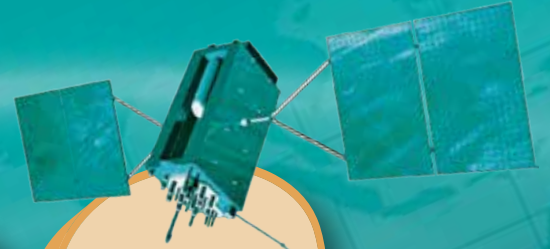




**ION**<sup>®</sup>  
INSTITUTE OF NAVIGATION



# GNSS+

The 32<sup>nd</sup>  
International  
Technical Meeting  
of the Satellite  
Division of  
The Institute  
of Navigation

**CALL FOR ABSTRACTS**

**September 16–20, 2019**  
Exhibit Hall: September 18 and 19  
Hyatt Regency Miami

**MIAMI** FLORIDA

**ABSTRACT  
DEADLINE:  
MARCH 1**

[www.ion.org/gnss](http://www.ion.org/gnss)

**Track A: Mass Market and Commercial Applications****Track Chair: Samantha Smearcheck, CAL Analytics, LLC****Applications of Raw GNSS Measurements from Smartphones**

Mobile phone manufacturers have begun to make available raw GNSS measurements, opening the door for improved positioning. With new techniques being developed to process these measurements, new and innovative applications are being realized. Emerging trends include the use of the dual frequencies and multi-constellation signals, and the integration of smartphones into unmanned air vehicles.

**Co-chairs:** Dr. Mohammed Khider, Google and Dr. Wouter Pelgrum, NextNav**Development of Indoor Positioning**

Techniques are being explored which leverage signals and features of opportunity to improve the accuracy, availability, and continuity of positioning information when operating indoors. These techniques are often applied to mobile devices and/or unmanned systems to enable indoor navigation, or to facilitate smooth transitions between indoor and outdoor navigation.

**Co-chairs:** Steve Malkos, Google and Dr. Ramsey Faragher, Focal Point Positioning, UK**GNSS Chipset Manufacturer Showcase**

The navigation community is eager to understand the current state of GNSS chipset technology, new capabilities that are being developed, and what application potential exists. Manufacturers are invited to showcase any aspect of their chipset. Presentations may be given directly by companies and/or a development partner.

**Chair:** Wei Cao, John Deere**Navigation in Urban Environments**

Navigation in urban environments poses many challenges. Techniques have been developed that address these challenges, many of which involve aspects of machine learning and/or autonomy to achieve accurate and reliable navigation. Ground- and air-based applications of these techniques exist, with an emphasis on unmanned platforms.

**Co-chairs:** Dr. Andrey Soloviev, QuNav and Dr. Li-Ta Hsu, Hong Kong Polytechnic University, Hong Kong**Panel: Machine Learning in Location**

Experts from academia, government, and industry will discuss how the increase in mobile device usage and location capabilities has expanded location databases and promoted the use of machine learning techniques. Panelists will discuss the many ways that machine learning techniques can help to improve location-based services, for both ground- and air-based applications, as well as outline challenges associated with using machine learning techniques for location-based applications.

**Co-chairs:** Dr. Frank van Diggelen, Google and Dr. Michael Veth, Veth Research Associates**Panel: The Spectrum of Autonomy in Navigation**

A wide spectrum of autonomy exists in navigation, from systems involving no aspects of autonomy to those that are fully autonomous. Considerations must be made to determine the appropriate level of autonomy for an application and how to balance that with human and other system interaction. Representatives from academia, government, and industry will discuss their thoughts on the spectrum of autonomy and the challenges associated with integrating autonomy into commercial and mass market applications.

**Organizer:** Dr. Andrew Hansen, US Department of Transportation**Track B: Current Status and Future Trends in GNSS****Track Chair: Dr. Di Qiu, Polaris Wireless, Inc.****Applications in Sectorial Policies**

Development of sectorial policies involving the use of satellite navigation technology; equipment mandates; timing for critical infrastructure; liability critical applications; digital tachograph for road tracking; maritime traffic tracking; monitoring of fishing zones; geofencing for UAV navigation; GNSS for emergency location; etc.

**Co-chairs:** Mitch Narins, Strategic Synergies and Paco Saliberto, Eurocontrol, Belgium**GNSS Applications in Space**

Space service volume; space-grade GNSS receivers; improving spacecraft positioning using inter-satellite links; satellite laser ranging; innovative solutions for constellation build-up and maintenance; use of GNSS for orbit and attitude determination as well as precise orbit determination; moon navigation; emerging space positioning applications. Advanced positioning techniques in space, such as snapshot-based positioning on ground and in space.

**Co-chairs:** Werner Enderle, European Space Agency, Germany and David Chelmins, NASA**GNSS Augmentation Systems and Integrity**

Development of integrity concepts and algorithms for multi-constellation GNSS users and receivers. Implications of GNSS integrity for automated navigation, including aviation, automotive, rail, maritime and other transportation applications. Integrity impact of GNSS faults (satellite and constellation failure modes) and external threats (spoofing). Monitoring, fault exclusion, and protection level algorithms and requirements for RAIM and ARAIM. Dissemination of integrity support information via high and low-capacity data channels. Status and evolution of existing GBAS and SBAS (WAAS, MSAS, EGNOS, GAGAN, SDCM, AGNOS, KASS).

**Co-chairs:** Dr. Jiwon Seo, Yonsei University, South Korea and Dr. Sam Pullen, Stanford University**Spectrum: Protection and Optimization**

Protection of GNSS RF (RNSS) bands through national and international policy and regulations. Effects of interference on the GNSS RF bands and risks of raising the noise floor. Effect of interference on safety critical applications. Interference detection, characterization, geolocation, and mitigation techniques. Effects of interference on GNSS receivers, receiver design trade-offs, acquisition and tracking performance and navigation integrity performance. Civilian anti-jam and anti-spoof technology, and spoof rejection. Optimization of spectrum usage for future navigation solutions. Usage of new frequency bands for navigation.

**Co-chairs:** James Miller, NASA and Dr. Sai Kalyanaraman, Rockwell Collins**Trends in Future Satellite Navigation Technology, System Design and Development**

New civil, military and governmental user capabilities and performance, including availability and accuracy improvement concepts. GNSS services including open and authorized services, search and rescue services, and commercial services; optimization of GNSS signal structure, codes and data message; concepts for interchangeability of GNSS constellations; concept of flexibility of future signals and service portfolios for global constellations; improvement and analysis of system performance; optimization of integration of future satellite navigation signals with other signals of opportunity; and complementarity and competition with ground based solutions.

**Co-chairs:** Boubeker Belabbas, German Aerospace Center (DLR), Germany and Dr. Takeyasu Sakai, Electronic Navigation Research Institute, Japan**Panel: Status of GPS, GLONASS, Galileo, BDS, QZSS and NavIC**

System overviews, summarize current or planned characteristics and performance, report recent programmatic events, updated schedules and plans, and summarize ongoing interactions with other service providers.

**Organizers:** Dr. John Betz, The MITRE Corporation and Dr. Minquan Lu, Tsinghua University, China

# GNSS+ Other Sensors in Today's Marketplace

Chair: Tim Murphy, Boeing Commercial Airplanes

## Track C: High Performance and Safety Critical Applications

Track Chair: Dr. Oscar Pozzobon, Qascom, Italy

### Authentication and Augmentation Services

Modernization of PPP techniques and provision of new products and services enhancing precision, integrity, robustness and trust. Use of emerging GNSS and SBAS authentication signals and services. Network-based techniques, integer ambiguity resolution, bandwidth efficient communication, and multi-GNSS/frequency solutions. Server/Network based services for authentication, integrity and precision. Use cases and applications highlighting the benefits and challenges of PPP solutions from a user perspective. Augmentation services for mobile applications. High-performance and safety critical applications using SBAS and GBAS.

**Co-chairs:** Dr. Ignacio Fernández Hernández, European Commission, Belgium and Dr. Gustavo López Risueño, European Space agency, The Netherlands

### Autonomous Applications

Advances in navigation for assisted and autonomous vehicle applications as well as mobile platforms. Evolution of artificial intelligence and machine learning for autonomous navigation. Emerging cyber threats and mitigations. Guided vehicle systems and pilot assistance with enhanced safety, availability and efficiency in challenging environments. Addressing of safety, navigation cybersecurity, integrity and certification requirements for autonomous navigation and guidance. Assistance and cloud based technologies for robust and trusted autonomous systems.

**Co-chairs:** Rod Bryant, u-blox AG, Australia and Mark Holbrow, Spirent Communications, UK

### Aviation and Aeronautics

Technologies to enhance safety, robustness and assurance and improve efficiency of air operations and space missions. Rockets and Autonomous Flight Termination System (AFTS). Adoption and impact assessment of modernized GNSS and SBAS, and use of new signal and services. Aircraft integration of GNSS technologies for civil aviation. Performance monitoring and alerting requirements. Future integrity, availability, accuracy and security requirements. Airborne GNSS and sensor integrations for current and novel applications.

**Co-chairs:** Dr. Alex Stratton, Rockwell Collins and Gerhard Berz, Eurocontrol, Belgium

### Land-Based Applications

Technologies to address safety aspects of land-based vehicle navigation. Sensor fusion, new algorithms, Artificial Intelligence and Machine Learning, GNSS augmentation and multi-GNSS system use to improve performance in accuracy, availability and reliability. Integration of 5G and LEO based positioning in land applications for enhanced assurance, integrity and robustness. Applications of GNSS authentication services in the road segment and railway. Advances in the dual frequency use of GNSS for land based applications.

**Co-chairs:** Livio Marradi, Thales Alenia Space, Italy and Lionel Ries, European Space Agency, The Netherlands

### Marine Applications and Search and Rescue

Concepts, innovation and applications in marine navigation (more accurate and safe position, resilient PNT, speed and heading, in particular when the vessel departs and arrives in port); autonomous vessels; managing vessel traffic; Safety of Life at Sea; buoy placement; underwater surveying; navigational hazard location and mapping; and activities such as fishing, oceanography and oil and gas exploitation. GNSS augmentations, terrestrial backup systems, marine standards and integration with other vessel sensors. Addressing of emerging safety, navigation cybersecurity, and integrity and certification requirements as well as impact of GNSS and SBAS evolutions.

**Co-chairs:** Fiammetta Diani, European GNSS Agency, Czech Republic and Dr. Lisa Mazzuca, NASA Search and Rescue

### Panel: Integrity and Cybersecurity: The Next Challenges for Safety Applications

Safety requirements and cybersecurity requirements to date are still considered separately. The panel discussion will focus on updates, practical scenarios and cases of integrity failures as well as spoofing, jamming and cyberattacks, impact that security requirements can have on safety and vice versa. Practical cases of non-intentional jamming and spoofing to safety critical applications, and considered results and mitigations. Impact of proposed GPS, Galileo and EGNOS authentication services to safety.

**Organizers:** Dr. Chris Wullems, Independent Consultant, Australia and Matt Harris, Boeing

## RESEARCH TRACKS

Program Co-chair

## Track D: Autonomous System Technology

Track Chair: Dr. Mathieu Joerges, The University of Arizona

### Connected and Collaborative Autonomy

Developments and techniques for exploiting network connectivity to assist and improve navigation. Multi-node collaborative signal processing and distributed state estimation and fault detection. Leveraging ground-based communications networks for autonomous navigation. Navigation of connected, automated vehicles. Vehicle-to-vehicle and vehicle-to-infrastructure communications for navigation and collision warning systems. ADS-B and alternative solutions for UAVs.

**Chair:** Dr. Nadezda Sokolova, Sintef, Norway

### Innovations for Robotic Vehicle Applications

Navigation technologies (sensors, signals of opportunity, vision, etc.) for autonomous air, land, marine, submarine or space robots. Emerging applications for unmanned, connected, autonomous and semi-autonomous systems. Navigation accuracy, integrity, continuity and availability requirements. Guidance and control algorithms. Techniques based on simultaneous location and mapping (SLAM) and its variants. Image based and terrain referenced navigation systems. Design of navigation algorithms and fusion architectures. Safety related aspects of autonomous vehicle operation.

**Co-chairs:** Laura Norman, NovAtel, Inc., Canada and Dr. David Bevil, Auburn University

### Navigation Using Environmental Features

New navigation techniques using natural and manmade features of the surrounding environment: visual features, terrain height signatures, magnetic and gravitational fields, celestial objects, spherics, stars, microclimate, acoustic features, odors and particulates, shadows, occlusions, signals of opportunity, and more. Feature extraction, identification, classification, and mapping methods. Multi-feature tracking and data association. Feature-based navigation performance analysis in terms of accuracy, availability, and robustness. Collaborative navigation using environmental features. Positioning algorithms using proximity, pattern matching.

**Co-chairs:** Kimia Shamaei, University of California, Riverside and Dr. Zhen Zhu, East Carolina University

### Technologies for GNSS-Denied Environments

Algorithms and methods for applications with LiDAR, optical sensors, IMUs, signals of opportunity, and other low cost sensors. Accuracy and integrity performance analysis. Calibration techniques, including for connected systems. Partial and redundant IMUs for enhanced navigation, guidance or control algorithms. Direct georeferencing, precision agriculture, guidance and control of vehicles, deformation monitoring, directional drilling, indoor positioning for first responders, pedestrian navigation systems, rapid mobile mapping, crowd-sourced mapping, and other novel applications.

**Co-chairs:** Dr. Laura Ruotsalainen, University of Helsinki/Finnish Geospatial Research Institute, Finland and Omar Garcia Crespiello, German Aerospace Center, (DLR), Germany

### UAV Navigation Technology and Algorithms

UAV-specific applications, requirements, and challenges. Requirements for absolute and relative position, velocity, and attitude information. Navigation performance analysis of GNSS (positioning and attitude with a multi-antenna system), GNSS/INS, and non-GNSS solutions. Anti-spoofing measures for UAVs. Map building for UAV operations. UAV safety, security, and risk assessment, including for damage to ground assets. Detect-and-avoid algorithms.

**Co-chairs:** Inchara Lakshminarayan, University of Minnesota and Dr. Cagatay Tanil, Illinois Institute of Technology

### Panel: Navigating Smart and Connected Cities

What is the future of navigation in smart and connected cities? What is the path towards overcoming the challenges of autonomous mass-transportation? Considering: Big Data, Networking, Human-Robot Interactions, Signals of Opportunity, Security and Privacy.

**Organizers:** Dr. Dorota Grejner-Brzezinska, The Ohio State University and Dr. Zak Kassas, University of California, Riverside

# ABSTRACTS DUE MARCH 1

Chair: Dr. Heidi Kuusniemi, University of Vaasa & Finnish Geospatial Research Institute, Finland

## Track E: Robust Multisensor Navigation

Track Chair: Dr. Daniele Borio, European Commission, JRC, Ispra, Italy

### Advanced Integrity Algorithms for Multisensor Navigation

New concepts in integrity monitoring for multi-constellation and multi-sensor navigation. Development of monitoring and fault exclusion algorithms, protection level derivation, and navigation requirement definition for RAIM and ARAIM. Integration of additional sensors, including IMU, odometers and cameras for fault detection and exclusion. Integrity of sensor fusion algorithms and potential implications of future GNSS integrity for automated navigation applications, including aviation, automotive, rail, and maritime transportation. **Co-chairs:** Juan Pablo Boyero, DG GROW, European Commission, Belgium and Dr. Todd Walter, Stanford University

### Aided GNSS and Sensor Fusion in Challenging Environments

Algorithms and methods for improved navigation and positioning with GNSS supported by additional sensors, RF signals and network services. Multisensor solutions with both high-end and low-cost sensors including smartphones, IoT and embedded devices. High-sensitivity GNSS receiver algorithms integrating Dead Reckoning (DR) devices such as cameras and IMUs. Integrated systems using signals of opportunity including communication signals such as LTE, 5G and digital TV. Applications including autonomous vehicles, drone navigation, indoor positioning for first responders, and pedestrian navigation. **Co-chairs:** Dr. Melania Susi, European Commission, JRC, Ispra, Italy and Dr. Juan Blanch, Stanford University

### GNSS Augmentation and Integrity

Augmentation of GNSS positioning in aviation, maritime, rail, automotive and other transportation applications (stand-alone or with additional ground infrastructure). Applications of augmentation systems to support autonomous navigation. Fault mode definition and monitoring. Integrity analysis for multi-constellation GNSS. Robustness of augmentation systems to signal degradation (ionospheric scintillations, multipath, spoofing, etc.). Exclusion techniques. Evaluation of continuity and availability. Dissemination of integrity support information via high and low capacity data channels from SBAS and GBAS. **Co-chairs:** Dr. Ciro Gioia, European Commission, JRC, Ispra, Italy and Dr. Martti Kirkko-Jaakkola, Finnish Geospatial Research Institute, Finland

### Interference Detection and Alternative PNT

Interference detection and mitigation, alternative PNT approaches in case of GNSS outages. Analysis of real-life data of interference and spoofing events; signal processing, hardware, and/or multisensor-based decision algorithms in case of divergent navigation solutions; techniques and algorithms for geo-locating interference and spoofing sources. **Co-chairs:** Alexander Rügamer, Fraunhofer IIS, Germany and Dr. Sherman Lo, Stanford University

### Remote Sensing, Timing and Clock Technology

GNSS and other techniques for remote sensing. Precision timing and clock technology. GNSS Earth observation techniques; radio occultation measurements of the troposphere and ionosphere; reflectometry for environmental remote sensing of land, ocean and ice; detection of natural hazards such as earthquakes, tsunamis, and volcanic eruptions. Technical advances of both COTS and specialized systems for space applications. GNSS meteorology and its applications; advances in precision timing; multi-GNSS or other multi-sensor approaches for timing and time transfer applications; development of GNSS timing services, robust time transfer approaches; reliability and sustainability of timing solutions, T-RAIM and multi-constellation GNSS time cross-verification; application of GNSS timing to finance, energy transfer, secure communications and computer networking. **Co-chairs:** Dr. Pascale Defraigne, Royal Observatory of Belgium, ORB, Belgium and Dr. Jihye Park, Oregon State University

### Panel: PNT Security and Robustness

Experts from academia, government and industry will discuss the different security threats to GNSS signal reception including jamming, spoofing and data forgery. Several strategies to toughen GNSS signal reception and improve PNT security will be analysed along with the different national and international initiatives currently under development for the protection of the GNSS ecosystem. New opportunities opened by technological advancements, such as the availability of raw measurements from smartphones and the possibility of multi-sensor PNT verification, will be discussed from the GNSS security prospective. **Organizers:** Dr. Oscar Pozzobon, Qascom, Italy and Logan Scott, LS Consulting

## Track F: Advanced GNSS

Track Chair: Dr. Sabrina Ugazio, Ohio University

### Atmospheric Science and Space Applications with GNSS

Tropospheric and ionospheric modeling, measurements and algorithms to compensate for atmospheric errors. Novel methods for data collection, processing and analysis. Characterization of propagation environments. Ionospheric scintillation studies and impact on GNSS services and applications. Space weather and terrestrial weather applications. New ground-based and space-based GNSS networks and experiments. GNSS data assimilation methods for scientific investigations of the atmosphere. Novel applications of GNSS-based atmospheric observations. **Co-chairs:** Dr. Attila Komjathy, NASA JPL and Dr. Lucilla Alfonsi, INGV, Italy

### GNSS Signal Processing in Degraded Environments

Receiver-based algorithms and techniques to improve the resilience of GNSS PNT against radio interference and degraded environments. Characterization and mitigation of interference, jammers or spoofers. Multipath modeling and mitigation, characterization and mitigation of NLOS, scintillation, high dynamic conditions and other effects such as near-far effects from pseudolites. (Emphasis on GNSS techniques rather than multi-sensor methods.) **Co-chairs:** Dr. Pau Closas, Northeastern University and Dr. Emanuela Falletti, Istituto Superiore Mario Boella, Italy

### Low-Cost High Precision GNSS Positioning

New algorithms and methods to support high precision applications using low-cost GNSS receivers and systems. New research results to address fundamental and essential issues unique to low-cost GNSS positioning and mass-market applications, such as signal processing techniques for quality carrier phase measurements, bias identification and mitigation, new corrections and service strategies, new user positioning models and algorithms, multi-GNSS systems (GPS, GLONASS, Galileo, BeiDou), quality control algorithms, fast convergence and ambiguity resolution with global PPP and PPP-RTK in wide areas. New algorithms and methods for integration of GNSS positioning with other low-cost navigation sensors, to enhance the availability and robustness of low-cost high precision GNSS systems in challenging environments. **Co-chairs:** Dr. Yang Gao, University of Calgary, Canada and Dr. Junesol Song, ENAC, France

### Next Generation RF, Antenna Techniques, and Receiver Processing

Developments in the design and practical implementation of GNSS receivers using the latest RF, antenna and digital signal processing technologies. Front-end architectures and design considerations, bandwidth and filter selections, improved methods and algorithms for acquisition, tracking and data demodulation (high-sensitivity, robustness to multipath, robustness to NLOS, use of assistance, robust carrier phase tracking). Recent advances in (hardware or software-defined) GNSS receivers processing methods. Multi-constellation, multi-frequency receivers. New and/or modernized GNSS signals tracking, advanced estimators and filters, vector-based implementations, assisted processing, low C/N0 signal acquisition and tracking. Processing efficiency, computational load, reliability. Use of software radio standards and tools. **Co-chairs:** Dr. Dennis Akos, University of Colorado Boulder and Dr. Kuangmin Li, Samsung Semiconductor Inc.

### Scientific Uses of Raw GNSS Measurements from Smartphones

Smartphones as grid of sensors to exploit GNSS measurements for scientific applications; ionosphere monitoring; troposphere water vapor mapping; smart city's applications; base station deployment; interference and spoofing detection/source localization; multipath mapping and shadow matching; signal monitoring. **Co-chairs:** Dr. Pai Wang, University of Colorado Boulder and Dr. Fabio Dovis, Politecnico di Torino, Italy

### Panel: GNSS Challenges and Unsolved Problems

What are the challenges for GNSS and which problems are waiting to be solved? **Organizers:** Dr. Christoph Günther, German Aerospace Center (DLR), Germany and Dr. John Raquet, Air Force Institute of Technology

# ABSTRACT SUBMISSION REQUIREMENTS



## ION GNSS+2019

GNSS + Other Sensors in Today's Marketplace

SEPTEMBER 16-20, 2019

### TECHNICAL COMMITTEE

#### Satellite Division Chair

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Tim Murphy, Boeing Commercial Airplanes

Dr. Heidi Kuusniemi, University of Vaasa & Finnish Geospatial Research Institute, Finland

#### Technical Chairs

##### Commercial and Policy Tracks

Dr. Oscar Pozzobon, Qascom, Italy

Dr. Di Qiu, Polaris Wireless, Inc.

Samantha Smearcheck, Johns Hopkins University - Applied Physics Laboratory

##### Research Tracks

Dr. Daniele Borio, European Commission, JRC, Ispra, Italy

Dr. Mathieu Joergler, The University of Arizona

Dr. Sabrina Ugazio, Ohio University

#### Tutorials Chair

Dr. John Raquet, Air Force Institute of Technology

#### Plenary Session Chair

Patricia Doherty, Boston College

Review the submission and publication requirements below and note different requirements based on different tracks.

To submit an abstract, sign into the ION Abstract Management Portal (AMP) at [www.ion.org/abstracts](http://www.ion.org/abstracts). If you have not used AMP before, click "Create My Account." Once signed in, click on "ION GNSS+" and complete the form.

Abstracts should be submitted electronically via AMP no later than **March 1**.

### COMMERCIAL AND POLICY TRACKS

**Content:** Abstracts should describe objectives, anticipated or actual results, conclusions, any key innovative steps and the significance of your work.

**Acceptance:** Acceptance to the ION GNSS+ conference is competitive. Speakers will be notified of acceptance after April 22 and will be provided with an electronic presentation kit with presentation and publication guidelines. All authors attending are required to pay registration fees.

**Proceedings Publication:** Presentations submitted through AMP by September 30 will be included in the proceedings. A full technical paper is optional and may be published on a voluntary basis. Presentations not representative of the original abstract submitted will NOT be included in the conference proceedings, regardless of whether or not they were presented at the conference, and may affect the acceptance of future abstracts. Papers submitted in these tracks are not eligible for peer review.

### RESEARCH TRACKS

**Content:** Extended abstracts (500-2500 words) are required. Abstracts should describe objectives, anticipated or actual results, conclusions, key innovative steps and the significance of your work. Abstracts not meeting the 500 word minimum shall not be forwarded to the program committee for review.

**Peer Review Option:** Authors whose abstracts are accepted in these sessions (either as a primary or as an alternate presenter) will have the option to have their paper peer reviewed. Peer reviews will be accomplished by reviewers and supervised by a committee. To be eligible for peer review:

- completed manuscript must be uploaded to AMP by June 30
- manuscript must pass initial peer review (note that there will be no secondary reviews)
- one of the authors must be present at the conference and prepared to present the paper

**Acceptance:** Acceptance to the ION GNSS+ conference is competitive. Speakers will be notified of acceptance after April 22 and will be provided with an electronic presentation kit with presentation and publication guidelines. All authors attending are required to pay registration fees.

**Proceedings Publication:** Papers meeting all the peer review requirements will be designated as "peer reviewed" in the conference proceedings. Papers not meeting the peer review requirements will be published in the proceedings without the peer reviewed designation. Manuscripts not representative of the original abstract submitted will NOT be presented or included in the conference proceedings. While final manuscripts are required for peer-review by June 30, corrected/updated manuscripts will be accepted through September 30.

## CONFERENCE INFORMATION

### REGISTRATION INFORMATION

Register online: Go to [www.ion.org/gnss](http://www.ion.org/gnss) (available summer 2019).

Full registration includes all technical sessions, access to the exhibit hall, ION meal functions and events, and proceedings. Individual registration benefits are non-transferable.

### REGISTRATION RATES

For attendees staying at an official conference hotel, and claiming hotel discount:

- Member: \$980; after August 16, \$1,180
- Non-member: \$1,060; after August 16, \$1,260
- Single day: \$460 (does not include proceedings); after August 16, \$660
- Student: \$600 (includes meals in exhibit hall, excludes awards luncheon); after August 16, \$800

### HOTEL RESERVATIONS

For easy online hotel reservations: Go to [www.ion.org/gnss/hotel.cfm](http://www.ion.org/gnss/hotel.cfm) for a list of hotels, rates, and a map. Click the "reserve now" button and follow the directions. You will receive an immediate online confirmation.

Remember, make your hotel reservation (and provide your hotel confirmation number when registering) by August 16 to get the discounted ION GNSS+ conference rates!

All technical sessions will be held at the Hyatt Regency Miami.

### EXHIBITOR INFORMATION

The ION GNSS+ conference is the largest GNSS-related trade show in the world! For exhibit information, contact Ken Esthus, ION National Office via phone at 703-366-2723, fax at 703-366-2724, or via email at [kesthus@ion.org](mailto:kesthus@ion.org). You can also visit [www.ion.org](http://www.ion.org).

### INTERNATIONAL PARTICIPANTS

We recommend that you apply for a visa at least three months in advance. Travelers from all visa waiver program countries must present either a machine-readable passport or a U.S. Visa. For general information about visas go to <http://www.nationalacademies.org/visas/>

Conference attendees requesting a visa letter to attend a conference must:

- 1) Submit the visa letter request form located at [www.ion.org/gnss](http://www.ion.org/gnss); and
- 2) Register and pay the conference registration fees before a letter of invitation will be sent. Exemptions to this policy apply only to those authors whose papers have been accepted for presentation, company personnel working in the exhibit area or trade associated press.

### STUDENT PAPER AWARDS

Student paper awards will be awarded on a competitive basis. Papers submitted by February 1 will be reviewed for technical content, clarity and presentation by a selection committee. The primary student author of each paper selected for presentation will receive a travel expense stipend, conference registration and publication of the selected paper in the ION GNSS+ proceedings. For information on eligibility and deadlines, please visit [www.ion.org/governance/student-paper-awards.cfm](http://www.ion.org/governance/student-paper-awards.cfm)

### JOURNAL PUBLICATION

Outstanding technical papers are reviewed for possible publication in the ION's archival journal *NAVIGATION*. *NAVIGATION* is indexed in the Thomson Reuters Science Citation Index Expanded (also known as SciSearch®), Thomson Reuters Journal Citation Reports/Science Edition, and Thomson Reuters Current Contents®/Engineering Computing and Technology. As of 2016, *NAVIGATION* has a 1.6 Journal Impact Factor (JIF).

For updated conference information, see [www.ion.org/gnss](http://www.ion.org/gnss)



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*GNSS + Other Sensors in Today's Marketplace*

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The 32nd International Technical Meeting of the Satellite Division of The Institute of Navigation

*GNSS + Other Sensors in Today's Marketplace*



**September 16-20, 2019**

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