NUMERICAL MODELLING AND ELECTROMAGNETIC COMPATIBILITY RESEARCH CENTER

Contact details

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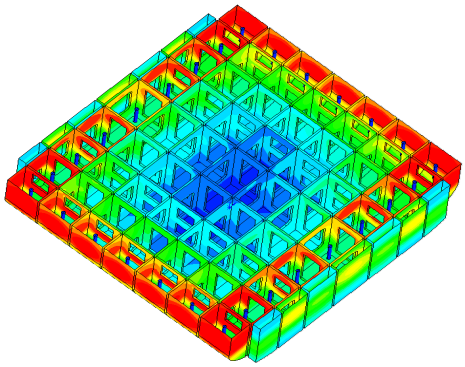

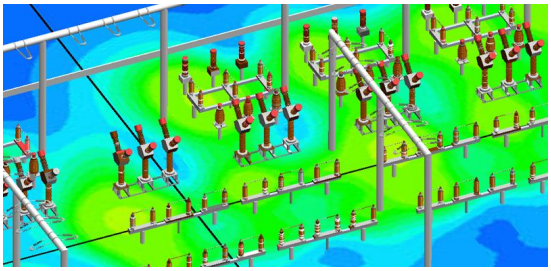

Areas of expertise

Numerical modelling and optimal design of electromagnetic devices.
Multiphysics modelling for advanced device and technology developments. Multiphysics modelling for microelectronics - Power Integrated Circuits. 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 electro
magnetics. Evolutionary algorithms for the optimization of the electromagnetic devices

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.

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.

Team

Prof. Calin MUNTEANU, Prof. Vasile TOPA, Assoc. Prof. Marius PURCAR, Assoc. Prof. Laura GRINDEI, Assoc. Prof. Adina GIURGIUMAN (RACASAN), Assoc. Prof. Claudia PACURAR (RACASAN), Lecturer Claudia CONSTANTINESCU (HEBEDEAN), PhD stud. Sergiu ANDREICA, PhD stud. Marian GLIGA, PhD stud. Adrian BOJITA

Representative projects

iDev40 - „Integrated Development 4.0”, ECSEL Call H2020-ECSEL-2017-1-IA-TWO STAGE 6/1.1.3.H/26.11.2019.

Trade-IT - ”Innovative Technologies for Advanced Materials Recovery from IT and Telecommunication Waste”,PN-III-P1-1.2-PCCDI2017-0652, 2017.

Set4CIP - „Multiscale Multigrid Simulator of Electro-Thermo-Mechanical Processes from Power Integrated Circuits”,- PN-III-P2-2.1-BG-2016-0388, 2016.

CEMIVA - “Coupled analysis electromagnetic interference / vibration for the development of electric actuators dedicated to automotive applications with low emissions”, PN II – PT – PCCA – 2013 – 4 – 1019, 2014.

“Measurements of electric and magnetic field in 220 / 110 kV Turnu Severin Est substation”, Research contract with industrial partner ENERGOBIT SA, no. 36526/2019.

“Computing services, analysis, numerical modeling and experimental measurements of electromagnetic field values in locations proposed by the beneficiary” Research contract with industrial partner CEPROM SA, no. 52/2018.

“Measurements of electric and magnetic field in 220 / 110 kV Campia Turzii substation”, Research contract with industrial partner ENERGOBIT SA, no. 55/2017.

Significant results

The most representetive publications of the past 5 years:

1. A. Bojiţă, M. Purcar, V. Ţopa, R. Oneţ and M. Neag, "Modelling Thermally-Induced Mechanical Faults in Power Integrated Circuits Assemblies," 2020 IEEE 26th International Symposium for Design and Technology in Electronic Packaging (SIITME), 2020, pp. 342-345, doi: 10.1109/SIITME50350.2020.9292136.
2. Vermeșan H., Tiuc A-E, Purcar M., "Advanced recovery techniques of waste materials from IT and telecommunication equipment Printed Circuit Boards", Sustainability 2020, 12(1), 74; https://doi.org/10.3390/su12010074.
3. Bojita A., Purcar M., Boianceanu C., Topa V., "Efficient Computational Model Mesh of Thermo-Mechanical Phenomena in the Metal System of Power ICs", 25th THERMINIC International Workshop, LECCO, Italy, 2019.
4. Florea C.I., Bostan C., Simon D., Țopa V., Purcar M., "Extraction of Equivalent Mechanical Properties for Power ICs Metallization", 25th THERMINIC International Workshop, LECCO, Italy, 2019.
5. Constantinescu C., Munteanu C., Pacurar C., Racasan A,, Gliga M., Andreica S., "High Frequency Analysis of Bowtie Antennas", 11th International Symposium on Advanced Topics in Electrical Engineering, ATEE 2019, Bucharest, Romania, DOI 10.1109/ATEE.2019.8724972, WOS: 000475904500129, 2019.
6. Pacurar C., Topa V., Giurgiuman A., Munteanu C., Constantinescu C., Andreica S., Gliga M., "Modelling and Analysis of the Halbach Array Magnets", 11th International Symposium on Advanced Topics in Electrical Engineering, ATEE 2019, Bucharest, Romania, DOI 10.1109/ATEE.2019.8724977, WOS:000475904500134, 2019.
7. Bojita, A., Purcar, M., Boianceanu, C., Florea, C., Simon, D., & Topa, V. "A Simple Metal-Semiconductor Substructure Model for the Thermal Induced Fatigue Simulation in Power Integrated Circuits", *Lecture Notes in Mechanical Engineering*, DOI:10.1007/978-981-13-2273-0_3, 2019.
8. Constantinescu C., Munteanu C., Păcurar C., Răcășan A., "Influence of the Patch Antenna Feeding on their Parameters", Proc. of the 2018 International Conference and Exposition on Electrical and Power Engineering, EPE 2018, pp. 235-240, Iasi, Romania, ISBN: 978-1-5386-5062-2, ISSN: 2471-6855, WOS: 000458752200044, 2018
9. Bojita A., Boianceanu C., Purcar M., Florea C., Simon D. and Pleșa C., "A simple metal-semiconductor substructure for the advanced thermo-mechanical numerical modeling of the power integrated circuits", Journal of Microelectronics Reliability, Elsevier, Volume 87, pages 142-150, August 2018, https://doi.org/10.1016/j.microrel.2018.06.013.
10. Constantinescu C., Munteanu C., Pacurar C. et al., "Influence of the Patch Antenna Feeding on their Parameters", International Conference and Exposition on Electrical and Power Engineering (EPE) Book Series: International Conference and Exposition on Electrical and Power Engineering Pages: 235-240, 2018.
11. Gliga M., Racasan A., Munteanu C. "The Influence of Ferrite on the Spiral Inductors Inductance used for the Design of Wireless Power Systems", 7th International Conference On Modern Power Systems (MPS), 2017.
12. Racasan A, Munteanu C., Topa V. et al., "Analysis and Improvement Techniques for the Transfer Function of a Planar Low - Pass Filter", *Environmental Engineering and Management Journal*, Vol. 15, Issue 12, Pp. 2579-2586, 2016.
13. Paljanos A., Miclaus S., Munteanu C., "Occupational Exposure of Personnel Operating Military Radio Equipment: Measurements and Simulation", *Electromagnetic Biology and Medicine*, Vol.34, Issue 3, Pp.221-227, 2015.

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 electro-corrosion 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	Multiphysics modelling; CAD in electrical engineering; Optimal design of the electromagnetic devices. EMC in electrical and electronics engineering Analysis and optimal design of complex electromagnetic device structures; EMC analysis and mitigation solutions by measurements and numerical modelling;
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. Multiphysics modelling for advanced device and technology developments.
Training	Training and postgraduate education in modelling and simulation of electromagnetic and electrochemical problems and process based on the specific software in the research centre. EMC solutions in order to avoid compliance tests failure.