UPCOMING SSCS & MTT-S JOINT WEBINAR

Transceiver Architectures for Beyond-5G: Challenges and R&D Opportunities

Presenter: Prof. Payam Heydari, University of California, Irvine
Thursday, May 14th, 2020
12:00 PM ET

Abstract: The ongoing super-linear growth of world's population coupled with the worldwide access to internet and the general public's tendency to use more bandwidth-intensive applications fuel the urgency to enhance wireless infrastructures so as to meet these demands. Consequently, the wireless R&D is headed towards the invention of "Beyond-5G" (e.g., 6G) technology. This webinar provides a comprehensive overview of challenges and opportunities in designing beyond-5G transceiver architectures capable of achieving high data rates above and beyond 20 Gbps.

Biography: Payam Heydari received his Ph.D. degree from the University of Southern California in 2001. He is currently a Full Professor of Electrical Engineering at the University of California, Irvine. Dr. Heydari's research covers the design of terahertz/millimeter-wave/RF and analog integrated circuits. He is the (co)-author of two books, one book chapter, and more than 150 journal and conference papers. He has given several Keynote Speech and tutorials to international forums and conferences. He was a Distinguished Lecturer of the IEEE Solid-State Circuits Society (Jan. 2014 - Jan. 2016), and is now a Distinguished Microwave Lecturer of the IEEE Microwave Theory and Techniques Society (Jan. 2019 - Dec.
His group was among the first who introduced the design of millimeter-wave integrated circuits in silicon technologies. They demonstrated the world's first fundamental frequency CMOS transceiver operating above 200 GHz, the world's highest radiated power and highest efficiency sub-terahertz circularly-polarized radiator in silicon employing a multi-port cavity-backed structure.

Dr. Heydari was selected as the inaugural Faculty Innovation Fellow by the University of California, Irvine (UCI) Beall Applied Innovation. He is the recipient of a number of awards including the 2017 UCI's School of Engineering Mid-Career Excellence in Research, the 2010 Faculty of the Year Award from UC-Irvine's Engineering Student Council (ECS), the 2009 School of Engineering Best Faculty Research Award, the 2007 IEEE Circuits and Systems Society Guillemin-Cauer Award, the 2005 IEEE Circuits and Systems Society Darlington Award, and the 2005 National Science Foundation (NSF) CAREER Award.

Dr. Heydari is an AdCom member of the IEEE Solid-State Circuits Society. Dr. Heydari currently serves an Associate Editor for the IEEE Journal of Solid-State Circuits and the IEEE Solid-State Circuits Letters. He was a member of the Technical Program Committee of the International Solid-State Circuits Conference (ISSCC). Dr. Heydari is an IEEE Fellow for contributions to silicon-based millimeter-wave integrated circuits and systems.

## NEWS

**Stay Connected to IEEE Xplore When Working Remotely**

If your organization has an institutional subscription to IEEE Xplore(R) and you need to work remotely due to school and workplace closures, you can still access IEEE Xplore and continue your work and research while offsite. Try these tips for remote access or contact IEEE for help. IEEE is here to support you, making certain that your IEEE subscription continues to be accessible to all users so they can continue to work regardless of location.

**Stay up-to-date with Learning with the SSCS Education Program**

The SSCS Education Program provides Society members with free access to a wide range of quality
Educational content related to integrated circuits including tutorials, short courses, webinars, and eBooks.

- **Tutorials and Short Courses:** SSCS members have access to free tutorials and short courses from past years of ISSCC. Renowned experts in the field talk about new and ongoing developments in integrated circuits. [Click here to access.]

- **Webinars:** Monthly webinars are held for free for SSCS members on topics ranging from Analog/RF and future microprocessors to new biomedical applications. [Register for an upcoming webinar or view past webinars]

- **eBooks:** SSCS has two books available for download - [IC Design Insights](#) - a selection of tutorial and invited presentations given at CICC 2017 and [Low Power Circuit Design Using Advanced CMOS Technology](#) - part of the Tutorials in Circuits and Systems series.

- **CONFedu Series:** The CONFedu series features short 10-minute talks from SSCS sponsored conferences including ISSCC, CICC, ESSCIRC, and VLSI. [Click here to access.]

- **SSCSx Lecture Series:** The first series of lectures is five parts and is presented by Prof. Behzad Razavi on Noise. [Click here to access.]

Educational credits (PDH's and CEU's) are available at a low cost for select products.

SSCS Educational content can be accessed via the [SSCS Resource Center](#) and the [SSCS YouTube Channel](#). The material is free for Society members.

---

### EDUCATION

### Upcoming 2020 Distinguished Lectures

Due to the COVID-19 Pandemic, there are currently no SSCS Distinguished Lectures scheduled.

### CONFERENCES

### Upcoming 2020 SSCS-Sponsored Conferences

<table>
<thead>
<tr>
<th>Conference</th>
<th>Date/Location</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 International Symposium on VLSI Technology, Systems, and Applications (VLSI-TSA)</td>
<td>Hsinchu, Taiwan</td>
<td>Rescheduled to August 10th -13th, 2020</td>
</tr>
<tr>
<td>2020 International Symposium on VLSI Design, Automation, and Test (VLSI-DAT)</td>
<td>Hsinchu, Taiwan</td>
<td>Rescheduled to August 10th -13th, 2020</td>
</tr>
<tr>
<td>2020 IEEE Symposia on VLSI Technology and Circuits</td>
<td>Honolulu, Hawaii</td>
<td>Jun 14 - 19, 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To be held virtually</td>
</tr>
<tr>
<td>2020 IEEE Biomedical Circuits and Systems</td>
<td></td>
<td>Rescheduled for October 2021</td>
</tr>
</tbody>
</table>
ESSCIRC/ESSDERC 2020

Due to the cancellation of ESSCIRC/ESSDERC 2020, the conferences steering committee recommends the following for authors:

For authors who were planning on submitting their paper to ESSCIRC/ESSDERC, you are encouraged to submit your publications to the following IEEE Journals:

For ESSCIRC, you can submit to Solid-State Circuits Letters (SSC-L). Visit: [https://mc.manuscriptcentral.com/ssc-l](https://mc.manuscriptcentral.com/ssc-l) and select the Special Section on ESSCIRC 2020 when submitting your paper. The submission deadline is May 15th, 2020. Publication will be in October/November 2020. Authors having accepted papers through this path will be invited to present their work in a Special Oral Session at ESSCIRC 2021.

Authors are also welcome to submit their papers to IEEE Journal of Solid-State Circuits and the IEEE Open Journal of Solid-State Circuits.

For ESSDERC, please see [https://eds.ieee.org/publications](https://eds.ieee.org/publications) for more information.

SSCS-Sponsored Conferences: Proceedings

Click the links below to access the latest SSCS-Sponsored conference proceedings.

2019
- [2019 IEEE Symposium on VLSI Circuits](https://vlsicircuits.org)
- [2019 IEEE 45th European Solid-State Circuits Conference (ESSCIRC)](https://www.esscc.org)

2020

PUBLICATIONS

JxCDC Call for Papers: Special Topic on Tunneling FETs for Energy-Efficient Computing & Information
A call for papers is now open for Special Topic on Tunneling FETs for Energy-Efficient Computing & Information Processing

Guest Editor:
Uygar Avci, Intel Corporation, uygar.e.avci@intel.com

Editor-in-Chief:
Azad Naeemi, Georgia Institute of Technology, azad@gatech.edu

Aims and Scope:
The Tunneling Field-Effect Transistor (T-FET) is considered a future transistor option due to its steep-slope prospects and the resulting advantages in operating at low supply voltage (VDD).

Reducing supply voltage (VDD) while keeping a low leakage current and a reasonably high on-current is critical for minimizing energy consumption and improving the energy efficiency of computing and information processing. The thermal limit (Boltzmann's Tyranny) of the MOSFET transistor subthreshold swing (SS) restricts lowering its threshold voltage (Vt), causing significant performance degradation at low VDD. A Tunneling Field Effect Transistor's (T-FET) SS is not limited by this thermal tail and may perform better at low VDD. Since the first experimental proof of subthreshold swing (SS) < 60mV/dec, T-FET's prospects have attracted the interest of researchers. Silicon's large indirect bandgap and large carrier mass prevents Si T-FET from achieving high drive currents. But due to the availability of high-quality material together with years of know-how, Si and Si/Ge T-FETs have been studied initially, and showed the first of many devices with SS < 60mV/dec. III-V materials for T-FETs attracted attention next because of their low bandgap and carrier mass. While more challenging to fabricate, the broken bandgap hetero-junctions III-V T-FETs eventually showed the highest T-FET drive-current. Beyond III-V materials, Transition Metal Dichalcogenide and other 2D materials may provide a path in the future to high performance energy efficient transistors, thanks to thinner channels enabling better control of the tunneling field.

This call for papers on Tunneling FETs is for rapid publication of seminal results across the areas of T-FET materials, devices, and circuits for novel computation and information processing paradigms. Paper submissions with key insights into the advantages and challenges of specific T-FET device and material designs and circuit techniques are especially valued in order to guide the semiconductor industry and academia on a path toward more energy-efficient computing.

Topics of Interest:
Special Topic on Tunneling Field Effect Transistors (Tunneling FETs, T-FETs)

- N- and P- Tunneling FET experimental transistors demonstrating high performance at low supply voltage
- T-FET material and device design, including hetero-junction III-V materials, transition metal dichalcogenides, other two-dimensional materials and their hetero-junctions
- T-FET circuits for energy efficient computing and information processing
- Energy-Efficient computing and information processing with T-FET transistor circuits and architectures.
Important Dates:
Open for Submission: April 15th, 2020
Submission Deadline: June 30th, 2020
First Notification: August 1st, 2020
Revision Submission: August 21st, 2020
Final Decision: September 30th, 2020
Publication Online: December 1st, 2020

Submission Guidelines:
The IEEE Journal on Exploratory Solid-State Computational Devices and Circuits (JXCD) IS AN OPEN ACCESS ONLY PUBLICATION:

Charge for Authors: $1,350 USD per paper.

Paper submissions must be done through the ScholarOne Manuscripts website: https://mc.manuscriptcentral.com/jxcdc

Guidelines for papers and supplementary materials, as well as a paper template, are provided at this website.

JXCD is sponsored by:
- Solid-State Circuits Society
- Magnetics Society
- Circuits & Systems Society
- Computer Society
- Council on Electronic Design Automation
- Council on Superconductivity
- Nanotechnology Council
- Computer Society
- Electron Devices Society

CLICK HERE TO BEGIN YOUR SUBMISSION

The latest in SSCS Flagship Publications...

IEEE Journal of Solid-State Circuits
Vol. 55, Issue 5, May 2020
Special Issue on the 2019 RFIC Symposium

Introduction to the Special Section on the 2019 RFIC Symposium
Hongtao Xu
Li-Xuan Chuo ; Zhen Feng ; Yejoong Kim ; Nikolaos Chiotellis ; Makoto Yasuda ; Satoru Miyoshi ; Masaru Kawaminami ; Anthony Grbic ; David Wentzloff ; David Blaauw ; Hun-Seok Kim

A Fully Passive RF Front End With 13-dB Gain Exploiting Implicit Capacitive Stacking in a Bottom-Plate N-Path Filter/Mixer
Vijaya Kumar Purushothaman ; Eric A. M. Klumperink ; Berta Trullas Clavera ; Bram Nauta

An 802.11ba-Based Wake-Up Radio Receiver With Wi-Fi Transceiver Integration
Renzhi Liu ; Asma Beevi K. T. ; Richard Dorrance ; Deepak Dasalukunte ; Vinod Cristem ; Mario A. Santana Lopez ; Alexander W. Min ; Shahrnaz Aziz ; Minyoung Park ; Brent R. Carlton

A Design and Analysis of Enhanced Mixer-First Receivers Achieving 40-dB/decade RF Selectivity
Sashank Krishnamurthy ; Ali M. Niknejad

A 24.5-43.5-GHz Ultra-Compact CMOS Receiver Front End With Calibration-Free Instantaneous Full-Band Image Rejection for Multiband 5G Massive MIMO
Min-Yu Huang ; Taiyun Chi ; Sensen Li ; Tzu-Yuan Huang ; Hua Wang

Multi-Mode 60-GHz Radar Transmitter SoC in 45-nm SOI CMOS
Wooram Lee ; Tolga Dinc ; Alberto Valdes-Garcia

A Code-Domain RF Signal Processing Front End With High Self-Interference Rejection and Power Handling for Simultaneous Transmit and Receive
Hussam Alshammary ; Cameron Hill ; Ahmed Hamza ; James F. Buckwalter

An 802.11ba-Based Wake-Up Radio Receiver With Wi-Fi Transceiver Integration
Renzhi Liu ; Asma Beevi K. T. ; Richard Dorrance ; Deepak Dasalukunte ; Vinod Cristem ; Mario A. Santana Lopez ; Alexander W. Min ; Shahrnaz Aziz ; Minyoung Park ; Brent R. Carlton

An 802.11ba-Based Wake-Up Radio Receiver With Wi-Fi Transceiver Integration
Renzhi Liu ; Asma Beevi K. T. ; Richard Dorrance ; Deepak Dasalukunte ; Vinod Cristem ; Mario A. Santana Lopez ; Alexander W. Min ; Shahrnaz Aziz ; Minyoung Park ; Brent R. Carlton

A 24.5-43.5-GHz Ultra-Compact CMOS Receiver Front End With Calibration-Free Instantaneous Full-Band Image Rejection for Multiband 5G Massive MIMO
Min-Yu Huang ; Taiyun Chi ; Sensen Li ; Tzu-Yuan Huang ; Hua Wang

Multi-Mode 60-GHz Radar Transmitter SoC in 45-nm SOI CMOS
Wooram Lee ; Tolga Dinc ; Alberto Valdes-Garcia

A Code-Domain RF Signal Processing Front End With High Self-Interference Rejection and Power Handling for Simultaneous Transmit and Receive
Hussam Alshammary ; Cameron Hill ; Ahmed Hamza ; James F. Buckwalter

A Coupler-Based Differential mm-Wave Doherty Power Amplifier With Impedance Inverting and Scaling Baluns
Huy Thong Nguyen ; Hua Wang

A Wideband Low-Power Cryogenic CMOS Circulator for Quantum Applications
Andrea Ruffino ; Yatao Peng ; Fabio Sebastianio ; Masoud Babaie ; Edoardo Charbon

A 1.7-dB Minimum NF, 22-32-GHz Low-Noise Feedback Amplifier With Multistage Noise Matching in 22-nm FD-SOI CMOS
Bolun Cui ; John R. Long

A 39-GHz 64-Element Phased-Array Transceiver With Built-In Phase and Amplitude Calibrations for Large-Array 5G NR in 65-nm CMOS
Yun Wang ; Rui Wu ; Jian Pang ; Dongwon You ; Ashbir Aviat Fadila ; Rattanan Saengchan ; Xi Fu ; Daiki Matsumoto ; Takeshi Nakamura ; Ryo Kubozoe ; Masaru Kawabuchi ; Bangan Liu ; Haosheng Zhang ; Junjun Qiu ; Hanli Liu ; Naoki Oshima ; Keichi Motoi ; Shinichi Hori ; Kazuaki Kunihiro ; Tomoya Kaneko ; Atsushi Shirane ; Kenichi Okada

Code-Domain Multiplexing for Shared IF/LO Interfaces in Millimeter-Wave MIMO Arrays
Manoj Johnson ; Armagan Dascurcu ; Kai Zhan ; Arman Galioglu ; Naresh Kumar Adedu ; Sanket Jain ; Harish Krishnaswamy ; Arun S. Natarajan

A 50-Gb/s PAM4 Si-Photonic Transmitter With Digital-Assisted Distributed Driver and Integrated CDR in 40-nm CMOS
Qiwen Liao ; Nan Qi ; Miaofeng Li ; Shang Hu ; Jian He ; Bozhi Yin ; Jingbo Shi ; Jian Liu ; Patrick Yin Chiang ; Xi Xiao ; Nanjian Wu

A 20-32-GHz Quadrature Digital Transmitter Using Synthesized Impedance Variation Compensation
Hui Zheng Jenny Qian ; Yiyang Shu ; Jie Zhou ; Xin Luo

Highly Integrated Guidewire Ultrasound Imaging System-on-a-Chip
Jaemyung Lim ; Coskun Tekes ; Evren F. Arkan ; Ahmad Rezvanitabar ; F. Levent Degertekin ; Maysam Ghovanloo

A High-Voltage Dual-Input Buck Converter Achieving 52.9% Maximum End-to-End Efficiency for Triboelectric Energy-Harvesting Applications
Inho Park ; Junyoung Maeng ; Minseob Shim ; Junwon Jeong ; Chulwoo Kim

An OTA-Less Second-Order VCO-Based CT ΔΣ Modulator Using an Inherent Passive Integrator and Capacitive Feedback
Shaolan Li ; David Z. Pan ; Nan Sun
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 102.2-dB, 181.1-dB FoM Extended Counting Analog-to-Digital Converter With Capacitor Scaling</td>
<td>Saqib Mohamad ; Jie Yuan ; Amine Bermak</td>
</tr>
<tr>
<td>An 8.2- μ W 0.14-mm² 16-Channel CDMA-Like Capacitance-to-Digital Converter</td>
<td>Yuxuan Luo ; Yida Li ; Aaron Voon-Yew Thean ; Chun-Huat Heng</td>
</tr>
<tr>
<td>A Time-Interleaved Resonant Voltage Mode Wireless Power Receiver With Delay-Based Tracking Loops for Implantable Medical Devices</td>
<td>Se-Un Shin ; Minseong Choi ; Seungchul Jung ; Hyung-Min Lee ; Gyu-Hyeong Cho</td>
</tr>
<tr>
<td>A Wireless Power and Data Transfer Receiver Achieving 75.4% Effective Power Conversion Efficiency and Supporting 0.1% Modulation Depth for ASK Demodulation</td>
<td>Dawei Ye ; Yu Wang ; Yingfei Xiang ; Liangjian Lyu ; Hao Min ; C.-J. Richard Shi</td>
</tr>
<tr>
<td>Mixer-First MIMO Receiver With Reconfigurable Multi-Port Decoupling and Matching</td>
<td>Charley Wilson ; Jacob Dean ; Brian A. Floyd</td>
</tr>
<tr>
<td>A 30-GHz CMOS SOI Outphasing Power Amplifier With Current Mode Combining for High Backoff Efficiency and Constant Envelope Operation</td>
<td>Kang Ning ; Yihao Fang ; Navid Hosseinzadeh ; James F. Buckwalter</td>
</tr>
<tr>
<td>TG-SPP: A One-Transmission-Gate Short-Path Padding for Wide-Voltage-Range Resilient Circuits in 28-nm CMOS</td>
<td>Weiwei Shan ; Wentao Dai ; Chuan Zhang ; Hao Cai ; Peiye Liu ; Jun Yang ; Longxing Shi</td>
</tr>
<tr>
<td>A 0.58-to-0.9-V Input 0.53-V Output 2.4- μ W Current-Feedback Low-Dropout Regulator With 99.8% Current Efficiency</td>
<td>Ziyu Wang ; Shahriar Mirabbasi</td>
</tr>
<tr>
<td>A Cryogenic CMOS Parametric Amplifier</td>
<td>Mohammadreza Mehrpoo ; Fabio Sebastianio ; Edoardo Charbon ; Masoud Babaie</td>
</tr>
<tr>
<td>A 117-dB In-Band CMRR 98.5-dB SNR Capacitance-to-Digital Converter for Sub-nm Displacement Sensing With an Electrically Floating Target</td>
<td>Hui Jiang ; Samira Amani ; Johan G. Vogel ; Saleh Heidary Shalmany ; Stoyan Nihtianov</td>
</tr>
<tr>
<td>A 2.6 TOPS/W 16-Bit Fixed-Point Convolutional Neural Network Learning Processor in 65-nm CMOS</td>
<td>Shihui Yin ; Jae-Sun Seo</td>
</tr>
<tr>
<td>A 1-V 8.1- μ W PPG-Recording Front-End With &gt; 92-dB DR Using Light-to-Digital Conversion With Signal-Aware DC Subtraction and Ambient Light Removal</td>
<td>Fatemeh Marefat ; Reza Erfani ; Pedram Mohseni</td>
</tr>
<tr>
<td>Novel Pulse-Based Analog Divider With Digital Output</td>
<td>Kuan-Hung Chen ; Tse-An Chen ; Chia-Ling Wei</td>
</tr>
<tr>
<td>Secondary Side-Channel Wireline Communication Using Transmitter Clock Frequency</td>
<td></td>
</tr>
</tbody>
</table>
IEEE Journal on Exploratory Solid-State Computational Devices and Circuits

**Volume 5: 2019 - December**

**Nonvolatile Spintronic Memory Cells for Neural Networks**
Andrew W. Stephan ; Qiuwen Lou ; Michael T. Niemier ; Xiaobo Sharon Hu ; Steven J. Koester

**Benchmarking Delay and Energy of Neural Inference Circuits**
Dmitri E. Nikonov ; Ian A. Young

**Energy-Efficient Convolutional Neural Network Based on Cellular Neural Network Using Beyond-CMOS Technologies**
Chenyun Pan ; Qiuwen Lou ; Michael Niemier ; Sharon Hu ; Azad Naeemi

**Ultracompact and Low-Power Logic Circuits via Workfunction Engineering**
Talha F. Canan ; Savas Kaya ; Avinash Karanth ; Ahmed Louri

**Early Access Articles**
Accurate Inference with Inaccurate RRAM Devices: A Joint Algorithm-Design Solution
Gouranga Charan ; Abinash Mohanty ; Xiaocong Du ; Gokul Krishnan ; Rajiv V. Joshi ; Yu Cao

A DNA Read Alignment Accelerator based on Computational RAM
Zamshed I. Chowdhury ; Masoud Zabihi ; S. Karen Khatamifard ; Zhengyang Zhao ; Salonik Resch ; Meisam Razaviyayn ; Jian-Ping Wang ; Sachin S. Sapatnekar ; Ulya R. Karpuzcu

Analyzing the Effects of Interconnect Parasitics in the STT CRM In-memory Computational Platform
Masoud Zabihi ; Arvind K. Sharma ; Meghna G. Mankalale ; Zamshed I. Chowdhury ; Zhengyang Zhao ; Salonik Resch ; Ulya R. Karpuzcu ; Jian-Ping Wang ; Sachin S. Sapatnekar

Short-Term Long-Term Compute-In-Memory Architecture: A Hybrid Spin/CMOS Approach Supporting Intrinsic Consolidation
Shadi Sheikhfaal ; Ronald F. DeMara

Energy-Efficient Moderate Precision Time-Domain Mixed-Signal Vector-by-Matrix Multiplier Exploiting 1T-1R Arrays
Shubham Sahay ; Mohammad Bavandpour ; Mohammad Reza Mahmoodi ; Dmitri Strukov

JxCDC papers listed in order of popularity can be found online HERE.

For paper submission details, click HERE.

For Society news and happenings, check out the Winter 2020 issue of the Solid-State Circuits Magazine.