

Guest Editorial

Environmental Electromagnetic Compatibility

In the last decades, there have been a number of significant advances in many areas of Environmental Electromagnetic Compatibility (EEMC). Valuable contributions of the electromagnetic field analysis related to the antennas, lines and cables, bioelectromagnetics, broadband EMI, lightning, etc. have been presented in many conferences and also reported in many acclaimed international journals.

These studies, which have been carried out by numerical simulation and experimental techniques, provide the scientific knowledge for the electromagnetic phenomena in general and also give scientific background and improvement in electromagnetic and thermal dosimetry, design and protection of electrical and electronic equipment.

Therefore, the Guests Editors enthusiastically accepted the proposal of prof. N. Rozic, Editorial Chair of *Journal of Communications, Software and Systems (JCOMSS)*, to edit a *Special Issue on Environmental Electromagnetic Compatibility* by collecting some important recent contributions achieved by prominent researchers in this area. Initial idea was to edit an issue on Mobile and Wireless Communications, but we finally extend aims and scopes of this particular issue to many other areas of EMC and decide to produce a special issue on Environmental Electromagnetic Compatibility (EEMC).

This Special Issue on Environmental Electromagnetic Compatibility contains 8 papers selected through the international review process and grouped into the three topics:

- Theoretical electromagnetic and thermal dosimetry (3 papers)
- Experimental dosimetry (2 papers)
- Lightning effects and grounding systems (3 papers)

The papers to follow enable the reader to have a glance on the advances in these areas of EEMC.

The issue starts with a paper: «Analysis Method for the Heating of the Human Eye Exposed to High Frequency Electromagnetic Fields», by Hrvoje Dodig et al. which pioneers the hybrid boundary element/finite element approach to the analysis of the heating of the human eye exposed to microwave radiation. The present study proposes a coupled electromagnetic-thermal model of the realistic eye geometry. The obtained results from numerical simulation have suggested that under certain exposure scenario the value of induced field, SAR and related temperature increase are not negligible.

The second paper by Andres Peratta et. al. entitled: Current Density Induced in the Human Body due to Power distribution Lines using The Boundary Element Method is related to the assessment of human exposure to extremely low frequency electric field via the Boundary Element Method. The paper

investigates the variations in the body response in terms of the current density subjected to the inclusion of internal organs in the conceptual model. The obtained numerical results have shown that the current density is almost insensitive to the internal structure of the human body, but highly dependent on the external shape of the body.

The third paper «A Comparative Study on the Induced Current Density in Human Exposed to ELF Electric Fields», written by Vitantonio Amoroso et al., is devoted to a comparative analysis of human exposure to ELF fields by using analytical and numerical method approach. The work features strengths and weaknesses of the diakoptic method and boundary element method, applied to the multisphere, cylindrical, body of revolution and realistic model of the human being, respectively.

The section on experimental dosimetry starts with a paper entitled: «Mobile Phones as Sources of Electromagnetic Interference» written by Jacek Skrzypczynski et. al. which deals with a theoretical and experimental analysis of a mobile phone as an EMI source. The experimental results and Method of Moments simulation results have been found to be in a good agreement. In this paper, the safety aspect of the phone antenna and the control signal cables coupling to a vehicle has been investigated.

In the second contribution from this topic, entitled «GTEM Cell Experimental Setup for in Vitro Dosimetry, by Giovanna Calò et.al., a GTEM cell experimental setup for in vitro dosimetry purpose has been presented. The paper deals with 900MHz and 1800MHz exposures and the experimental assessment of SAR has been reported, as well.

The third set of papers is related to the analysis of lightning and grounding systems.

In «Dangerous Voltages due to Direct Lightning Strike into the Communication Tower» by Slavko Vujevic and Petar Sarajcev, the authors propose a novel technique for the determination of dangerous voltages due to direct lightning strike into the communication tower and the corresponding grounding system based on the extension of the well-known ATP-EMTP software package. The ground model is related to homogeneous medium representation by also neglecting the ionisation effect.

The paper «Induced Disturbance in Power Network by Lightning», by S. Kaouche et al. deals with the transient analysis of a power network excited by indirect lightning and carried out directly in the time domain using the FDTD approach. The original approach proposed for the analysis of the coupling lightning stroke with complex power network leads to very satisfactory results. The proposed formalism provides not only the analysis of a power network with complex topology, but also allows the treatment directly in time domain, thus providing one to avoid numerical disturbances which appear in frequency analysis by use of Fourier transform.

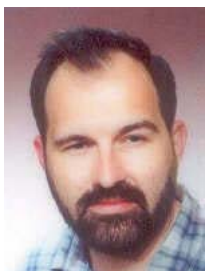
The last paper «Transient Analysis of Grounding Systems Associated to Substation Structures under Lightning Strokes» by B. Harrat et al. proposes a new formalism for analyzing the transient behavior of grounding systems related to substation structures under lightning strike. The protective device under study is formed of a guard filet connected to a grounding grid by simple conductors called down conductors. The principal advantages of the proposed approach are related to the direct time domain analysis and the simplicity of the implementation.

Most of the papers published in this issue arise from the well established international research projects and scientific collaboration as a result of the permanent value of these scientific exchanges.

Beside the eight papers accepted for this issue the Guest Editors have received few additional papers for which the review process has not been completed yet. Taking into account the importance of satisfying EMC requirements in for the successful development of communications we believe that the contributions to the EEMC topics will find the space in future issues of JCOMSS.

The Guest Editors hope that they put together an interesting piece of work regarding some hot topics in environmental electromagnetic compatibility and would like to thank Prof. N.Rozic, Editorial Chair of JCOMSS for this nice opportunity.

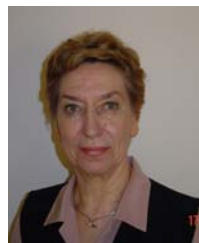
They would also like to thank all contributors for their valuable contributions and all reviewers for their qualified efforts.



Dragan Poljak is the Full Professor at the Department of Electronics at the University of Split, and he is also Adjunct Professor at Wessex Institute of Technology. His research interests include frequency and time domain computational methods in electromagnetics, particularly in the numerical modelling of wire antenna structures, and recently numerical modelling applied to environmental aspects of electromagnetic fields. Professor Poljak is a member of IEEE, a member of the Editorial Board of the journal *Engineering Analysis with Boundary Elements*, and co-chairman of the WIT International Conference on Computational Methods in Electrical Engineering and Electromagnetics. He is also editor of the WIT Press Series *Advances in Electrical Engineering and Electromagnetics*.



Andres Peratta received his MSc in Physics in 2001 from University of Buenos Aires, Argentina, and his PhD in 2004 from University of Wales, UK. During 2005 he has been a Postdoctoral Fellow and Assistant Professor at the Wessex Institute of Technology (WIT), Southampton UK. In 2006 he became Head of the ICE Division at WIT and member of the International Scientific Advisory Committee member of the WIT International Conferences on Environmental Electromagnetic Compatibility, Simulation of Electrochemical Processes, and Computational Ballistics. His research interests are Num. Modelling, Boundary and Finite Elements, Electromagnetism and CFD.



Vesna Roje received the B.Sc. (Eng.) degree from the University of Split, Croatia in 1967, and the M.Sc. and the Ph.D. degree (in 1974 and 1983 respectively) from the University of Zagreb, Croatia, all in electrical engineering. Since 1997 she serves as a Full Professor at the Department of Electronics of the University of Split, FESB. Her research interests are in the area of electromagnetic wave theory, antennas and propagation and electromagnetic compatibility, currently focused on electromagnetic interference problems in wireless communication systems. She is founder and chair of the IEEE EMCS Croatia Chapter and Croatia national coordinator of the EU EMC Action COST 286.



Francesco Lattarulo, 1951, was researcher in High-Voltage Engineering from 1977 to 1985; from 1985 to 1999 he was Associate Professor in Electrotechnology and since 1999 he has been full professor in Fundamentals of Electrical Engineering and Electromagnetic Compatibility. His primary interest is in some topics of applied electrostatics which include EMC and d.c. corona. Dr. Lattarulo has been appointed as a member of the AEI Special Group on EMC and a member of the CEI Technical Committee of EMC.



Choy Yoong Tham has been Professor is a Professor at the Faculty of Engineering and Science, Kuala Lumpur, Malaysia. He was also the Research Associate in the Astro-physics Group, Cavendish Laboratory, Cambridge. His areas of interest include computational electromagnetics (CEM), superconducting millimeter and sub-detectors, antennas, and transient electromagnetic.