56th Annual Meeting & Exhibition
July 20–24, 2014

AAPM 2014 innovation

Symposium: Globalization of Medical Physics

EFOMP and ICTP initiatives in supporting the development of medical physics in Europe and in the third world

Renato Padovani

EFOMP & ICTP

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    - PhD and training programmes
    - College and training courses
    - Master of advanced sciences in medical physics

EFOMP mission

- Since its inauguration during the second conference of representatives from European organisations for Medical Physics in London in May 1980, one of the main objectives of the European Federation of Organisations for Medical Physics (EFOMP) has been to harmonise and promote the best practice of Medical Physics in Europe.
  - EFOMP is a Federation of 25 National MP Organisations representing more than 7000 MPs
  - “EFOMP Policy Statements” are recommendations on the appropriate general responsibilities and roles of the Medical Physicist and proposing guidelines for Education, Training and Accreditation Programmes in Medical Physics.

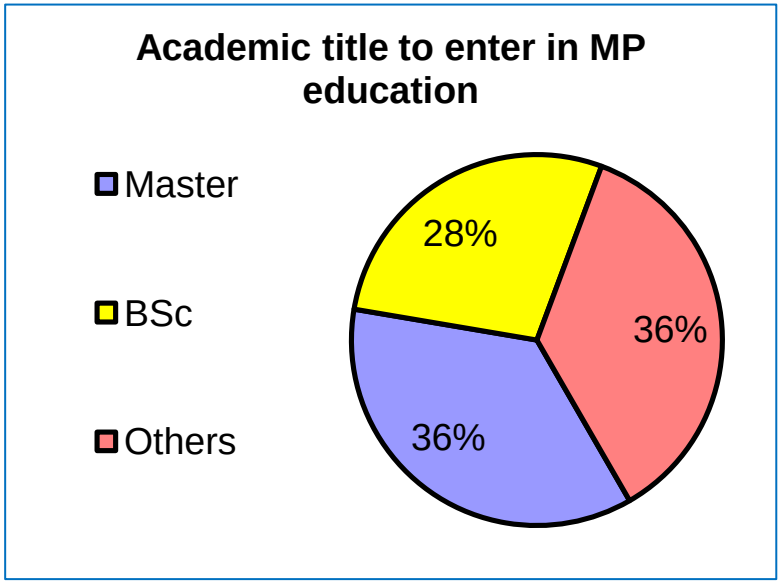
Status of E&T in Europe

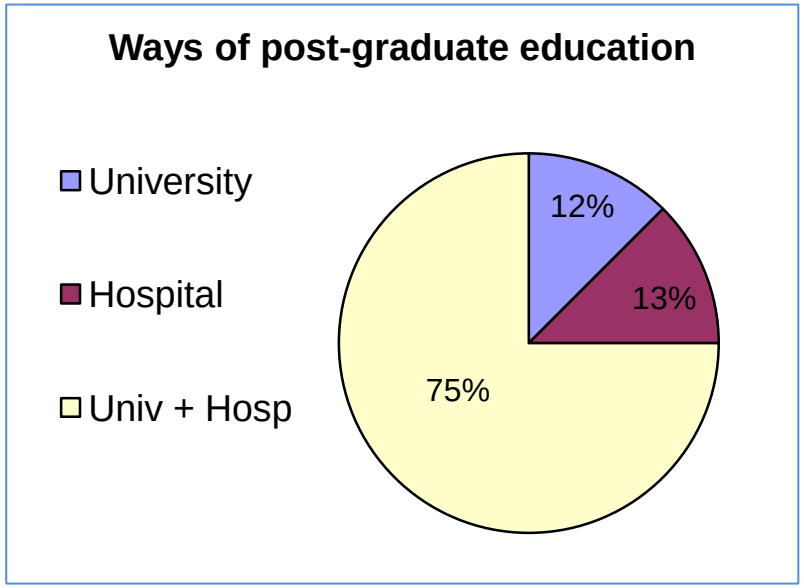
- Survey on 25 European countries:
  - Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, The Netherlands, Norway, Poland, Portugal, Russia, Serbia-Montenegro, Spain, Sweden, Turkey and United Kingdom

T. Eudaldo, K. Olsen, The present status of Medical Physics Education and Training in Europe: An EFOMP survey, Physica Medica (2008) 24, 3-20

Status of E&T in Europe

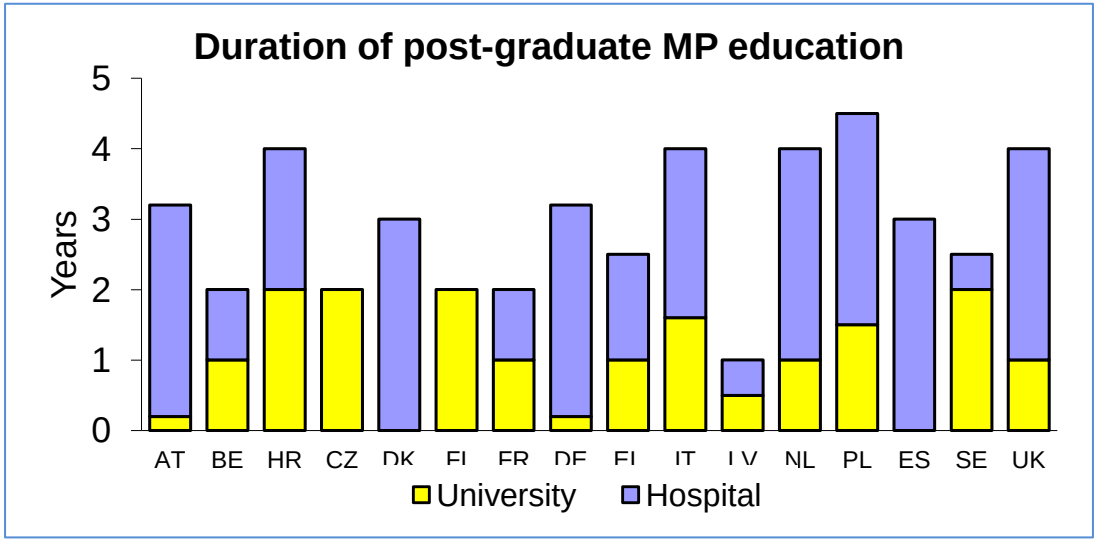
- 16 of the 25 countries have a nationally approved post-graduate education programme

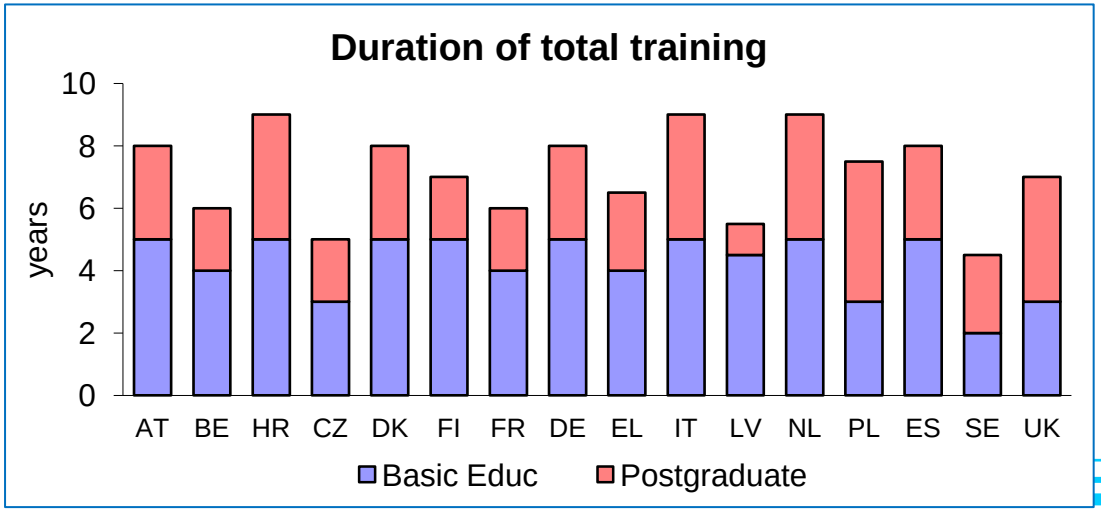




- 9, mainly form East and Balcanes areas, don't have a nationally approved MP programme !

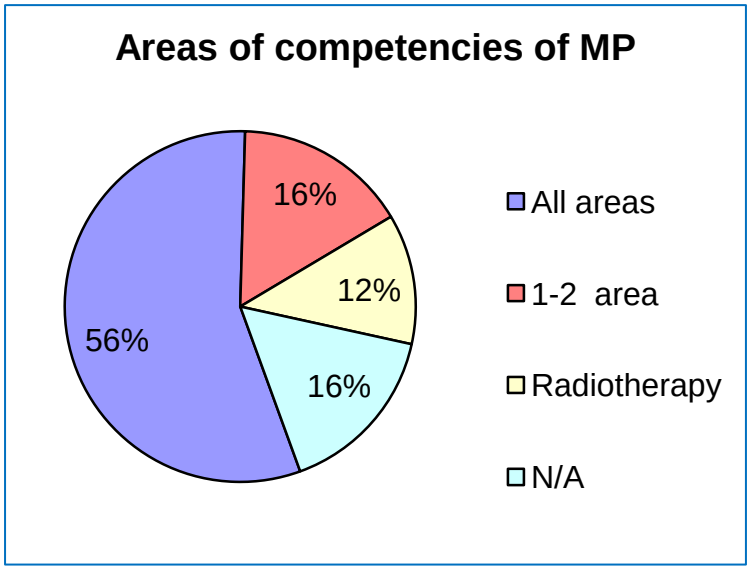
Status of E&T in Europe





- The duration of the post-graduated education and clinical training is very different between European countries
- Name of the qualified MP varies:
  - *Specialist (or qualified or clinical) medical physicistt (most countries)*
  - *Acknowledged expert in Medical Physics (Belgium),*
  - *Professional qualification for pursuing the health profession of radiological physicist (Czeck),*
  - *Professional Master degree in Medical Physics (Latvia)*

Status of E&T in Europe



- In the majority of countries, the diploma/license allows medical physicists to work in all areas of competencies (in Belgium, Denmark, Germany and the Netherlands only in a specific area).
- 68 % of the countries have a register for Medical Physicists.
- A formal CPD programme is in operation in 52% of the countries

EFOMP initiative to harmonise E&T

- The Medical Physics Expert (MPE) project
  - MPE responsibilities and duties are defined by the European Directive of radiation protection in medical exposure (revised BSS December 2013)
  - EU supported a project to define E&T of the MPE
  - EU issued the European Guidelines RP 174 (January 2014) that can have an important role in the harmonisation of E&T and in the recognition of the profession
    - pathway of E&T and CPD
    - Content of E&T in term of learning outcomes defined in term of Knowledge, Skill and Competences (KSC)

http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/174.pdf

Qualification Framework for the Medical Physics Expert (MPE) in Europe

MPE: "An individual having the knowledge, training and experience to act or give advice on matters relating to radiation physics applied to medical exposure, whose competence to act is recognized by the Competent Authorities" (Revised BSS)

The Qualifications Framework is based on the European Qualifications Framework (EQF). In the EQF learning outcomes are defined in terms of Knowledge, Skills, Competences (KSC) (European Parliament and Council 2008/C 111/01)

EDUCATION

EQF Level 6
(e.g., Bachelor with 180 - 240 ECTS)
(i)

Physics or equivalent
(ii)

EQF Level 7
(e.g., Master with 90 - 120 ECTS)
(iii)

Medical Physics* or equivalent
(iv)

CLINICAL TRAINING

Clinical Certification in Medical Physics Specialty
(v)

Structured accredited clinical training residency in the specialty of Medical Physics in which the candidate seeks clinical certification. The duration should be typically two full-time year equivalents**
(vi)

ADVANCED EXPERIENCE and CPD

EQF Level 8 in Medical Physics Specialty
(vii)

Structured accredited advanced experience and CPD in the specialty of Medical Physics in which the candidate seeks certification as MPE. The duration would be an additional *minimum* of two full-time year equivalents***
(viii)

RECOGNITION

By Competent Authorities as MPE in Medical Physics specialty
(ix)

RE-CERTIFICATION

5 year CPD cycle
(x)

* Should include, as a minimum, the educational components of the Core KSC of Medical Physics and the educational components of the KSC of the specialty of Medical Physics (i.e., Diagnostic & Interventional Radiology or Nuclear Medicine or Radiation Oncology) for which the candidate seeks clinical certification. When this element of specialization is not included it must be included in the residency.

** The EQF level of the residency is intermediate between EQF levels 7 and 8.

*** In countries where the MPE is required to be certified in more than one specialty of Medical Physics the number of years would need to be extended such that the MPE will achieve level 8 in each Specialty.

The European guidelines RP 174

- EQF 8 is the highest level corresponding to the most advanced and specialised skills and techniques required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice
- The guidelines can not only support the harmonisation but also the recognition of the profession and can elevate the profession at the same level of the clinicians
- These guidelines can be taken as a model for several countries outside Europe

http://ec.europa.eu/energy/nuclear/radiation_protection/doc/publication/174.pdf

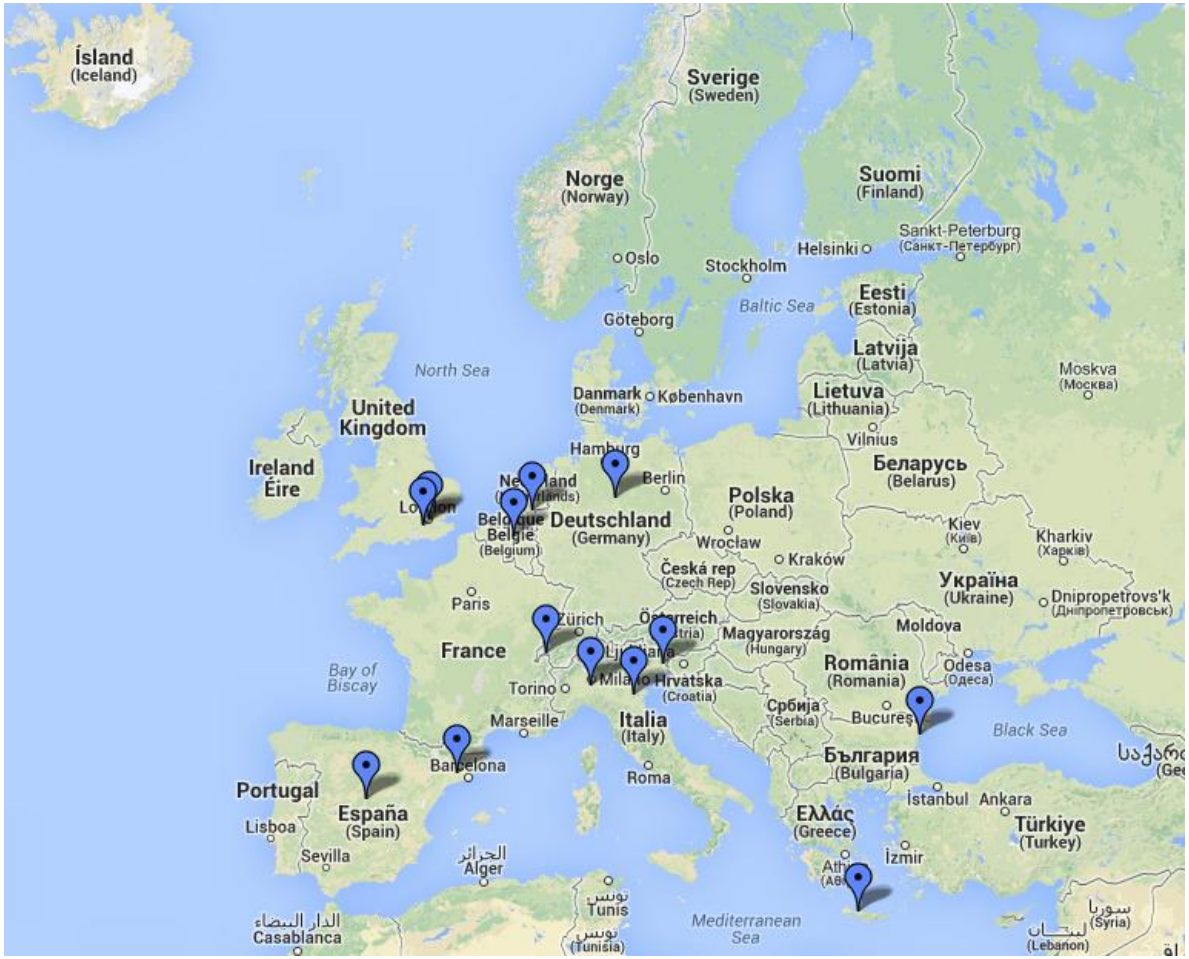
The EUTEMPE-Rx project

www.eutempe-rx.eu

- To support harmonisation of E&T and facilitate free movement of MPs (MPEs) across Europe,
- Europe is supporting (1.6 ml €) the Eutempe-Rx project (lead: Leuven University and other 12 universities/hospitals)
  - To develop a sustainable network of excellence in E&T
  - To develop and test advanced training courses on diagnostic and interventional radiology
  - To develop an e-learning platform

- EFOMP is looking to develop similar projects for other areas of MP

Project Partners



Course Modules

Number	Title	Lead
1	Developments of the profession and the challenges of the MPE: Legal aspects, professional matters, communication and risk assessment, incidents and accidents, today and tomorrow. Raising the public profile of the profession. Basics of teaching RX users, interaction with the RPE	C. Caruana & E. Vano
2	Radiation biology for MPEs	A. Ottolenghi
3	Monte Carlo simulation of the complete X-ray imaging chain	J. Sempau
4	Fundamental physics of X-rays: energy, absorption and their phase	M. Gambaccini
5	Antropomorphic phantoms	K. Bliznakova
6	From routine QA to advanced QA and performance testing	H. Bosmans & E. Vano

Course Modules

Number	Title	Lead
7	Advanced measurements of the performance of X-ray imaging systems	K. Young & A. McKenzie
8	CT imaging and dose optimized with objective means	F. Verdun
9	Achieving quality in the medical physics aspect of breast cancer screening	R. van Engen & W. Veldkamp
10	High dose X-ray procedures in Interventional radiology and cardiology	R. Padovani & A. Trianni & E. Vano
11	Dosimetry, from conceptus to the adolescent	J. Damilakis
12	Personnel dosimetry, including techniques to communicate practical results to the users (RPE)	M. Borowski & M. Fiebich

Other EFOMP actions

- Since 1997 the European School of Medical Physics (Archamps, France) with ESI
  - A 6 week course for young physicists, residents and MPs with some financial support for students from developing countries (East Europe and Balcanies area, Middle East and North Africa)
- Starting with 2013, the Summer School for Medical Physics Experts, addressed mainly to MPs from small and developing countries:
  - Prague 2013; “Clinical Medical Device Management: Specification, Acceptance testing, Commissioning ,QC and Advanced applications in Whole-body PET/CT”
  - Prague 2014; “Advanced Kinetic Modelling and Parametric Methods. Advanced SPECT and PET Applications”
- Since 2010, to support ICTP advanced training courses (jointly organised by ICTP and IAEA and AAPM, IOMP support)
- Accreditation (EFOMP CPD system) of tenths of training courses organised by national European MP organisations

The European Conference of Medical Physics (ECMP)

- Organised together with a National MP Organisation
- Former name was the biannual EFOMP Congress (the 10th was organised in Pisa, Italy in 2007)

- In 2014 in Athens the 8th ECMP, 11-13 September

http://www.efomp-2014.gr

ICTP Mission:

The Abdus Salam International Centre for Theoretical Physics

- Foster the growth of advanced studies and research in physical and mathematical sciences, especially in support of excellence in developing countries.
- Provide an international forum of scientific contact for scientists

- Thanks to the funding from the Italian Government, UNESCO and the IAEA, ICTP is able to implement various schemes of support and assistance to scientists from developing countries.
- In 2014, ICTP is celebrating its 50th anniversary.

ICTP IN NUMBERS 2013

ICTP VISITORS 2013

5,977 VISITORS FROM **139** NATIONS

77 TRAINING ACTIVITIES AT CAMPUS, **18** IN DEVELOPING COUNTRIES

11 DAYS AVERAGE LENGTH OF VISIT FOR CONFERENCE PARTICIPANTS

65 DAYS AVERAGE FOR RESEARCH VISITORS

57 POSTDOCS ON CAMPUS [56% FROM DEVELOPING COUNTRIES]

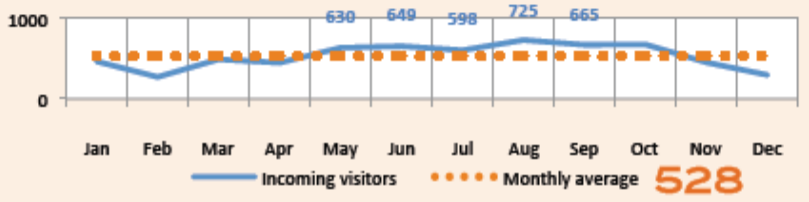
105 STUDENTS ENROLLED IN PRE-PHD EDUCATIONAL PROGRAMMES

340 SCIENTISTS ENGAGED IN CAREER DEVELOPMENT PROGRAMMES

TOP 10 DEVELOPING COUNTRIES, BY REGION

Africa	N. of visitors	Asia	N. of visitors	Latin America	N. of visitors
Algeria	109	India	348	Brazil	131
Nigeria	86	Iran	150	Argentina	78
Egypt	66	China	137	Colombia	71
South Africa	63	Pakistan	85	Mexico	59
Cameroon	45	Viet Nam	75	Cuba	41
Ghana	43	Singapore	59	Venezuela	31
Morocco	39	Korea Rep.	54	Peru	26
Kenya	36	Turkey	45	Costa Rica	16
Sudan	35	Indonesia	24	Ecuador	15
Ethiopia	29	Georgia	22	Guatemala	14

FLOW OF INCOMING VISITORS BY MONTH AT ICTP



18 REGIONAL TRAINING ACTIVITIES

6 - EARTH SYSTEM PHYSICS (ESP)
4 - APPLIED PHYSICS (AP)
4 - CONDENSED MATTER PHYSICS (CMSP)
2 - MATHEMATICS (MATH)
1 - HIGH ENERGY PHYSICS (HECAP)
1 - PHYSICS AND DEVELOPMENT (PD)

DISTRIBUTION OF FEMALE VISITORS

1380 FEMALE VISITORS [23%]

Asia	330
Africa	189
Latin America	141
Eastern Europe	138

48% OF FEMALE VISITORS ARE FROM DEVELOPING COUNTRIES

COURSE PARTICIPANTS BY RESEARCH AREA

1784 CMSP

1482 HECAP

1158 AP

804 ESP

573 Math

1,500 MONTHS OF TRAINING TO COURSE PARTICIPANTS LECTURED BY MORE THAN 1,000 EXPERTS

COUNTRIES REPRESENTED

21 in LDCs in Africa
16 from rest of Africa

4 from LDCs in Asia
33 from rest of Asia

1 from LDCs Latin America
21 from rest of Latin America

18 from Eastern Europe

ICTP Public Information Office, March 2014.

Medical Physics ICTP Activities

- The **Associate Programme**
  - **Junior/Regular/Senior, Simons & Group Associateships**
    - 6-year appointment, during which associate visits ICTP or a partner institute 3 times
    - 5 new appointed every year in MP
  - **TRIL** (Training and Research in Italian Laboratories):
    - offers scientists from developing countries the opportunity to undertake training and research in an Italian hospital/university

Medical Physics ICTP Activities

- The **Associate Programme (cont.)**
  - **STEP (Sandwich Training Educational Programme)**
    - A ICTP/IAEA programme
    - financial support of the IAEA Department of Technical Cooperation
    - Fellowship opportunities to Ph.D. students from developing countries
    - The fellowships are awarded for a period of at least three months to be spent at host institutes during the first year. Pending the approval of the host institute and the two supervisors, the fellowship is renewable for up to two additional successive years.

About 4% of associate programme budget for MP

Medical Physics ICTP Activities

- **TRAINING ACTIVITIES**: already active professional medical physicists, who need
  - either an updating in the broad area of imaging (College) or in radiotherapy (recent Training course)
  - or a deeper, advanced knowledge in a well defined area (ICTP-IAEA schools)

College on Medical Physics
(Benini, Cameron, Sprawls, Tabakov…)

- 3-4 week duration, 50 – 70 participants each
- Mainly devoted to imaging, but also radiation protection and dosimetry

1. 10 Oct – 4 Nov 1988
2. 10-28 Sept 1990
3. 31 Aug – 18 Sept 1992
4. 5-23 Sept 1994
5. 9-27 Sept 1996
6. 20 Sept – 15 Oct 1999
7. 2-27 Sept 2002
8. 30 Aug – 22 Sept 2004
9. 4 – 29 Sept 2006
10. 1-19 Sept 2008
11. 13 Sept – 1 Oct 2010
12. 10 – 28 Sept 2012
13. 1 – 19 Sept 2014

The Abdus Salam
International Centre
for Theoretical Physics
50th Anniversary 1964–2014

College on Medical Physics

Advances in Medical Imaging Physics to Enhance Healthcare in Developing Countries

1 - 19 September 2014

Miramare, Trieste, Italy

DIRECTORS

Anna BENINI (Denmark)

Luciano BERTOCCHI
(Local Organizer, ICTP, Italy)

George Donald FREY (USA)

Franco MILANO (Italy)

Perry SPRAWLS (USA)

Slavik TABAKOV (UK)

- Digital Image Applications in Each Imaging Modality
- Image Characteristics and Quality Factors
- Optimization of Imaging Procedures and Quality Control
- Dose Management in Medical Imaging and Radiation Protection
- Evaluation and Analysis of Images in Medical Applications
- Development and Delivery of Highly Effective Educational Activities

Medical Physics ICTP Activities

- Training courses/schools
  (often in cooperation with the IAEA)
  - In 2014 (with AAPM support)
    - Joint ICTP-IAEA: Workshop on determination of uncertainties of measurements in medical radiation dosimetry, 9-13 June
    - Joint ICTP-IAEA: Meeting on training in patient safety in radiotherapy, 4-28 November

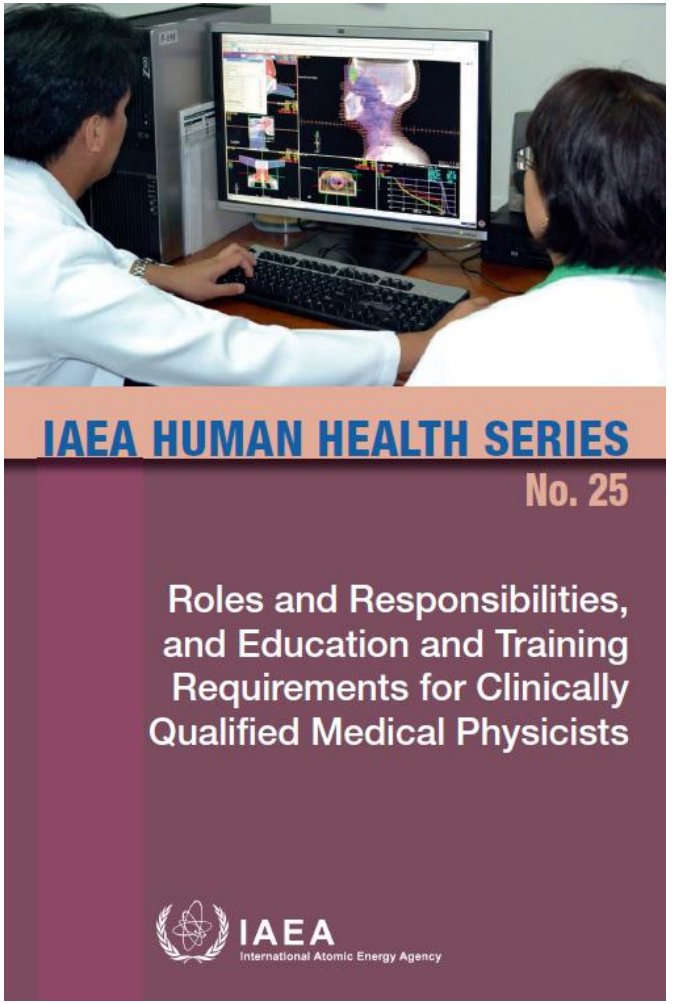
Statistical data

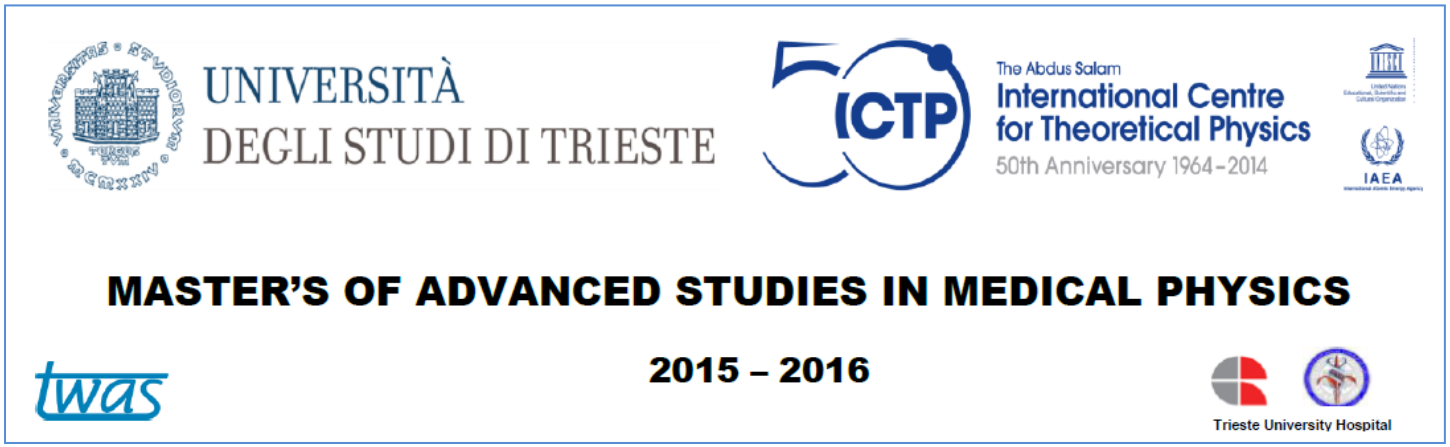
- The figures corresponding to the various items in the five years 2007-2011 are:
  - Visitors in training activities: 483
  - Associate members : 34
    (Asia: 14; Africa: 11; Latin America: 8; Europe 1)
  - TRIL fellows: 10
  - STEP fellows: 6

The ICTP Master of advanced science of medical physics

Why a MP Master at ICTP?

- IAEA (HHS No. 25, 2013) recognizes:
  - A shortage of clinically qualified medical physicists (CQMPs)
  - Insufficient education and training (especially properly organized and coordinated clinical training)
  - Lack of professional recognition





- **A ICTP and Trieste University initiative**
- **Scientific contributions from IAEA and IOMP**
- **Society supports from IOMP, EFOMP and MEFOMP**

- 2 years programme
- Syllabi adapted from IAEA and IOMP guidelines
- Entrance criteria: M.Sc. or 5 years of University education, possibly from small developing countries without a MP programme

- Financial support: ICTP, TWAS and IAEA and contributions from EFOMP. Looking to students with total or partial support from their country
- First cycle 2014-2015: 13 students (Vietnam, Madagascar, Iran, Qatar, Montenegro, Morocco, Nigeria, Ghana, Togo, Guatemala, Uruguay); 5 fully and 4 half supported by ICTP.

The Master in MP scheme

- **The first year at ICTP**:
  - 60 credits (ECTS), 228 h exercises, 12 sessions at Trieste hospital
  - Academic and professional faculty from ICTP, Trieste University, Elettra, Trieste hospital and from the network hospitals

Anatomy and Physiology as applied to MP
Radiobiology
Radiation Physics
Radiation Dosimetry
Medical Imaging Fundamentals
Physics of Imaging Detectors
Physics of Nuclear Medicine
Physics of Diagnostic and Int. Radiology
Physics of Diagnostic with US and MR
Physics of Radiation Oncology
Radiation Protection
Information technology in medicine
Statistics for medicine
Monte Carlo simulation methods
Guided exercises at Trieste Hospital
Guided exercises at ICTP

The Master programme

- **The second year** of full-time clinical training in a hospital of the network
  - Clinical training in an area of MP
  - Content adapted from the IAEA Guidelines and from AFRA Guidelines for the clinical training of MPs
  - Inter-hospital audit to be implemented
  - Possible extension for another year with a IAEA grant

Network of Hospitals	Medical Physics Dpt Head
Oncology Reference Centre of Aviano	Elvira Capra
Oncology Reference Centre of Padua	Marta Paiusco
University Hospital of Trieste	Mario de Denaro
University Hospital of Verona	Carlo Cavedon
University Hospital Torino	Roberto Ropolo
University & Oncology Hospital of Zagreb	Nenad Kovacevic
University Hospital of Udine	Maria Rosa Malisan
Hospital of Vicenza	Paolo Francescon
Niguarda Hospital (Milan)	Alberto Torresin
Hospital of Trento	Aldo Valentini
Others from Ljubiana, Novara, Rieka	

Many thanks for your attention