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August 2020

UPCOMING SSCS & Mtt-S JOINT WEBINAR



Chip-Scale Wave-Matter Interactions at RF-to-Light Frequencies: Circuits, Systems and Applications

**Presenter: Ruonan Han
Thursday, August 25, 2020
12:00 PM ET**

Abstract: Traditional electromagnetic (EM) spectral sensors using integrated circuit technologies (e.g. automotive radars, security imagers, cameras, etc.) are normally based on wave scattering or absorption by macroscopic objects at remote distances; and the operations are also not specific in wave frequencies. In the past couple of years, a new paradigm of chip-scale EM spectral sensing has emerged with features complementary to the above: they utilize various modalities of interactions between EM waves with high-precision frequency control and microscopic particles (molecules, atoms, etc.) in close proximity to the chip. This progress is enabled by the recent advances of silicon devices and processes, especially the increase of circuit operation frequencies into the terahertz regime. Chip-scale sensing and metrology systems with new capabilities, higher performance and unprecedented affordability now become possible. Examples include THz gas spectroscopy sensors, on-chip "atomic-clock-grade" frequency references, room-temperature CMOS-quantum magnetometers, etc. This talk will present the basic physics of a few types of wave-matter interactions, key enabling technologies, as well as the designs and prototypes of the chip systems. We will also discuss their potential applications in bio-chemical analysis, wireless networks,

positioning, navigation and timing (PNT), security and so on.

Biography: Ruonan Han received the B.Sc. degree in microelectronics from Fudan University, in 2007, the M.Sc. degree in electrical engineering from the University of Florida in 2009, and the Ph.D. degree in electrical and computer engineering from Cornell University in 2014. He has been with the Department of Electrical Engineering and Computer Science, MIT, since July 2014, and is now an Associate Professor. His research group at MIT focuses on RF-to-photonics integrated circuits and systems for spectroscopy, metrology, imaging, quantum sensing/processing, broadband/secure communication, etc. He was the recipient of the Cornell ECE Directors Ph.D. Thesis Research Award, Cornell ECE Innovation Award, and two Best Student Paper Awards of the IEEE Radio-Frequency Integrated Circuits Symposium (2012 and 2017). He was also the recipient of the IEEE Microwave Theory and Techniques Society (MTT-S) Graduate Fellowship Award, and the IEEE Solid-State Circuits Society (SSC-S) Predoctoral Achievement Award. He is an Associate Editor of IEEE Transactions on Very-Large-Scale Integration System and IEEE Transactions on Quantum Engineering, a Guest Associate Editor of IEEE Transactions on Microwave Theory and Techniques (2019), and also serves on the Technical Program Committee (TPC) of IEEE RFIC Symposium (2017 to the present) and the Steering Committee and TPRC of the 2019 IEEE International Microwave Symposium. He is an IEEE MTT-S Distinguished Microwave Lecturer for years 2020-2022. Dr. Han won the Intel Outstanding Researcher Award in 2019 and the National Science Foundation (NSF) CAREER Award in 2017.

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NEWS

IEEE Annual Election Balloting Has Begun; Have You Voted?

Balloting has begun for the 2020 IEEE Annual Election, including for IEEE Division I Delegate-Elect/Director-Elect, 2021; Delegate/Director, 2022-2023. The Division I Delegate/Director is your voice on the IEEE Board of Directors, so please cast your vote for this and other positions by October 1st.

Division I candidates in alphabetical order of last name are former SSCS President Rakesh Kumar, former Sensors Council and CAS President Franco Maloberti, and former EDS President Samar K. Saha. More information on each candidate can be found on the [IEEE Division I election page](#).

2020 IEEE Young Professionals Hall of Fame Award



The SSCS Young Professionals Group is one of the 2020 IEEE Young Professionals Hall of Fame Award winners! Congratulations to our YP team for the award, and more importantly for their successes in engaging and serving our YP's.

Solid-State Circuits Magazine Fall 2020: Call For Chapter News

The IEEE Solid-State Circuits Magazine is seeking chapter news for inclusion in the upcoming Fall 2020 issue. Reports on any SSCS chapter related news or happenings are welcome. This would include recent distinguished lectures, events your chapter hosted, Webinars and any awards your members may have received.

Article Submission deadline is August 31st. We will not be able to accept any articles after this date due to a strict production schedule.

Please submit articles to Kelsey Rodriguez at k.rodriquez@ieee.org

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.



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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 Seoul Chapter Virtual DL - Makoto Nagata	Talk Title: On-Chip Physical Attack Protection Circuits for Hardware Security	VIRTUAL - Click here for more information
SSCS Seoul Chapter Virtual DL - Sudhakar Pamarti	Talk Title: Low power clocking for energy conscious IoT systems	VIRTUAL - Click here for more information

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
SSCS Israel Chapter Virtual DL - Dr. Venumadhav (Venu) Bhagavatula.	Talk Title: Evolution of cellular RFICs (2G to 5G)	VIRTUAL - Click here for more information

CONFERENCES

Upcoming 2020 SSCS-Sponsored Conferences

2020 European Solid-State Circuits Conference/2020 European Solid-State Device Research Conference Grenoble, France	Rescheduled to September 2021. A new virtual educational event is currently being developed for September 14, 2020.
2020 IEEE Biomedical Circuits and Systems Conference (BioCAS) Berlin, Germany	Rescheduled for October 2021
2020 IEEE BiCMOS and Compound Semiconductor Integrated Circuits and Technology Symposium (BCICTS) Monterey, California	Nov 8 - 11, 2020
2020 IEEE Asian Solid-State Circuits Conference (A-SSCC) 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 \(CICC\)](#)

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:

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, ranging from max cut and factorization to neural networks and traveling salesman problem. Here, the problems are first mapped to a coupled oscillator network by configuring the coupling strengths, 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, which is inspired by metallurgy where metals are treated with heat to promote certain physical properties. Annealing in the context of coupled oscillators involves increasing the randomness during the initial phase of coupling to help the oscillator phases break out of the local minima state, while the noise is gradually reduced as the network converges to a better solution.

Coupled oscillator networks vary in their device implementation as well as in their architectures. For the devices, experimental demonstrations include CMOS oscillators, emerging device based, such as ferroelectric, spintronic, phase change oscillators, optical oscillators, of 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. Arrays of oscillators have been connected via nearest neighbors, to the common node, or fully connected via a crossbar. Oscillators are operated to their synchronization or without, when they play the role of stochastic elements. Depending on their architecture, oscillator arrays have been applied to associative memories, convolutional neural networks, problems of constrained optimizations such as graph or map coloring or max-cut, temporal pattern recognition including voice, robotic locomotion, etc.

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 include but are not limited to:

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](#).

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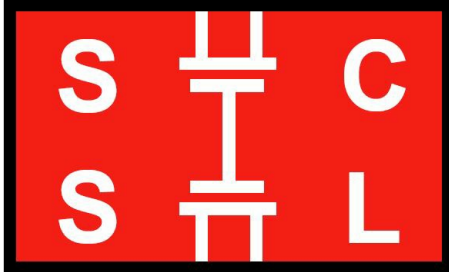
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IEEE Journal of Solid-State Circuits

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[A Cryogenic CMOS Parametric Amplifier](#)

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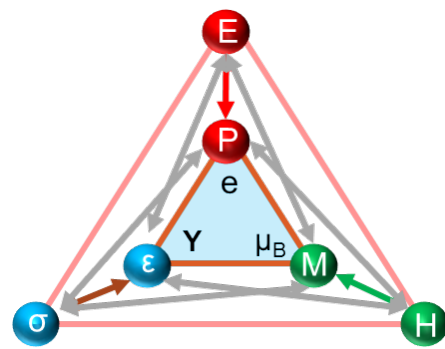
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Accurate Inference with Inaccurate RRAM Devices: A Joint Algorithm-Design Solution

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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

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