Session 12 Overview:
Innovations in Low-Power and Secure IoT
TECHNOLOGY DIRECTIONS SUBCOMMITTEE

Session Chair:
Sriram Vangal,
Intel, Hillsboro, OR

Session Co-Chair:
Long Yan,
Samsung Electronics,
Hwaseong, Korea

Session Moderator:
Frederic Gianesello
STMicroelectronics, Crolles, France

Emerging IoT systems demand higher levels of energy-efficiency and security for mobile applications. The first paper describes a low-power event-driven wake-up IC, followed by a paper proposing reflective and MIMO antenna arrays to improve the efficiency of Wi-Fi backscattering systems. The final paper addresses key security challenges by presenting an advanced PUF solution using spectral regrowth of a power amplifier as the RF fingerprint for IoT devices.

2021 IEEE International Solid- State Circuits Conference (ISSCC) | 978-1-7281-9549-0/20/$31.00 ©2021 IEEE | DOI: 10.1109/ISSCC42613.2021.9365793

7:00 AM

12.1 A 148nW General-Purpose Event-Driven Intelligent Wake-Up Chip for AIoT Devices Using Asynchronous Spike-Based Feature Extractor and Convolutional Neural Network

Zhixuan Wang, Peking University, Beijing, China

In Paper 12.1, Peking University presents a 148nW general-purpose event-driven intelligent wake-up chip. An asynchronous spike-based feature extractor and CNN-based intelligent inference engine achieves a keyword hit rate of up to 94.1% and 99.7% abnormal ECG wake-up hit rate.

7:08 AM

12.2 Improving the Range of WiFi Backscatter Via a Passive Retro-Reflective Single-Side-Band-Modulating MIMO Array and Non-Absorbing Termination

Miao Meng, University of California San Diego, La Jolla, CA

In Paper 12.2, the University of California, San Diego introduces a 38μW IC that performs both fully reflective single-side-band (SSB) Wi-Fi backscattering for single antenna designs, and a retro-reflective SSB Wi-Fi backscattering using a MIMO antenna array, providing 4 and 15 dB improvements over prior-art, resulting in communication ranges beyond 20m.

7:16 AM

12.3 Exploring PUF-Controlled PA Spectral Regrowth for Physical-Layer Identification of IoT Nodes

Qiang Zhou, Rice University, Houston, TX

In Paper 12.3, Rice University demonstrates a 2.4GHz PA whose spectral regrowth is used as the RF fingerprint for robust physical-layer identification. A reliable >11.5dB out-of-band leakage power variation and <1.5dB in-band variation is achieved. Sixteen unique PUF settings are measured per chip, showing a close-to-uniform distribution.