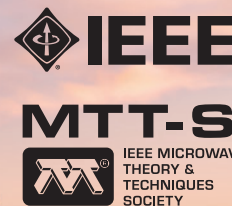




2022 IEEE MTT-S INTERNATIONAL MICROWAVE SYMPOSIUM

19-24 JUNE
COLORADO CONVENTION CENTER
Denver, Colorado



www.ims-ieee.org

IMS2022 is the centerpiece of Microwave Week 2022, which includes the RFIC Symposium (www.rfic-ieee.org) and the ARFTG Microwave Measurement Conference (www.arftg.org).

The Peaks of Microwaves

Join us as we explore the new Peaks of Microwaves including:

- Radar, Phased Arrays, OTA test: the triumvirate of modern microwave systems
- Microwaves for Tiny AI and IoT
- Hardware for Intelligent Mobility, Automotive, and IIoT applications
- Microwaves and satellites for Space 2.0
- 5G/6G Hardware: from components to system-on-chip and RF to THz
- Quantum RF Engineering
- Evolving RF/EM design strategies

Microwave Week provides a wide variety of technical and social activities for attendees and exhibitors.

New This Year: IMS2022 Systems Forum

- "The Connected Futures Summit," presenting current thinking on next generation wireless technologies at mmWave and THz frequencies, will include presentations, panels and a pavilion on the exhibition floor
- Focused sessions investigating the synergy between radar, phased arrays, and OTA test and applications
- Space 2.0 event highlighting advances in aerospace, the Internet-of-Space and the MTT CubeSat competition

Something for Everyone

- Competitions for best Advanced Practices Paper and Student Paper
- RF Bootcamp intended for students, engineers, and managers new to microwave engineering disciplines
- Workshops and application seminars from our exhibitors, explaining the technology behind their products
- Networking events for Amateur Radio (HAM) enthusiasts, Women in Microwaves (WiM), and Young Professionals
- Guest hospitality suite

Important Dates

17 September 2021 (Friday)

PROPOSAL SUBMISSION DEADLINE For workshops, technical lectures, focus and special sessions, panel and rump sessions. Preliminary workshop and technical lecture proposals due 16 July.

7 December 2021 (Tuesday)

PAPER SUBMISSION DEADLINE All submissions must be made electronically.

2 February 2022 (Wednesday)

PAPER DISPOSITION Authors will be notified by email.

9 March 2022 (Wednesday)

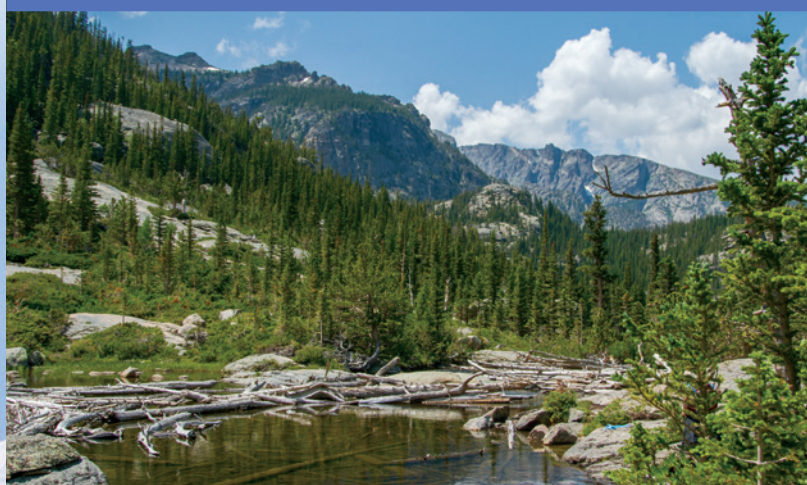
FINAL MANUSCRIPT SUBMISSION DEADLINE
Manuscript and copyright of accepted papers.

6 April 2022 (Wednesday)

SLIDE PRESENTATIONS DEADLINE FOR ALL AUTHORS AND PRESENTERS

19-24 June 2022

MICROWAVE WEEK IMS2022, RFIC 2022, ARFTG, and Exhibition





IMS2022 will feature technical sessions, interactive forums, plenary and panel sessions, workshops and technical lectures, application seminars, historical exhibits, and the world's largest RF and microwave industry exhibition.

With more than 9000 participants and 800 industrial exhibits of state-of-the-art microwave products, Microwave Week is the world's largest gathering of RF and microwave professionals.

NEW FOR 2022!

New! Systems Forum

The three-day Systems Forum will highlight the latest in telecommunications, radar and space applications.

New! Industrial Showcase

Papers with industrial authors can showcase their paper and answer questions about their company at the "Industrial Showcase" reception.

New! Industry-Supported Papers

Oral papers from industry-supported work may acknowledge industry sponsorship and/or booth number. Interactive-Forum Poster papers from industry-supported work may distribute approved coupons for prize at associated booth.

New! Industry Paper Contest Prize

Full-page ad in *IEEE Microwave Magazine* and *Microwave Journal*.

New! Paper Demonstrations

Authors of Oral and Interactive-Forum Poster papers may request time for live demonstrations in the Interactive Forum.

New! Interactive-Forum Poster Paper Previews

Interactive-Forum Poster papers and demonstrations will be previewed by an oral-session chair for greater visibility.

New! Virtual Content

See virtual previews and tutorials and participate in live events.

New(ish)! Publication in MWCL

The 50 top-ranked papers, as determined by the Technical Paper Review Committee, will be invited to submit the paper to IEEE Microwave and Wireless Components Letters.



SPECIAL STUDENT PROGRAMS

IMS2022 encourages student participation! Visit the website for additional programs.

Student Design Competition:

All eligible students or student teams are invited to consider taking part in the Student Design Competitions (SDCs) during IMS2022. This is the premier IMS event where you can translate theory into real hardware and software designs.

Project Connect:

An exceptional group of undergraduate and first-year graduate students from underrepresented groups will be invited to IMS2022 on a travel grant provided by NSF and IEEE through a competitive application process.

PhD Student Initiative:

Available for all first- and second-year PhD students worldwide. The initiative provides sponsorship to attend IMS2022.



Technical Program Committee Members

Ronald Ginley, *General Chair*

Kate Remley/Dylan Williams, *TPC Chairs*

Osama Shana'a, *RFIC Conference General Chair*

Jeff Jargon, *ARFTG Conference General Chair*

Peter Aaen/Zoya Popovic, *Plenary Session Chairs*

Zoya Popovic/Michael Roberg/Scott Schafer, *Workshop and Technical Lecture Chairs*

Larry Dunleavy/Joanne Mistler/David Ricketts, *RF Boot Camp Chairs*

Jasmin Grosinger/Alan Brannon, *Panel Sessions Chairs*

Alan Brannon, *Focus/Special Sessions Chair*

Rob Horansky/Justus Brevic, *Interactive-Forum Chairs*

Gregor Lasser/Jan Verspecht/Taylor Barton, *Student Design Competition Chairs*

Elsie Vega, *Conference/Event Manager*



Technical Paper Submission

Authors are invited to submit technical papers describing original work and/or advanced practices on RF, microwave, mmWave, and THz theory and techniques. The deadline for submission is 7 December 2021.

Presentation Formats

1. Full-length (20 minute) oral papers report significant contributions, advancements, or applications.
2. Short (10 minute) oral papers report specific refinements or improvements in the state of the art.
3. Interactive-Forum Poster Papers provide a conversational setting where authors may also display hardware and perform demonstrations.

Paper Selection Criteria

There are four selection criteria: Originality, Quantitative Content, Clarity and Interest to MTT-S Membership.

Page Limit

For the initial submission deadline, the paper length should be 3 pages. An accepted paper may be 3 or 4 pages long.

Student Paper Competition

Full-time-student lead authors are encouraged to submit papers for the Student Paper Competition. First, second, and third prizes will be awarded based on content and presentation.

Industry and Advanced-Practice Paper Competitions

Submissions from industrial authors are automatically included in the Industry Competition. Advanced-Practice papers describe innovative techniques in practical aspects of design, processing, measurement or analysis that result in significant improvements in performance and/or time to production. Prizes will be awarded.

Submission Instructions

1. All submissions must be in English.
2. Authors should adhere to the format provided in the template, which can be downloaded from the conference website.
3. The initial submission should be in PDF format, and cannot exceed 4 MB in size.
4. Authors should upload their paper by midnight Hawaii time on 7 December 2021.

Details at www.ims-ieee.org



Paper Review

Papers are reviewed by IMS2022 Technical Program Subcommittees. A double-blind review process will be used to ensure anonymity for both authors and reviewers.

Notification

Authors will be notified of the decision by 2 February 2022 via email. For accepted papers, an electronic version of the final 3-4 page manuscript along with a copyright assignment to the IEEE must be submitted by 9 March 2022. The Symposium proceedings will be recorded on electronic media and archived in IEEE Xplore.

IEEE T-MTT Special Issue

Authors of all papers presented at IMS2022 can submit an expanded version of their papers to a special symposium issue of the IEEE Transactions on Microwave Theory and Techniques.

Clearances

It is the responsibility of the authors to acquire all required company and government clearances and IEEE copyright forms.

Health and Safety

Please refer to the conference website.



TECHNICAL AREAS:

Electromagnetic Field, Device and Circuit Techniques

- 1 **Field analysis and guided waves** – Novel guiding and radiating structures, new physical phenomena in transmission lines and waveguides, and new analytical methods for solving guided-wave and radiation problems.
- 2 **Numerical techniques & CAD algorithms** – Finite-difference, finite-element, integral equation, and hybrid methods for RF, microwave, and THz applications. Simulation, modeling, uncertainty quantification, and design optimization; circuit-, EM-, multi-physics-, and statistics-based, including surrogate modeling, space mapping, and model order reduction techniques.
- 3 **Instrumentation and measurement techniques** – Theoretically supported and experimentally demonstrated linear and nonlinear measurement techniques for devices and materials, error correction, de-embedding, calibration, and novel instrumentation.
- 4 **MHz-to-THz device modeling** – Active and passive, linear and nonlinear device and structure modeling (physical, empirical, and behavioral) including characterization, parameter extraction, and validation.
- 5 **Nonlinear circuit and system analysis, simulation, and design** – Distortion, stability and qualitative dynamics analysis; circuits and systems (C&S) simulation techniques and applications; behavioral modeling of nonlinear C&S (excluding PAs); and nonlinear C&S design and implementations.
- 6 **MHz-To-THz interaction of materials and tissues** – Electromagnetic field characterization and interaction at molecular, cellular, tissue and living systems levels; MRI and microwave imaging; medical applications; microwave-enhanced chemistry.

Passive Components and Packaging

- 7 **Transmission-line structures** – Novel transmission-line structures and devices, transmission-line equivalent circuits, artificial transmission lines and metamaterial structures, transmission-line applications for devices and systems.
- 8 **Passive circuit elements** – Couplers, dividers/combiners, hybrids, resonators, and lumped-element approaches.
- 9 **Planar passive filters and multiplexers** – Planar passive filters and multiplexers including lumped elements, theoretical filter and multiplexer synthesis methods.
- 10 **Non-planar passive filters and multiplexers** – Resonators, filters and multiplexers based on dielectric, waveguide, coaxial, or other non-planar structures.
- 11 **Active, tunable, and integrated filters** – Integrated (on Si, LTCC, LCP, MCM-D, GaAs, etc.), active, and tunable filters.
- 12 **Microwave acoustic, ferrite, ferroelectric, phase-change, and MEMS components** – Surface and bulk acoustic wave devices including FBAR devices, bulk and thin-film ferrite components, ferroelectric-based devices, and phase-change devices and components. RF microelectromechanical and micromachined components and subsystems.
- 13 **Packaging, MCMs, and 3D manufacturing techniques** – Component and subsystem packaging, assembly methods, inkjet printing, multi-chip modules, wafer stacking, 3D interconnect, and integrated cooling. Novel processes related to 3D printing or additive manufacturing techniques.

Active Devices

- 14 **Semiconductor devices and process characterization** – RF, microwave, mm-wave, and THz devices on III-V, silicon and other emerging technologies. MMIC and Si RFIC manufacturing, reliability, failure analysis, yield, and cost.
- 15 **Low-noise amplifiers, variable-gain amplifiers and receivers** – LNAs, VGAs, detectors, receivers, integrated radiometers, cryogenic amplifiers and models, and characterization methods for low-noise integrated circuits and components.
- 16 **Signal generation, modulators, frequency conversion, and signal shaping ICs** – CW and pulsed oscillators in silicon and III-V processes including VCOs, DROs, YTOs, PLOs, and frequency synthesizers, signal modulators, and frequency conversion ICs in silicon and III-V processes, such as IQ modulators, mixers, frequency multipliers/dividers, switches, and phase shifters.
- 17 **Mixed-signal and wireline ICs** – High-speed mixed-signal components and subsystems for transmission; equalization and clock-data recovery techniques for electrical backplanes and electro-optical interfaces. High-speed mixed-signal components and subsystems, including ADC, DAC and DDS technologies.
- 18 **High-power MHz, RF and microwave amplifiers** – Advances in discrete and IC power amplifier devices and design techniques based on III-V and LD-MOS devices, demonstrating improved power, efficiency, and linearity for HF, UHF, VHF, RF and microwave bands (< 26 GHz). Power-combining techniques for SSPA and vacuum electronics.
- 19 **Compound semiconductor power amplifiers** – Advances in IC power amplifier devices, design techniques and power combining based on III-V and other compound semiconductor devices demonstrating improved power, efficiency, and linearity for millimeter-wave bands; vacuum electronics for millimeter-wave.
- 20 **Silicon power amplifiers** – Advances in RFIC and digital power amplifier design and power combining techniques based on silicon CMOS and SiGe processes, demonstrating improved power, efficiency, and linearity for RF, millimeter-wave, and sub-THz bands.

- 21 **Linearization and transmitter techniques for power amplifiers** – Power amplifier design, characterization, and behavioral modeling; linearization and pre-distortion techniques; envelope-tracking, outphasing and Doherty transmitters for III-V and silicon technologies
- 22 **Integrated transceivers, beamformers, imaging and phased-array chips and modules** – Design and characterization of complex III-V ICs, silicon ICs, heterogeneous systems, and related packaging in the RF to mm-wave including narrowband and wide-band designs. Innovative circuits and sub-systems for communications, radar, imaging, and sensing applications. Integrated on-chip antennas and on-package antennas.
- 23 **Millimeter-wave and terahertz integrated circuits and systems** – Design and characterization of active components including LNAs, PAs, and frequency conversion ICs in silicon and III-V processes and/or packaging in the upper mm-wave and THz regimes; innovative THz circuits systems for communications, radar, imaging, and sensing applications. Demonstrations of on-chip antennas. Novel multi-feed antennas and antenna-electronics co-designs and co-integrations.
- 24 **Microwave photonics and nanotechnology** – Integrated devices and 1D-2D material-based technology. Multidisciplinary field studying the interaction between microwaves, THz waves, and optical waves for the generation, processing, control, and distribution of microwave, mm-wave, and THz signals. Emerging RF applications of nanophotonics, nanoplasmonics, and nano-optomechanics; nanoscale metrology and imaging.
- 25 **HF/VHF/UHF Technologies and Applications** – Advances in active and passive circuits, components, and systems that operate in the HF, VHF, and UHF frequency ranges.

Systems and Applications

- 26 **Phased Arrays, MIMO and Beamformers** – Technology advances combining theory and hardware implementation in the areas of phased-array antennas, integrated beamformers, spatial power combining, retrodirective systems, built-in self-test techniques, broadband arrays, digital beamforming, and multi-beam systems. New beamforming, beam-tracking, and spatial notching algorithms, signal processing, and demonstrations.
- 27 **Radar and Imaging Systems** – RF, millimeter-wave, and sub-THz radar and imaging systems, automotive radars, sensors for intelligent vehicular highway systems, UWB and broadband radar, remote sensing, radiometers, passive and active imaging systems, radar detection techniques, and related signal processing.
- 28 **Wireless System Characterization and Architectures for 5G and Beyond** – RF, millimeter-wave, and sub-THz communication systems with hardware implementation for terrestrial, vehicular, satellite, and indoor applications, point-to-point links, backhaul and fronthaul applications, radio-over-fiber links, cognitive and software-defined radios, MIMO, massive MIMO, full-duplex technologies, simultaneous transmit and receive (STAR) systems, shared and novel spectrum use, waveform design, modulation schemes, and channel modeling.
- 29 **Sensing and RFID Systems** – Short range wireless and RFID sensors, gas and fluidic sensors, passive and active tags from HF to millimeter-wave frequency, RFID systems including wearables and ultra-low-power.
- 30 **Wireless Power Transmission** – Energy harvesting systems and applications, rectifiers, circuits, self-biased systems, combined data and power transfer systems
- 31 **MHz-to-THz instrumentation for biological measurements and healthcare applications** – Devices, components, circuits and systems for biological measurements and characterizations; biomedical therapeutic and diagnostic applications; systems and instrumentation for biomedical applications; wireless sensors and systems, and implantable and wearable devices for health monitoring and telemedicine.
- 32 **AI/ML for RF and mmWave** – AI/ML algorithms, implementations, and demonstrations for spectrum sensing, mobile edge networking, and MIMO and array beam operations and management; AI/ML algorithms for design and optimization of RF/mmWave components, circuits, and systems; AI/ML algorithms for in-situ sensing, diagnostics, control, reconfiguration, and optimization of MHz to THz communication and sensing circuits and systems.

Emerging Technologies

- 33 **Innovative systems and applications** – Emerging technologies and novel system concepts for RF/microwave applications such as 6G, Internet of Things (IoT), Internet of Space (IoS), wearable computing/communication systems, machine-to-machine (M2M) communication, intelligent transportation, smart cities, smart environment, heterogeneous integration and 3D ICs, silicon photonics and plasmonics.
- 34 **MHz-to-THz physical layer security** – Devices, circuits, and systems for secured communication and sensing from MHz to THz, addressing general security vulnerability due to electromagnetic emissions, hardware and software co-design for physical layer security, advanced devices and materials to enhance RF, mm-Wave, and THz physical layer security, trusted design, fabrication, packaging, and validation for RF, mm-Wave, and THz electronics.
- 35 **Quantum devices, systems, and applications** – Cryogenic RF devices, circuits, systems and interfaces for quantum computing and sensing applications.