Terahertz, RF, Millimeter, and Submillimeter-Wave Technology and Applications XIV (OE106)

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This conference brings together researchers and engineers from academia, industry, and government laboratories to explore and present work in the frequency range covering approximately less than 1 GHz (300 mm) to greater than 3 THz (100 ;m) as well as infrared including near, mid and far infrared. Papers on RF and millimeter and infrared technology including advances in wireless communications, radar, lidar, microwave and mm-wave photonics, metamaterials, antennas, phased array radar, modulation, security, monitoring, detection, imaging are encouraged. Papers in photonic-related fields including, but not limited to, radio over fiber (RoF) RF photonics including photonic generation of microwave signals, photonic processing of microwave signals, and photonic distribution of microwave signals and semiconductor (including Si, SiC, SOI, GaAs, GaN, InP, SiGe, diamond, graphene and other materials) RF, mm-wave and terahertz devices and related applications are also encouraged, as well as the hybrid photonic systems and applications. Terahertz (THz) technology deals with the generation and utilization of electromagnetic energy covering what is also known as the sub-millimeter wave region of the spectrum. In this region, which lies between the millimeter wave and far infrared spectral regions, materials exhibit properties that can be exploited to advantage for use over a broad range of important technologies and applications. Papers on terahertz photonics including photonic generation and detection of terahertz waves to/or infrared, THz to/or infrared lasers are also encouraged.

This conference includes low- to high-power sources, detectors, amplifiers, systems, including both photonic and electronic modulated sources, detectors, and systems as well as nanodevices, nanomaterials, nanotechnology, nanostructures, etc. At THz frequencies, the primary difficulty encountered by scientists and engineers working in this field is the lack of convenient and affordable sources and detectors of terahertz radiation, but this difficulty is gradually changing as new sources and improved detectors are being developed as the technology continues to mature and broaden. At RF and millimeter frequencies, more and more hybrid systems are being integrated with photonic devices that enhance the functions, specifications and stabilities tremendously compared to their traditional counterparts. The purpose of this conference is to gather scientists and engineers from a diverse set of disciplines, who are interested in either learning more about terahertz and sub-millimeter and millimeter wave and RF technology and related and coupled technologies, or who are contributing to the field through their own research, development, or manufacturing activities. This conference also includes hybrid technologies including, for example, microwave to Thz wearable devices of any type and form as well as microwave to THz communications and data links, artificial intelligence, machine learning virtual reality and augmented reality in microwave to THz, GHz, mm-wave, sub-mm-wave, microwave and IR imaging, etc.

Disciplines utilizing terahertz technology include physical chemistry (certain molecules or molecular segments exhibit strong resonances in the 10 cm-1 to 100 cm-1 spectral region), military, and homeland security (terahertz radiation can penetrate clothing and packing materials but is reflected by metals and other materials), biomedical technology (tissue exhibits reflection and absorption properties that change dramatically with tissue characteristics), medical and dental, secure short-distance wireless communications (atmospheric water content prevents terahertz radiation from traveling very far), astronomy (the cold background of the universe exhibits a peak in this spectral region), space communications (where the terahertz region is wide open for use) and other disciplines where new, yet-to-be-discovered applications will undoubtedly come forth. Since the low energy associated with terahertz radiation is expected to be no more harmful than infrared or microwave radiation, safety issues are not expected to limit the use of terahertz radiation at low-power levels.

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Papers on power supplies and electronic power conditioners and associated power protection systems including energy-efficient power supplies are also encouraged.

Papers are solicited in the following and related areas:

**TERAHERTZ SOURCES**
- solid-state sources, electron-beam sources, vacuum electronics sources, frequency mixers, frequency multipliers, parametric oscillators, hybrids, graphene, FET and HEMT sources, gas lasers, quantum cascade lasers and related sources, p-germanium sources, photoconductive switches, resonant tunneling diodes, backward wave oscillators
- novel stabilized photonic THz sources
- fabrication processes
- high bandwidth devices, structures, sources, detectors, sensors, etc.
- wearables
- systems and systems integration
- THz pulse-induced ferroelectric behavior in materials
- using THz to control quantum properties
- measuring nonlinear effects in matter due to THz radiation.

**RF, SUB-MILLIMETER-WAVE, AND MILLIMETER-WAVE SOURCES**
- power sources of all types in the range of 1 GHz to 300 GHz and 300 GHz and higher (i.e. from S-band to the higher end of the millimeter-wave frequencies and all of the sub-millimeter-wave frequency region)
- novel stabilized photonic RF, millimeter-wave, sub-millimeter-wave sources.

**DETECTORS AND SENSORS**
- bolometers and other thermal detectors, Schottky and other mixers, thermopiles, quantum devices, antenna integrated detectors, heterodyne detection techniques, hybrid detection, direct detection techniques
- transistor-based detectors including graphene, silicon, III-V, II-VI, nitride-based, etc.
- theoretical modeling
- novel detectors and sensors
- detector arrays.

**HIGH-POWER SOURCES, MODULES, AND SYSTEMS**
- THz, RF, millimeter-wave and sub-millimeter-wave high-power sources
- THz, RF, millimeter-wave and sub-millimeter-wave modules
- THz, RF, millimeter-wave and sub-millimeter-wave systems
- power supplies and support circuits, electronics, optoelectronics, systems.

**TERAHERTZ, IR, RF, MILLIMETER-WAVE, AND SUB-MILLIMETER-WAVE PASSIVE COMPONENTS**
- metamaterials, plasmonics, and artificial materials
- optics, lenses, gratings, waveguides, photonic crystal structures and metamaterials, couplers, wire guides, other components
- using graphene to control polarization of IR and THz waves.

**MATERIALS FOR THZ AND GHZ DEVICES**
- metamaterials, plasmonics, and artificial materials
- linear and nonlinear optical materials and devices
- organic and inorganic source and modulator materials and devices
- RF, millimeter-wave and sub-millimeter-wave materials, devices and fabrication processes
- THz and/or GHz material systems including devices, detectors and sensors
- silicon (Si)-based
- silicon carbide (SiC)-based
- silicon-on-insulator (SOI)-based
- gallium arsenide (GaAs)-based
- gallium nitride (GaN)-based
- indium phosphide (InP)-based
- silicon germanium (SiGe)-based
- quantum dot-(QD) based including for QDs for sensors, detectors and sources
- diamond-based
- graphene-based
- other-based.

**ENHANCEMENTS, IMPROVEMENTS AND ADVANCES IN RF, MILLIMETER-WAVE AND SUB-MILLIMETER WAVE GENERATION, MODULATION AND DETECTION**
- RF, millimeter-wave and sub-millimeter-wave integrated photonic devices
- RF, millimeter-wave and sub-millimeter-wave and photonic integration process development
- RF, millimeter-wave and sub-millimeter-wave performance characterization
- phased-array and single-element photonically-driven antennas
- phased-array and single-element antennas, systems, concepts, approaches
- low-Vt and wide-bandwidth modulators
- direct-driven millimeter-wave lasers and amplifiers
- millimeter-wave, sub-millimeter and THz photonic crystal devices and applications
- RF, millimeter-wave, sub-millimeter-wave and THz photonic up- and down-converters
- photonic phase locked loops
- RF, millimeter-wave, sub-millimeter-wave, and THz MMICs
- wearables
- RF, millimeter-wave, sub-millimeter-wave, high power solid-state and electronic vacuum devices.

**SIMULATIONS AND MODELING**
- simulations and/or modeling of RF devices, components, and/or systems
- simulations and/or modeling of millimeter-wave devices, components, and/or systems
- simulations and/or modeling of sub-millimeter-wave devices, components, and/or systems
- simulations and/or modeling of THz devices, components, and/or systems
- modeling of optical components, optical systems, imaging systems, wave propagation, modes, Gaussian beam characteristics, couplers, antennas, performance limitations, software designs
- artificial intelligence, machine learning, augmented reality, virtual reality.

**SPECTROSCOPY AND FREQUENCY METROLOGY**
- terahertz and/or sub-millimeter spectroscopy, DNA segment identification, cell abnormalities, cancer identification and screening, imaging, medical and dental detection
- infrared spectroscopy
- identification of biological and chemical detection and fingerprinting
- identification of hazardous, explosive, and/or dangerous materials
- identification of chemical or biological threats
- scalar and vector network analysis at sub-millimeter and terahertz frequencies
- measurement techniques at sub-millimeter, millimeter, and terahertz frequencies
- identification of organic and inorganic compounds using terahertz and/or sub-millimeter wave spectroscopy
- high-speed and/or high-resolution spectroscopic techniques, methods, approaches
- artificial intelligence, machine leaning, augmented reality, virtual reality, etc.
- novel approaches, systems, designs, techniques, reflection, sensitivity, applications.
BIOMEDICAL APPLICATIONS
- DNA identification, burn analysis, tissue abnormality identification, pharmaceutical, dentistry, medical, clinical, commercial applications
- cancer, burn, and/or water content detection; high sensitivity, high contrast, etc.
- biological and/or physiological aspects and/or related effects of RF, millimeter-wave, sub-millimeter-wave and/or THz
- artificial intelligence, machine learning, augmented reality, virtual reality, etc.
- imaging techniques, methods, hardware design, strategies, technologies and techniques.

COMMUNICATION AND SENSING SYSTEMS
- terahertz, RF, millimeter-wave and sub-millimeter-wave communications, media characteristics, wireless communications, inspection systems, detection systems, screening systems
- RF, millimeter, sub-millimeter-wave and microwave links
- RF, millimeter-wave, sub-millimeter-wave photonics communication and sensing systems
- Internet of things (IOT) sensors, detectors and communication interfaces, protocols and implementations including but not limited to wireless sensors and wireless communications.

IMAGING AND SECURITY
- RF imaging devices, components, and/or systems
- millimeter-wave imaging devices, components, and/or systems
- sub-millimeter-wave imaging devices, components, and/or systems
- THz imaging devices, components, and/or systems
- RF, millimeter-wave and sub-millimeter-wave active and passive imaging systems
- artificial intelligence, machine learning, augmented reality, virtual reality, etc.
- x-ray imaging including components, systems, power supplies, applications, techniques, etc.

ASTRONOMY, SPACE AND OTHER AREAS OF PHOTONICS, LIGHT, AND MATTER
- imaging techniques, ultra-sensitive detection, applications, programs
- artificial intelligence, machine learning, augmented reality, virtual reality, etc.
- satellite communications
- space based electronics and devices
- satellite components and systems
- space and satellite qualifications and testing
- radiation hard electronics
- high-energy physics and related topics
- fusion and related topics
- fission and related topics.

INNOVATIONS
- new or novel terahertz, RF, millimeter-wave and sub-millimeter, microwave concepts, systems, applications
- new or novel developments in THz or sub-millimeter waves including teaching, instruction, course offerings, simulations, conceptional and/or experimental procedures, implementations, concepts, etc.
- wearables, implantable, etc.

POWER SUPPLIES AND ELECTRONIC POWER CONDITIONERS
- high-power power supplies
- low- and ultra-low-power power supplies
- low-noise power supplies
- high- and ultra-efficient power supplies
- associated power protection systems
- energy-efficient power supplies
- novel designs and architectures
- specialized power electronics
- portable power supplies
- power supplies tailored for photonics and/or RF, mm-wave and/or THz applications
- power supplies for lighting applications including solid state lighting such as LEDs, OLEDs and quantum dots.

ORGANIC ELECTRONICS
- DC and low frequency
- high frequency
- novel designs and architectures
- passive and active addressable arrays
- low power
- modulated configurations
- sensing, detection, and/or emitting
- organic light-emitting diodes and associated electronics
- lighting therapy using solid state lighting including microLEDs, LEDs, OLEDs and quantum dots
- solid state lighting including microLEDs, OLEDs and quantum dots.

INFRARED DEVICES, COMMUNICATIONS, SOURCES, SENSORS, AND DETECTORS
- infrared amplifiers
- infrared imaging devices, components, and/or systems
- infrared sources devices, components, and/or systems
- infrared sensors, detectors and/or associated devices, components, and/or systems
- infrared communications devices, components, and/or systems
- infrared active and passive components and/or systems
- infrared advances including components, systems, power supplies, applications, techniques, etc.
- infrared applications
- wearables
- artificial intelligence, machine learning, augmented reality, and virtual reality.

SMALL SATELLITES
- systems
- components
- detectors
- sensors
- instrumentation
- communications
- concepts
- implementations.

ADDITIONAL MANUFACTURING AND 3D PRINTING
- additive manufacturing and/or 3D printing of for RF, microwaves, millimeter-waves, THz and/or infrared devices, systems, communications, etc.
- additive manufacturing and/or 3D printing of for electronics and materials
- 2D for electronics and/or materials for RF, microwaves, millimeter-waves, THz and/or infrared
- chip-level waveguides
- chip-level frequency comb generator
- nanotubes including graphene films for RF, microwaves, millimeter-waves, THz and/or infrared
- other quantum technologies, devices, and applications
- comb generators for use in electronics, RF, microwaves, millimeter-waves, THz, and/or infrared.

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<td>26 August 2020</td>
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<td>Acceptance Notification Sent to Contact Author</td>
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<td>Manuscripts Due (Conferences OE506, and OE801-OE803 Only)</td>
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