Session 14 Overview:
mm-Wave Transceivers for Communication and Radar

WIRELESS SUBCOMMITTEE

Session Chair:
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The session is focused on key advances in mm-wave wireless communication and radar systems. It features papers describing a state-of-the-art multi-user beamforming receiver, an early fusion radar-LiDAR system, self-interference cancellation techniques, FMCW radar MIMO transceivers, along with temperature-healing techniques and crystal-less transceivers.

7:00 AM

14.1 A 71-to-86GHz Packaged 16-Element by 16-Beam Multi-User Beamforming Integrated Receiver in 28nm CMOS

Emily Naviasky, University of California, Berkeley, CA

In Paper 14.1, the University of California, Berkeley, presents a 16-element by 16-beam multi-user beamforming integrated receiver in 28nm CMOS with on-chip LO generation and baseband analog BF matrix. The proposed chip supports up to 2Gb/s/user wireless links, and handles 16 concurrent user streams over the whole band.

7:08 AM

14.2 An Early Fusion Complementary RADAR-LiDAR TRX in 65nm CMOS Supporting Gear-Shifting Sub-cm Resolution for Smart Sensing and Imaging

Liheng Lou, Nanyang Technological University, Singapore, Singapore

In Paper 14.2, Nanyang Technological University and Singapore University of Technology and Design present an early fusion complementary RADAR-LiDAR TRX in 65nm CMOS with hierarchy detection supporting gear-shifting sub-cm resolution for smart sensing and imaging.

7:16 AM

14.3 A 26GHz Full-Duplex Circulator Receiver with 53dB/400MHz (40dB/800MHz) Self-Interference Cancellation for mm-Wave Repeaters

Robin Garg, Oregon State University, Corvallis, OR

In Paper 14.3, Oregon State University demonstrates a 26GHz full-duplex circulator receiver with 53dB over 400MHz (40dB over 800MHz) self-interference cancellation for mm-wave repeaters that can enhance coverage by addressing challenges of path loss/shadowing for 5G mm-wave radios.

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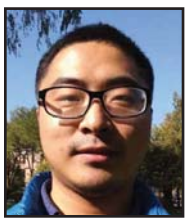
7:24 AM

14.4 A 24-to-30GHz Double-Quadrature Direct-Upconversion Transmitter with Mutual-Coupling-Resilient Series-Doherty Balanced PA for 5G MIMO Arrays

Masoud Pashaeifar, Delft University of Technology, Delft, The Netherlands

In Paper 14.4, TU Delft presents a 24-to-30GHz double-quadrature direct-upconversion transmitter with mutual-coupling-resilient series-Doherty balanced PA for 5G MIMO arrays. It achieves more than 30% PA drain efficiency over 6dB power back-off while its S_{22} is less than -18dB at 24 to 30GHz. The measured I/Q image (for 100MHz tone spacing) is less than -54dBc in the operating frequency band without any calibration.

7:32 AM



14.5 A 1V W-Band Bidirectional Transceiver Front-End with <1dB T/R Switch Loss, <1°/dB Phase/Gain Resolution and 12.3% TX PAE at 15.1dBm Output Power in 65nm CMOS Technology

Wei Zhu, Institute of Microelectronics of Tsinghua University, Beijing, China

In Paper 14.5, the Institute of Microelectronics of Tsinghua University presents a 1V W-band bidirectional transceiver front-end in 65nm CMOS. The coupled-line-based T/R switches, phase shifters and attenuators were integrated in the TRX FE, achieving <1dB T/R switch IL, >12.3% peak PAE at 15.1dBm output power and <1°/1dB phase/gain resolution with <±2.1dB/±6° gain/phase variation.

7:40 AM

14.6 A 76-to-81GHz 2×8 FMCW MIMO Radar Transceiver with Fast Chirp Generation and Multi-Feed Antenna-in-Package Array

Zongming Duan, East China Research Institute of Electronic Engineering, Hefei, China

In Paper 14.6, the East China Research Institute of Electronic Engineering, Eindhoven University of Technology, Southwest Integrated Circuit Design and the University of Science and Technology of China, present a 76-to-81GHz 2×8 FMCW MIMO radar transceiver with fast chirp generation and multi-feed antenna-in-package array. The radar is tailored for short- and ultra-short-range radar detection applications and is packaged with eGFO technology. The on-field measured detection range is over 36.4 meters.

7:48 AM

14.7 An Adaptive Analog Temperature-Healing Low-Power 17.7-to-19.2GHz RX Front-End with ±0.005dB/°C Gain Variation, <1.6dB NF Variation, and <2.2dB IP_{1dB} Variation across -15 to 85°C for Phased-Array Receiver

Min Li, Zhejiang University, Zhoushan, China

In Paper 14.7, Zhejiang University and the University of California, San Diego, present an adaptive analog temperature-healing low-power 17.7-to-19.2GHz RX front-end with ±0.005dB/°C gain variation, <1.6dB NF variation, and <2.2dB IP_{1dB} variation across -15 to 85°C for phased-array receivers.

7:56 AM

14.8 A Fully Integrated 62-to-69GHz Crystal-Less Transceiver with 12 Channels Tuned by a Transmission-Line-Referenced FLL in 0.13μm BiCMOS

Jaeho Im, University of Michigan, Ann Arbor, MI

In Paper 14.8, the University of Michigan presents a fully integrated 62-to-69GHz crystal-less transceiver designed to eliminate the bulky off-chip frequency reference. An on-chip transmission-line-referenced frequency-locked loop (FLL) allows locking to the desired channel frequency within 4325ppm chip-to-chip variation, and supports 12 non-overlapping channels across the 62-to-69GHz band.