Session 4 Overview:
mm-Wave Wireless for Communication & Radar
WIRELESS SUBCOMMITTEE

Session Chair: ***Matteo Bassi***
Infineon Technologies, Villach, Austria

Session Co-Chair: ***Vito Giannini***
Uhnder, Austin, TX

Subcommittee Chair: Stefano Pellerano, Intel, Hillsboro, OR

Mm-wave wireless communication and radar systems are key drivers for cutting-edge integrated circuit design advancements. The session features papers describing state-of-the-art mm-wave transceivers, antenna-RX co-integration, multiplexed MIMO RX arrays, MIMO systems, spatial-modulated secure directional transmitters, and FMCW radars with 100GHz bandwidth.

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4.1 A 39GHz-Band CMOS 16-Channel Phased-Array Transceiver IC with a Companion Dual-Stream IF Transceiver IC for 5G NR Base-Station Applications
H-C. Park, Samsung Electronics, Suwon, Korea

In Paper 4.1, Samsung Electronics presents a 5G NR solution including a 39GHz 16-channel RF phased-array transceiver IC in 28nm bulk CMOS and a dual-stream IF transceiver IC in 65nm bulk CMOS.

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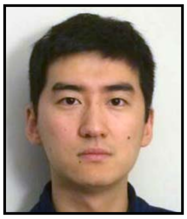

4.2 An E-Band High-Linearity Antenna-LNA Front-End with 4.8dB NF and 2.2dBm IIP3 Exploiting Multi-Feed On-Antenna Noise-Canceling and G_m-Boosting
S. Li, Georgia Institute of Technology, Atlanta, GA

In Paper 4.2, Georgia Institute of Technology and Rice University present an E-band high-linearity antenna-LNA front-end achieving 4.8dB NF and 2.2dBm IIP3. It exploits on-antenna noise canceling and a gm-boosting scheme. Over-the-air modulation testing demonstrates its capability to support >10Gb/s high-order QAM signals.

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4.3 A 28GHz 4-Element MIMO Beam-Space Array in 65nm CMOS with Simultaneous Spatial Filtering and Single-Wire Frequency-Domain Multiplexing
R. Garg, Oregon State University, Corvallis, OR

In Paper 4.3, Oregon State University and Columbia University demonstrate a novel harmonic-mixing-based beam-space RX architecture that achieves both spatial filtering and frequency-domain multiplexing with a single IF interface. The four-element 28GHz RX array consumes <30mW per-stream/per-element. An OTA wireless MIMO test shows concurrent reception of two 400Mb/s streams.

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2:45 PM

4.4 A 28/37GHz Scalable, Reconfigurable Multi-Layer Hybrid/Digital MIMO Transceiver for TDD/FDD and Full-Duplex Communication

S. Mondal, Carnegie Mellon University, Pittsburgh, PA

In Paper 4.4, Carnegie Mellon University introduces a multi-layer hybrid/digital architecture enabling efficient scaling of MIMO streams and demonstrating full-duplex (FD) multi-antenna communication.

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4.5 A 64Gb/s 1.4pJ/b/element 60GHz 2×2-Element Phased-Array Receiver with 8b/symbol Polarization MIMO and Spatial Interference Tolerance

A. Chakrabarti, Intel, Hillsboro, OR

In Paper 4.5, Intel enables both high throughput and spectral reuse with a 4-element 60GHz phased-array RX with dual-polarization MIMO data rates up to 64Gb/s. It demonstrates measurements of in-band spatial interferer tolerance at 60GHz for dense multi-user connectivity.

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4.6 Space-Time Modulated 71-to-76GHz mm-Wave Transmitter Array for Physically Secure Directional Wireless Links

X. Lu, Princeton University, Princeton, NJ

In Paper 4.6, Princeton University describes a scalable spatio-temporal modulated mm-wave TX array for physically secure directional wireless links across 71 to 76 GHz.

4:15 PM

4.7 A Single-Antenna W-Band FMCW Radar Front-End Utilizing Adaptive Leakage Cancellation

M. Kalantari, Hong Kong University of Science and Technology, Hong Kong, China
Sharif University of Technology, Tehran, Iran

In Paper 4.7, Hong Kong University of Science and Technology, Sharif University of Technology and the University of California at Berkeley present a single-antenna FMCW W-band CMOS radar TRX that uses an adaptive feedback leakage cancellation technique to mitigate TX leakage.

4:45 PM

4.8 A Terahertz FMCW Comb Radar in 65nm CMOS with 100GHz Bandwidth

X. Yi, Massachusetts Institute of Technology, Cambridge, MA

In Paper 4.8, Massachusetts Institute of Technology and Universidad Politécnica de Madrid present a frequency-comb-based scalable FMCW radar architecture to achieve state-of-the-art cumulative chirp bandwidth of 100GHz. Implemented in 65nm CMOS, the TRX radar chip prototype demonstrates seamless coverage of the entire 220-to-320GHz band.