

Electromagnetic Technologies for Life Sciences: challenges and opportunities in the EurAAP community



Abstract

Medical applications of electromagnetic fields are increasingly popular, both for diagnosis and therapy. Since they are grounded on antennas and electromagnetic propagation in complex environment (the human body), EuCAP represents the meeting of choice for researchers working in this area. This is testified by the growing relevance of the biomedical track in the EuCAP program. This workshop is meant to complement technical sessions, offering the audience an intersectoral and interdisciplinary event wherein speakers will present some successful stories and ongoing collective efforts and participants will have the opportunity to openly exchange ideas and experiences on policies, projects and emerging challenges.

Workshop outline

The workshop illustrates different aspects of the research in medical applications of electromagnetic fields. The pool of speakers includes colleagues coming from academia and industry which will provide (15min) focused presentations, to stimulate an open discussion.

Confirmed presentations:

1. An overview of some recent and ongoing projects in the field of medical electromagnetics (Francesca Vipiana, Italy)
2. The role of COST actions to build an international network on EM technologies for life sciences (Raquel Cruz Conceição Portugal)
3. Validation studies towards reproducibility of results: Hyperthermia grand challenge outputs (Hana Dobsicek Trefna, Sweden)
4. Standards developments: ASME effort on standardization of terms and measurement techniques for thermal medicine (Marta Cavagnaro, Italy)
5. Pathways from research to clinical applications: MiWendo Solutions case (Marta Guardiola, Spain)
6. Proposal of a EurAAP WG: ELSA - Electromagnetic Technologies for Life Sciences Applications (Lorenzo Crocco, Italy)

Speakers

MARTA CAVAGNARO is Associate Professor of Electromagnetic Fields at Sapienza University of Rome. Her research activity is devoted to dosimetric aspects of the interaction between electromagnetic fields and biological systems. Her interests include numerical methods for solving Maxwell's equations, evaluation of power absorption and temperature increase in subjects under different exposed conditions, techniques for therapeutic use of microwave energy, and dielectric properties' spectroscopy. Marta Cavagnaro serves as a reviewer for several scientific journals and is Associate Editor of *Bioelectromagnetics* (Wiley). She is Author or Co-author of more than 170 scientific publications.

LORENZO CROCCO is a Research Director at the Institute for the Electromagnetic Sensing of the Environment of the National Research Council of Italy (IREA-CNR), Naples, Italy. His scientific activities concern diagnostic and therapeutic uses of EM fields, non-invasive electromagnetic inspections, through-the-wall radar and GPR. On these topics, he has published more than 120 papers, edited special issues and given keynote talks and lectures. He has edited two books on medical applications of electromagnetic technologies. Dr. Crocco is Board Member at European School of Antennas (ESOA) and of EurAPP Delegate Assembly as representative of Italy, San Marino and Vatican City.

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RAQUEL CRUZ CONCEICAO. Award-winning assistant professor with habilitation with a significant record of peer-reviewed publications and funded grants. She is the coordinator of the Biophysics and Biomedical Engineering Institute, Portugal, developing a breast and axillary lymph node microwave imaging device. She is the vice-president of the URSI Portuguese committee for Commission K "Electromagnetics in Biology and Medicine". She won the FP7 Marie Curie Intra-European-Fellowship, was the chair for COST Action TD1301, MiMed, and is now the coordinator of a 1.5M€ Twinning project 3BATwin. Overall, she has published over 110 journal and conference papers, edited 2 books, having co-authored with over 100 international researchers.

MARTA GUARDIOLA, Engineer and Doctor in Telecommunications. Since 2008, she has worked in microwave imaging systems for medical diagnosis, initially at UPC and since 2014 at UPF. She is an associate professor at UIC. In 2019, she co-founded the spinoff MiWEndo Solutions, where she serves as CTO. MiWEndo Solutions is clinically validating a microwave imaging system for colonoscopy. Her research experience includes microwave imaging algorithms, phantoms, simulations, and microwave systems design and manufacturing. She is the author of a dozen peer-reviewed papers, holds 2 patents, and has received several national and international awards.

HANA DOBSICEK TREFNA is Associate Professor in Biomedical Engineering at Chalmers University of Technology since 2018. Her research interest includes the engineering development of microwave hyperthermia systems as well as other medical diagnosis and treatment applications of microwaves. Her work aims at clinical introduction of hyperthermia in Sweden, developing an UWB hyperthermia system for treatment of tumours in difficult to treat locations, such as head and brain. She is Chair of Technical Committee of European Society for Hyperthermic Oncology (ESHO), which sets the standards for hyperthermia devices, their testing and clinical application. She is ESHO board member since 2022 and Profile leader for Biomedical engineering in Health Engineering Area of Advance at Chalmers.

FRANCESCA VIPIANA is a Full Professor of Electromagnetic Fields at the Dept. of Electronics and Telecommunications of the Politecnico di Torino, Torino, Italy. She received the Lot Shafai Mid-Career Distinguished Award from the IEEE Antennas and Propagation Society (AP-S) in 2017, and she was an Associate Editor of IEEE Trans. on Antennas and Propagation (2018-2024). Currently, she is the responsible of the Women in Engineering Column in the IEEE Antennas and Propagation Magazine, the Chair of the EurAAP Women in Antennas and Propagation Working Group, and the Vice-Chair of the IEEE AP-S Diversity, Equity, Inclusion and Sense of Belonging Committee.