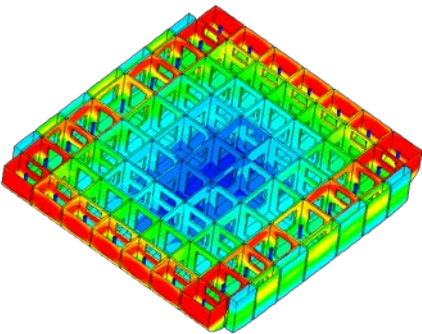

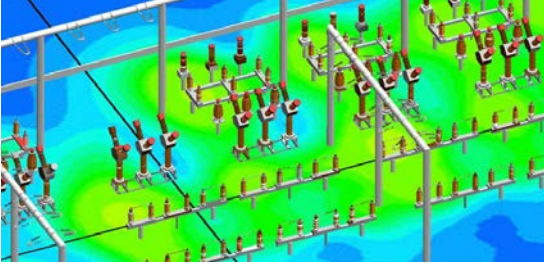


NUMERICAL MODELLING AND ELECTROMAGNETIC COMPATIBILITY RESEARCH LABORATORY

Contact details

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Acronym	NUMELEC	
Logo		
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Areas of expertise

Numerical modelling and optimal design of electromagnetic devices.

Numerical modelling of the electromagnetic field behaviour in complex systems. Time-varying electromagnetic fields. High-frequency electromagnetic fields analysis and waves propagation. Optimal design of the electromagnetic devices and systems. Optimization algorithms in electromagnetics. Evolutionary algorithms for the optimization of the electromagnetic devices

Electrochemical systems and cathodic protection

Manufacturing techniques using the electrochemical process; Software for simulation of the electrochemical processes; Mitigation of the electromagnetic interference effects of HVAC and HV power transmission lines on pipeline networks; Optimal design of the cathodic protection systems.

Electromagnetic compatibility

Pre-compliance and compliance tests for conducted and radiated disturbances (emissions and susceptibility) according to the IEC 61000 standards. Analysis of the electromagnetic interferences generated by HV lines on neighbourhood metallic structures. Computation and measurements of the electric and magnetic field values in vicinity of power lines and high voltage substations for compliance with the EMC EU Directive.

Team

Prof. Dr. Eng. Calin Munteanu, Prof. Dr. Eng. Vasile Topa, Assoc. Prof. Dr. Eng. Marius Purcar, Assoc. Prof. Dr. Eng. Laura Grindei, Assist. Prof. Dr. Eng. Adina Racasan, Assist. Prof. Dr. Eng. Claudia Pacurar, Assist. Dr. Eng. Claudia Hebedean, Assist. Eng. Alexandru Avram

Representative projects

“Integrated software package for the analysis and prediction of the electromagnetic pollution generated by HV lines and substations on the neighbour metallic structures and their cathodic protection”, PN-II-ID-PCE, (2008-2011)

“Development of a mathematical analysis technique for modelling electrode shape changes in electrochemical processes, a new virtual design tool”, PN-II-ID-PCE, (2008-2011)

“The study of the exposure to magnetic field in residential areas of Cluj-Napoca city”, Research contract with industrial partner (FDEE Electrica Distributie Transilvania Nord SA), (2013)

“Study of the electromagnetic interferences between the 110 kV Oradea Sud – Oradea Centru power line conductors and the mobile communication system antennas in the case of the Nufarul Oradea site”, Research contract with industrial partner (Electrogrup SA), (2011)

“The study of the electric and magnetic field values inside the 400 kV Gadalin substation by in site measurements”, Research contract with industrial partner (ELM Electromontaj Cluj), (2011)

Significant results

The most representative publications of the past 5 years:

1. Paljanos Annamaria, Miclaus Simona, Munteanu Calin, Occupational exposure of personnel operating military radio equipment: measurements and simulation, ELECTROMAGNETIC BIOLOGY AND MEDICINE, Vol.34, Issue 3, Pp.221-227, Published: 2015
2. Racasan Adina, Munteanu Calin, Topa Vasile, et al., Home Appliances Conducted Electromagnetic Emissions
3. Analysis and Mitigation Methods, 9th International Symposium on Advanced Topics in Electrical Engineering (ATEE), Bucharest, ROMANIA MAY 07-09, 2015, Pages: 356-361 Published: 2015
4. Czumbil Levente, Micu Dan D., Munteanu Calin, et al., Optimization of Pipeline-Overhead Line Right-of-Way using Genetic Algorithms, 9th International Symposium on Advanced Topics in Electrical Engineering (ATEE), Bucharest, ROMANIA MAY 07-09, 2015, Pages: 531-534 Published: 2015
5. Hebedean Claudia, Munteanu Calin, Racasan Adina, et al., The Influence of Parameters on the Parasitic Capacitance Values in a Planar Transformer, 9th International Symposium on Advanced Topics in Electrical Engineering (ATEE), Bucharest, ROMANIA MAY 07-09, 2015, Pp. 838-843, Published: 2015
6. Avram Alexandru, Topa Vasile, Purcar Marius, et al., Numerical Optimization of an Electrostatic Device Based on the 3D XFEM and Genetic Algorithm, 49th International Universities Power Engineering Conference (UPEC) ClujNapoca, ROMANIA SEP 02-05, 2014, Published: 2014
7. C. Munteanu, E. Merdan, V. Topa, I. T. Pop, S. Deleanu, "Power Frequency Magnetic Field Mitigation Nearby Power Lines using Rectangular Frames", in *Environmental Engineering and Management Journal*, vol. 12, no. 6, 2013, pp. 1137-1143
8. C. Pacurar, V. Topa, C. Munteanu, A. Racasan, C. Hebedean, "Studies of Inductance Variation for Square Spiral Inductors using CIBSOC Software", in *Environmental Engineering and Management Journal*, vol. 12, no. 6, 2013, pp. 1161-1169
9. C. Hebedean, C. Munteanu, C. Pacurar, A. Racasan, "Application of Windings Shifting for the Optimization of Planar Structures", in *Environmental Engineering and Management Journal*, vol. 12, no. 6, 2013, pp. 1153-1159
10. M. Purcar, C. Munteanu, V. Topa, "3D Electrode Shape Change Simulation in Electroplating", in *Revue Roumaine des Sciences Techniques - Électrotechnique et Énergetique*, vol. 58, no. 3, 2013, p. 252-262
11. C. Munteanu, G. Mates, M. Purcar, V. Topa, I.T. Pop, L. Grindei, A. Racasan, "Electromagnetic field model for the numerical computation of voltages induced on buried pipelines by high voltage overhead power lines", in *The European Physical Journal, Applied Physics*, 2012
12. V. Topa, M. Purcar, A. Avram, C. Munteanu, R. Chereches, L. Grindei, "Simulation of the electrode shape change in electrochemical machining based on the LSM", in *The European Physical Journal-Applied Physics*, vol. 56, no. 1, 2012, pp. 11302-p1 -11302-p8

Significant solutions:

3D mathematical model of Laplace equation with nonlinear boundary conditions for electrochemical applications using the boundary element method (BEM) and finite element method (FEM); Mathematical and numerical model based on "Level Set Method" for shape optimization; Mathematical and numerical model based on "Level Set Method" and Nodal displacement method (NDM) for moving boundary simulation in electrochemical applications of electroerosion and electrodeposition.

Products and technologies:

Software package for the full 3D numerical analysis of the electromagnetic interferences between HV lines and pipelines and the optimal design of the cathodic protection systems arrangement; Software package for the numerical computation of the electric and magnetic field values in the vicinity of power lines and inside substations and the optimal design of conductor arrangements for the field mitigation.

International Patents:

Van Den Bossche B. J. W.; Purcar M. I., International Patent Number: WO2008010090-A2; NL1032174-C2; WO2008010090-A3; EP2044242-A2; S2009288954-A1

The offer addressed to the economic environment

Research & development	Numerical methods applied in the modelling of the electric and electrochemical process; Optimal design of the electromagnetic devices; CAD in electrical engineering; EMC in electrical end electronics engineering Analysis and optimal design of complex electromagnetic device structures; EMC analysis and mitigation solutions by measurements and numerical modelling; Human exposure to electromagnetic fields by numerical computation and in situ measurements;
Consulting	EMC tests according to IEEE 61000 standards series for compliance with the EMC Directive and CE marking; Compliance with 2004/40/EC Directive regarding the human exposure to electromagnetic fields; Manufacturing techniques using the electrochemical process; Mitigation of the inductive and resistive effects of HVAC and HV power transmission lines on pipeline networks; Investigation of fault conditions: 1-phase and 3-phase short circuits discharge current to soil that can lead to coating stress and bridge potentials pipe-soil.
Training	Training and postgraduate education in modelling and simulation of electromagnetic and electrochemical problems and process based on the specific software in the research center. EMC solutions in order to avoid compliance tests failure.