**16-19 October 2022,
Lucca, Italy**

QMRLUCCA.org

MR phase,
Magnetic Susceptibility
and Electrical Properties Mapping

CHAIRED BY:

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)

Sunday, October 16th, 2022

12:30-14:30 Registration

14:30-19:00 **Educational Session - Guinigi Chapel**
Chaired by: **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"

19:00-20:00 Welcome Cocktail

Monday, October 17th, 2022

7.30-8.30 Registration

8:30-9:00 Opening remarks
Luca Zilberti and **Mauro Costagli**
Emiliano Ricciardi

9:00-10:30 **Session 1 - San Francesco Church**
Chaired by: **Mauro Costagli, Luca Zilberti, Emiliano Ricciardi**

- **Cristina Granziera** "Multiparametric quantitative MRI in clinical application" (invited lecture)
- **Dong-Hyun Kim** "EMTP acquisition and reconstruction" (invited lecture)
- **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
- **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"
- **Jae-Hun Lee** "Jointly unrolled alternating cross-domain optimization-based Spatio-Temporal reconstruction network for accelerated 3D Myelin Water Imaging"

10:30-11:10   **Coffee Break**

11:10-13:00   **Session 2 - San Francesco Church**
Chaired by **Emma Biondetti** and **Stefano Mandija**

- **Yusuf Ider** "crEPT, gEPT, DBar, divergence methods: assumptions and implementation" (invited lecture)
- **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"
- **Arnaud Le Troter** "Parcellation of the Substantia Nigra from QSM using multi-modal 7T MRI Template"

Power Pitches #2
- **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 (NATIve 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"
- **Fahad Salman** "Effect of limited segmentation performance on regional susceptibility estimations using FSL FIRST in anatomical regions with poor T1 contrast"

13:00-14:00   **Lunch**

14:00-15:00   **Traditional Poster Session - Refettorio room**

15:00-16:20 **Parallel Sessions 3 & 4**

QSM parallel Session 3 - San Francesco Church
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"
- **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"
- **Sooyeon Ji** "Pre- and post-processing method fo 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 - Guinigi Chapel
Chaired by **Yusuf Ider** and **Riccardo Lattanz**i

- **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)"
- **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"

16:20-17:00 **Coffee Break**

17:00-18:20 **Session 5 - San Francesco Church**
Chaired by **Michela Tosetti** and **Ulrich Katscher**

- **Jeff Duyn** "Myelin and Iron Content" (invited lecture)
- **Peter Van Zijl** "Oxygenation, magnetic susceptibility and T2 relaxation in blood" (invited lecture)
- **Chunlei Liu** "Susceptibility tensor imaging and tissue microstructure" (invited lecture)
- **Rosalind Sadleir** "Cross-validation of CTI and DT-MREIT and MREIT reconstruction using minimal data" (invited lecture)

Tuesday, October 18th, 2022

9:00-10:45 **Session 6 - San Francesco Church**
Chaired by **Mirco Cosottini** and **Ferdinand Schweser**

- **Susan Gauthier** "The added value of QSM in multiple sclerosis" (invited lecture)
- **Thanh Nguyen** "Mapping of Time-Dependent Positive and Negative Susceptibility Changes in Multiple Sclerosis Lesions"
- **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"
- **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
- **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"
- **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", GIDRM award
- **Fahad Salman** "Temporal evolution of the concentration and content of tissue iron in the pulvinar of patients with multiple sclerosis"

10:45-11:30 **Coffee Break - with the compliments of** ∼·ventio

11:30-12:50 **Session 7 - San Francesco Church**
Chaired by **Dong-Hyun Kim** and **Berkin Bilgic**

- **Jongho Lee** "Deep Learning and QSM" (invited lecture)
- **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"
- **Ilias I. Giannakopoulos** "MR-Based Electrical Property Reconstruction Using Physics-Informed Neural Networks"

Power Pitches #4

- **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", GIDRM award
- **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"

12:50-13:50   Lunch: 12:50-13:50

13:50-14:50   Traditional Poster Session

14:50-15:35   Session 8 - San Francesco Church
Chaired by **Rosalind Sadleir**

- **Riccardo Lattanzi** "Global EPT techniques to stop worrying (at least) about tissue boundaries" (invited lecture)
- **Khin Khin Tha** "Biochemical analysis of the cerebrospinal fluid using electric properties tomography"

- **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"
- **Xuelan Hu** "A Novel Contrast Agent for Electrical Properties Tomography Based on Dextran-coated Iron Oxide Nanoparticles"

15:35-16:20   Coffee Break

16:20-18:20   Session 9 - San Francesco Church
Chaired by: **Emiliano Ricciardi, Nico van den Berg, Yi Wang** and **Sina Straub**

- **Xavier Golay** "Quantitative MRI" (invited lecture)
- **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

18:30-19:30   Steering Committee Meeting - Guinigi Chapel
Figures of this joint meeting
Discussion about this Joint QSM & EPT meeting
Presentation of candidates for 2024 workshop(s)

20:00-22:00   Social event

Wednesday, October 19th, 2022

8:45-10:00 **Session 10 - San Francesco Church**
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
- **Mustafa Kaan Çan** "Bias Correction for Phase-Based cr-MREPT Using Low Resolution B1+ Magnitude"
- **Aleksander 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"
- **Zhuang Xiong** "QSM extraction from MRF acquisitions through deep neural networks"

Closing Remarks:

Mauro Costagli, Luca Zilberti, Emiliano Ricciardi
and **Organizers** of the 2024 Workshop(s)

10:00-10:30 **Coffee Break**

10:30-13:00 **Satellite Symposium - San Francesco Church**
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?"
- **Matteo Cencini** "Quantitative Transient Imaging: acquisition and reconstruction" (invited lecture)
- **Luca Peretti** "The role of machine learning" (invited lecture)
- **Graziella Donatelli** "MRF in the clinical setting" (invited lecture)
- **Michela Tosetti** "Present and future: advanced applications" (invited lecture)

13:00-14:00 **Closing / sandwich corner**

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