
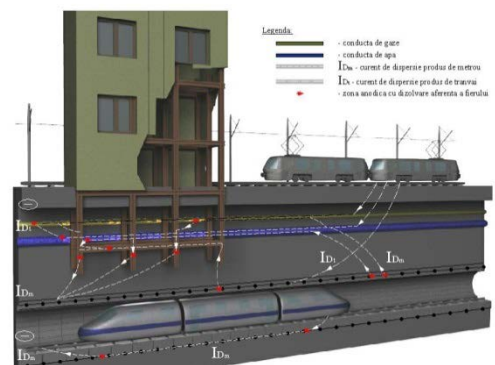
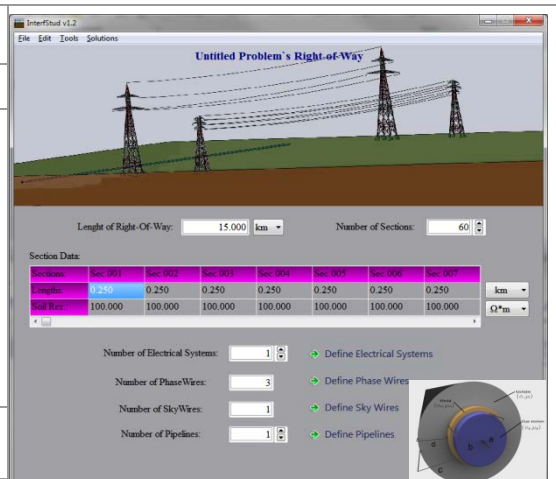


# NUMERICAL METHODS RESEARCH LABORATORY

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## Areas of expertise

- Advanced analysis methods and numerical modeling dedicated tools applied in electrical engineering**  
Advances in numerical modelling of different electromagnetic interference problems (prediction, diagnosis and feasible solutions for induced voltages and AC corrosion); Support and applied techniques regarding the practical implementation of case studies: electromagnetic interferences, lightning protection, optimal right of way grid for energy transmission (oil, gas, electricity); Implementation of artificial intelligence algorithms in EMI.
- Electromagnetic field numerical analysis and synthesis.** Numerical field synthesis and optimization of different electromagnetic devices; Inverse reconstruction and parameter identification of cracks, sources and materials in inaccessible locations; magnetic stimulation.
- Applied engineering services.** Investigations through numerical analysis and in situ evaluations of AC/DC electromagnetic interferences; Energy solutions and methodologies regarding the efficient use of energy; Energy quality evaluations, diagnosis and solutions for industry and residential.

## Team

Dr. Dan D. MICU, Dr. Laura DARABANT, Dr. Denisa STET, Dr. Andrei CECLAN, Dr. Levente CZUMBIL, Dr. Mihaela CRETU, Dr. Aurel BOTEZAN, Dr. Adrian HOLHOS, Dr. Bogdan TOMOIAGA, Dr. Razvan RADU, eng. Adrian RUSU, eng. Paul MURESAN, eng. Bogdan BARGAUAN, eng. Stefan BRAICU.

## Representative projects

**HORIZON 2020: 649773-H2020-EE-2014-3-MU**, "Meeting of Energy Professional Skills", (2015-2017)  
**HORIZON 2020: 696114 - H2020-EE-2015-2-RIA**, "Demand Response in Block of Buildings" (2016-2018)  
**PN-II-RU-TE-253**, "Modeling, prediction and design solutions, with maximum effectiveness, for reducing the impact of stray currents on underground metallic gas pipelines", (2010-2013);  
**CEEx X2C37 ICMECOS**, "The impact of the antropoc electromagnetic fields on eco-systems", (2007-2010);  
**CEEx 136/2006 DIRECTOR**, "Intelligent and active diagnosis and prediction of buildings with reinforced concrete structures in a complex polluted environment", (2006-2009);  
**CEEx 6856/2006 MATELIZ**, "Theoretical and experimental studies regarding the insulation materials." (2006-2009);  
**PN-II-ID-PCE-2007-1, ID1024**, "Mathematical model for investigating the influence of ac electromagnetic interference on metallic pipelines, with/ without cathodic protection, placed nearby a high voltage substation", (2007-2010);

**PNCDI II - 22122/2009 CABDIAG**, “Intelligent diagnosis and prediction system for power cable damages”; (2006-2009);  
**ROMATSA\_3423/2013**, “Electric and electronic equipment protection to overvoltage and electromagnetic pulses appeared in electrical cables, respectively voice and data circuits due to lightning”;  
**TRANSGAZ II\_04/2011**, “The study of corrosion of the metallic gas pipelines under the influence of HV power lines and mitigation methods. Onsite measurements and software validation”.

### Significant results

#### The most representative publications of the past 5 years:

##### ISI Journals

1. M. Crețu, Dan D. Micu, “Improved coil design for repetitive magnetic stimulation of the spinal cord”, *COMPEL*, Vol. 34, Issue 4, pp. 1043-1053, 2015.
2. Dan D. Micu, G. Christoforidis, L. Czumbil, “AC interference on pipelines due to double circuit power lines: A detailed study”, *Electric Power System Research*, ISSN: 0378-7796, Vol. 103, pp. 1-8, 2013;
3. Dan D. Micu, “Electric field computation inside a rectangular petrol tank”, *Journal of Electrostatics*, ISSN: 0304-3886, Vol. 71, pp. 332-335, 2013;
4. Andrei Ceclan, Vasile Țopa, Dan D. Micu, Amedeo Andreotti, “Lightning Inverse Reconstruction by Remote Sensing and Field Synthesis”, *IEEE Transactions on Magnetics*, Vol. 49, Issue 5, 2013;
5. D. Popa, Dan D. Micu, O. Miron, L. Szabo, “Optimized Design of a Novel Modular Tubular Transverse Flux Reluctance Machine”, *IEEE Transactions on Magnetics*, Volume: 49, Issue: 11, Pages: 5533-5542, 2013;
6. Dan D. Micu, L. Czumbil, G. Christoforidis, A. Ceclan, Denisa Șteț, “Evaluation of induced AC voltages in underground metallic pipeline”, *COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering*, Vol. 31 No.4, pp. 1133 – 1143, 2012;
7. Dan D. Micu, L. Czumbil, G. Christoforidis, “Neural networks applied in electromagnetic interference problems”, *Revue Roumaine des Sciences Techniques serie Electrotechnique*, vol 57, nr. 2, pp. 162-171, 2012;
8. Denisa Șteț, Dan D. Micu, L. Czumbil, Laura Darabant, A. Ceclan, “Simulation of interferences between power lines and gas pipelines in unbalanced phase currents state”, *COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering*, Vol. 31 Iss: 4, pp.1178 – 1189, 2012;
9. A. Ceclan, V. Țopa, Dan D. Micu, L. Czumbil, Anca Șimon, O. Creț, “Improved framework for Monte Carlo numerical evaluations in field interference problems”, *IJAEM, International Journal of Applied Electromagnetics and Mechanics*, ISSN 1383-5416, Vol. 39, No1/4., pp. 693-698, 2012;

##### ISI Proceedings

1. M. Nassereddine, Dan D. Micu, J. Rizk, M. Nagrial, A. Hellany, OHEW Condition and its Impact on Substation Earthing System and AC Interference between Pipeline and Transmission Line, *50th International Universities Power Engineering Conference*, Stoke on Trent, UK, 2015.
2. Ceclan, A. Holhos, Dan D. Micu, L. Czumbil, A. Andreotti, “Lightning return stroke current reconstruction or vertical and variable channel shape, *International Conference on Lightning Protection*, Shanghai, China, 2014.
3. Tomoiaga, Dan D. Micu, A comparative study of pareto optimal approaches for distribution system reconfiguration, *49th Universities Power Engineering Conference*, Cluj-Napoca, Romania 2014.

**Remarkable results achieved in the projects in the last 5 years – products/technologies adopted by companies Solutions adopted by companies** - TRANSGAZ SA., ENERGObIT, ROMATSA, UTI Grup, POWER-DESIGN, PETROM, SERVELECT, ELECTROMONTAJ, BETA, HITECH, PRIMOSAL, ELECTROVALCEA, UTILITAS, SICULUS: Development of a hybrid method for computing the effect of inductive, capacitive and conductive interferences on metallic gas pipelines placed nearby a HV power line; Development of artificial intelligence techniques to compute the induced voltages and currents in the metallic gas pipelines; Development of a controlled draining device for stray currents; Implementation of new synthesis methods for parametric circuits; Numerical model for an electromagnetic device and it’s field synthesis; Support and applied techniques regarding the practical implementation of case study numerical interferences; Prediction and monitoring of the damages due to AC eddy-currents; Ground resistances testing for industrial structures and substations; Localization of the underground cable paths and cable faults; Power flow and grid reconfiguration numerical analysis; Optimal energy efficiency solutions.

### The offer addressed to the economic environment

Research & development	Advances in numerical modelling of different electromagnetic interference problems; Optimal right of way evaluation of gas streams, as related to possible AC interferences; Lightning protection of infrastructures; Investigations through numerical analysis and <i>in situ</i> evaluations of AC/DC interferences; Electromagnetic inverse problems.
Energy Consulting	Optimization of right of way gas or oil corridors as related to AC/DC interferences; Investigation of different electromagnetic interference problems; Energy evaluation solutions and methodologies regarding the efficient use of energy; Power quality evaluations, diagnosis and solutions for industry.
Applied engineering services	Energy audit for industrial/residential consumers; Energy quality measurements, filtering solutions; Measurements and testing of: quantitative and quality energy indicators, remote electric or magnetic fields (DC to GHz), earth resistances, etc.
Training	Numerical analysis and computational geometry applied in engineering problems; Support and applied techniques regarding the practical implementation of case study numerical interferences, lightning protection, optimal right of way transmission of energy corridors; Energy audits.