ESSCIRC Conference 2015 – 41st European Solid-State Circuits Conference (ESSCIRC 2015)

Graz, Austria
14-15 September 2015
## Joint Plenary Talks

**B1L-A JOINT PLENARY: J. Hansryd / G. Baccarani**

Date: Wednesday, September 16, 2015  
Time: 08:40 - 10:00  
Room: Graz  
Chair(s): Martin Schrems; *ams AG*  
Gernot Hueber; *University of Erlangen Nuremberg*  

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<td>Giorgio Baccarani, Emanuele Baravelli, Elena Gnani, Antonio Gnudi, Susanna Reggiani, <em>Università di Bologna, Italy</em></td>
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**C1L-A JOINT PLENARY: B. Stadlober / P. Boudre**

Date: Thursday, September 17, 2015  
Time: 08:40 - 10:00  
Room: Graz  
Chair(s): Tibor Grasser; *Technische Universität Wien*  
Franz Dielacher; *Infineon*  

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## Invited Plenary Talks

**C4L-C INVITED Session: Advanced Biomedical Devices**

Date: Thursday, September 17, 2015  
Time: 14:00 - 15:40  
Room: Klagenfurt  
Chair(s): Roland Thewes; *TU Berlin*  

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**A2L-A**  
**ESSCIRC Plenary - B. Nikolic**
Date: Tuesday, September 15, 2015  
Time: 13:20 - 14:00  
Room: Graz  
Chair(s): Gernot Hueber; University of Erlangen Nuremberg  
**Simpler, More Efficient Design**  
Borivoje Nikolic  
*University of California, Berkeley, United States*

**B4L-A**  
**ESSCIRC Plenary - M. Steyaert**
Date: Wednesday, September 16, 2015  
Time: 15:40 - 16:20  
Room: Graz  
Chair(s): Franz Dielacher; Infineon  
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Michiel Steyaert, Filip Tavernier, Hans Meyvaert, Athanasios Sarafianos, Nicolas Butzen  
*Katholieke Universiteit Leuven, Belgium*

**C3L-A**  
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Date: Thursday, September 17, 2015  
Time: 13:20 - 14:00  
Room: Graz  
Chair(s): Gernot Hueber; University of Erlangen Nuremberg  
**RFIC Design by Mathematics for Next Generation Wireless Access**  
Yann Deval  
*University of Bordeaux, France*

Technical Sessions

**A4L-A**  
**Filters and Optical Links**
Date: Tuesday, September 15, 2015  
Time: 14:00 - 15:40  
Room: Graz  
Chair(s): Hugo Veenstra; Philips  
Trajan Visan; Infineon  
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Antonio D’Amico², Marcello De Matteis², Stefano D’Amico⁴, Claudio De Berti³, Lorenzo Crespi¹, Andrea Baschirotto²  
¹Conexant Systems, United States; ²Università degli Studi di Milano-Bicocca, Italy; ³Università degli Studi di Pavia, Italy; ⁴Università del Salento, Italy
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Stefan Shopov, Sorin Voinigescu
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Teerachot Siriburanon1, Hanli Liu2, Kengo Nakata2, Wei Deng2, Ju Ho Son1, Dae Young Lee1, Kenichi Okada2, Akira Matsuzawa2
1Samsung Group, Korea, South; 2Tokyo Institute of Technology, Japan

A 150 kHz-80 MHz BW DT Analog Baseband for SDR RX Using a 5th-Order IIR LPF, Active FIR and 10b 300 MS/s ADC in 28nm CMOS
Badr Malki1, Bob Verbruggen1, Ewout Martens1, Piet Wambacq2, Jan Craninckx1
1imec, Belgium; 2imec / Vrije Universiteit Brussel, Belgium

In-Band Full-Duplex Transceiver Technology for 5G Mobile Networks
Björn Debaillie1, Barend van Liempd2, Benjamin Hershberg1, Jan Craninckx1, Kari Rikkinen3, Dirk-Jan van Den Broek4, Eric Klumperink4, Bram Nauta4
1imec, Belgium; 2imec / Vrije Universiteit Brussel, Belgium; 3Oulu University, Finland; 4Universiteit Twente, Netherlands

Multi-Standard Wideband OFDM RF-PWM Transmitter in 40nm CMOS
Shailesh Kulkarni2, Ibrahim Kazi2, David Seebacher1, Peter Singerl1, Franz Dielacher1, Wim Dehaene2, Patrick Reynaert2
1Infineon Technologies AG, Austria; 2Katholieke Universiteit Leuven, Belgium

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Ying Chen2, Yu Pei1, Domine Leenaerts2
1Eindhoven University of Technology, Netherlands; 2NXP Semiconductors, Netherlands
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National Chiao Tung University, Taiwan

Intelligent Task Scheduler with High Throughput NoC for Real-Time Mobile Object Recognition SoC
Kyuho Lee, Junyoung Park, Injoon Hong, Hoi-Jun Yoo
Korea Advanced Institute of Science and Technology, Korea, South

A 0.5V Power and Area Efficient Laplacian Pyramid Processing Engine Using FIFO with Adaptive Data Compression
Seyed Mohammad Ali Zeinolabedin², Jun Zhou¹, Xin Liu¹, Tony Tae-Hyoung Kim²
¹Agency for Science, Technology and Research, Singapore; ²Nanyang Technological University, Singapore

28nm FD-SOI Technology and Design Platform for Sub-10pJ/Cycle and SER-Immune 32bits Processors
Fady Abouzeid, Sylvain Clerc, Cyril Bottoni, Benjamin Coeffic, Jean-Marc Daveau, Damien Croain, Gilles Gasiot, Dimitri Soussan, Philippe Roche
STMicroelectronics, France

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Mitsuhiko Igarashi, Kan Takeuchi, Takeshi Okagaki, Koji Shibutani, Hiroaki Matsushita, Koji Nii
Renesas Electronics Corporation, Japan

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Sanu Mathew, David Johnston, Paul Newman, Sudhir Satpathy, Vikram Suresh, Mark Anders, Himanshu Kaul, Gregory Chen, Amit Agarwal, Steven Hsu, Ram Krishnamurthy
Intel Corporation, United States
A6L-B  VCOs and Frequency Generators

Date: Tuesday, September 15, 2015
Time: 16:00 - 18:00
Room: Vienna
Chair(s): Andrea Bevilacqua; University of Padova
Baudouin Martineau; CEA

A 45GHz/55GHz LO Frequency Selector for E-Band Transceivers Based on Switchable Injection Locked Oscillators in BiCMOS 55nm

Jose Luis González, Vincent Puyal, Alexandre Sligaris, Clement Jany, Cedric Dehos
CEA-Leti / Université Grenoble Alpes, France

An 8.2 GHz Triple Coupling Low-Phase-Noise Class-F QVCO in 65nm CMOS

Haikun Jia, Baoyong Chi, Zhihua Wang
Tsinghua University, China

Suppression of VCO Pulling Effects Using Even-Harmonic Quiet Transmitting Circuits

Yue Wu, Tianyu Jia, Bo Xia, Xinlong Ma, Li Kang, Xiaodong Yang
Vimicro Corporation, United States

A 124 to 132.5 GHz Frequency Quadrupler with 4.4 dBm Output Power in 0.13µm SiGe BiCMOS

Yihu Li¹, Wang-Ling Goh¹, Yong-Zhong Xiong²
¹Nanyang Technological University, Singapore; ²University of Electronic Science and Technology of China, China

A Quadrature Clock Generator with Calibration for 22~31.4 GS/s Real-Time Sampling System

Shunli Ma, Guangyao Zhou, Jianbing Jiang, Chixiao Chen, Yongzhen Chen, Fan Ye, Junyan Ren
Fudan University, China

Non-Trimmable LC Oscillator for All CMOS Frequency Control

Philipp Greiner¹, Jasmin Groserger¹, Christoph Steffan¹, Gerald Holweg², Wolfgang Bösch¹
¹Graz University of Technology, Austria; ²Infineon Technologies AG, Austria

A6L-C  Wireline and Optical

Date: Tuesday, September 15, 2015
Time: 16:00 - 18:00
Room: Klagenfurt
Chair(s): Filip Tavernier; KU Leuven
Andrea Mazzanti; Univ. of Pavia

A 48mW 15-to-28Gb/s Source-Synchronous Receiver with Adaptive DFE Using Hybrid Alternate Clock Scheme and Baud-Rate CDR in 65nm CMOS

Shuai Yuan², Liji Wu², Ziqiang Wang², Xuqiang Zheng², Peng Wang², Wen Jia², Chun Zhang², Zhihua Wang²
¹Research Institute of Tsinghua University in Shenzhen, China; ²Tsinghua University, China
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1École Polytechnique Fédérale de Lausanne, Switzerland; 2IBM Research GmbH, Switzerland; 3IBM Research GmbH / École Polytechnique Fédérale de Lausanne, Switzerland; 4IBM Research GmbH / ETH-Zürich, Switzerland

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1CNSE SUNY Polytechnic Institute, United States; 2Massachusetts Institute of Technology, United States; 3University of California, Berkeley, United States

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B2L-A RF Circuits

Date: Wednesday, September 16, 2015
Time: 10:50 - 12:10
Room: Graz
Chair(s): Patrick Reynaert; Amin Arbabian; Stanford

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B2L-B Power Management Techniques

Date: Wednesday, September 16, 2015
Time: 10:50 - 12:10
Room: Vienna
Chair(s): Christoph Sandner; Infineon
Drago Strle; Univ. Ljubljana

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¹Reutlingen University, Germany; ²Robert Bosch GmbH, Germany;
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¹Metal Industries Research and Development Centre, Taiwan; ²Nanhua University, Taiwan; ³National Chiao Tung University, Taiwan; ⁴Realtek Semiconductor Corp., Taiwan

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¹ON Semiconductor, Romania; ²University Politehnica of Bucharest, Romania
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Date:       Wednesday, September 16, 2015
Time:      10:50 - 12:10
Room:     Klagenfurt
Chair(s):  Peter Mole; Intersil
           Wladek Grabsinski;

BSIM-CMG: Standard FinFET Compact Model for Advanced Circuit Design
Juan P. Duarte\(^2\), Sourabh Khandelwal\(^2\), Aditya Medury\(^2\), Chenming Hu\(^2\),
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\(^1\)Indian Institute of Technology Kanpur, India; \(^2\)University of California, Berkeley, United States

Low-Power Analog/RF Circuit Design Based on the Inversion Coefficient
Christian Enz, Maria-Anna Chalkiadaki, Anurag Mangla
École Polytechnique Fédérale de Lausanne, Switzerland

B3L-A  Sigma-Delta Modulators

Date:       Wednesday, September 16, 2015
Room:     Graz
Chair(s):  Lucien Breems; NXP
           Angelo Nagari; STMicroelectronics

A 106.7-dB Dr, 390-µW CT 3rd-Order Sigma-Delta Modulator for MEMS Microphones
Claudio De Berti\(^3\), Piero Malcovati\(^1\), Lorenzo Crespi\(^1\), Andrea Baschirotto\(^2\)
\(^1\)Conexant Systems, United States; \(^2\)Università degli Studi di Milano-Bicocca, Italy;
\(^3\)Università degli Studi di Pavia, Italy

A 5.1mW 74dB DR CT Delta Sigma Modulator with Quantizer Intrinsic ELD Compensation Achieving 75fJ/Conv.-Step in a 20MHz BW
Chongjun Ding, Yiannos Manoli, Matthias Keller
Albert-Ludwigs-Universität Freiburg, Germany

A Continuous-Time Delta Sigma Modulator with 91 dB Dynamic Range in a 2MHz Signal Bandwidth Using a Dual Switched-Capacitor Return-to-Zero DAC
Amrith Sukumaran, Shanthi Pavan
Indian Institute of Technology Madras, India

A 19.2-mW, 81.6-dB SNDR, 4-MHz Bandwidth Delta-Sigma Modulator with Shifted Loop Delays
Xin Meng\(^1\), Jinzhou Cao\(^2\), Tao He\(^2\), Yi Zhang\(^2\), Gabor Temes\(^2\), Mitsuru Aniya\(^1\),
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**FOCUS SESSION: Sensors and Smart Systems**

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**Time:** 13:20 - 15:20  
**Room:** Klagenfurt  
**Chair(s):** Kofi Makinwa; TU Delft

**FOCUS: Key Building Blocks and Integration Strategy of a Miniaturized Wireless Sensor Node**
Taekwang Jang, Seokhyeon Jeong, Myungjoon Choi, Wanyeong Jung, Gyouho Kim, Yen-Po Chen, Yejoong Kim, Wootaek Lim, Dennis Sylvester, David Blaauw  
*University of Michigan, United States*

**An Integrated Fluxgate Magnetometer for Use in Closed-Loop/Open-Loop Isolated Current Sensing**
Martijn Snoeij, Viola Schaffer, Sudarshan Udayashankar, Mikhail Ivanov  
*Texas Instruments Deutschland GmbH, Germany*

**A 0.02mm² Embedded Temperature Sensor with ±2°C Inaccuracy for Self-Refresh Control in 25nm Mobile DRAM**
Yeomyung Kim³, Woorin Choi³, Jaehoon Kim³, Sanghoon Lee³, Sangho Lee², Hyeongon Kim², Kofi Makinwa¹, Youngcheol Chae³, Taewook Kim³  
¹*Delft University of Technology, Netherlands*; ²*SK Hynix Inc., Korea, South*; ³*Yonsei University, Korea, South*

**A Temperature Sensor with a 3 Sigma Inaccuracy of ±2°C Without Trimming from -50°C to 150°C in a 16nm FinFET Process**
Mei-Chen Chuang, Chia-Liang Tai, Ying-Chih Hsu, Alan Roth, Eric Soenen  
*Taiwan Semiconductor Manufacturing Company, Limited, United States*

**A Ratiometric Readout Circuit for Thermal-Conductivity-Based Resistive Gas Sensors**
Zeyu Cai¹, Robert van Veldhoven², Annelies Falepin², Hilco Suy², Eric Sterckx², Kofi Makinwa¹, Michiel Pertjís¹  
¹*Delft University of Technology, Netherlands*; ²*NXP Semiconductors, Belgium

**B5L-A Analog Techniques**

**Date:** Wednesday, September 16, 2015  
**Time:** 16:20 - 17:40  
**Room:** Graz  
**Chair(s):** Kimmo Koli; HiSilicon  
Marco Berkhout; NXP

**Continuous-Time Hybrid Computation with Programmable Nonlinearities**
Ning Guo, Yipeng Huang, Tao Mai, Sharvil Patil, Chi Cao, Mingoo Seok, Simha Sethumadhavan, Yannis Tsividis  
*Columbia University, United States*
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Peng Chen¹, Xiongchuan Huang², Yao-Hong Liu², Ming Ding², Cui Zhou², Ao Ba³, Kathleen Philips³, H. De Groot³, Robert Bogdan Staszewski³
¹Delft University of Technology, Netherlands; ²imec / Holst Centre, Netherlands; ³University College Dublin, Ireland

A 0.01 mm² Fully-Differential 2-Stage Amplifier with Reference-Free CMFB Using an Architecture-Switching-Scheme for Bandwidth Variation
Matthias Kuhl, Yiannos Manoli
Albert-Ludwigs-Universität Freiburg, Germany

120V/Ns Output Slew Rate Enhancement Technique and High Voltage Clamping Circuit in High Integrated Gate Driver for Power GaN Fets
Hsiang-An Yang², Chao-Chang Chiu², Shin-Chi Lai², Jui-Lung Chen³, Chih-Wei Chang², Che-Hao Meng², Ke-Horng Chen², Chin-Long Wey², Ying-Hsi Lin², Chao-Cheng Lee², Jian-Ru Lin², Tsung-Yen Tsai², Hsin-Yu Luo¹
¹Metal Industries Research and Development Centre, Taiwan; ²National Chiao Tung University, Taiwan; ³National Chiao Tung University & Vanguard Semiconductor Corp., Taiwan; ⁴Realtek Semiconductor Corp., Taiwan

B5L-B RF Receivers
Date: Wednesday, September 16, 2015
Time: 16:20 - 17:40
Room: Vienna
Chair(s): Jan Craninckx; IMEC
Giuseppe Gramegna; Samsung

A 0.8-3 GHz Mixer-First Receiver with on-Chip Transformer Balun in 65-nm CMOS
Tero Tikka¹, Kari Stadius¹, Jussi Ryynänen¹, Mikko Kaltikallio²
¹Aalto University, Finland; ²TDK Europe, Finland

A 0.6-3.0 GHz 65 nm CMOS Radio Receiver with Delta Sigma-Based A/D-Converting Channel-Select Filters
Anders Nejdell¹, Xiaodong Liu², Mattias Palm¹, Lars Sundström¹, Markus Törmänen², Henrik Sjöland², Pietro Andreani²
¹Ericsson AB, Sweden; ²Lund University, Sweden

A 3.1-10.6GHz Wavelet-Based Dual-Resolution Spectrum Sensing with Harmonic Rejection Mixers
Nam-Seog Kim, Jan Rabaey
University of California, Berkeley, United States

A 278 GHz Heterodyne Receiver with on-Chip Antenna for THz Imaging in 65 nm CMOS Process
Alexandre Siligaris², Yogadissen Andee¹, Eric Mercier¹, Jose Moron Guerra³, Jean-François Lampin⁵, Guillaume Ducournau⁵, Yves Quere⁴
¹CEA-Leti, France; ²CEA-Leti / Université Grenoble Alpes, France; ³IMEP-LAHC, France; ⁴Université de Bretagne Occidentale, France; ⁵Université Lille 1 / IEMN, France
B6L-C Nyquist ADC

Date: Wednesday, September 16, 2015
Time: 16:20 - 18:00
Room: Klagenfurt
Chair(s): Dieter Draxelmayr; Infineon
Piero Malcovati; Univ. of Pavia

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Date: Thursday, September 17, 2015
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