



QMRLucca.org

MR Phase, Magnetic Susceptibility and
Electrical Properties Mapping

16-19 October 2022, Lucca, Italy

Preliminary Program, v.9.22

Sunday, October 16th, 2022 (12:30-20:00)

Registration: 12:30-19:30

Educational Session: 14:30-19:00 (4h:30'). Chairmen: Christian Langkammer, José Marques, Ferdinand Schweser, Ulrich Katscher, Riccardo Lattanzi

- José Marques "Interactions of Electro-Magnetic Fields with Tissues - What's behind QSM and EPT"

Meet the Teacher / Coffee Corner

- Ferdinand Schweser "How to Measure Tissue Magnetic Properties with MRI"
- Kwok-Shing Chan "QSM live demo: A crash course with SEPIA"
- Christian Langkammer "Clinical QSM and novel applications"

Meet the Teachers / Coffee Corner

- Ulrich Katscher "How to Measure Tissue Electrical Properties with MRI"
- Alessandro Arduino "Open-Source Software for MR-Based Estimation of Tissue Electrical Properties"
- Khin Khin Tha "Electrical Conductivity in Normal and Pathological Tissues"

Registration and Welcome Cocktail: 19:00-20:00 (1h)

Monday, October 17th, 2022 (8:00-18:30)

Registration: 8:00-9:00

Opening remarks: 8:30-9:00:

- Luca Zilberti and Mauro Costagli .
- Emiliano Ricciardi.

Session 1: 9:00-10:30 (1h:30'). Chairmen: Mauro Costagli, Luca Zilberti, Emiliano Ricciardi

- **Cristina Granziera "Multiparametric quantitative MRI in clinical application"**
- **Dong-Hyun Kim "EMTP acquisition and reconstruction"**
- Thierry G. Meerbothe "ADEPT: A Database for MR-Electrical Properties Tomography"
- Hyeong-Geol Shin "Imaging multiple sclerosis histopathology using chi-separation: a postmortem study"
- Marta Lancione "Multi-center and multi-vendor reproducibility of a standardized protocol for Quantitative Susceptibility Mapping (QSM) of the human brain at 3T"

Power Pitches #1: 10:05-10:30 (25')

- Ludovic de Rochefort "Clinical Whole-Brain R2* and Quantitative Susceptibility Mapping at 3T and 7T –Reproducibility across field strengths and hardware generation"
- Valentina Bordin "QSM in a clinical-research framework: a preliminary test-retest study on normal volunteers"
- Jannette Nassar "Preliminary Functional Quantitative Susceptibility Mapping with Multi-Echo EPI"
- Mathieu Santin "First QSM of an ex vivo human brain on the Iseult 11.7T whole-body system using parallel transmission and virtual coil reconstruction"
- Jun-Hyeok Lee "A toolbox of χ -separation for magnetic susceptibility source separation"
- Jessica A. Martinez "In silico Experimental Array of a Heterogeneous Phantom for EPT Reconstruction during Temperature Increase"
- Ilias I. Giannakopoulos "Effect of the coil's incident field accuracy on Global Maxwell Tomography"
- Sabrina Zumbo "A new physics-based learning approach to solve inverse scattering problems for MRI-EPT"
- Umberto Zanovello "Helmholtz-EPT with a multichannel Tx/Rx RF coil at 3 T"
- Jun-Hyeok Lee "Jointly unrolled alternating cross-domain optimization-based Spatio-Temporal reconstruction network for accelerated 3D Myelin Water Imaging"

Coffee Break: 10:30-11:10 (40')

Session 2: 11:10-13:15 (2h). Chaired by Emma Biondetti and Stefano Mandija

- **Yusuf Ider “crEPT, gEPT, DBar, divergence methods: assumptions and implementation”**
- Safa Özdemir “Sub-second Conductivity imaging in MREPT with Spiral Trajectories”
- Oriana V. Arsenov “Quantitative Conductivity Mapping Using a Multi-Echo EPI Sequence”
- Fábio Seiji Otsuka “Study of QSM’s contrast sources in the brain using Electron Paramagnetic Resonance”
- Thomas Jochmann “Nonsusceptibility frequency shifts in the human brain and their impact on quantitative susceptibility mapping”
- Jiaen Liu “Combined motion and B0 correction enables robust quantitative cortical R2* and susceptibility imaging at 0.3 mm in-plane resolution at 7 T”
- Pascal Spincemaille “Combining QSM with the qBOLD model and incorporating spatially varying neural tissue susceptibility enables more robust cerebral oxygen extraction fraction quantification: comparison of QQ (QSM + qBOLD) and qBOLD oxygen extraction fraction mapping from gradient echo with 15O PET” (on behalf of first-author Hangwei Zhuang)
- Arnaud Le Troter “Parcellation of the Substantia Nigra from QSM using multi-modal 7T MRI Template”
- **Jeff Duyn “Myelin and Iron Content”**

Power Pitches #2: 12:50-13:15:

- Hwihun Jeong “Application of susceptibility source separation (χ -separation) to UK Biobank protocol and clinical protocol using deep neural network”
- Hwihun Jeong “ChEST: A novel model estimating both Chemical Exchange and Susceptibility Tensor from resonance frequency shift”
- Beata Bachrata “QSM in No Additional imaging Time (NATlve QSM) using 2D EPI in 3 orthogonal planes”
- Saleha Mir “A Fully Automated Pipeline for the Determination of the Iron Microstructure Coefficient (IMC) from Multi-Echo GRE Data”
- Patrick Fuchs “Regional Analysis of the 2019 QSM Challenge Submissions”
- Nestor Muñoz “Microstructure simulation in susceptibility tensor brain phantom”
- Alexandra Roberts “SuperQ: 3D Super-Resolution of Quantitative Susceptibility Maps”
- Ferdinand Schweser “Embedding medium alters local phase contrast in postmortem MRI of the human brain”
- Dominick Romano “White Matter Microstructure Fingerprinting using Single Orientation Multi Gradient Echo” (on behalf of first-author Mert Sisman)
- Fahad Salman “Effect of limited segmentation performance on regional susceptibility estimations using FSL FIRST in anatomical regions with poor T1 contrast”

Lunch: 13:15-14:00 (45')

Traditional Poster Session 14:00-15:00 (1h)

Parallel Sessions 3 & 4: 15:00-16:20 (1h20')

QSM parallel Session 3. Chaired by José Marques and Simon Robinson

- Christof Boehm "Robust QSM in the breast using silicone-regularized water—fat—silicone total inversion"
- Javier Silva Orellana "Evaluation of abdominal QSM approaches using a realistic in-silico phantom"
- Anders Dyhr Sandgaard "Towards microstructure-informed QSM: A digital phantom study"
- Peter Van Zijl "The impact of white matter microstructure with multi-fiber populations on gradient-echo frequency map" (on behalf of first-author Lin Chen)
- Christian Kames "Multi-echo dipole inversion"
- Oliver Kiersnowski "Dynamic Geometric Distortion Correction Improves Multi-Echo EPI QSM"
- Carlos Milovic "From Weak to Strong Harmonic QSM: Exhaustive Parameter Exploration on the 2019 QSM Challenge Field Maps"
- Pascal Spincemaille "Accelerated Stack-of-Spiral Data Acquisition for Cardiac Quantitative Susceptibility Mapping" (on behalf of first-author Jiahao Li)
- Sooyeon Ji "Pre- and post-processing method for resolution-free QSM reconstruction using existing QSM networks"
- Monica Ferreira "Optimized Quantitative Susceptibility Mapping using 3D-EPI Multi-Parametric Mapping for Deep Cerebellar Nuclei at 7T"

EPT parallel Session 4 (in Guinigi Chapel). Chaired by Yusuf Ider and Riccardo Lattanzi

- Fróði Gregersen "Estimation of conductivities in a personalized volume conductor model of the human head using MRCDI"
- Rosalind J. Sadleir "Single current DT-MREIT scale factor reconstruction"
- Ulrich Katscher "Comparison of conductivity derived from B1 phase and from water content"
- Matteo Cencini "Fast high-resolution Electric Properties Mapping using 3D MR Fingerprinting based water fraction estimation (MRF-EPT)"
- Khin Khin Tha "Biochemical analysis of the cerebrospinal fluid using electric properties tomography"
- Jessica A. Martinez "Subject Specific Brain SAR Maps Based on B1+ with CR-EPT Derived Electrical Conductivity"
- Chuanjian Cui "Implicit Regularization for Improving Simplified Helmholtz-based Conductivity Reconstruction with Stein's Unbiased Risk Estimator"
- Naohiro Eda "Helmholtz decomposition-based denoising for electrical properties tomography"
- Zhongzheng He "Phantom validation of MR-EPT: comparison to vector network analyzer and resolution assessment"
- José E. C. Serrallés "Replacing the Coil Model with a Numerical Electromagnetic Basis in Global Maxwell Tomography: Preliminary Experimental Results"

Coffee Break: 16:20-17:00 (40')

Session 5: 17:00-18:20 (1h20'). Chaired by Michela Tosetti and Ulrich Katscher

- **Richard Bowtell "Mapping Electro-Magnetic Tissue Properties with Ultra-High Field MR"**
- **Peter Van Zijl "Oxygenation, magnetic susceptibility and T2 relaxation in blood"**
- **Chunlei Liu "Susceptibility tensor imaging and tissue microstructure"**
- **Rosalind Sadleir "Cross-validation of CTI and DT-MREIT and MREIT reconstruction using minimal data"**

Tuesday, October 18th, 2022

Registration: 8:30-9:00

Session 6: 9:00-10:45 (1h:45'). Chaired by Mirco Cosottini and Ferdinand Schweser

- **Susan Gauthier "The added value of QSM in multiple sclerosis"**
- Thanh Nguyen "Mapping of Time-Dependent Positive and Negative Susceptibility Changes in Multiple Sclerosis Lesions" (on behalf of first-author Alexey Dimov)
- Sina Straub "Quantitative MRI biomarkers for cortical pathology in multiple sclerosis at 7 Tesla"
- Alan Wilman "Lesions in Multiple Sclerosis: One Year Changes with Magnetic Susceptibility Separation"
- Xu Li "Brain tissue susceptibility and oxygen extraction are more associated with cognitive performance than amyloid burden in cognitively normal older adults" (on behalf of first-author Lin Chen)
- Giulia Debiasi "Lesion heterogeneity captured by QSM can differentiate between high- and low-grade gliomas"
- Graziella Donatelli "Qualitative and quantitative iron-sensitive imaging to detect cortical patterns of upper motor neuron pathology in amyotrophic lateral sclerosis"

Power Pitches #3: 10:20-10:45

- Valeria Elisa Contarino "Visual and Automatic Assessment of the Precentral Cortex Susceptibility in Amyotrophic Lateral Sclerosis"
- Dominick Romano "On Preparing Alzheimer's Disease Brain Phantoms for Quantitative Susceptibility Mapping"
- Sonia Mazzucchi "Combined use of Morphometric Indexes and Quantitative Susceptibility Mapping for the differential diagnosis of degenerative parkinsonisms"
- Henrik Sjöström "Quantitative susceptibility mapping in orthostatic tremor"
- Mitchel Lee "Investigating Regional Changes in Magnetic Susceptibility in Tanzanian Children With Sickle Cell Anaemia at 1.5 Tesla"
- Miguel Guevara "QSM4SENIOR: Quantitative susceptibility mapping in the aging of the healthy brain"
- Jongho Lee "Preliminary results of χ -separation in the layer-wise analysis of iron and myelin along the cortex and white matter in the human brain" (on behalf of first-author Subin Lee)
- Lars Skattebøl "Clinical integration of an automated QSM pipeline for multiple sclerosis on a 3 T MRI"
- Lorenzo Principi "Quantitative susceptibility mapping of the normal-appearing white matter as a new marker of disability progression in multiple sclerosis"
- Fahad Salman "Temporal evolution of the concentration and content of tissue iron in the pulvinar of patients with multiple sclerosis"

Coffee Break: 10:45-11:30 (45') **WITH THE COMPLIMENTS OF VENTIO**

Session 7: 11:30-12:50 (1h:20'). Chaired by Dong-Hyun Kim and Berkin Bilgic

- **Jongho Lee “Deep Learning and QSM”**
- Zhuang Xiong “Unsupervised Multi-task learning for solving ill-posed dipole inversion in quantitative susceptibility mapping”
- Kwok-Shing Chan “Semi-supervised learning for fast multi-compartment relaxometry myelin water imaging”
- Xu Li “Deep Susceptibility Tensor Imaging: Towards Tensor Reconstruction at Fewer Angles” (on behalf of first-author Zhenghan Fang)
- Ilias I. Giannakopoulos “MR-Based Electrical Property Reconstruction Using Physics-Informed Neural Networks” (on behalf of first-author Xinling Yu)

Power Pitches #4: 12:25-12:50:

- Swetali Nimje “Accelerating Phase Mapping with Scan-Specific Complex Convolutional Neural Networks”
- Ilyes Benslimane “Self-calibration, histological validation, and an improved signal model for χ -separation using single-subject (N=1) physics-constrained deep learning”
- Mathias Lambert Villanueva “Deep k-space inversion (DKI)”
- Zhuang Xiong “Swin-QSM: Quantitative susceptibility mapping using Swin-Transformer”
- Chungseok Oh “Fair comparison in deep learning QSM”
- Cristiana Fiscone “Enhanced-Deep-Super-Resolution Neural Network on QSM Brain Images”
- Carlos Milovic “HaarChi, a New Quality Metric for QSM Based on Visual Perception”
- Patrick Fuchs “Incomplete Spectrum Inversion QSM”
- Oliver Kiersnowski “Optimising Multi-Echo and Single-Echo 2D EPI for Rapid QSM: What is the Maximum TE?”
- Jorge Campos Pazmino “Accurate direct inversion susceptibility mapping in deep gray matter with feature and voxel fidelity constraints”
- Anders Dyhr Sandgaard “Masking the measured volume improves QSM quality”

Lunch: 12:50-13:50 (1h')

Traditional Poster Session 13:50-14:50 (1h)

Session 8: 14:50-15:35 (45'). Chaired by Rosalind Sadleir

- **Riccardo Lattanzi “Global EPT techniques to stop worrying (at least) about tissue boundaries”**
- Xuelan Hu “A Novel Contrast Agent for Electrical Properties Tomography Based on Dextran-coated Iron Oxide Nanoparticles”
- Santhosh Iyyakkunnel “Conductivity mapping at 0.55 T with balanced steady state free precession”
- Alessandro Arduino “A metrologically sound uncertainty assessment in EPT experiments on a homogeneous phantom under repeatability and reproducibility conditions”

Coffee Break: 15:35-16:20 (45')

Session 9: 16:20-18:20 (2h). Chairman: Emiliano Ricciardi, Nico van den Berg, Yi Wang and Sina Straub

- **Xavier Golay “Quantitative MRI”**
- Luca Zilberti “Metrology and EPT at a crossroad: lessons learned from the QUIERO project”
- Stefano Mandija “The First EPT Challenge and future activities. EPT, quo vadis?”

Open discussion on EPT.

- Carlos Milovic “The roadmap for future QSM Reconstruction Challenges”
- Pascal Spincemaille “QSM acquisition across vendors”
- Ferdinand Schweser “Recommended implementation of quantitative susceptibility mapping for clinical research in the brain: Consensus of the QSM community”

Open discussion on QSM.

Closing remarks

Steering Committee Meeting: 18:30-19:30 (1h) in Guinigi Chapel:

- Figures of this joint meeting (10’)
- Discussion about this Joint QSM & EPT meeting: marriage or divorce (10’)
- Presentation of candidates for 2025 workshop(s)

Closing reception: 20:00-22:00

Wednesday, October 19th, 2022

Session 10: 8:45-10:00 (1h:15'). Chaired by Stefano Mandija and Emma Biondetti

- **Marco Geppi "The Italian Discussion Group on Magnetic Resonance (GIDRM)"**
- Irene Incerti "Quantitative Susceptibility Mapping (QSM) and haemorrhagic risk in Cerebral Cavernous Malformations (CCMs)", GIDRM AWARD
- Simona Schiavi "Multimodal lesion characterization in multiple sclerosis", GIDRM AWARD
- M. K. Çan "Bias Correction for Phase-Based cr-MREPT Using Low Resolution B1+ Magnitude"
- A. Sadikov "Towards Anomaly Detection in Electrical Properties Tomography Brain Scans"
- Thanh Nguyen "mCLARO: Multi-Contrast Learned Acquisition and Reconstruction Optimization for Simultaneous T1- and T2-weighted imaging and Quantitative Susceptibility Mapping" (on behalf of first-author Jinwei Zhang)
- Zhuang Xiong "QSM extraction from MRF acquisitions through deep neural networks" (on behalf of first-author Yang Gao)

Closing Remarks: Mauro Costagli, Luca Zilberti, Emiliano Ricciardi and Organizers of the 2025 Workshop(s)

Coffee Break: 10:00-10:30 (30')

Satellite Symposium 10:30-13:00 (2h30') – Open to all registrants of the QMR Lucca Workshop

"MR Fingerprinting in Pisa: from technical development to clinical applications"

Dissemination of the scientific results achieved by the study GR-2016-02361693, funded by the Italian Ministry of Health

Chaired by Mauro Costagli and Graziella Donatelli

- Mauro Costagli "Increasing diagnosis rates while reducing examination time: can MR Fingerprinting deliver on its promise?" (Presentation of the study GR-2016-02361693)
- Matteo Cencini "Quantitative Transient Imaging: acquisition and reconstruction"
- Luca Peretti "The role of machine learning"
- Graziella Donatelli "MRF in the clinical setting"
- Michela Tosetti "Present and future: advanced applications"

Closing / sandwich corner 13:00-14:00

QMR Lucca – Steering Committee:

Mauro Costagli, University of Genoa (QSM workshop chair)
Luca Zilberti, INRIM Turin (EPT workshop chair)
Emiliano Ricciardi, IMT School of Advanced Studies Lucca (LOC chair)
Berkin Bilgic, Massachusetts General Hospital
Emma Biondetti, University of Chieti-Pescara
Mirco Cosottini, University of Pisa
Yusuf Ider, Bilkent University
Ulrich Katscher, Philips Healthcare
Dong-Hyun Kim, Yonsei University
Christian Langkammer, Medical University of Graz
Riccardo Lattanzi, New York University
Jongho Lee, Seoul National University
Stefano Mandija, University Medical Center Utrecht
José Marques, Radboud University Nijmegen
Simon Robinson, University of Queensland Brisbane
Rosalind Sadleir, Arizona State University
Ferdinand Schweser, University at Buffalo
Karin Shmueli, University College London
Michela Tosetti, IRCCS Stella Maris Pisa
Nico van den Berg, University Medical Center Utrecht
Yi Wang, Cornell University
Eung-Je Woo, Kyung Hee University

Local Organizing Committee:

Emiliano Ricciardi, Mauro Costagli, Luca Zilberti, Emma Biondetti, Stefano Mandija, Anna Gnozzi (KARDO s.r.l. Organizing Secretariat)

Educational Session – Organizing Committee:

Ulrich Katscher, Christian Langkammer, Riccardo Lattanzi, José Marques, Ferdinand Schweser

Abstract Evaluation Committee:

Alessandro Arduino, INRIM, Turin; **Berkin Bilgic**, Massachusetts General Hospital; **Richard Bowtell**, University of Nottingham; **Emma Biondetti**, University of Chieti-Pescara; **Mauro Costagli**, University of Genoa; **Yusuf Ider**, Bilkent University; **Ulrich Katscher**, Philips Healthcare; **Patrick Fuchs**, University College London; **Susan Gauthier**, Cornell University; **Jeff Duyn**, National Institute of Health, Bethesda; **Marta Lancione**, IRCCS Stella Maris Foundation, Pisa; **Christian Langkammer**, Medical University of Graz; **Riccardo Lattanzi**, New York University; **Jongho Lee**, Seoul National University; **Xu Li**, Johns Hopkins University, Baltimore; **Chunlei Liu**, University of California, Berkeley; **Stefano Mandija**, University Medical Center Utrecht; **José Marques**, Radboud University Nijmegen; **Carlos Milovic**, University College London; **Simon Robinson**, University of Queensland Brisbane; **Ferdinand Schweser**, University at Buffalo; **Hyeong-Geol Shin**, Johns Hopkins University, Baltimore; **Pascal Spincemaille**, Cornell University; **Sina Straub**, German Cancer Research Center, Heidelberg; **Yi Wang**, Cornell University; **Luca Zilberti**, INRIM, Turin

Endorsed by:

ISMRM – International Society for Magnetic Resonance in Medicine
INRIM – Italian National Metrology Institute
IMT School of Advanced Studies Lucca
IRCCS Fondazione Stella Maris Research Institute and Hospital
Fondazione Imago 7 – 7T Magnetic Resonance Facility and Research Center

Sponsored by:

VENTIO – Your partner for Quantitative Susceptibility Mapping in Europe
EMS – Solutions for Neurosciences
QUIERO – QUAntitative Imaging Enables Reproducible Outcomes