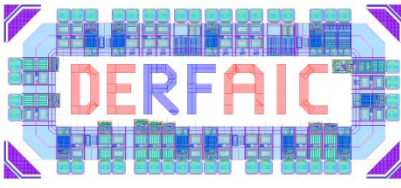
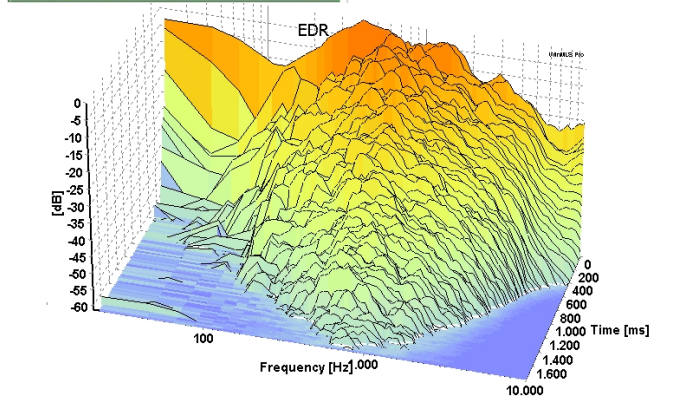
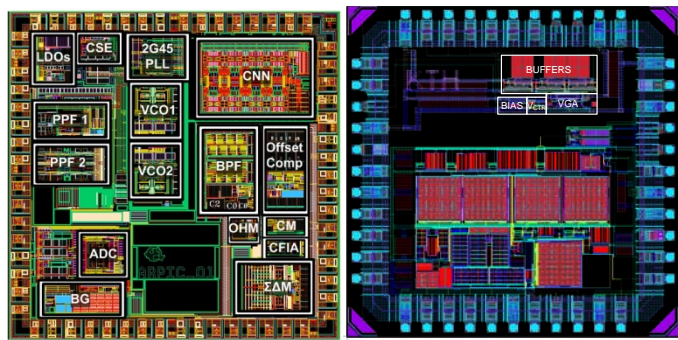


DIGITALLY ENHANCED ANALOG AND RF INTEGRATED CIRCUITS

Contact details

Name	Digitally Enhanced Analog and RF Integrated Circuits
Acronym	DERFAIC
Logo	
Site	http://www.icdesign.utcluj.ro/
Address	26-28 G. Baritiu St, Rooms 26, B2, B3, S3.1, S3.2, Cluj-Napoca
Faculty	Faculty of Electronics, Telecommunications and Information Technology
Department	Basis of Electronics Department
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Areas of expertise

Design of RF, Analog and Mixed-Signal Integrated Circuits

- Reconfigurable and programmable analog circuits
- High performance Power Management circuitry, including Energy harvesting and conversion;
- Digitally-intensive frequency synthesizers
- Low-power radio transceivers
- Analog Front-Ends for sensors

Circuit and Signal Theory and Applications

- Optimization techniques for analog and digital circuits
- System modeling and analysis
- Feedback theory & stability

Electronic circuits and systems for acoustics

- Optimized synthesis of acoustic equalizers
- Analysis and improvement of the acoustic behavior of enclosures

Methodologies for optimized design and testing of electronic circuits and systems

- Robustness optimization
- Multivariate performance analysis for application verification

Algorithms and techniques for compensating the effects of non-idealities inherent to analog circuits&systems

- Compensation of IQ mismatch in integrated radio receivers
- Reduction and compensation of DC offsets

Team

Prof. Dr. Eng. Marina Topa, Assoc. Prof. Dr. Eng. Marius Neag, Lecturer Dr. Eng. Botond-Sandor Kirei, Lecturer Dr. Eng. Ioana Sărăcuț, Lecturer Dr. Eng. Erwin Szopos, Assist. Dr. Raul Onet, 10 PhD and Master students

Representative projects

“2.5D Modeling of sound propagation in rooms and improvement of room acoustical properties using digital implementations”, CNCSIS PCE-Idei, (2007-2010)

“New approaches in the design of multi-standard integrated radio receivers for digital radio and mobile TV: from system architecture to novel topologies and circuit solutions”, CNCSIS PCE-Idei, (2008-2011)

“Design of analog blocks within the baseband of a radio transceiver for geological sensor, able to operate in harsh environments”, Consultancy Contract, 2010-2011

“New integrated circuits and systems for power management, with applications to energy harvesting” Consultancy Contract, 2011-2012

“Digital compensation of I/Q mismatches in wide-band radio receivers”, POSDRU Postdoc Project, 2010-2013

“Frequency synthesizer for UWB transceiver tailored to location applications”, Consultancy Contract, 2013
 “Power Management Integrated Circuits for Automotive applications”, Consultancy Contract , 2014-2016
 “New Methodologies for multivariate performance analysis”, Consultancy Contract , 2014-2016
 “Analog Front-End for Automotive Sensors”, Consultancy Contract , 2015-2016

Significant results

The most representative publications of the past 5 years:

1. E. Szopos, M. Neag, I. Sărăcuț, V. Popescu, M. Țopa - Synthesis Tool Based on Genetic Algorithm for FIR Filters with User-Defined Magnitude Characteristics, *Circuits, Systems and Signal Processing*, vol. 35, Issue 1, pp 253-279, January 2016, ISSN 0278-081X, Springer, DOI: 10.1007/s00034-015-0054-0
2. Neag, Marius; Onet Raul; Kovacs, Istvan; Martari, Paul - Comparative Analysis of Simulation-Based Methods for Deriving the Phase- and Gain- Margins of Feedback Circuits with OpAmps, *IEEE Transactions on Circuits and Systems I - Regular Papers*, vol 62, issue 3, March 2015, pp. 625-634, DOI: 10.1109/TCSI.2014.2370151
3. R. Onet, M. Neag, I. Kovacs, M.D. Topa, S. Rodriguez, A. Rusu, "Compact Variable Gain Amplifier for a Multistandard WLAN/WiMAX/LTE Receiver", in *IEEE Trans.Circuits and Systems I*: vol. 61, no.1, 2014, pp. 247-257
4. M. Neag - "Optimization Methods and Circuit Topologies for Low-Power Analog Filters", Invited Paper, Proc. of the Int. Conf. CAS 2013, ISBN: 978-1-4673-5670-1, pp. 11-16, Ocotber 2013, DOI 10.1109/SMICND.2013.6688074
5. C. Contan, B. S. Kirei, M. D. Topa, "Modified NLMF Adaptation of Volterra Filters Used for Nonlinear Acoustic Echo Cancellation", in *Signal Processing, Elsevier*, vol. 93, no. 5, 2013, pp. 1152-1161
6. B. S. Kirei, M. Neag, M. D. Topa, "Blind Frequency-Selective I/Q Mismatch Compensation Using Sub-band Processing", in *IEEE Trans. on Circuits and Systems II: Express Briefs*, vol. 59, no. 5, 2012, pp. 302-306
7. E. Szopos, M. Neag, I. Sărăcuț, H. Hedeșiu, L. Feștilă - A Method for Designing FIR Filters with Arbitrary Magnitude Characteristic Used for Modeling Human Audiogram, *AECE*, ISSN 1582-7445, vol. 12(2012), no.2, pp 51-56
8. M. D. Topa, N. Toma, B. S. Kirei, I. Homana, M. Neag, G. De Mey, "Comparison of Different Experimental Methods for the Assessment of the Room's Acoustics", in *Acoustical Physics*, vol. 57, no. 2, 2011, pp. 199-207

Patents:

D. Petreus, M. Neag, B. Morley – Improved MPPT control for PWM-based DC-DC converters with average current control, Republic of Ireland, 2010

M. Topa, B.S. Kirei, I. Muresan, M. Neag, A. Fazakas - "System for blind signal separation from convolutive acoustical mixtures", Romania Patent application published in the OSIM Journal nr. 6/2012, 2012

A. Oros, A. Buzo, M. Rafailă, G. Pelz, M. Țopa, "Method for System Performance Assessment by Modeling the Performance Metrics", United States Application Number INF 2015 P 50354 US

Product realized for industrial beneficiaries:

1. High-Voltage LDO for automotive applications – Integrated circuit designed in custom technology, currently in mass production at Infineon Technologies Romania
2. Analog Front-End for automotive sensors - Integrated circuit designed in a 0.18um technology, produced as a test-chip for Melexis Technologies NV, Belgium
3. Frequency synthesizer integrated within an UWB transceiver produced in 90nm technology, for Anacores Ltd., Castlebar, Republic of Ireland
4. Integrated transceiver for geological explorations – chip mass produced in a CMOS 0.35um technology, for Silansys Semiconductor Ltd., din Dublin, Republic of Ireland, currently used in industrial exploration of oil deposits
5. Smart solar charger for Li-Ion batteries and supercapacitors, with a novel analog-digital MPPT algorithm – demo board realized for Anacores Ltd., Castlebar, Republic of Ireland

The offer addressed to the economic environment

Research & development	Development of adaptive filter theory, with applications in the processing of non-stationary signals by non-linear systems Extensions of the classical feedback theory, with applications in the stability analysis Analysis and design of electronic systems and circuits using advanced modelling and optimization methods Adaptive filters for signal processing and system analysis, with applications in acoustics Electronic systems and circuits for harvesting power from un-conventional energy sources
Consulting	Analysis and design of analog, RF and mixed-signal integrated circuits Analysis and design of digital systems, including FPGA and/or ASIC implementation Top-level verification of digital systems using SystemVerilog and SystemC Analysis and design of electro-acoustic systems – echo cancellation, reverberation control, signal separation, equalization etc.
Training	Design of analog, RF and mixed-signal integrated circuits using the industry-standard software package Virtuoso – Cadence: Schematic Editor, ADE, Layout Editor, Assura