system will emerge from working groups. A synthetic document should be issued to help MPs preparing and managing their plans. This document will be presented during the next national congress, end of May in Saint-Malo.

*Hélène Bouscayrol*

Reference: « Arrêté du 19 novembre 2004 relatif à la formation, aux missions et aux conditions d'intervention de la personne spécialisée en radiophysique médicale »

Note: if such plans are defined in law texts in other countries, the French delegate would be glad to hear from them, please do not hesitate to contact her (Helene.bouscayrol@chr-orleans.fr)

## Spain

In Spain, physicists started working in radiation oncology departments in the sixties when the first Cobalt-60 units were installed. The Spanish Society of Medical Physicists (SEFM) was founded in 1975, uniting physicists working in four different fields in hospitals (radiation oncology, diagnostic and interventional radiology, nuclear medicine and radiation protection) and

physicists working in related fields at universities. The SEFM presently has about 600 full members. Since its foundation, the SEFM worked towards obtaining official government recognition of medical physicists as health professionals and unifying criteria for the education of physicists wanting to work in the above-mentioned fields in hospitals. These goals were met in 1997 when Royal Decree 220/1997 came into effect. To date, 250 medical physicists have gone through the established training program in medical physics departments with teaching accreditation. Following a national selection examination each year about 25 physicist graduates enter a full-time three-year training programme and receive a government salary. As they receive training in all four fields, once they have qualified as a specialist in hospital radiophysics, they are competent to work in any one of these. Salary scales and professional scales are the same as those for physicians. About 50% of the medical physics departments in Spain are independent from medical departments and incorporate all physicists working in the different fields within the hospital.

The SEFM maintains an excellent relationship with physics faculties at Spanish universities, facilitating preparation and completion of PhDs. in medical physics. Each year, the SEFM organises several continuous education courses as well as basic

courses on medical physics for physicists in training (in this case jointly with the "Universidad Internacional de Andalucía"). It holds a bi-annual national meeting that will be held this year in May in Granada. It also edits a three-monthly journal in which peer-reviewed scientific papers are published (<http://www.sefm.es/revistafisicamedica/>).

For further information about SEFM and its activities please feel free to consult the following web page: [www.sefm.es](http://www.sefm.es)

*Nuria Jornet*

## Austria



The new Officer's Board of the Austrian Society for Medical Physics (ÖGMP) is as follows:

President: Dr Michael Oberlad-

statter, Innsbruck

Past President: DI Ruth Freund, Vienna

Vice President : Dr Werner Schmidt, Vienna

Secretary General : DI Bernhard Gruy, Linz

Treasurer:; DI Michael Vejda, Neustadt

A pool of QC-phantoms for gamma cameras and PET-scanners has been established by a joint working group of the Austrian Societies for Medical Physics (OGMP) and Nuclear Medicine (OGN). The goal was to provide a complete set of phantoms mainly for acceptance testing after installation or major service operations or modifications without having to buy expensive phantoms. The pool is managed by the "Institut für Krankenhausphysik", Vienna, responsible for storage, time schedule, care and shipment.

The requesting individual (reservation for a specific date via e-mail/phone) has to be member of one of the societies, mandatory data are: which phantoms, duration, contact addresses and modalities of transport.

Phantoms have to be handled with great care. For each phantom a manual including special comments and tools are added. All phantoms have to be sent back decontaminated, dry and packed safely. A transport insurance has been contracted. Damages during use have to be covered by the requesting institute's insurance.

*Werner Schmidt, Michael Oberladstatter*

SCANDITRONIX

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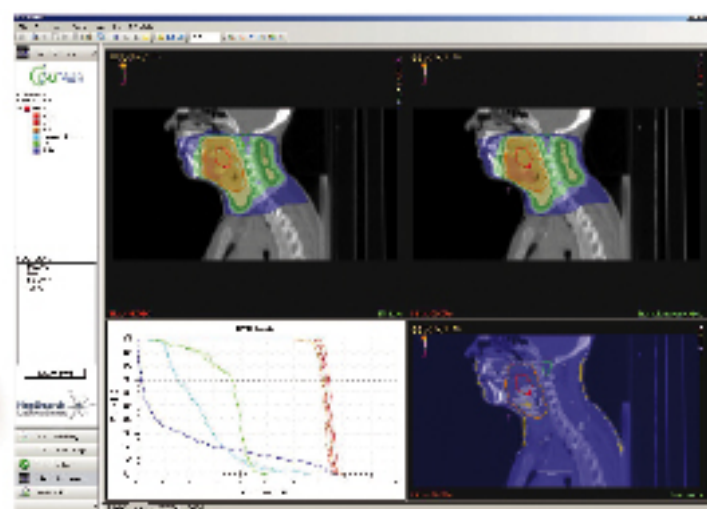
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# Country Profile—Medical Physics in Poland

Marta Wasilewska-Radwańska  
 AGH University of Science and Technology, Kraków, Poland  
 radwanska@novell.ftj.agh.edu.pl



Polish medical physicists are employed in cancer radiotherapy centres, in clinics and hospitals (radiology, nuclear medicine, magnetic resonance departments), in regional branches of radiation hygiene services, universities, and scientific institutes. The Polish Society for Medical Physics groups some 200 members in 12 Regional Branches (Białystok, Bydgoszcz, Gdańsk, Katowice, Kielce, Kraków, Łódź, Lublin, Poznań, Szczecin, Warszawa, Wrocław).



Medical radiation physics in Poland dates back to the thirties of the 20th century when Maria Skłodowska-Curie (Nobel prizes 1903 and 1911) suggested that a Physics Department be set up at the new building of the Radium Institute to be established in Warsaw. Professor Cezary Pawłowski (1895-1981), her co-worker in France, after his return to Poland, implemented this idea. Irene and Frederic Joliot (Nobel prize 1935) offered a large sum of money for the purchase a large electromagnet for the Wilson chamber experiments. Professor Pawłowski founded a Laboratory intended for the measurements of X-rays and radioactive materials for the use in various cancer hospitals. At that time, teaching was carried out on an individual basis. It was only after the Second World War, i.e. in 1946, that thanks to Professor Pawłowski's efforts a special field of study was initiated at Warsaw University of Technology, in the form of a Medical Electro-Engineering Division, where students were taught

general radiology, industrial radiology, radiation measurements, radiation protection, etc. His co-workers, Professors J. Keller and S. Nowosielski, continued this work, which has developed into regular studies in biomedical engineering carried out at present at the Institute of Precision and Biomedical Engineering, Faculty of Mechatronics, Warsaw University of Technology (Professors G.Pawlicki and T.Pańko). Professor M. Miesowicz started teaching Technical Physics in the fifties of the 20th century at the University of Mining and Metallurgy (now AGH University of Science and Technology) in Kraków. Then medical physics as a branch of Experimental Physics started in 1974 at Warsaw University (Prof. B. Gwiazdowska - now National Consultant in Medical Physics and Medical Engineering for the Polish Ministry of Health, Prof. J. Pniewski, Prof. E. Skrzypczak, Prof. J. Tołwiński) and at the Jagellonian University in Kraków (Prof. A. Hryniewicz). In 1990/91, medical physics and dosimetry as part of

Technical Physics was taught as a separate discipline at the AGH University of Science and Technology in Kraków (Prof. J. Niewodniczański, Prof. M. Wasilewska-Radwańska) in close cooperation with the Faculty of Medicine, Collegium Medicum of the Jagellonian University (Prof. Z. Chłap, Prof. Z. Szybiński, Prof. S. Konturek) and the Centre of Oncology – Kraków Division (Prof. J. Skołyszewski and Prof. M. Waligórski). A few years later, medical physics was initiated at the Adam Mickiewicz University in Poznań (Prof. R. Krzyminiewski) and at the University of Silesia (Prof. Z. Drzazga).

In the academic year of 2006/2007 medical physics education is offered by 70% of universities (Gdańsk, Katowice, Kraków, Łódź, Opole, Poznań, Szczecin, Toruń, Warszawa and Wrocław) and 30% of technical universities (Kraków, Łódź, Wrocław) in Poland.

Biomedical engineering courses are offered in about 60% of technical universities.

The Polish Society for Medical Physics (PSMP) was founded in 1965 under the patronage of the Polish Ministry of Health. Its main activities were focused on the development of medical physics in this country and representation of the medical physics community before national authorities, as well as collaboration with other national and international scientific organisations of similar interest.



**Oskar Chomicki**

The first General Assembly of the PSMP elected in 1965 the Governing Board with Prof. D. Shugar as President and Oskar Chomicki as General Secretary. It worth noting that Mr Chomicki was elected Vice-President of the International Organisation of Medical Physics (IOMP) for term of 1997-2000 and then became President of the IOMP in 2000-2003.

The PSMP became one of the first national organisations to join IOMP, and later a member of the European Federation of Organisations for Medical Physics (EFOMP). The President and the Governing Board of the PSMP are elected for a 3-year term by the General Assembly held jointly with a scientific conference on medical physics. The names of Presidents were: Professors D. Shugar (1965-1969), J. Keller (1969-1984), E. Trembaczowski (1984-1986), B. Gwiazdowska (1986-1989) and G. Pawlicki (1989-2005). In September 2005 Prof. Michael Waligórski. (Centre of Oncology in Kraków, Head of the clinical medical physics & research) was elected President for the term 2005-2008. The Governing Board elected in 2005 included: Vice-Presidents: Prof. Tadeusz Pałko (Warsaw University of Technology; biomedical engineering) and Prof. Natalia Gol-

nik (Warsaw University of Technology; medical engineering & radiation protection); Secretary General: Prof. Marta Wasilewska-Radwańska (AGH University of Science and Technology; medical physics); Treasurer: Prof. Krzysztof Zaremba (Warsaw University of Technology; radioelectronics & medical engineering), and Members: Prof. Ryszard Krzyminiewski (Adam Mickiewicz University, Poznań; medical physics), Dr Pawel Kukołowicz (Holly Cross Centre of Oncology, Kielce; clinical medical physics & research), Prof. Paweł Olko (Institute of Nuclear Physics, Polish Academy of Science, Kraków; dosimetry & radiation protection), and Prof. Ewa Zalewska (Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Science in Warsaw; biomedical engineering & neurophysiology).

The PSMP has 12 branches (divisions) in Białystok, Bydgoszcz, Gdańsk, Katowice, Kielce, Kraków, Lublin, Łódź, Poznań, Szczecin, Warszawa and Wrocław. The aim of the Society is, first of all, to initiate and support the development of medical physics and medical engineering. Towards this aim, the Polish Society for Medical Physics organises scientific congresses, symposia, workshops, seminars and lectures, publishes a scientific journal (quarterly) and topical reports, reviews the development of medical physics in Poland and represents the medical physics community before national authorities, collaborates with other national, European and international scientific organisations of similar interest. The Governing Board of the Society establishes commissions and committees to deal with particular issues.

Between 1966 and 1992 the PSMP published a bulletin „Advances in Medical Physics” under the patronage of the Polish Academy of Science. Prof. A. Piątkowski was the President of the Editorial Board in 1966-1982. Since 1995 PSMP has been publishing The Polish Journal of Medical Physics and Engineering with financial support by the Polish Ministry of Science. Prof. E. Zalewska was the first Editor-in-Chief (1995-2006). Now Prof. N. Golnik has since taken her place.

Systems of educating specialists in medical physics and radiation protection in Poland leading to a national certificate are based on the new Polish Atomic Act passed in 2004 (as an implementation of 96/29/EURATOM and 97/43/EURATOM Directives), as well as on Regulations issued by the Polish Government and the Polish Ministry of Health.

Medical physicists in Poland are mostly employed at oncological centres and hospitals. The new Regulations stipulate that medical physicists can work at Departments of Radiology, Departments of Nuclear Medicine and Departments of Imaging Diagnosis also in those without the use of non-ionising radia-

tion such as magnetic resonance, ultrasound, impedance etc.

In 2005, the PSMP held a National Conference with International Participation on „Physics and Engineering in the Present Day Medicine and Healthcare – the Challenges to Poland as a new Member of the European Union”, jointly with the 13th Congress of the Polish Society for Medical Physics in Warsaw, Poland, 29-30 September 2005 ).



**From the left: Prof. Barbara Gwiazdowska - National Consultant in Medical Physics and Medical Engineering for the Polish Ministry of Health, Prof. Marta Wasilewska-Radwanska and Prof. Natalia Golnik.**

The next conference entitled “A EUROPEAN CONFERENCE ON MEDICAL PHYSICS AND ENGINEERING 110 YEARS AFTER THE DISCOVERY OF POLONIUM AND RADIUM” will be held on September 17-21, 2008 in Kraków, the old capital of Poland. This Conference will coincide with the 14th Congress of the Polish Society of Medical Physics and the EFOMP Council and Officers’ meeting. For more details see <http://mpekrak08.ftj.agh.edu.pl>.

### Just English humour?!

An English professor writes on the board:

„A woman without her man is nothing“

and asks his students to punctuate the sentence.

A male student writes,

„A woman, without her man, is nothing.“

A female student writes,

„A woman: without her, man is nothing.“



## Postdoctoral fellowship in medical physics available in Portugal

School of Engineering, The Catholic University of Portugal (Sintra Campus), Lisbon, Portugal. Minimum duration 5 years.

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Closely collaborate in developing and strengthening an academic/research group in medical physics; Lecture, at both undergraduate and postgraduate levels, in medical physics related subjects; Participate in national and international research projects in medical physics related areas.

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Ph.D. in Medical Physics (or related area), knowledge and expertise in (academic/clinical) medical physics (preferably medical imaging), at least 3 years postdoctoral research experience and evidence of ability to work independently. Proficiency in English, good communication and team working skills

### Applications and Contacts

Further information can be requested by e-mail to [apascoal@fe.ucp.pt](mailto:apascoal@fe.ucp.pt). Applicants are encouraged to apply asap by submitting by e-mail a letter outlining their career objectives and a Curriculum Vitae (including names/contacts of two referees).

### Contact Person:

Ana Pascoal, Ph.D., School of Engineering,  
The Catholic University of Portugal, (web: [www.fe.ucp.pt](http://www.fe.ucp.pt))  
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2635-631 Rio de Mouro  
Sintra, PORTUGAL  
phone (direct): (+351) 21 426-97 82, (general): -97 70  
fax: (+351) 21 426-98 00

# Teaching and Learning in Radiation Oncology Physics

Prof. Dr. G. H. Hartmann,  
Medical Physics in Radiation Oncology  
German Cancer Research Centre (DKFZ)  
Heidelberg



Teaching as well as learning always requires good textbooks. Classic radiation oncology physics textbooks have been written by many authors, most notable Johns and Cunningham, Khan, Hendee and Van Dyk. Recently (since 2005), a new textbook is available in paperback format: "Radiation Oncology Physics: A Handbook for Teachers and

Students" issued by the International Atomic Energy Agency, Vienna. The text focusing on radiation oncology physics has been developed with the assistance of a large number of contributing specialist authors from multiple continents under the expert guidance of the editor, E. B. Podgorsak.

The main goal of this textbook (hence called the "Handbook") is to support graduate programmes in medical radiation physics. In 16 chapters and in about 650 pages the "Handbook" provides a comprehensive overview of the basic and essential knowledge required for radiotherapy trainees in the form of a syllabus for modern radiation oncology. It comprises fundamental topics (such as basic physics theory, detection principles, and radiotherapy-source properties); all aspects of external beam therapy (photon and electron therapy with linear accelerators, teletherapy and kilovoltage units, special procedures); brachytherapy with sealed sources; treatment planning; beam calibration; quality assurance; as well as radio-biology; and radiation protection.

Very positive reviews of the "Handbook" already appeared in several journals [1,2,3]. The "Handbook" is now available in paperback format from IAEA Publications, IAEA, Wagramer Str. 5, PO Box 100, A-1400 Vienna, Austria (email: sales.publications@iaea.org) or as pdf file directly from the IAEA website at: [www-naweb.iaea.org/nahu/dmrip/pdf\\_files/ToC.pdf](http://www-naweb.iaea.org/nahu/dmrip/pdf_files/ToC.pdf).

Since the "Handbook" is considered to be very well suited for anyone currently teaching or studying a graduate level course in medical physics, the IAEA recently has undertaken a supplemental project in

order to support further the teaching of medical physics aspect. To this end, the content of each of the 16 chapters has been "translated" into slide sets with almost 2500 slides in total. The slide set has been developed jointly by the editor of the "Handbook" and the author of this article, and can be obtained from the IAEA website:

## Syllabus

<http://www-naweb.iaea.org/nahu/dmrip/syllabus.shtm>

## Slide set

<http://www-naweb.iaea.org/nahu/dmrip/slides.shtm>

Initially, the slide set will be posted on the IAEA Website as working material seeking comments, corrections, and feedback. These should be forwarded directly to the secretary of the project at the IAEA, Stanislav M. Vatnitsky at: [s.vatnitsky@iaea.org](mailto:s.vatnitsky@iaea.org).

## Simulating Interactions with Matter

### About RadSim

RadSim was developed in the summer of 2004 by a research team of the Medical Physics Unit at McGill University:

Steven Palefsky and Jason Yan (Junior Scientists), François DeBlois (Senior Scientist) and Frank Verhaegen (Team Leader).

The program is intended for classroom teaching and self-teaching of radiation physics interactions in Medical Physics. The program can simulate individual interactions, or perform a Monte Carlo simulation of a number of particles with output statistics.

- RadSim was developed for educational purposes.
- Use for research is discouraged.
- RadSim cannot be used for commercial purposes.
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# UTILISATION DE LA MAITRISE STATISTIQUE DES PROCEDES POUR L'OPTIMISATION DES CONTROLES QUALITE EN RADIOTHERAPIE CONFORMATIONNELLE PAR MODULATION D'INTENSITE (RCMI)

“Using Statistical Process Control to optimise quality assurance in intensity-modulated radiotherapy “



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## ABSTRACT

Although intensity modulated radiation therapy (IMRT) offers the opportunity to achieve a better compromise between target volume coverage and sparing organs at risk, its routine clinical implementation is partially held back by the excessive time required to perform pre-treatment quality control.

The purpose of our study is to evaluate and then optimise the pre-treatment quality control in IMRT, using Statistical Process Control (SPC). SPC is a method currently used in industry for controlling and improving the quality of a process through statistical analysis.

SPC shows that, instead of monitoring individual results, in order to control a process it is necessary to simultaneously monitor the location and dispersion of subgroups of data. This practice constitutes an important change to current methodology. A retrospective statistical analysis showed that the distribution representing the differences between the measured and the calculated dose could be approximated by a normal distribution. This implies that the treatment delivery process is not subject to assignable causes, but to many factors that occur randomly.

We then retrospectively evaluated the interest of setting a SPC. We found that using control charts during quality controls would have allowed us to detect genuine deviations, such as multileaf collimator calibration, more quickly. The control charts also confirmed that our process is only subject to causes of random variability, which means it is statistically controlled. The next step will be to try to reduce the causes of random variability.

Finally, the capability analysis estimated our process performance and confirmed the descriptive statistics results: our process is not centred on the target value (0% difference between the calculated and the measured dose) and data dispersion is too large. Indeed, 4,3% of the results were outside the clinical thresholds. The next step will be to identify all the factors affecting our process by looking at the design of experiments, and then to take action when it

is possible.

Key words: quality assurance, Statistical Process Control, IMRT

## I. INTRODUCTION

Actuellement, la RCMI est utilisée principalement pour les traitements du cancer de la prostate et de la sphère ORL. En effet, elle permet, par rapport à la radiothérapie conformationnelle classique, de mieux conformer le volume cible quelle que soit sa forme, et donc de préserver d'avantage les organes à risque [1-4].

Ces deux localisations (prostate et ORL) représentent à elles seules, 19% des patients traités en radiothérapie externe en 2005 au Centre Alexis Vautrin (Nancy, France). Bien que la RCMI y soit mise en œuvre depuis 2001, seul 1,5% de ces patients bénéficient des traitements par RCMI. La cause principale est le temps nécessaire à la mise en œuvre du traitement.

Le but de notre étude est donc de mettre au point une démarche permettant d'étendre l'accès à cette technique, à une majorité de patients. Il s'agit pour cela de concilier la recherche du meilleur traitement répondant aux attentes du patient, et la réduction du temps nécessaire à la planification et à la vérification dosimétrique de chaque plan de traitement.

Seule l'étude concernant la vérification dosimétrique sera développée dans cet article.

En RCMI, des contrôles pré-traitement sont effectués systématiquement avant la première séance de traitement du patient, sur fantôme. Une des méthodes recommandées [5-7], et utilisée par le Centre Alexis Vautrin (Nancy, France), consiste à évaluer, pour chaque faisceau du plan de traitement, l'écart entre la dose calculée par le Système de Planification de Traitement (TPS) et la dose mesurée (par chambre d'ionisation et film radiographique, respectivement pour des mesures de dose absolue et dose relative). Ces contrôles permettent d'une part, de vérifier le calcul de la distribution de dose et du déplacement des lames du TPS et d'autre part, de détecter d'éventuels problèmes mécaniques liés à l'ac-

célérateur.

Bien que nécessaires, ces contrôles nécessitent un temps physique important (3 à 4 heures par patient), ainsi qu'une immobilisation de l'accélérateur. La pratique a montré qu'ils n'ont pas conduit (sur un total de 638 contrôles (prostate et ORL) réalisés au Centre Alexis Vautrin), à une modification du plan de traitement initial. Ils n'ont donc permis que des vérifications et validations. Le but principal de notre étude est d'évaluer puis d'optimiser ces contrôles pré-traitement en RCMI, à l'aide de la Maîtrise Statistique des Procédés (MSP). Il s'agit d'une méthode d'analyse statistique pour le contrôle et l'amélioration de la qualité des procédés et processus qui a été développée par l'industrie.

Nos objectifs sont donc d'utiliser la MSP pour (1) évaluer la stabilité de notre processus de contrôle actuel : contrôle systématique de tous les faisceaux de chaque patient (contrôle à 100%), (2) améliorer, si nécessaire, la stabilité du processus en prévenant une dérive des valeurs cibles ou de leur dispersion, en les mettant sous contrôle statistique, au lieu de subir cette dérive et enfin (3) déterminer, lorsque le processus est considéré stable, s'il est possible d'éviter le contrôle à 100%, et de rationaliser le processus en agissant sur le nombre et la fréquence des contrôles en fonction de risques statistiques prédéfinis, au lieu de les choisir par expérience ou par intuition.

## II. METHODE

### A. La MSP appliquée aux contrôles qualité en RCMI

#### 1. Définition générale

La Maîtrise Statistique des Procédés est une véritable démarche préventive de gestion de la qualité. Elle englobe méthodes et outils visant à amener tout processus au niveau requis de régularité, de qualité, et à l'y maintenir grâce à un système de surveillance (les cartes de contrôle), permettant de réagir rapidement et efficacement à des dérives. Ainsi, la MSP permet une amélioration dynamique de la qualité, et apporte un niveau de confiance supplémentaire dans les résultats obtenus.

Ici, nous proposons d'utiliser ces outils et méthodes et de les appliquer aux contrôles pré-traitement effectués en RCMI.

#### 2. Un changement de point de vue

Actuellement, les contrôles qualité en RCMI dits « faisceau par faisceau », consistent à vérifier individuellement pour chaque faisceau, que l'écart entre la dose mesurée et la dose calculée reste dans les tolérances recommandées par le GORTEC (Groupe d'Oncologie Radiothérapie des tumeurs de la Tête Et du Cou) : 4% dans les zones à faibles gradients de dose, et 4mm dans les zones à forts gradients [6].

Néanmoins, cette méthode de contrôles individuels peut conduire à des erreurs [8]. En effet, supposons que les valeurs c'est-à-dire les écarts entre la dose

mesurée et la dose calculée se distribuent selon une loi normale (nous verrons plus tard que c'est le cas), et que la valeur contrôlée soit juste à la position cible recherchée, soit 0% d'écart. Sous cette hypothèse, étudions deux cas extrêmes (figure 1a et 1b) :

a- cette valeur contrôlée est positionnée au milieu de la courbe de Gauss (qui représente la distribution des valeurs correspondant au réglage retenu). Puisqu'elle est dans les tolérances, nous allons conclure que le processus est bien réglé, ce qui est vrai.

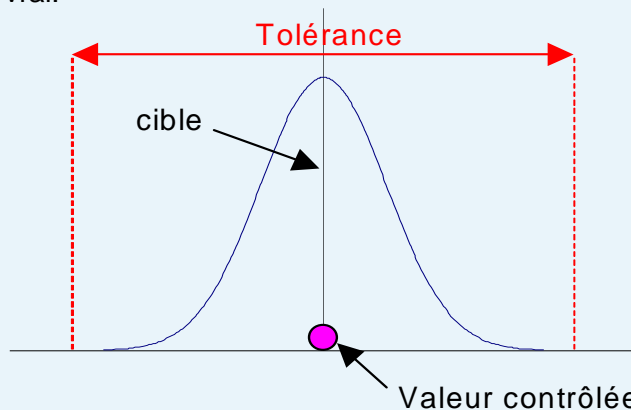


Figure 1a : Cas où la valeur contrôlée est positionnée au milieu de la courbe de Gauss.

Figure 1a : The controlled value is located in the middle of the Gaussian curve.

b- cette valeur contrôlée est située en bordure de la courbe de Gauss (qui représente la distribution des valeurs correspondant au réglage retenu). Puisqu'elle est dans les tolérances, nous allons croire que le processus est bien réglé, or ce n'est pas vrai : on note un dérèglement de la valeur moyenne du processus.

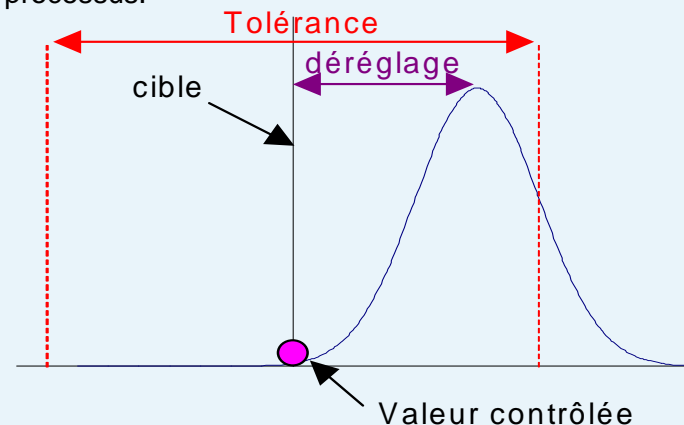


Figure 1b : Cas où la valeur contrôlée est située en bordure de la courbe de Gauss.

Figure 1b : The controlled value is located at the border of the Gaussian curve.

La méthode des contrôles individuels peut donc entraîner des risques de conclusions erronées. L'origine de ces erreurs de jugement provient de la dispersion des valeurs, qui n'est pas prise en compte ici. En effet, une valeur se caractérise par deux paramètres : un paramètre de réglage, et un paramètre de dispersion.

Pour éviter ce type d'erreurs, nous allons, à l'aide de la MSP, suivre les variations de groupes de valeurs. Ainsi, nous effectuerons la moyenne de plusieurs valeurs (obtenues dans les mêmes conditions), ce qui permettra de tenir compte de l'effet de la dispersion (figure 1c).

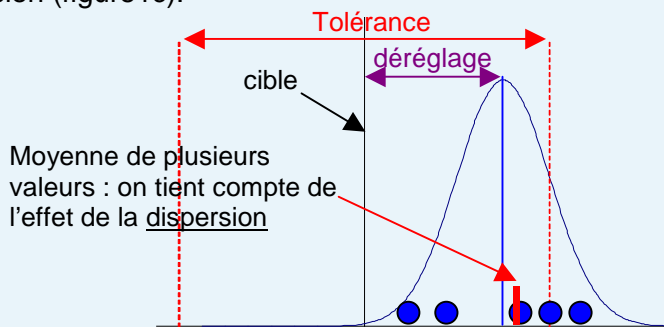


Figure 1c : Méthode suggérée : suivre les variations d'un échantillon de valeur (calculer la moyenne) pour tenir compte à la fois de l'effet du réglage et de l'effet de la dispersion.

Figure 1c : Suggested method : to monitor the variations of a subgroup of data (calculation of the average) to take into account both, the location and dispersion effect.

Pour parvenir à maîtriser le processus, il est donc nécessaire de suivre un groupe de valeurs, et de suivre simultanément l'évolution de sa moyenne et de sa dispersion estimée.

### 3. Les cartes de contrôle

Pour suivre ces deux paramètres (moyenne et dispersion), la MSP dispose d'un outil : les cartes de contrôle, lesquelles permettent un enregistrement chronologique des données sous forme graphique.

Il existe différents types de cartes de contrôle, selon que la caractéristique à maîtriser est quantifiable ou non. Dans le cas des contrôles qualité en RCMI, ce que l'on veut maîtriser, c'est l'écart entre la dose mesurée et la dose calculée : il s'agit donc d'une quantité mesurable.

Afin de maîtriser cette quantité, comme évoqué précédemment, il est nécessaire de mettre en place deux cartes de contrôle distinctes : l'une pour surveiller le paramètre de position en observant l'évolution de la moyenne  $\bar{X}$  d'un échantillon de valeurs, et l'autre pour surveiller le paramètre de dispersion en observant l'évolution de l'étendue R ou de l'écart-type  $\sigma$  de ce même échantillon.

Dans notre cas, l'échantillon de valeurs sera constitué des écarts entre la dose calculée et la dose mesurée de tous les faisceaux contrôlés d'un même patient. Puisque nos échantillons ne dépasseront pas 10 valeurs (en général pas plus de 10 faisceaux pour le traitement d'un patient), l'étendue, qui représente la différence entre la valeur la plus élevée et la plus faible, est largement suffisante comme indice de variabilité. Les figures 3 et 4 représentent respectivement les cartes de contrôle de la moyenne  $\bar{X}$  et de l'étendue R que nous avons obtenues. Chaque carte de contrôle comporte trois lignes : la limite supérieure de contrôle (LSC) et la limite inférieure

de contrôle (LIC) qui sont définies à partir de lois statistiques (équations (1) à (4)), ainsi que la limite centrale qui représente la moyenne des moyennes des échantillons  $\bar{\bar{X}}$  pour la carte de contrôle  $\bar{X}$ , et la moyenne des étendues des échantillons  $\bar{R}$  pour la carte de contrôle R [8, 9]. Chaque point des cartes de contrôle  $\bar{X}$  et R correspond respectivement à la moyenne et à l'étendue des écarts entre la dose mesurée et la dose calculée pour tous les faisceaux d'un même patient.

Pour la carte de contrôle de la moyenne :

$$(1) \quad LSC = \bar{\bar{X}} + A_2 \bar{R}$$

$$(2) \quad LIC = \bar{\bar{X}} - A_2 \bar{R}$$

Pour la carte de contrôle de l'étendue :

$$(3) \quad LSC = D_4 \bar{R}$$

$$(4) \quad LIC = D_3 \bar{R}$$

$A_2$ ,  $D_4$  et  $D_3$  sont des coefficients établis dans des tables, avec une hypothèse de normalité des distributions du processus. Ils dépendent du nombre de valeurs contenues dans l'échantillon. Dans le cas des contrôles qualité, ce nombre varie, mais il est choisi égal à 5 dans la majorité des cas, ce qui implique que  $A_2 = 0,577$ ,  $D_4 = 2,11$  et  $D_3 = 0$ .

Ces cartes de contrôles permettent de visualiser la variabilité du procédé en distinguant les causes de variabilité aléatoires (ou normales, au sens statistique du terme) des causes assignables (les causes assignables étant celles qui sortent des limites de contrôle ; ce sont des sources majeures de variations irrégulières, instables et imprévisibles). L'utilisation des cartes de contrôle permet de dire si le procédé est sous contrôle (variabilité due uniquement à des causes aléatoires), et donc de prévoir sa performance, ou au contraire, si le procédé est hors contrôle (présence de causes assignables). Enfin, la carte de contrôle permet d'intervenir avant d'être hors tolérances cliniques, en utilisant les limites de contrôles définies statistiquement ; elle permet donc d'anticiper les dérives.

Grâce aux cartes de contrôles, l'information sur les actions à décider est immédiate et leur interprétation est unique.

### 4. La capacité du processus

Afin de mesurer le niveau de la qualité d'un processus par rapport à des tolérances, deux indicateurs numériques  $C_p$  et  $C_{pk}$  ont été créés pour chiffrer la performance du procédé et suivre son évolution. Ces indicateurs sont les seuls liens entre les spécifications et les procédés tels qu'ils existent.

En effet, ils évaluent le rapport entre la performance demandée du processus (écart dose mesurée et dose calculée à l'intérieur des tolérances +/-4%), et la performance réelle (dispersion réelle des valeurs).

$C_p$  évalue la dispersion du procédé, et  $C_{pk}$  évalue à la fois la dispersion du procédé et son centrage.

$$(5) \quad C_p = \frac{\text{Intervalle de tolérance}}{\text{Dispersion du procédé}} = \frac{TS - TI}{6\sigma}$$

$$(6) \quad C_{pk} = \frac{\text{Min}\{(TS - \bar{X}); (\bar{X} - TI)\}}{3\sigma}$$

TI et TS représentent respectivement la Tolérance Inférieure : -4% et la Tolérance Supérieure : 4%.  $\bar{X}$  et  $\sigma$  représentent respectivement la moyenne et l'écart-type des valeurs individuelles.

Un procédé capable se caractérise par une valeur minimale cible de  $C_p$  et  $C_{pk}$ . Dans certains cas, lorsque  $C_p$  et  $C_{pk}$  sont supérieurs à 1, on peut considérer le processus capable. En termes statistiques, cela garanti que dans le cas d'une distribution normale, 99,73% des valeurs sont à l'intérieur des tolérances. Dans l'industrie, certaines entreprises exigent que cette valeur minimale cible soit égale à 1,33, 1,67 ou encore 2. Cette valeur doit donc être adaptée en fonction du problème et des risques liés aux choix statistiques.

#### B. Méthode de l'étude

Dans le but de mettre en place une MSP, dont le principal objectif est de réduire la variabilité et d'améliorer la qualité du processus de contrôle en RCMI, nous avons tout d'abord effectué une étude statistique rétrospective afin de faire le point sur le processus de contrôle actuel. Ainsi, nous avons caractérisé la distribution de nos résultats, analysé les résultats des statistiques descriptives, et recherché les paramètres pouvant influencer sur les résultats (étude encore en cours).

Nous avons ensuite évalué rétrospectivement l'intérêt de mettre en place une MSP. Pour cela, des cartes de contrôles de la moyenne et de l'étendue ont été établies a posteriori. Le but de ces cartes de contrôle, est de visualiser la variabilité de notre processus de contrôle actuel.

En parallèle, nous avons évalué la capabilité du processus.

L'étape suivante de notre étude (non présentée ici), sera de mettre en place la MSP pour les contrôles futurs. L'objectif final est d'aller vers une amélioration dynamique et continue de la qualité, en augmentant la valeur minimale cible des indices de capabilité  $C_p$  et  $C_{pk}$ .

### III. MATERIEL

Les contrôles qualité ont été effectués en mode RCMI dynamique, sur un accélérateur linéaire Varian (Clinac EX23) muni d'un collimateur multilames (MLC) de 120 lames. La chambre d'ionisation PTW Semiflex 31002 (dont le volume de détection est de  $0,125\text{cm}^3$ ) a été insérée dans un fantôme parallélépipédique en plaques de polystyrène, pour effectuer les mesures de dose absolue présentées ici. Le système de planification de traitement utilisé est le TPS

Cadplan/Helios.

### IV. RESULTATS ET DISCUSSION

Nous présentons ici uniquement (pour plus de clarté), les résultats des contrôles qualités effectués pour les traitements ORL en 6MV avec la chambre d'ionisation.

#### A. Etude statistique rétrospective des contrôles actuels

La distribution de nos valeurs a été caractérisée à l'aide d'un test de normalité (un test du  $\text{Khi}^2$  et de Kolmogorov Smirnov) qui permet de conclure positivement sur l'hypothèse de normalité de la distribution de nos valeurs (figure 2). Ceci implique que notre système n'est pas soumis à des causes assignables importantes, mais que de nombreux facteurs interviennent de manière aléatoire. L'objectif futur sera de réduire l'influence de ces facteurs aléatoires.

L'objectif futur sera de réduire l'influence de ces facteurs aléatoires pour rendre le processus plus stable et performant. Pour cela, nous avons dans un premier temps, fait un inventaire des facteurs qui peuvent influencer l'écart entre la dose calculée et la dose mesurée.

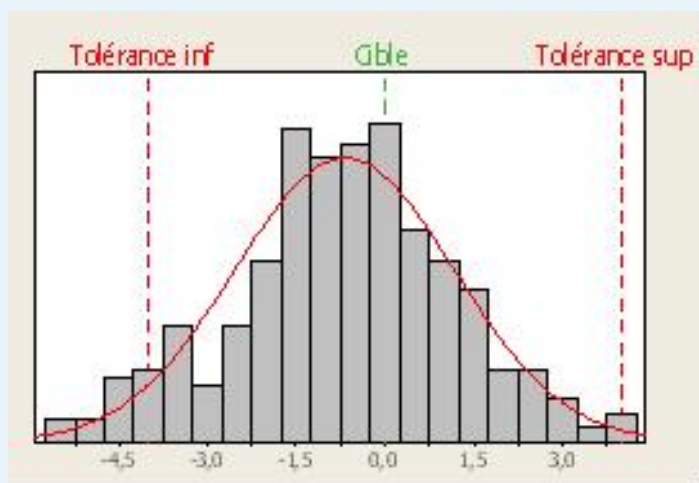


Figure 2 : La distribution des écarts entre la dose calculée et la dose mesurée (histogramme) peut être approximée par la loi normale (courbe) de moyenne -0,68% et d'écart-type 1,86%. 4,3% des valeurs sortent des tolérances cliniques fixées, ce qui se caractérise par un  $C_p$  et  $C_{pk}$  inférieurs à 1.

Figure 2 : The distribution of the differences between the calculated and the measured dose (histogram) can be approximated by the normal distribution (curve) having an average of -0,68% and a standard deviation of 1,86%. 4,3% of the data are outside the clinical thresholds, which is characterised by a value of  $C_p$  and  $C_{pk}$  inferior to 1.

Les résultats des statistiques descriptives ont ensuite été analysés. Nous avons recueilli les données de 364 contrôles, dont la moyenne des écarts entre la dose calculée et la dose mesurée est de -0,68%, et l'écart-type est de 1,86%. La distribution des va-

leurs étant normale, nous pouvons conclure que 4,3% des valeurs sont en dehors des tolérances. Ainsi, bien que les contrôles soient effectués systématiquement sur tous les faisceaux, cela ne garanti pas une qualité optimale des contrôles.

B. Evaluation rétrospective de l'intérêt de la MSP

1. Suivi du processus : cartes de contrôles  $\bar{X}$  et R

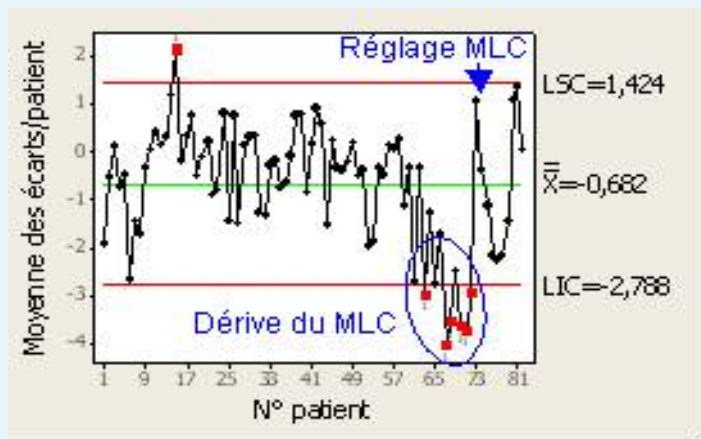


Figure 3 : Carte de contrôle de la moyenne  
Figure 3 : Average chart

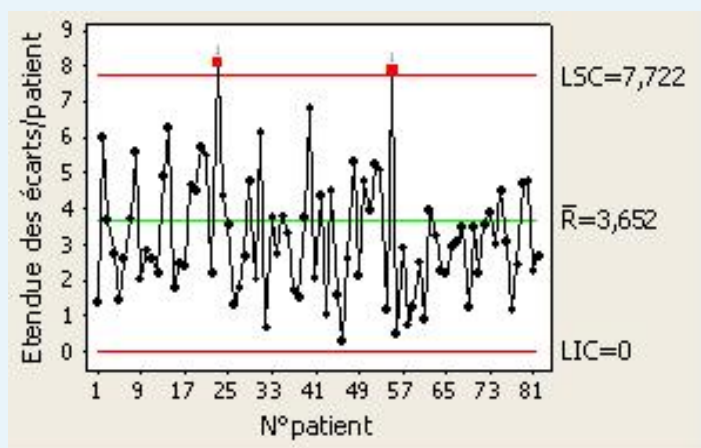


Figure 4 : Carte de contrôle de l'étendue.  
Figure 4 : Range chart

Sur la carte de contrôle de la moyenne (figure 3) on constate à partir du patient 62, que les points dévient vers la limite de contrôle inférieure. En se reportant à l'historique des valeurs, nous avons pu identifier cette dérive : elle est due à une dérive du MLC. Celle-ci avait bien été mise en évidence et le MLC avait donc été réglé au niveau du patient 73. Sur la carte de contrôle on peut voir l'effet de ce réglage : les valeurs se redistribuent aléatoirement autour de la moyenne.

La mise en place d'une carte de contrôle pendant les contrôles qualité aurait pu permettre d'intervenir avant d'être hors tolérances cliniques, en utilisant les limites de contrôles définies statistiquement. Ces cartes de contrôles ont également permis de confirmer que notre processus n'est pas soumis à des causes assignables importantes : il est donc maîtrisé statistiquement.

Cette condition étant satisfaite, nous pouvons à présent évaluer la capabilité du processus.

2. Evaluation de la capabilité du processus

Nous obtenons un  $C_p$  et  $C_{pk}$  inférieurs à 1 (comme prévu par nos premiers résultats de statistiques descriptives), ce qui signifie qu'il faut agir à la fois sur le centrage et sur la dispersion de nos valeurs, pour rendre notre processus capable.

Pour cela, il est important d'avoir préalablement identifié tous les facteurs pouvant agir sur les résultats. Bien que nous n'ayons pas encore testé l'influence de ces paramètres, par expérience, et d'après les résultats de nos cartes de contrôles établies a posteriori, nous pensons que le MLC est un des éléments les plus importants, responsables d'un décentrage de la moyenne. En ce qui concerne la dispersion, de nombreux facteurs peuvent être en cause ; il peut s'agir d'une usure de l'accélérateur ou du détecteur par exemple. Un champ trop modulé pourrait peut-être également agir sur la variabilité du processus. Ainsi, après avoir ciblé, à l'aide de la théorie des plans d'expérience, les paramètres agissant sur le centrage et sur la dispersion, nous saurons précisément sur quels facteurs intervenir pour améliorer la capabilité de notre processus, et ainsi aller vers une amélioration dynamique de la qualité.

V. Conclusion et perspectives

Les objectifs de la méthode proposée ici, étaient d'utiliser la Maîtrise Statistique des Procédés afin d'évaluer puis de réduire la variabilité et enfin d'améliorer la qualité du processus de contrôle en RCMI. Ainsi, plus que les résultats, c'est la méthode elle-même qui est importante, et implique une nouvelle façon de penser les contrôles qualité. En effet, un des changements importants que nous avons mis en évidence est que, pour parvenir à maîtriser le processus, il est nécessaire de suivre simultanément l'évolution de la moyenne et de l'étendue d'un groupe de valeurs, et non des valeurs individuelles. Les cartes de contrôle permettent de visualiser une éventuelle dérive des résultats (la dérive du MLC a par exemple été identifiée) et d'intervenir avant d'être hors tolérances cliniques, en utilisant les limites de contrôles définies statistiquement. Elles permettent donc d'anticiper les dérives.

Grâce aux outils de la MSP, nous avons donc pu chiffrer la performance de notre processus de contrôle actuel. Les cartes de contrôle ont montré que notre processus n'est soumis qu'à des causes de variabilité aléatoires, c'est-à-dire qu'il est maîtrisé statistiquement. L'étape suivante sera d'essayer de réduire ces causes de variabilité aléatoires. Enfin, l'étude de la capabilité révèle que notre processus n'est pas capable au sens statistique du terme, puisqu'avec un  $C_p$  et  $C_{pk}$  inférieurs à 1, 4,3% des valeurs sont en dehors des tolérances. Il est donc nécessaire d'agir sur le centrage et sur la dispersion de nos valeurs. Ainsi, comme pour réduire les causes de variabilité aléatoires, il s'agira maintenant d'iden-

tifier, à l'aide des plans d'expérience, les facteurs influençant notre processus, et d'intervenir lorsque cela est possible. Une de nos hypothèses, est qu'un champ très modulé pourrait entraîner une variabilité importante ; il serait donc intéressant d'étudier les résultats des contrôles de qualité réalisés avec les films radiographiques (gamma index [10]), puisqu'ils permettent d'avoir une information sur la répartition de la dose dans tout le champ.

Enfin, ce n'est que lorsque notre processus sera démontré capable (cela nécessite d'avoir fixé une valeur minimale cible de  $C_p$  et  $C_{pk}$ ), que nous pourrions envisager une réduction des contrôles.

#### Références:

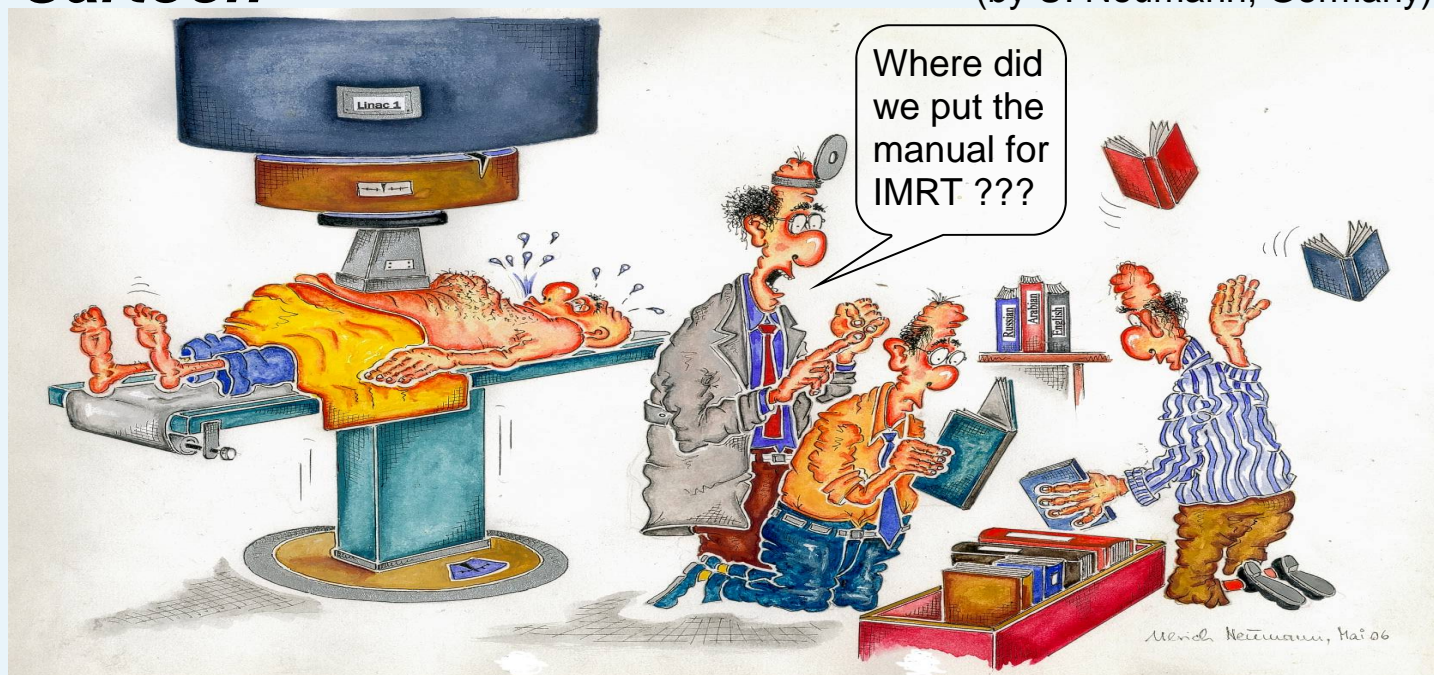
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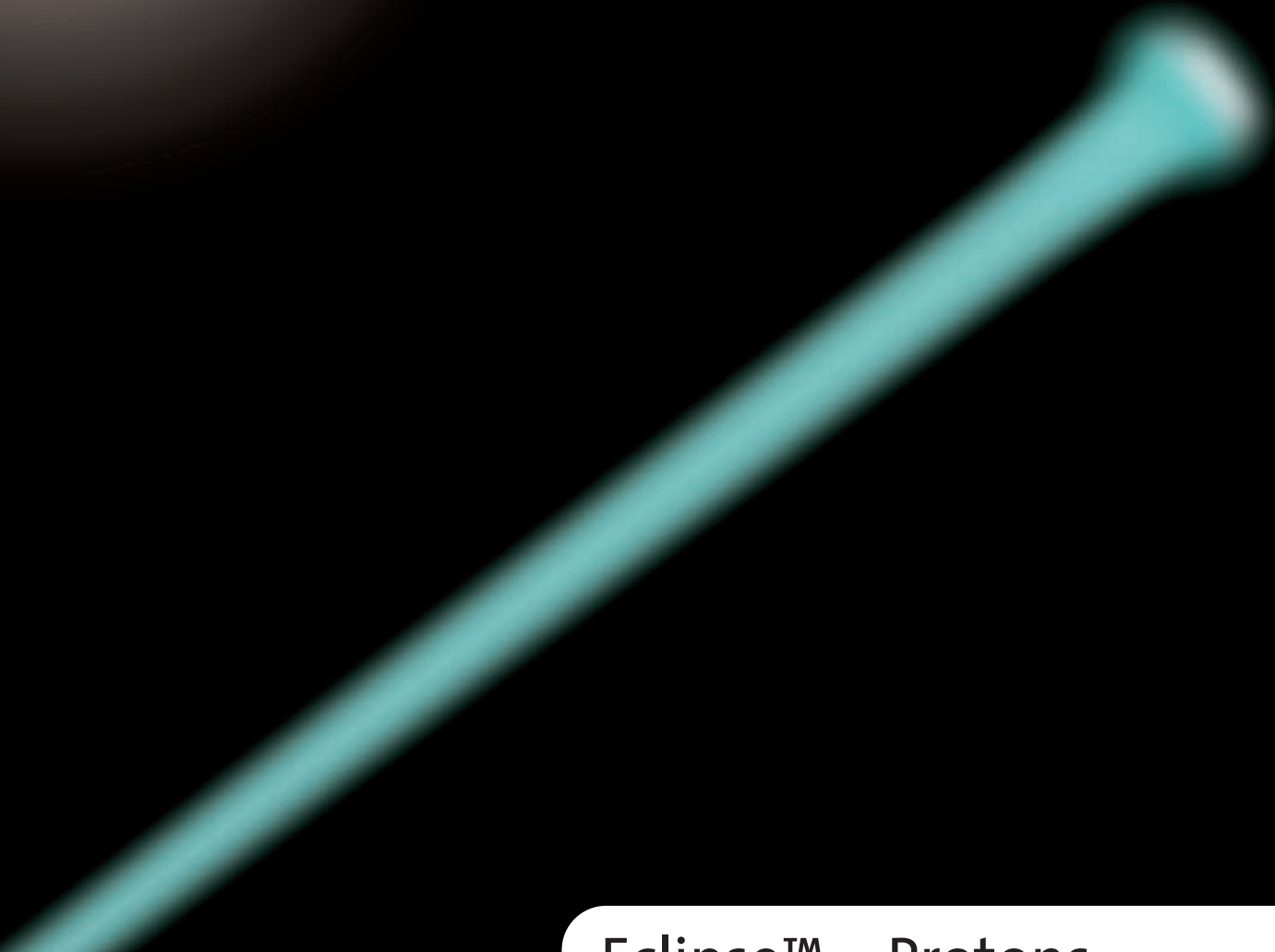
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## Cartoon

(by U. Neumann, Germany)





## Eclipse™ = Protons

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# Exchange programmes for medical physicists?

Markus Buchgeister  
Tübingen, Germany



Would you like to visit other clinical sites to see their installations and equipment?

Are you curious about how they do their job?

What do you think about your own work – surely it is worth showing to others?

The work of clinical medical physicists can be dominated by routine:

- Regular checks of the equipment and software to ensure best quality of healthcare delivered to the patient by the physicians;
- Optimising treatments and procedures using specialist equipment and highly complex software (and often fighting their bugs due to the complexity of the software packages);
- Finding individual solutions to problems using your capabilities in physics and computer know-how.

Academic colleagues often go to conferences and meetings abroad to exchange and discuss their results. Do you envy them? Maybe, but that is what they live on. Perhaps they envy your permanent position and close clinical contacts. Once in a while you can get to a regional or national meeting in your speciality. Maybe also to a users meeting of one of the manufacturers of your equipment and meet other medical physicists there. What do you talk with them? Your own technical problems and solutions? Or your hobbies?

Many medical physicists work in small groups or even almost alone with one or two colleagues. Our national organisations for Medical Physics and sub-specialities are the first link to other colleagues on a next level. Their effort is to serve your needs of communication on a local level. Bulletins and homepages or forums/ mailing lists are the tools of today to fulfil this task. Maybe there exists also a regional audit program run by your society to help you with quality checks etc. on a higher level. There you can show your work to others to have it examined. Have you been just relieved? or were you proud when they left your site?

What about an exchange of clinical medical physi-

cists on a national or even European level? If you can host a colleague in your own speciality for a few days and visit her (or him) in return, that could help establish closer links between 'islanded' medical physicists. This is a bit like the Indian saying: If you want to know someone you have to walk a mile in his shoes.

Well, not so literally, but to work with him for a while. Not just looking, working. If you share the same equipment, software etc. you are familiar with it and can take over (some) routine work rather quickly. You will have to become accustomed to local implementations, but that will give you a new view on what you know from your home site. And maybe some elements of their workflow could improve your work at home, too. You do not have to show off the top equipment. Getting your work organised in a smart way requires a smart brain not money. This is most likely not about the big change but many little things may ease your everyday life. Even it is just to know someone you could call on the phone or write an email to.

Well, you'd say, who will pay me the travel and accommodation costs? Will I be able to get off my work? There are exchange programs at schools, where one hosts the other to lower the costs. That would be a very personal exchange. There are scientific travel programs or bursaries, mostly for young scientists, but not exclusively, run by EFOMP the European Union or other international organisations. Maybe such an exchange exists already on a national or regional level, then, please, let us know! If not, your national Medical Physics organisations will surely be willing to act as a contact bureau and support you to find an exchange partner. You may discuss this also at your next societies meeting. And even this European Medical Physics News could be a pin-board for your offers to host someone. Just specify your type of work and your speciality (diagnostic radiology, nuclear medicine, radiotherapy etc.) and equipment/software in a small note with your contact address. And if there is enough response, your manager could be approached to support this exchange. It should be in their interest, too, to have well trained and motivated medical physicists helping them to do the best possible work for the patient.

And in the long run, why not approach the European Union for further support? This is also about the free movement of workers despite many national regulations!



## ESMRMB - Lectures on Magnetic Resonance 2007

The 2007 Lectures on Magnetic Resonance educational programme offers five courses dedicated to basic and clinical scientists.

### Molecular MR Imaging in Experimental Neuroscience

*June 21-23, Cologne/Germany*

The new course on Molecular MR Imaging in Experimental Neuroscience aims to introduce the field of molecular imaging and to discuss its potential applications in the field of experimental neuroscience. Topical focus will deal with cell tracking, various types of morphological imaging and functional imaging, extending the term beyond functional brain activation. Broad attention will be dedicated to contrast generation on a cellular and/or molecular basis, looking at responsive contrast agents and molecular biology for production of contrast self-generating transgenic cell lines.

### MR-Physics for Basic Scientists

*July 4-6, Kazan/Russia*

The lecture on MR-Physics for Basic Scientists will be organised in Kazan (the Capital of the Republic of Tatarstan, Russia). The most important concepts and applications of various MR techniques will be covered, such as cardiovascular imaging, diffusion imaging, parallel imaging and imaging sequences, as well as MR spectroscopy and contrast mechanisms in living tissue. This two day course is preceded by a two day International Conference 'Modern Developments in Magnetic Resonance Imaging and Spectroscopy in Medicine', which is supported by ISMRM International Outreach programme. The ISMRM Outreach Conference and ESMRMB Lecture on MR Course is the first joint conference and teaching activity outside our joint ISMRM/ESMRMB annual meeting.

### Proton MR Spectroscopy

*September 13-15, Nottingham/United Kingdom*

The Proton MR Spectroscopy course provides a fundamental overview of the most important spectroscopic acquisition techniques, the quantification of proton spectra, as well as important clinical applications. This course is dedicated to physicians, basic scientists, and technicians who already have experi-

ence in MR imaging, and who wish to extend their knowledge on practical proton spectroscopy, recommended methodology and how to design a spectroscopic study.

### Flow and Motion

*September 20-22, Zurich/Switzerland*

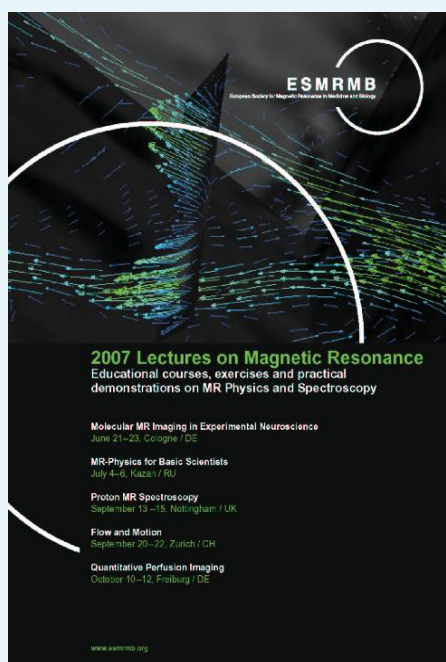
The course on Flow and Motion offers an introduction to MR imaging and quantification in the presence of blood flow and cardiac motion. It covers basic principles as well as advanced applications and processing strategies for further work in this active research field. Fundamentals of physics of flow encoding and analysis of cardiac function serve as a basis for a detailed discussion of various encoding strategies and MR imaging techniques that have been developed over the years. The course provides a critical comparison of different acquisition and quantification strategies and is dedicated to scientists who already have some experience in MRI and wish to extend their knowledge on flow and motion imaging.

### Quantitative Perfusion Imaging

*October 10-12, Freiburg/Germany*

The course on Quantitative Perfusion Imaging gives an overview on modern technologies for perfusion imaging with a focus on the MRI modalities. The variety of methods that have been developed in the past is presented and analysed critically. The course is aimed at providing the participants with criteria for deliberate selection of methods in their studies. The in-depth analysis is based on the physics of perfusion encoding, the theory of contrast agent effects on the MR signal and the mathematics of data processing.

If you would like to receive a 'Lectures on MR 2007' brochure, send an email with your address to: [sschuller@esmrm.org](mailto:sschuller@esmrm.org)



For further information, as well as online registration, please visit the ESMRMB website at: [www.esmrm.org](http://www.esmrm.org)

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# X<sup>th</sup> EFOMP Congress 2007

The 10th EFOMP Congress will be held from 20th - 22nd September 2007 near Pisa, Italy.

The main topics addressed at the congress will be:

Physics in:  
Radiotherapy  
Diagnostic Radiology  
Nuclear Medicine  
Medical Imaging  
Physiological Measurements  
Molecular Imaging  
Radioprotection  
Education and Training in Medical Physics

The event is scheduled for mid-September, when the Tuscan climate is at its best for enjoying the landscape and the countryside of the Garfagnana hills.

For more details see the conference website at <http://efomp-2007.df.unipi.it/>

## Other Scientific Meetings

### **June 27th to June 30th, 2007**

CARS 2007 - Computer Assisted Radiology and Surgery  
Berlin, Germany  
<http://www.iccr2007.org>

### **July 29th to August 12th, 2007**

1st EMBS-IEEE Summer School on Information Technologies in Biomedicine International  
University of Ioannina,  
Ioannina, Greece  
<http://medlab.cs.uoi.gr/biomed-ss2007/>

### **Sep 25th to Sep 28th, 2007**

Medical Physics Joint Meeting of SSRMP, DGMP & ÖGMP  
Bern, Switzerland  
<http://www.bern07.ch>

### **Oct 25th to Nov 27th 2007**

10th session of the European School of Medical Physics (ESMP)  
Archamps, Geneva  
<http://lemoine.home.cern.ch/lemoine/esiweb/ESMPnn10.htm>

### **Nov 29th to Dec 1st, 2007**

Third Croatian Symposium on Lasers in Medicine and Dentistry  
Zagreb, Croatia  
<http://laser.mediaplus.hr/en/index.php>

### **Sep 17th to Sep 21st, 2008**

Medical Physics and Engineering 110 Years After the Discovery of Polonium and Radium  
Krakow, Poland  
<http://mpekrak08.ftj.agh.edu.pl>