

ESMPE European School for Medical Physics Experts

Quantitative MRI: basic principles, optimization, quality assurance

24th-26th October 2024, Milan, Italy

EFOMP in collaboration with the Italian Association of Medical Physics (AIFM) would like to invite you to the next ESMPE on **24th-26th October 2024**.

MRI is unquestionably the most complex but also the richest and most versatile imaging method. Although inherently quantitative, MRI has been used largely as a qualitative imaging technique, with the main limitation being the subjective nature of the results. An increasing number of diagnostic problems in clinical medicine require a quantitative assessment of tissue structure, physiology and function, which demand in-depth and systematic training.

This course is addressed at medical physicists who seek a general overview of the basic principles of MR imaging, from signal generation to image reconstruction, with a special focus on optimization and quantification techniques. Technological advances in hardware as well as in software will be presented, including advanced MR sequences used in clinical routine and artifact management. The importance of standardization in clinical quantitative MRI will be underlined and an emphasis will be placed on quality assurance and multicenter comparison, including safety aspects.

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 clinical MRI.

ESMPE have decided this event to be in a hybrid format. All talks will be given either on-site in Milan but participants can choose to attend the school on-site (limited number of participants) or online.

Content

- MRI physics: signal generation, contrast, signal localization.
- MRI technology
- Clinical sequences and fast imaging techniques
- Quantification in MRI, quantitative advanced techniques
- Quality assurance in quantitative MRI
- Metrology and intercomparison

Final exam

The final exam is voluntary. Participants can gain additional credits when successfully pass the test, seeking a higher level of certification beyond attendance.

Organisers

Brendan McClean (**Chair of the School**)
Luisa Altabella, Ioannis Tsougos (**Scientific Chair**)

Faculty

Luisa Altabella	Azienda Ospedaliera Universitaria Integrata Verona, Italy
Simone Busoni	Azienda Ospedaliero-Universitaria Careggi, Firenze, Italy
Gisela Hagberg	Max Planck institute, Tübingen, Germany
Matt Hall	National Physical Laboratory, UK
Alexander Leemans	University Medical Center Utrecht, The Netherlands
Cristina Lenardi	Department of Physics, Università di Milano, Italy
Lorenzo Nicola Mazzoni	AUSL Toscana Centro, Pistoia, Italy
Brendan McClean	St Luke's Radiation Oncology Network, Dublin, Ireland.
Roberto Sghedoni	Azienda USL - IRCCS di Reggio Emilia, Italy
Ioannis Tsougos	University of Thessaly, Medical School, Greece – King's College London, UK
Alberto Torresin	Polis, Regione Lombardia Department of Physics, Università di Milano, Italy
Steve Williams	IoPPN, King's College London, UK
Xavier Golay	Gold Standard Phantoms
Pablo Garcia-Polo	General Electric
Foteini Zacharopoulou	Siemens
Mariya Doneva	Philips





ESMPE

Thursday 24th October 2024

	Session	Title	Description	Lecturer
8:00-9:00	<i>Registration</i>			
9:00-9:15	Introduction	Setting the scene	Presentation of the ESMPE and introduction to the course	B. McClean C.Lenardi
9.15-10.00	MRI concepts	The Physical Basis of Nuclear Magnetic Resonance	Spin, magnetic moment, Larmor frequency,	A. Torresin
10:00-10.30	<i>Coffee break</i>			
10:30-11:15	MRI concepts	The Physical Basis of Nuclear Magnetic Resonance	Relaxation, signal generation	R.Sghedoni
11.15-12.00		Basics of Image Formation	Gradients, spatial encoding, phase and frequency encoding	L. Altabella
12:00-12:30			Question & Answer discussion on the morning lectures	All Faculty
12:30-14:00	<i>Lunch break</i>			
14.00-14.30	MRI concepts	Basics of Image Formation	Kspace, Image reconstruction, 2D 3D Imaging Basic MRI sequences	L. Altabella
14.30-15.00		Advanced Reconstruction Techniques	Sampling techniques Parallel imaging, Compressed sensing	L.N. Mazzoni
15.00-15.30	MRI Safety	MRI Safety	Basics and more	A. Torresin
15.30-16.00	<i>Coffee break</i>			
16.00-16:45	Quantitative techniques	Diffusion Principles	Introduction - Diffusion Sequences	A. Leemans
16:45-17:30	Interactive session	Guess the Artifacts	Interactive session	L.N.Mazzoni
17.30-18.00			Questions & Answers discussion on the afternoon lectures	All Faculty
20:00-23:00	Social dinner - participants + lecturers			



Please note: All times shown are in C

Friday 25th October 2024

	Session	Title	Description	Lecturer
09:00-09:45	Quantitative techniques	Advanced Diffusion Techniques - Quantification	Quantification Software	A. Leemans
09:45-10:30		MR Perfusion	Techniques and applications	R. Sghedoni
10:30-11:00	<i>Coffee break</i>			
11:00 – 11:45	Quantitative techniques	fMRI	Basics, Applications and Pitfalls	S. Williams
11:45-12:30		MR Spectroscopy	Basics, Applications and Pitfalls	I. Tsougos
12:30-14:15	<i>Lunch break</i>			
14:15-14:45			Questions & Answers discussion on the morning lectures	All Faculty
14:45-15:30	Quantitative techniques	Quantitative MR – Mapping Part I	From T1 and T2 relaxometry to synthetic MRI. Magnetization Transfer (MT).	G. Hagberg
15:30-16:00	<i>Coffee break</i>			
16:00-16:45	Quantitative techniques	Quantitative MR – Mapping Part II	Quantification of magnetic susceptibility effects (QSM). Quantification of (<i>almost</i>) everything through MR fingerprinting.	G. Hagberg
16:45-17:30	QA in qMRI	QA in advanced MR techniques	QA in Quantitative MRI	S. Williams / L. Altabella
17.30-18:00			Questions & Answers discussion on the afternoon lectures	All Faculty



Saturday 26th October 2024

	Session	Title	Description	Lecturer
09:00-9.45	QA and quantification	Metrology in MRI	MRI Metrology, Pitfalls and Challenges	M. Hall
09:45-10:30		Intercomparisons as quality tool for qMRI	Intercomparisons in MRI: organization, standardization of operating procedures, benefits	S. Busoni
10:30-11:00	<i>Coffee break</i>			
11:00-11.30	Imaging Biomarkers	Radiomics and AI	Radiomics and AI Applications in MRI	I. Tsougos
11.30-12.30	Company Presentations I	Application of metrology principles for the calibration of MR images	Gold Standard Phantoms	X. Golay
		Quantitative MR in the clinical routine	General Electric	P. Garcia Polo
11.30-13.30	Company Presentations II	Challenges and opportunities in quantitative MRI	Philips	M. Doneva
		MR Fingerprinting: An important leap for precision medicine	Siemens	F. Zacharopoulou
13.30-14.00			Questions and Answers discussion	All Faculty
14.00-15.00	<i>Final examination (optional; for those seeking a higher number of CPDs beyond attendance)</i>			



Course language	English
Level	Medical Physics Expert
Registration fee* (2 main meals, 5 coffee breaks, 1 social dinner)	300 € 350 € (from 30 September 2024)
Reduced registration fee* <ul style="list-style-type: none"> • subsidized by EFOMP • first-come, first-served policy 	150 € - for the first 15 participants (max. 2 from one country) coming from the following European countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Estonia, Greece, Hungary, Latvia, Lithuania, Moldova, North Macedonia, Poland, Portugal, Romania, Serbia, Slovakia, Spain, Ukraine. 150€ - for 15 early career participants (Italy). Registration via AIFM
Maximum number of onsite/online participants	100/110
Duration	24 th -26 th October 2024
Study load	15 hours of lectures and demonstrations
Venue	Fondazione UNIMI, Viale Ortles, 22/4, 20139 Milano MI, ITALY
GPS coordinates	N 45° 26.364858 E 9° 12.342795
Accommodation	Participants are responsible for their own travel and accommodation arrangements
Information, programme at:	www.efomp.org
Registration	Electronic registration via EFOMP website
Registration period	20nd January 2024 – 15th October 2024 (20th October 2024 for online participation only)

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

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