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July 2020

UPCOMING SSCS WEBINAR



Millimeter Wave Power Amplifiers in Silicon: State of the Art and Future Technology Trend

Presenter: Dr. Hua Wang
Thursday, July 30th, 2020
11:00 AM ET

Abstract: There is a rapidly growing need for high-performance mm-Wave power amplifiers to address mm-Wave 5G and Beyond 5G communication and numerous mission-critical multi-functional DoD applications. These next-generation mm-Wave PAs are often expected to deliver nearly "perfect" performance. They should offer large output power to ensure sufficient link budget, broad bandwidth to support multi-standard communication or frequency reconfigurability/agility, high peak and back-off efficiency for energy saving, and also inherent linearity for Gbit/s complex modulations with minimum or even no digital pre-distortions (DPD). Compared to compound devices, silicon devices often exhibit inferior device-level performance, including power density, gain, efficiency, linearity, and reliability. However, besides their unparalleled fit for system-level integration, silicon technologies offer matured modeling, flexible metal options, and extensive digital control, making them an extremely versatile and attractive platform for design innovations. In this talk, we will review the state of the art of silicon mm-Wave PAs and compare them to recent compound semiconductor PAs. We will then present several recently reported silicon mm-Wave PA design examples that essentially leverage architectural and circuit level innovations to overcome silicon device limitations and radically advance the state

of the art.

Biography: Hua Wang is an associate professor at the School of Electrical and Computer Engineering (ECE) at Georgia Institute of Technology and the director of Georgia Tech Electronics and Micro-System (GEMS) lab. Prior to that, he worked at Intel Corporation and Skyworks Solutions on mm-Wave integrated circuits and RF front-end modules. He received his M.S. and Ph.D. degrees in electrical engineering from the California Institute of Technology, Pasadena, in 2007 and 2009, respectively.

Dr. Wang is interested in innovating analog, mixed-signal, RF, and mm-Wave integrated circuits and hybrid systems for wireless communication, sensing, and bioelectronics applications. He has authored or co-authored over 170 peer-reviewed journal and conference papers.

Dr. Wang received the DARPA Director's Fellowship Award in 2020, the DARPA Young Faculty Award in 2018, the National Science Foundation CAREER Award in 2015, the IEEE MTT-S Outstanding Young Engineer Award in 2017, the Georgia Tech Sigma Xi Young Faculty Award in 2016, the Georgia Tech ECE Outstanding Junior Faculty Member Award in 2015, and the Lockheed Dean's Excellence in Teaching Award in 2015. He held the Demetrius T. Paris Professorship from 2014 to 2018. His GEMS research group has won multiple academic awards and best paper awards, including the 2019 Marconi Society Paul Baran Young Scholar, the IEEE RFIC Best Student Paper Awards (1st Place in 2014, 2nd Place in 2016, and 2nd Place in 2018), the IEEE CICC Outstanding Student Paper Awards (2015, 2018, and 2019), the IEEE CICC Best Conference Paper Award (2017), the 2016 IEEE Microwave Magazine Best Paper Award, and the IEEE SENSORS Best Live Demo Award (2nd Place in 2016).

Dr. Wang is a Technical Program Committee (TPC) Member for IEEE ISSCC, RFIC, CICC, and BCICTS conferences. He is a Steering Committee Member for IEEE RFIC and CICC. He is the Conference Chair for CICC 2019 and Conference General Chair for CICC 2020. He is a Distinguished Lecturer (DL) for the IEEE Solid-State Circuits Society (SSCS) for the term of 2018-2019. He serves as the Chair of the Atlanta's IEEE CAS/SSCS joint chapter that won the IEEE SSCS Outstanding Chapter Award in 2014.

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Solid-State Circuits Society Announces New Executive Director



As many of you already know, the executive offices of Solid State Circuits Society (SSCS) and Power Electronics Society (PELS) have been growing significantly over the past few years, under Mike Kelly's watchful eye. This year, it became clear that IEEE needed to split the offices to allow each to blossom and move to the next level. Mike will be moving on to become the full-time Executive Director of PELS. We thank Mike for his service to our society and wish him well in his new role.

After several months of searching and interviews, IEEE has named Adam Greenberg as the new Executive Director of SSCS. Adam comes to us from IEEE ComSoc, where he served as Technical Activities and Industry Outreach Director since May 2016. He led several new technical initiatives and graduated Future Directions efforts. Adam has also been driving the professional development programs and technical community building within ComSoc. Before joining IEEE, Adam was a business leader at Verizon, AT&T, and IBM.

Reporting to Adam are the following members of the SSCS Executive Office:

- **Abira Altvater**, Technical Community Program Specialist supporting Marketing and Society Communications, Governance, Publications, and Education, DLs and Webinars. Abira is temporarily out of the office; during this time her duties are being assumed by Kelsey Rodriguez.
- **Lauren Caruso**, Administrator supporting Finance and Accounting, Membership and Chapter Services, and Awards and Grants Programs/Processing.
- **Danielle Marinese**, Senior Society Administrator supporting Finance and Accounting, Conferences, and Publications.

Call for Nominations: IEEE TFAs, Herz Staff Award, and Medals & Recognitions

Nominations are due January 15th annually for the IEEE Technical Field Awards and the IEEE Eric Herz Outstanding Staff Member Award and 15 June annually for IEEE Medals and Recognitions.

All are encouraged to submit a nomination for a worthy candidate within their technical fields.

Nomination guidelines, award-specific criteria, and components of a nomination form can be downloaded from



<https://www.ieee.org/about/awards/information.html> and http://www.ieee.org/about/awards/recognitions/recognitions_herz.html. All nominations must be submitted through the online nomination portal.

The IEEE Awards Board (AB) administers the highest medals, awards, and recognition's presented by IEEE. The IEEE Technical Field Awards are awarded for contributions or leadership in specific fields of interest of the IEEE. IEEE Medals embrace significant and broad IEEE interests and purposes.

For more information visit www.ieee.org/awards or e-mail awards@ieee.org.



**2020 IEEE Medal of Honor recipient,
Chenming Hu**

Call for Nominations: IEEE TFAs, Herz Staff Award, and Medals & Recognitions

2020 IEEE Medal & Recognition Recipients Honored Online

This year, in light of the global health emergency and pervasive travel restrictions, IEEE made the difficult decision not to hold the in-person IEEE Honors Ceremony. Instead, the 23 diverse 2020 IEEE Medal and Recognition recipients will be honored in a series of online promotions.

--Visit the Awards' [Facebook](#) and [Twitter](#) social media platforms to see a continuing series of posts highlighting each 2020 recipient.

--Watch videos about each award recipient and learn more about their accomplishments on the [Awards Channel on IEEE.TV](#).

--Flip through the digital [2020 IEEE Awards Booklet](#).

--The Awards Program is also partnering with the IEEE History Center to promote the 2020 recipients on their [Engineering and Technology Wiki](#). Q&As with these recipients will be posted there in the months to come.

--Plans are being made to recognize the 2020 recipients at the [2021 IEEE Vision, Innovation, and Challenges Summit & Honors Ceremony](#).

[Stay tuned](#) for updates about the online promotions.

2020 IEEE Radio Frequency Integrated Circuits (RFIC) Symposium

We invite you to join us in the 2020 IEEE Radio Frequency Integrated Circuits (RFIC) Symposium, to be held as a virtual symposium beginning on Tuesday 4 August 2020 with the plenary Session.

A single registration will allow attendees to access all Microwave Week content, including RFIC, IMS, ARFTG, the 5G Summit, a virtual exhibition, panel sessions, and more. This registration is free to all members of the IEEE Microwave Theory and Technique Society (MTTS). All Microwave Week content will be available on-line beginning on 4 August 2020 and lasting through 30 September 2020.

Our technical program features 95 paper presentations organized within 21 technical sessions. These pre-recorded video presentation will be available to attendees on demand allowing attendees to digest all that our symposium has to offer.

A joint RFIC/IMS live-streamed panel session is scheduled for Wednesday, 5 August 2020 at 11:30 AM PDT. This panel will feature speakers discussing the important topic of "Who needs RF when we can digitize at the antenna interface". This topic is sure to interest both experts and newcomers alike. Finally, as students of today will be our leaders for tomorrow, the RFIC 2020, in partnership with IMS, offers opportunities for students to enhance their career growth and educational experiences. These include the RFIC student paper contest and the Three-Minute Thesis (3MT®) program.

On behalf of the RFIC Steering, Executive and Technical Committees, we welcome you to join us at the 2020 RFIC Symposium! Please visit the RFIC 2020 website (<http://rfic-ieee.org/>) for more details and updates.

To Academia, or to Industry,
That is the Question.



Kofi Makinwa



Shih-Lien Lu

SSCS Webinars for Young Excellence

Talk Title: To Academia, or to Industry, That is the Question.

Abstract:

You are about to finish graduate school or perhaps a young or seasoned professional, contemplating a career transition. Which is better - a career in academia or industry? What are the pros and cons of one versus the other? How can you start exploring

and build up your career accordingly? In this webinar, we will interview Dr. Linus Lu, a professor-turned-industry veteran, and Prof. Kofi Makinwa, an industry veteran-turned-professor, who will share their insights and perspectives from their personal journeys in both academia and industry

careers. They will also address what triggered their transitions, how they staged their transitions, and offer their crystal ball projections on present and future career prospects in the solid-state-circuits profession.

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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

SSCS/EDS Bangladesh Jt. Chapter Virtual DL - Prof. Makato Nagata	Talk Title: On-Chip Physical Attack Protection Circuits for Hardware Security	VIRTUAL - Click here for more information
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SSCS Switzerland Chapter Virtual DL - Dr. Gabriele Manganaro	Talk Title: Mixed-signal technologies for ultra-wide band signal processing systems	VIRTUAL - Click here for more information
SSCS Central Illinois Chapter Virtual DL - Dr. Keith Bowman	Talk Title: Adaptive and Resilient Circuits for Processors	VIRTUAL - Click here for more information

CONFERENCES

Upcoming 2020 SSCS-Sponsored Conferences

<u>2020 International Symposium on VLSI Technology, Systems, and Applications (VLSI-TSA)</u> Hsinchu, Taiwan	Rescheduled to August 10th -13th, 2020
<u>2020 International Symposium on VLSI Design, Automation, and Test (VLSI-DAT)</u> Hsinchu, Taiwan	Rescheduled to August 10th -13th, 2020
<u>2020 IEEE Radio Frequency Integrated Circuits Symposium (RFIC)</u> Los Angeles, California	Aug 4 - 6, 2020
<u>2020 European Solid-State Circuits Conference/2020 European Solid-State Device Research Conference</u> Grenoble, France	Rescheduled to September 2021. A new virtual educational event is currently being developed for September 14, 2020.
<u>2020 IEEE Biomedical Circuits and Systems Conference (BioCAS)</u> Berlin, Germany	Rescheduled for October 2021
<u>2020 IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium (BCICTS)</u> Monterey, California	Nov 8 - 11, 2020
<u>2020 IEEE Asian Solid-State Circuits Conference (A-SSCC)</u> Hiroshima, Japan	Nov. 9 - 11, 2020

SSCS-Sponsored Conferences: Proceedings

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

2019

[2019 IEEE International Solid-State Circuits Conference \(ISSCC\)](#)

[2019 IEEE Custom Integrated Circuits Conference \(CICC\)](#)

[2019 IEEE Symposium on VLSI Circuits](#)

[2019 IEEE 45th European Solid-State Circuits Conference \(ESSCIRC\)](#)

[2019 IEEE Asian Solid-State Circuits Conference \(A-SSCC\)](#)

2020

[2020 IEEE International Solid-State Circuits Conference \(ISSCC\)](#)

[2020 IEEE Custom Integrated Circuits Conference \(CICC\)](#)

PUBLICATIONS

JxCDC Call for Papers: Special Topic on Coupled Oscillators for Non- von Neumann Computation

A call for papers is now open for Special Topic on Coupled Oscillators for Non- von Neumann Computation

Guest Editor:

Chris H. Kim, University of Minnesota, chriskim@umn.edu

Editor-in-Chief:

Azad Naeemi, Georgia Institute of Technology, azad@gatech.edu

Aims and Scope:

When oscillators are loosely coupled to each other, energy transfer between the individual oscillators causes their frequencies to synchronize. The same principle can be found in real life; for instance, metronomes placed on a floating wooden board, pendulums connected via springs, and internal organs following a circadian rhythm. Depending on the strength and time lag of the coupling medium, the phases of the oscillators settle in a way that minimizes the contentions among the oscillating signals. Recent works have shown that the coupled oscillator's natural ability to evolve to the ground state can be exploited to solve computationally intractable problems, such as graph coloring, max cut, factorization, neural networks, associative memories and pattern recognition. Here, the problems are first mapped to a coupled oscillator network by configuring the coupling weights, and the phase information is read out once the ground state is found. While resolving to the ground state, the network may get stuck in a local minima state, which can be avoided by a concept called annealing where random noise is added during the early exploration phase to help the oscillators break out of a local minima state.

Coupled oscillator networks vary in their device implementation as well as in their connectivity. For the devices, experimental demonstrations include CMOS oscillators, emerging device based, such as ferroelectric, spintronic, phase change oscillators, optical oscillators, and quantum devices at cryogenic temperatures. In some cases, oscillators were discrete devices assembled on a board, in other cases, they were monolithically integrated on a chip. In terms of connectivity, fully-connected, nearest-neighbor, hybrid networks (e.g. Chimera), and common node coupling architectures have been demonstrated.

Against this backdrop, the IEEE Journal on Exploratory Computational Devices and Circuits (JxCDC) is pleased to announce the next special issue focusing all aspects of coupled oscillator based system specifically targeted for non-von Neumann computing applications.

Topics of Interest:

- Emerging device (e.g. optical, NEMS, ferroelectric, spintronic, phase change) based coupled oscillator systems
- CMOS based coupled oscillator systems
- Variability and reliability effects in coupled oscillator systems
- Probabilistic behavior and operation under noise
- Security properties of coupled oscillator systems
- Weight programming and phase readout techniques
- Annealing techniques for coupled oscillator systems
- Network connectivity and architecture considerations
- Testing, parameter turning, and measurements aspects
- Oscillator Neural Networks (ONNs)
- Associative memories based on oscillators
- Techniques for mapping large problems onto coupled oscillator systems
- Graph embedding algorithms for locally connected coupled oscillator systems
- NP-hard and NP-complete problem case studies
- Comparison with quantum computers and software based approaches (e.g. simulated annealing)
- Literature review and historical trends on coupled oscillator systems

Important Dates:

- Open for Submission: July 10th, 2020
- Submission Deadline: September 31st, 2020
- First Notification: October 21st, 2020
- Revision Submission: November 15th, 2020
- Final Decision: December 15th, 2020
- Online Issue Publication: January 1st, 2021

Submission Guidelines:

The IEEE Journal on Exploratory Solid-State Computational Devices and Circuits (JXCDC) 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](#).

JxCDC is sponsored by:

- Solid-State Circuits Society
- Magnetism Society
- Circuits & Systems Society
- Computer Society
- Council on Electronic Design Automation
- Council on Superconductivity
- Nanotechnology Council
- Computer Society
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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

[Millimeter-Scale Node-to-Node Radio Using a Carrier Frequency-Interlocking IF Receiver for a Fully Integrated 4 × 4 × 4 mm³ Wireless Sensor Node](#)

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 Kristem ; Mario A. Santana Lopez ; Alexander W. Min ; Shahrnaz Azizi ; Minyoung Park ; Brent R. Carlton

[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

[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 Sebastiano ; 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 ; Keiichi 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 Adepu ; Sanket Jain ; Harish Krishnaswamy ; Arun S. Natarajan

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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](#)

Huizhen Jenny Qian ; Yiyang Shu ; Jie Zhou ; Xun Luo

[Highly Integrated Guidewire Ultrasound Imaging System-on-a-Chip](#)

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Shaolan Li ; David Z. Pan ; Nan Sun

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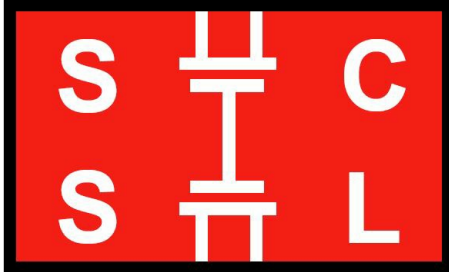
Charley Wilson ; Jacob Dean ; Brian A. Floyd

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Ziyu Wang ; Shahriar Mirabbasi

[A Cryogenic CMOS Parametric Amplifier](#)

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Shihui Yin ; Jae-Sun Seo

[A 1-V 8.1- \$\mu\$ W PPG-Recording Front-End With > 92-dB DR Using Light-to-Digital Conversion With Signal-Aware DC Subtraction and Ambient Light Removal](#)

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