

# The Industry Showcase

Chair: Domine Leenaerts, NXP Semiconductors

The RFIC Industry Showcase Session, held concurrently with the plenary reception, will highlight the 10 outstanding paper finalists listed below, submitted by authors from the industry. In this interactive session, authors will present their innovative work in poster format, and some will also show a demonstration. These 10 paper finalists were nominated by the RFIC Technical Program Committee to enter the final contest and a committee of eleven judges have selected the top three among them after rigorous reviews and discussions. The top three will be announced during the RFIC Plenary Session preceding the Industry Showcase, and each winner will receive a plaque. This year's Industry Paper Award finalists are:

*An 802.11ba 495 $\mu$ W -92.6dBm-Sensitivity Blocker-Tolerant Wake-Up Radio Receiver Fully Integrated with Wi-Fi Transceiver*

<sup>1</sup>Intel, USA, <sup>2</sup>Intel, Mexico

Renzhi Liu<sup>1</sup>, Asma Beevi K.T.<sup>1</sup>, Richard Dorrance<sup>1</sup>, Deepak Dasalukunte<sup>1</sup>, Mario A. Santana Lopez<sup>2</sup>, Vinod Kristem<sup>1</sup>, Shahrnaz Azizi<sup>1</sup>, Minyoung Park<sup>1</sup>, Brent R. Carlton<sup>1</sup>

*Reconfigurable 60-GHz Radar Transmitter SoC with Broadband Frequency Tripler in 45nm SOI CMOS*

IBM T.J. Watson Research Center, USA

Wooram Lee, Tolga Dinc, Alberto Valdes-Garcia

*22nm Fully-Depleted SOI High Frequency Noise Modeling up to 90GHz Enabling Ultra Low Noise Millimetre-Wave LNA Design*

<sup>1</sup>GLOBALFOUNDRIES, Singapore, <sup>2</sup>GLOBALFOUNDRIES, USA, <sup>3</sup>Research Foundation CUNY, USA

L.H.K. Chan<sup>1</sup>, S.N. Ong<sup>1</sup>, W.L. Oo<sup>1</sup>, K.W.J. Chew<sup>1</sup>, Chi Zhang<sup>2</sup>, Abdellatif Bellaouar<sup>2</sup>, W.H. Chow<sup>1</sup>, T. Chen<sup>2</sup>, R. Rassel<sup>2</sup>, J.S. Wong<sup>1</sup>, C.K. Lim<sup>1</sup>, C.W.F. Wan<sup>1</sup>, J. Kim<sup>1</sup>, W.H. Seet<sup>1</sup>, David L. Haramé<sup>3</sup>

*A 26dBm 39GHz Power Amplifier with 26.6% PAE for 5G Applications in 28nm Bulk CMOS*

Intel, USA

Kaushik Dasgupta, Saeid Daneshgar, Chintan Thakkar, James Jaussi, Bryan Casper

*Direct Digital Synthesizer with 14GS/s Sampling Rate Heterogeneously Integrated in InP HBT and GaN HEMT on CMOS*

BAE Systems, USA

Steven Eugene Turner, Mark E. Stuenkel, Gary M. Madison, Justin A. Cartwright, Richard L. Harwood, Joseph D. Cali, Steve A. Chadwick, Michael Oh, John T. Matta, James M. Meredith, Justin M. Byrd, Lawrence J. Kushner

*Excellent 22FDX Hot-Carrier Reliability for PA Applications*

<sup>1</sup>GLOBALFOUNDRIES, USA, <sup>2</sup>GLOBALFOUNDRIES, Germany, <sup>3</sup>GLOBALFOUNDRIES, Singapore

T. Chen<sup>1</sup>, Chi Zhang<sup>1</sup>, W. Arfaoui<sup>2</sup>, Abdellatif Bellaouar<sup>1</sup>, S. Embabi<sup>1</sup>, G. Bossu<sup>2</sup>, M. Siddabathula<sup>2</sup>, K.W.J. Chew<sup>3</sup>, S.N. Ong<sup>3</sup>, M. Mantravadi<sup>1</sup>, K. Barnett<sup>1</sup>, J. Bordelon<sup>1</sup>, R. Taylor<sup>1</sup>, S. Janardhanan<sup>1</sup>

**Sunday, 2 June 2019**

**19:00–21:00**

**BCEC Ballroom Foyer**

*A 1.04–4V, Digital-Intensive Dual-Mode BLE 5.0/IEEE 802.15.4 Transceiver SoC with Extended Range in 28nm CMOS*

<sup>1</sup>Samsung, Korea, <sup>2</sup>Samsung, USA

Nam-Seog Kim<sup>1</sup>, Myoung-Gyun Kim<sup>1</sup>, Ashutosh Verma<sup>2</sup>, Gyungseon Seol<sup>1</sup>, Shinwoong Kim<sup>1</sup>, Seokwon Lee<sup>1</sup>, Chilun Lo<sup>1</sup>, Jaeyeol Han<sup>1</sup>, Ikkyun Jo<sup>1</sup>, Chulho Kim<sup>1</sup>, Chih-Wei Yao<sup>2</sup>, Jongwoo Lee<sup>1</sup>

*A High Efficiency 39GHz CMOS Cascode Power Amplifier for 5G Applications*

Samsung, Korea

Hyun-chul Park, Byungjoon Park, Yunsung Cho, Jaehong Park, Jihoon Kim, Jeong Ho Lee, Juho Son, Kyu Hwan An, Sung-Gi Yang

*A Low Power Fully-Integrated 76–81GHz ADPLL for Automotive Radar Applications with 150MHz/ $\mu$ s FMCW Chirp Rate and -95dBc/Hz Phase Noise at 1MHz Offset in FDSOI*

<sup>1</sup>GLOBALFOUNDRIES, USA, <sup>2</sup>Mantric Technology, Canada

Ahmed R. Fridi<sup>1</sup>, Chi Zhang<sup>1</sup>, Abdellatif Bellaouar<sup>1</sup>, Man Tran<sup>2</sup>

*X-Band NMOS and CMOS Cross-Coupled DCO's with a "Folded" Common-Mode Resonator Exhibiting 188.5dBc/Hz FoM with 29.5% Tuning Range in 16-nm CMOS FinFet*

Intel, Israel

R. Levinger, D. Ben-Haim, I. Gertman, S. Bershansky, R. Levi, J. Kadry, G. Horovitz

Industry Paper Contest Eligibility: The first author must have an industry affiliation. The first author must also be the lead author of the paper and must present the paper at the symposium.

# The Student Paper Award Finalists Showcase

Chair: Osama Shana'a, MediaTek

The RFIC Symposium's Student Paper Award is devised to encourage student paper submissions to the conference as well as to give the authors of the finalist papers a chance to promote their research work with the conference attendees after the plenary session during the reception time. Twelve outstanding student paper finalists were nominated this year by the RFIC Technical Program Committee to enter the final contest. A committee of eleven judges selected the top three papers after rigorous reviews and discussions. All finalists benefit from a complimentary RFIC registration. The top three Student Papers will be announced during the RFIC Plenary Session, and each winner will receive an honorarium and a plaque. This year's Student Paper Award finalists are:

*A 4×4×4-mm<sup>3</sup> Fully Integrated Sensor-to-Sensor Radio Using Carrier Frequency Interlocking IF Receiver with -94dBm Sensitivity*

Li-Xuan Chuo<sup>1</sup>, Yejoong Kim<sup>1</sup>, Nikolaos Chiotellis<sup>1</sup>, Makoto Yasuda<sup>2</sup>, Satoru Miyoshi<sup>3</sup>, Masaru Kawaminami<sup>2</sup>, Anthony Grbic<sup>1</sup>, David Wentzloff<sup>1</sup>, Hun-Seok Kim<sup>1</sup>, David Blaauw<sup>1</sup>  
<sup>1</sup>University of Michigan, USA, <sup>2</sup>Mie Fujitsu Semiconductor, Japan, <sup>3</sup>Fujitsu Electronics, USA

*A 24–43GHz LNA with 3.1–3.7dB Noise Figure and Embedded 3-Pole Elliptic High-Pass Response for 5G Applications in 22nm FDSOI*

Li Gao, Gabriel M. Rebeiz  
University of California, San Diego, USA

*A 77dB-SFDR Multi-Phase-Sampling 16-Element Digital Beamformer with 64 4GS/s 100MHz-BW Continuous-Time Band-Pass  $\Delta\Sigma$  ADCs*

Rundao Lu, Sunmin Jang, Yun Hao, Michael P. Flynn  
University of Michigan, USA

*A Sub-mW All-Passive RF Front End with Implicit Capacitive Stacking Achieving 13dB Gain, 5dB NF and +25dBm OOB-IIP3*

Vijaya Kumar Purushothaman, Eric Klumperink, Berta Trullas Clavera, Bram Nauta  
University of Twente, The Netherlands

*Enhanced Passive Mixer-First Receiver Driving an Impedance with 40dB/Decade Roll-Off, Achieving +12dBm Blocker-P1dB, +33dBm IIP3 and Sub-2dB NF Degradation for a 0dBm Blocker*

Sashank Krishnamurthy, Ali M. Niknejad  
University of California, Berkeley, USA

*A Quadrature Class-G Complex-Domain Doherty Digital Power Amplifier*

Shih-Chang Hung, Si-Wook Yoo, Sang-Min Yoo  
Michigan State University, USA

*A Coupler-Based Differential Doberty Power Amplifier with Built-In Baluns for High mm-Wave Linear-Yet-Efficient Gbit/s Amplifications*  
Huy Thong Nguyen, Hua Wang  
Georgia Tech, USA

*A 350mV Complementary 4–5GHz VCO Based on a 4-Port Transformer Resonator with 195.8dBc/Hz Peak FOM in 22nm FDSOI*  
Omar El-Aassar, Gabriel M. Rebeiz  
University of California, San Diego, USA

*A 39GHz 64-Element Phased-Array CMOS Transceiver with Built-In Calibration for Large-Array 5G NR*  
Yun Wang<sup>1</sup>, Rui Wu<sup>1</sup>, Jian Pang<sup>1</sup>, Dongwon You<sup>1</sup>, Ashbir Aviat Fadila<sup>1</sup>, Rattanan Saengchan<sup>1</sup>, Xi Fu<sup>1</sup>, Daiki Matsumoto<sup>1</sup>, Takeshi Nakamura<sup>1</sup>, Ryo Kubozoe<sup>1</sup>, Masaru Kawabuchi<sup>1</sup>, Bangan Liu<sup>1</sup>, Haosheng Zhang<sup>1</sup>, Junjun Qiu<sup>1</sup>, Hanli Liu<sup>1</sup>, Wei Deng<sup>1</sup>, Naoki Oshima<sup>2</sup>, Keiichi Motoi<sup>2</sup>, Shinichi Hori<sup>2</sup>, Kazuaki Kunihiro<sup>2</sup>, Tomoya Kaneko<sup>2</sup>, Atsushi Shirane<sup>1</sup>, Kenichi Okada<sup>1</sup>  
<sup>1</sup>Tokyo Institute of Technology, Japan, <sup>2</sup>NEC, Japan

*A 24.5–43.5GHz Compact RX with Calibration-Free 32–56dB Full-Frequency Instantaneously Wideband Image Rejection Supporting Multi-Gb/s 64-QAM/256-QAM for Multi-Band 5G Massive MIMO*  
Min-Yu Huang<sup>1</sup>, Taiyun Chi<sup>2</sup>, Fei Wang<sup>1</sup>, Sensen Li<sup>1</sup>, Tzu-Yuan Huang<sup>1</sup>, Hua Wang<sup>1</sup>  
<sup>1</sup>Georgia Tech, USA, <sup>2</sup>Speedlink Technology, USA

*A 51.5–64.5GHz Active Phase Shifter Using Linear Phase Control Technique with 1.4° Phase Resolution in 65-nm CMOS*  
Tianjun Wu, Chenxi Zhao, Huihua Liu, Yunqiu Wu, Yiming Yu, Kai Kang  
UESTC, China

*A 6.5-GHz Cryogenic All-Pass Filter Circulator in 40-nm CMOS for Quantum Computing Applications*  
Andrea Ruffino<sup>1</sup>, Yatao Peng<sup>1</sup>, Fabio Sebastiano<sup>2</sup>, Masoud Babaie<sup>2</sup>, Edoardo Charbon<sup>1</sup>  
<sup>1</sup>EPFL, Switzerland, <sup>2</sup>Technische Universiteit Delft, The Netherlands

Student Paper Contest Eligibility: The student must have been a full-time student (9 hours/term graduate, 12 hours/term undergraduate) during the time the work was performed. The student must also be the lead author of the paper and must present the paper at the Symposium.