

# IMS2022 Systems Forum Focus and Special Sessions

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The Systems Forum is a new addition to the 2022 IEEE Microwave Theory and Techniques Society International Microwave Symposium (IMS2022). This forum complements the Connected Future Summit and comprises focus, special, and panel sessions that run concurrently with the IMS2022 Technical Program and focus on systems-level applications and metrology around three main topics: Quantum Systems, Radar and Aerospace, and Phased Arrays and Over-the-Air (OTA) Applications. These three

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topics are respectively aligned with Tuesday, Wednesday, and Thursday of the conference.

While the focus sessions that fall on a particular day do not all fit the same theme, we have tried to organize nonthemed sessions to cover

areas that a general audience would find technically engaging or are indirectly applicable to the theme. The focus session lineup promises both technical breadth and depth on topics including measurements for quantum circuits, metrology for space and ground radar, and the latest in steerable phased arrays, to name just a few. We could not be more excited for this inaugural Systems Forum that offers

nearly a full week of content and could be a conference in itself!

The titles and organizers of each session are listed in Table 1. A Systems Forum keynote address will kick off the first focus session each day. For session times, please see the final

TABLE 1. Systems Forum Focus and Special Sessions Schedule.		
Tuesday: Quantum Systems Day	Wednesday: Radar and Aerospace Day	Thursday: Phased Arrays and OTA Day
<p><b>Focus Session (Keynote):</b> <i>Microwave technologies for quantum-system integration</i></p> <p><b>Organizer:</b> Nizar Messaoudi (Keysight Technologies), Sorin Voinigescu (University of Toronto)</p>	<p><b>Focus Session (Keynote):</b> <i>Radar from Space to Ground (and Below) – The synergy between commercial, government, and metrology applications</i></p> <p><b>Organizers:</b> Peter Knott (Fraunhofer FHR), Peter Vouras (NSA)</p>	<p><b>Focus Session w/ARFTG (Keynote):</b> <i>Efficient Characterization and Test of Phased Array Antenna Systems: Is it really a nightmare?</i></p> <p><b>Organizers:</b> Marc Vanden Bossche (NI), Jan Fromme (NI)</p>
<p><b>Focus Session:</b> <i>Cryogenic measurement and characterization for quantum systems</i></p> <p><b>Organizer:</b> Fabio Sebastiano (Delft University of Technology), Evan Jeffrey (Google)</p>	<p><b>Focus Session:</b> <i>New Advances in RF Circuits and Systems</i></p> <p><b>Organizer:</b> John Papapolymou (Michigan State), Linda Katehi (Texas A&amp;M)</p>	<p><b>Focus Session:</b> <i>Reconfigurable RF Systems for 5G mmWave Communications</i></p> <p><b>Organizers:</b> Holger Maune (OVGU), Nathan Orloff (NIST)</p>
<p><b>Focus Session w/RFIC:</b> <i>Next-Generation mm-wave GaN Technologies and MMICs for 5G/6G and DoD Applications</i></p> <p><b>Organizer:</b> Jeong-Sun Moon (HRL), David Brown (BAE Systems)</p>	<p><b>Focus Session:</b> <i>Cognitive Radar</i></p> <p><b>Organizer:</b> Joseph Guerci (Information Systems Labs)</p>	
<p><b>Special Session:</b> <i>A Retrospective and a Vision of Future Trends in RF and Microwave Design Optimization</i></p> <p><b>Organizers:</b> Jose Rayas-Sanchez (ITESO), Qi-Jun Zhang (Carleton University)</p>		<p><b>Closing Session</b></p>

IMS2022 program at <http://ims-ieee.org>.

### Tuesday, 21 June: Quantum Systems Day (in Parallel With the Connected Future Summit)

Quantum computing relies heavily on RF systems for manipulation and readout of qubit states and is key to the scalability of future quantum systems. Furthermore, integrated superconducting circuits and a suite of microwave components, operating at microwave and millimeter-wave (mm-wave) frequencies, have enabled quantum computers to demonstrate their computing supremacy. However, accurate microwave measurements in a millikelvin environment posit a unique challenge because of the sensitivity and noise levels required.

There are two themed focus sessions covering quantum technologies and supporting measurements. The first session is titled “Microwave Technologies for Quantum-System Integration,” organized by Nizar Messaoudi (Keysight Technologies) and Sorin Voinigescu (Uni-

versity of Toronto). This session contains a keynote on the challenges of quantum engineering and covers a broad spectrum of cryogenic packaging, interconnect, and system integration technologies and challenges as well as the design of microwave readout amplifier and control circuits for superconducting and ion-trap quantum computer systems. The second themed focus session, “Cryogenic Measurement and Characterization for Quantum Systems,” organized by Fabio Sebastiano (Delft University of Technology) and Evan Jeffrey (Google), covers measurement techniques for cryogenic characterizing of microwave resonators, amplifiers, and noise.

“Next-Generation mm-Wave GaN Technologies and MMICs for 5G/6G and DoD Applications” is a joint focus session with the Radio Frequency Integrated Circuits (RFIC) Symposium, organized by Jeong-Sun Moon (HRL Laboratories). This session will cover emerging mm-wave gallium nitride (GaN) transistor technologies and monolithic microwave integrated circuits (MMICs) geared toward 5G/6G

wireless and Department of Defense (DoD) applications.

Finally, we also have our only special session: “A Retrospective and a Vision of Future Trends in RF and Microwave Design Optimization,” organized by Jose Rayas-Sanchez (ITESO, The Jesuit University of Guadalajara) and Qi-Jun Zhang (Carleton University), which covers the impact of microwave design optimization on core enabling technologies in telecommunications, transportation, biomedicine, energy, and high-performance computer platforms. Using history as a guide, the session will attempt to identify potential future challenges for state-of-the-art optimization techniques and applications of neuronal and machine learning techniques.

### Wednesday, 22 June: Radar and Aerospace Day

With the explosion of aerospace activity in both the government and private sectors over the last 10 years, there is

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by the organizers to reduce further overlap and better use allocated time.

The topics of the workshops range from traditional microwave topics, such as power amplifiers, to new areas for the MTT-S, such as quantum sensing.

With the other topics ranging from 6G to commercial applications for RF in medical fields, it will be difficult to find overlapping topic areas! We are excited by the quality of the proposed workshops and hope you

will find the time to attend a few, benefit from the excellent competent speakers, and challenge them with some excellent questions. See you in Denver in June!



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a huge push for compact, reliable, and low-power RF components in bands from dc to terahertz. Similarly, there has been a surge of research around critical radar and sensing technologies enabling high-resolution applications in congested environments. The sessions on Wednesday will cover the latest developments in radar techniques and RF technologies that are driving terrestrial and aerospace communications, radar, and sensing systems.

The day is kicked off with “Radar From Space to Ground (and Below)—The Synergy Between Commercial, Government, and Metrology Applications,” organized by Peter Knott (Fraunhofer FHR) and Peter Vouras (National Security Agency), which will provide an overview of the worldwide state of the art of radar technology and present a wide range of applications in the military, civil, and dual-use sectors while also highlighting common features in technologies and methods.

“Cognitive Radar,” organized by Joseph Guerci (Information Systems Laboratories), will provide an

up-to-the-minute overview of the recent research activities in the cognitive radar field, including advanced machine learning, knowledge-aided processing, high-performance embedded computing, including neuromorphic computing, and other artificial intelligence methods.

**Electronically steerable arrays are being used in an ever-increasing number of applications as commercial mm-wave deployment rolls out and phased-array technology becomes commonplace.**

“New Advances in RF Circuits and Systems,” organized by John Papapolymou (Michigan State University) and Linda Katehi (Texas A&M University), will focus on new technologies and advances in RF circuits and systems that are expected to play a major role in future communication, radar, and sensing applications, highlighting novel circuits, such as memristor-based RF electronics, GaN-based RF electronics, silicon-photonics electronics, 3D-printed mm-wave packages and interconnects, and active incoherent mm-wave imaging systems.

### **Thursday, 23 June: Phased Arrays and OTA Applications Day**

Electronically steerable arrays are being used in an ever-increasing num-

ber of applications as commercial mm-wave deployment rolls out and phased-array technology becomes commonplace. Furthermore, the advances in antenna-in-package/module/chip technology are driving our new connectorless paradigm, which has led to unique measurement challenges. The focus sessions on Thursday address the latest phased array technologies and the techniques necessary to characterize those systems.

The day starts with a joint focus session with the Automatic Radio Frequency Techniques Group (ARFTG) conference, titled “Efficient Characterization and Test of Phased Array Antenna Systems: Is it Really a Nightmare?” organized by Marc Vanden Bossche and Jan Fromme (National Instruments), which introduces the newest developments related to fast and compact characterization to engineers and system-level designers of phased array antenna systems.

Our final session, “Reconfigurable RF Systems for 5G mm-Wave Communications,” organized by Holger Maune, Otto von Guericke University of Magdeburg (OVGU), will cover technologies in future communication systems that enable changing communication parameters even when the front end is not accessible (e.g., as in satellites).

