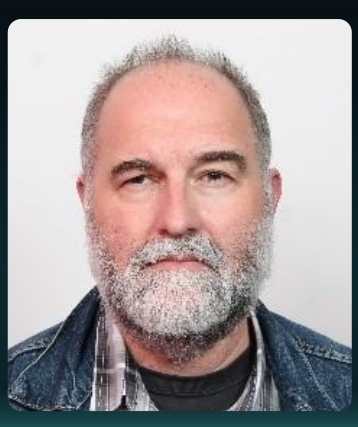
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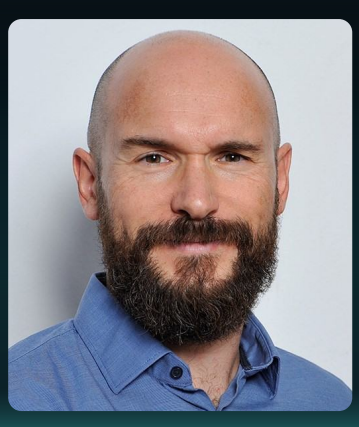
Tutorial

# HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS (EMFS) MADE SIMPLE

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## CALL FOR PAPERS

Tutorials on human exposure to electromagnetic fields (EMFs), based on rigorous electromagnetic field theory and related numerical solution methods, have been regularly delivered by D. Poljak and M. Cvetković at SplitTECH conferences over the years. Traditionally, these tutorials have provided detailed mathematical formulations and computational approaches, primarily targeting senior researchers, postdoctoral researchers, and PhD students working in the field.

Contrary to such an approach 2026 Tutorial edition aimed to offer a beginner's guide on the subject for much broader audience. This variant of the Tutorial omitted entire mathematical/ physical language and acceptable for anyone interested in the subject without requesting mathematical skills as a prerequisite. Such an approach partly follows the style of some papers published by the authors in Journal Replica and numerous interviews given in various media for decades.

An outcome was rather successful event followed by a fruitful and lively discussion between the Tutorial presenters and the participants. To sum up, by having skipped mathematical rigor some important information easily meet the public and phenomenological and basic physical explanation on this hot topic being of public interest for decades were transferred to broader audience. In short, the participants obtained some principal ideas on basic concepts, the known health effects, the actual national/international exposure limits and typical levels of the electric and magnetic fields in the environments.

Also, the Tutorial presenters got some useful response from the participants how to improve the future editions of the Tutorial.

The actual version of this 'beginner's guide Tutorial' keeps the basic structure of the previous edition but at the same time contains much more easy language explanations. Tutorial starts by addressing some general environmental aspects of electromagnetic fields, coupling mechanisms between human body and EMFs, well-established biological effects of EMFs from static to high-frequency range, international safety guidelines related to limiting exposures to those fields, including relevant exposure limits, basic electromagnetic-thermal dosimetry concepts and some recent findings pertaining to activities undertaken within the framework of IEEE ICES working groups, which Tutorial presenters participated (WG2, WG3, WG5 and WG7) and IRPA TG NIR will be reported.

Real world scenarios pertain to power lines, transformer substations, PLC systems, RFID antennas, Wireless Power Transfer (WPT) systems and radio base stations (2G/3G/4G and 5G technology).

Illustrative computational examples pertain to typical realistic exposure scenarios, such as; pregnant woman/foetus exposed to low frequency (LF) fields, the human eye, the brain, the eye and the entire human head exposed to HF radiation. In particular, for exposure within GHz frequency range, several tissue models, from rather simple to more realistic, will be addressed.

The obtained results for relevant EMF quantities are compared against exposure limits proposed by ICNIRP (International Commission on Non Ionizing Radiation Protection).

This is followed by some examples of biomedical applications of electromagnetic fields, including the transcranial magnetic stimulation (TMS), transcranial electrical stimulation (TES), but also some electrotherapy and magnetotherapy techniques. Also, some illustrative examples pertaining to thermal modeling of certain ophthalmological procedures will be given.

Dragan Poljak received his PhD in el. Eng. in 1996 from the Univ. of Split, Croatia. He is the Full Prof. at Dept. of Electron. and Computing, Univ. of Split. His research interests include computational electromagnetics (electromagnetic compatibility, antennas and propagation, bioelectromagnetics, ground penetrating radar, wireless power transfer, lightning electromagnetics, plasma physics and nuclear fusion). To date Prof. Poljak has been involved in numerous projects on electromagnetic-thermal dosimetry, published more than 200 journ. and 500 conf. papers, and authored some books, e.g. one by IEEE Press, two by Wiley, New Jersey and one by Elsevier, St Louis. He is a Senior member of IEEE, a member of Editorial Board of Eng. Anal. with Boundary Elements, Math. Problems in Eng. And IET Sci. Measur. & Techn. He was also guest editor in a number of journals, e.g. Eng. Anal. with Boundary Elements, Fusion Engineering and design. He was awarded by several prizes for his research achievements, such as National Prize for Science (2004), Croatian sect. of IEEE annual Award (2016), Technical Achievement Award of the IEEE EMC Society (2019), George Green Medal from University of Mississippi (2021), IEEE Standards Associations – Certificate of Appreciation, 2022, National Prize for Science (2004 and 2023) and several recognitions from University of Split. From May 2013 to June 2021 Prof. Poljak was a member of the board of the Croatian Science Foundation. He was involved in ITER physics EUROfusion collaboration and he is currently involved in IFMIF-DONES EUROfusion collaboration and in Croatian center for excellence in research for tech. sciences (DATACROSS), Croatian-Chinese bilateral projects, etc. He is active in few Working Groups of IEEE/Internat. Committee on Electromagnetic Safety (ICES) Tech. Comm. 95 SC6 EMF Dosimetry Modeling, (co-chair of WG2 and WG7) and Task Group of Nonionizing Radiation of International Radiation Protection Association (IRPA).

Mario Cvetković received his B.S. degree from the University of Split, Split, Croatia, in 2005, the M.Phil. degree from Wessex Institute of Technology, University of Wales, Cardiff, U.K., in 2009, and the Ph.D. degree from the University of Split in 2013. He is currently Chair for Fundamentals in electrical engineering and an Associate Professor with the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, Croatia. To date, he has co-authored more than 100 papers published in international journals and conference proceedings and several book chapters. In 2019 he coauthored a book entitled "Human Interaction with Electromagnetic Fields - Computational Models in Dosimetry" published by Elsevier. His research interests include numerical modeling with finite elements and method of moments, computational bioelectromagnetics, and heat transfer related phenomena. He held a series of tutorials and seminars related to advanced topics in bioelectromagnetics and various aspects of interaction of humans with electromagnetic fields at: Technical University of Ilmenau, Germany (2010), Malardalen University, Vasteras, Sweden (2014, 2018), Nagoya Institute of Technology, Nagoya, Japan (2017, 2023), University of Maribor, Slovenia (2018, 2019), Hohai University Nanjing, China (2025), several SpliTech conferences (2016-2020, 2023-2026), and SoftCOM conferences (2019, 2021, 2022, 2026). He is a Member of the International Committee on Electromagnetic Safety (ICES) Technical Committee 95 and its Subcommittee 6 EMF Dosimetry Modeling where he also served as a Working Group 2 secretary from 2017-2019. He was the recipient of the Best Student Paper Award, awarded at the 16th Edition of the International Conference SoftCOM 2008.

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