CALL FOR PAPERS

2019 **International Microwave Symposium**

2 – 7 JUNE AT THE BOSTON CONVENTION AND EXHIBITION CENTER

PAPER SUBMISSION DEADLINE: 5 December 2018, 11:59pm Hawaiian Standard Time at www.ims-ieee.org

BOSTON 2019
THE HUB OF MICROWAVES

Come join us in Boston, to present and learn the latest developments in microwave theory, techniques, and applications at the Hub of Microwaves, the International Microwave Symposium (IMS).

The IEEE Microwave Theory and Techniques Society's 2019 International Microwave Symposium (IMS2019) will be held 2 – 7 June 2019 at the Boston Convention and Exhibition Center in Boston, Massachusetts. IMS2019 (**www.ims-ieee.org**) is the centerpiece of Microwave Week 2019 comprised of the RFIC Symposium (**www.rfic-ieee.org**) and the ARFTG Conference (**www.arftg.org**).

Microwave Week, with more than 9000 participants and 800 industrial exhibits of state-of-the-art microwave products, is the world's largest gathering of radio-frequency (RF) and microwave professionals and the most important forum for the latest research advances and practices in the field. IMS2019 offers something for everyone, including the following:

- 5G Summit showcasing the next-generation wireless technologies for mobility
- Competitions for best Industry Paper, Advanced Practices Paper, Student Paper, Three Minute Thesis (3MT), Sixty-second Presentation (S2P), and Student Design Competitions
- RF Bootcamp intended for students, engineers, and managers from non-microwave engineering disciplines
- Technical workshops and short courses
- Exhibitor workshops and application seminars featuring presentations by the preeminent technologists from our exhibitors, explaining the technology behind their products
- STEM Program featuring hands on activities and exhibitions designed to help students in middle and high school expand their understanding of what it is to be an engineer
- Project Connect for underrepresented minority engineering students, and the Ph.D. Student Initiative for new students
- Networking events for Amateur Radio (HAM) enthusiasts, Women in Engineering (WIE)/Women in Microwaves (WIM), and Young Professionals (YP)
- There will be a special small business/entrepreneurs' area on the exhibitor floor

Paper Submission: Authors are invited to submit technical papers describing original work in the areas of microwave, millimeter-wave, and terahertz theory and techniques. The deadline for submission is 5 December 2018, 11:59pm Hawaiian Standard Time. A double-blind review process will be used to ensure anonymity for both authors and reviewers. Detailed instructions on submitting a double-blind compliant paper can be found at **www.ims-ieee.org**. Papers will be evaluated on the basis of originality, content, clarity, and relevance to IMS.

Emerging Technical Areas: IMS2019 enthusiastically invites submission of papers that report state-of-the-art progress in technical areas that are outside the scope of those specifically listed in this call for papers, or that may be new to IMS, but are of interest to our attendees.

MTT-S IEEE

PAPER SUBMISSION INSTRUCTIONS:

1. All submissions must be in English.
2. Authors must adhere to the format provided in the template, which can be downloaded from **www.ims-ieee.org**.
3. Authors must submit the paper at **www.ims-ieee.org** by 11:59pm Hawaiian Standard Time on 5 December 2018. Late submissions will not be considered. The initial submission may be 3 or 4 pages, must be in PDF format, must be double-blind compliant, and cannot exceed 2 MB in size. Hardcopy and email submissions are not accepted. The final page length for papers accepted for publication in the proceedings is 3 to 4 pages.

Paper Selection Criteria: Papers are reviewed by IMS2019 Technical Program subcommittees. The selection criterial will be:

- **Originality:** Is the contribution unique and significant? Does it advance the state of the art of the technology and / or practices? Are proper references to previous work by the authors and others provided?
- **Quantitative content:** Does the paper give a comprehensive description of the work with adequate supporting data?
- **Clarity:** Is the paper contribution and technical content presented with clarity? Are the writing and accompanying figures clear and understandable?
- **Interest to MTT-S membership:** Why should this work be reported at this conference?

Technical Areas: During the paper submission process, authors will choose a primary and two alternative technical areas (see the Technical Areas). The paper abstract should contain information that clearly reflects the choice of the area(s). Author-selected technical areas will be used to determine an appropriate review committee for reviewing the paper. The technical areas are divided into five different categories that are used to organize the paper presentation schedule. It is permissible to choose primary and alternative technical areas that are in different categories.

Presentation Format: IMS offers three types of presentation formats. The authors' preference will be honored where possible, but the IMS2019 Technical Program Committee (TPC) reserves the right to place papers in the most appropriate technical area and presentation format.

4. Full-length (20 minute) papers report significant contributions, advancements, or applications in a formal presentation format with questions and answers (Q&A) at the end.
5. Short (10 minute) papers typically report specific refinements or improvements in the state of the art in a formal presentation format with Q&A at the end.
6. Interactive forum papers provide an opportunity for authors to present their theoretical and/or experimental developments and results in greater detail and in a more informal and conversational setting. Papers will be presented in a standard poster format. In addition, authors have the opportunity to display hardware, perform demonstrations, and conduct discussions with interested IMS attendees (see description for new S2P Competition).

Student Paper Competition: Eligible students are encouraged to submit papers for the Student Paper Competition. These papers will be reviewed in the same manner as all other contributed papers. First, second, and third prizes will be awarded based on content and presentation. To be considered for an award, the student must be a full-time student during the time the work was performed, be the lead author, and personally present the paper at IMS. During the submission process, the student is required to provide the email address of the faculty advisor, who will be asked upon the selection of the paper to certify that the work is primarily that of the student. Please refer to **www.ims-ieee.org** for full eligibility details.

Industry and Advanced Practice Paper Competitions: Eligible authors from industry are encouraged to submit papers for the Industry Paper Competition. Additionally, any author who submits a paper on advanced practices may be entered into the Advanced Practice Paper Competition. A paper on advanced practices describes an innovative RF/microwave design integration technique, process enhancement, and/or combination thereof that results in significant improvements in performance and/or in time to production for RF/microwave components, subsystems, or systems. The papers will be evaluated using the same standards as all contributed papers. Please refer to **www.ims-ieee.org** for details.

Notification: Authors will be notified of the decision by 1 February 2019 via the email address(es) provided with the initial paper submission. For accepted papers, an electronic version of the final manuscript (3 to 4 pages, to be published in the Symposium proceedings) along with a copyright assignment to the IEEE must be submitted by 1 March 2019. The submission instructions will also be provided through emails and can be accessed through the Symposium website. The Symposium proceedings will be recorded on electronic media and archived in IEEE Xplore.

Clearances: It is the authors' responsibility to obtain all required company and government clearances prior to submitting a paper. Authors are strongly urged not to wait until the last day to start the paper submission process. Those unfamiliar with the process may encounter paper formatting or clearance issues that may take time to resolve. A statement certified by the submitting author that such clearances have been obtained and a completed IEEE copyright form must accompany the manuscript of each accepted paper. Details regarding clearances will be available during the paper submission process.

Workshops, Short Courses, Focus and Special Sessions, Panel and Rump Sessions: Topics being considered for these areas include, but are not limited to, next-generation wireless systems (5G and beyond), emerging RF/microwave applications, latest technologies for RF/microwave measurements, and advances in RFIC technology. Please consult **www.ims-ieee.org** for a more detailed list of desired topics and instructions on how to prepare a proposal. Proposals must be received by 1 September 2018.

MicroApps and Industry Workshops: Microwave application seminars (MicroApps) continue as a forum on the exhibition floor for IMS exhibitors to present the technology and special capabilities behind their commercial products. In addition, the Industry workshops provide IMS exhibitors a unique opportunity to provide more in-depth presentations of technical topics to the attendees. Both events are open to all conference and exhibit attendees. Industry workshops require a nominal fee while MicroApps are free of charge.

IEEE T-MTT Special Issue: Authors of all papers presented at IMS2019 can submit an expanded version of their IMS papers to the Special Issue of the IEEE Transactions on Microwave Theory and Techniques (IEEE T-MTT) devoted to the IMS2019.

Student Design Competition: All eligible students or student teams are invited to consider taking part in the student design competitions (SDCs) during the IMS2019. This is the only IMS event in which students get to put theories into real hardware and software designs. Please refer to **www.ims-ieee.org** for full eligibility details, a list of IMS2019 SDCs, and the rules for each SDC.

Sixty-Second Presentation (S2P) Competition: aims to recognize interactive forum (poster) participants who can best highlight their technical concept in a compelling video of less than one minute. In order to be considered, interactive forum presenters must upload their video at the same time as their final paper submission. Winners will be determined by popular vote via an online rating system.

Three Minute Thesis (3MT®) Competition: is for eligible students and young professionals, who indicated upon submission of a paper their desire to enter the competition and whose paper is accepted for either oral or interactive forum presentation. The 3MT® contestants will make a presentation of three minutes or less, supported only by one static slide, in a language appropriate to a non-specialist audience.

TECHNICAL AREAS:

Microwave 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. **Time- and frequency-domain numerical techniques –** Finite-difference, finite-element, integral equation, and hybrid methods for RF, microwave, and THz applications.
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. **CAD algorithms and techniques –** Simulation, modeling, uncertainty quantification, and design optimization; circuit-, EM-, multi-physics-, and statistics-based, including surrogate modeling, space mapping, and model order reduction techniques.
5. **Microwave device modeling –** Active and passive, linear and nonlinear device and structure modeling (physical, empirical, and behavioral) including characterization, parameter extraction, and validation.
6. **RF nanotechnology and applications –** 1D-2D material-based technology and applications including but not limited to nanoparticles, nanophotonics, nanoplasmonics, and nano-optomechanics; nanoscale artificial materials; nanoscale metrology and imaging.
7. **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.

Passive Components

8. **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.
9. **Passive circuit elements –** Couplers, dividers/combiners, hybrids, resonators, and lumped-element approaches.
10. **Planar passive filters and multiplexers –** Planar passive filters and multiplexers including lumped elements, theoretical filter and multiplexer synthesis methods.
11. **Non-planar passive filters and multiplexers –** Resonators, filters and multiplexers based on dielectric, waveguide, coaxial, or other non-planar structures.
12. **Active, tunable, and integrated filters –** Integrated (on Si, LTCC, LCP, MCM-D, GaAs), active, and tunable filters.
13. **Microwave acoustic, ferrite, ferroelectric, and phase-change 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.
14. **MEMS components and technologies –** RF microelectromechanical and micromachined components and subsystems.

Active Components

15. **Semiconductor devices and monolithic ICs –** RF, microwave, and mm-wave devices and MMICs on III-V, silicon and other emerging technologies; MMIC manufacturing, reliability, failure analysis, yield, and cost.
16. **Signal generation techniques –** CW and pulsed oscillators, VCOs, DROs, YTOs, PLOs, and frequency synthesizers; applications of new devices, noise in oscillators, DDS techniques.
17. **RF modulators and frequency conversion circuits –** Nonlinear elements in microwave systems relating to signal modulation and frequency conversion, such as IQ modulators, mixers, frequency multipliers/dividers, and phase shifters.
18. **HF, VHF, and UHF technologies and applications –** Innovative approaches to RF theory and practice with demonstrated working hardware below 1 GHz.
19. **Power amplifier devices and circuits –** Advances in discrete and IC power amplifier devices and design techniques, demonstrating improved power, efficiency, and linearity for RF, microwave, and mm-wave signals.
20. **High power amplifiers –** High-power amplifier design, characterization, and behavioral modeling; linearization and pre-distortion techniques; power-combining techniques for SSPA and vacuum electronics from RF to mm-wave.
21. **Low-noise components and receivers –** LNA, detectors, devices, receivers, radiometers, models, and characterization methods for low-noise circuits and components.
22. A **mm-wave and THz devices and circuits –** Design and characterization of passive and active components and/or packaging in the mm-wave and THz regimes; novel chip-scale (i.e. probing) test and measurement techniques.
22. B **mm-wave and THz communication, imaging, and sensing systems –** Innovative mm-wave and THz systems for communication, imaging, and sensing applications composed of one or more integrated circuit components packaged and measured as a system (i.e. not probed).
23. **Microwave through THz photonics devices and systems –** 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.

Systems and Applications

24. **Mixed-mode and digital signal processing circuits and systems –** High-speed mixed-signal components, modules and subsystems, including ADC, DAC, and DDS technologies for transmission and electrical/optical interfaces, backplanes, MIMO, software-defined radio, and cognitive systems considering signal integrity, equalization, and other performance criteria.
25. **Packaging, interconnects, MCMs, and integration –** Dielectrics and substrates, components and subsystem packaging, assembly methods, inkjet printing, interconnects, multi-chip modules, wafer stacking, 3D interconnect, interconnect between heterogeneous materials, and packaging technologies with integrated cooling.
26. **3D printed RF and microwave components and systems –** Design, modeling, fabrication, and measurement of RF and microwave components, material characterization, and novel processes related to 3D printing or additive manufacturing techniques; innovative designs using additive manufacturing.
27. **Biological interaction and effects, and their applications –** Devices and components for biological measurements, therapeutic, and diagnostic applications; electromagnetic field interaction at molecular, cellular, and tissue levels; microwave characterization of biological materials and living systems; MRI and microwave imaging.
28. **Antenna arrays and integrated beam formers –** Technology advances combining theory and hardware implementation in the areas of array antennas, integrated beam formers, spatial power combining, phased arrays, retrodirective systems, T/R modules, and multiple-beam scanning.
29. **Radar and broadband communication systems –** Broadband and mm-wave communication systems for terrestrial, vehicular, satellite, and indoor applications; radar systems/sub-systems; UWB systems.
30. **Wireless and cellular communication systems –** Wireless and cellular system architectures; channel modeling; wireless transceiver systems; small form factor modules for wireless subsystems; highly integrated front ends and circuit architectures; satellite communications; shared and novel spectrum use; cognitive radios.
31. **Sensors and sensing systems –** Point sensors, wireless sensors, radar detection approaches, gas sensors, fluidic sensors, sensors for intelligent vehicle highway systems, non-destructive testing, remote sensing, nanosensors, advanced and novel concepts.
32. **RFID technologies –** RFID solution for the Internet of Things (IoT) including wearables, ultra-low-power communication, and sensing from purely chip-less operation to active tags and from HF to millimeter wave and THz domain.
33. **Applications of high-power microwave technology –** Energy-efficient systems and processes utilizing high-power microwave technology, multiphysics modeling of microwave heating systems, non-destructive evaluation/testing, and material property measurements.
34. **RF systems and instrumentation for healthcare applications –** Systems and instrumentation for biomedical applications; wireless sensors and systems, radars, and implantable and wearable devices for health monitoring and tele-medicine.
35. **Wireless power transmission –** Energy harvesting systems and applications, rectifier circuits, self-biased systems, combined data and power transfer systems.

Emerging Technologies and Applications

36. **Innovative systems and applications –** Emerging technologies and novel system concepts for RF/microwave applications such as Internet of Things (IoT), Internet of Space (IoS), wearable computing/communication systems, machine-to-machine (M2M) communication, intelligent transportation, smart cities, smart environment.
37. **5G technologies and architectures –** 5G enabling technologies including but not limited to beamforming, MIMO, massive MIMO; multiple radio access technologies (multi-RAT) systems; centralized and virtualized radio access networks (RAN), microwave and mm-wave links; waveform designs, modulation schemes, and full-duplex technologies.

JOIN US IN BOSTON FOR IMS2019 2-7 JUNE 2019

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Important Dates

- **1 September 2018** (Saturday)
  PROPOSAL SUBMISSION DEADLINE
  For workshops, short courses, focus and special sessions, panel and rump sessions.

- **5 December 2018** (Wednesday)
  PAPER SUBMISSION DEADLINE
  All submissions must be made electronically.

- **1 February 2019** (Friday)
  PAPER DISPOSITION
  Authors will be notified by email.

- **1 March 2019** (Friday)
  FINAL MANUSCRIPT SUBMISSION DEADLINE
  Manuscript and copyright of accepted papers.

- **24 April 2019** (Wednesday)
  WORKSHOP NOTES SUBMISSION DEADLINE
  Electronically upload both color and B&W versions of workshop notes to the Workshop Organizers.

- **2-7 June 2019**
  MICROWAVE WEEK
  IMS2019, RFIC 2019, ARFTG, and Exhibition

Steering Committee

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