

# ION GNSS+2026

GNSS + Other Sensors in Today's Marketplace

SEPTEMBER 14-18, 2026

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## NEW! ABSTRACT SUBMISSION REQUIREMENTS

ABSTRACT SUBMISSION/PUBLICATION REQUIREMENTS HAVE CHANGED

Read carefully to understand how new requirements impact your submissions.

### ABSTRACT SUBMISSION/PUBLICATION REQUIREMENTS

**Submission:** Sign into the ION Abstract Management Portal (AMP) at [ion.org/abstracts](http://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. All abstracts should be submitted electronically via AMP no later than March 3. Authors will be given the option at the point of abstract submission to submit for either in-person presentation, with pre-recorded video presentation for on-demand viewers; or on-demand, pre-recorded presentation video only. No live-stream remote presentation option will be offered.

**Content:** Abstracts should describe objectives, anticipated or actual results, conclusions, key innovative steps, and the significance of your work. Acceptance is competitive and averages a 50% acceptance rate. Extended abstracts (500-2500 words) are highly recommended.

**Acceptance:** Speakers will be notified of acceptance/rejection after April 21 and will be provided with an electronic presentation kit with presentation and publication guidelines.

**Peer Review:** Peer reviews will be accomplished by a minimum of two qualified reviewers, and supervised by a committee. Papers will only be peer reviewed one time (there will be no secondary reviews). While final manuscripts are required for peer-review by June 30, corrected/updated manuscripts will be accepted through September 25.

- Research Track (peer review required): Papers will be required to pass peer review in all Research Track sessions. Authors whose abstracts have been accepted will be required to submit completed paper to AMP for peer review by June 30.
- **NEW THIS YEAR: Papers not received for, or failing peer review, will be withdrawn from the conference.**
- Commercial Track (peer review optional): Peer review is optional. Authors desiring peer review must submit papers to AMP for peer review by June 30. Only papers that pass peer review will be published in the official conference proceedings.

#### Author Presentation Requirements (in-person and on-demand):

- Authors presenting in the Research Track must submit completed papers to AMP for peer review by June 30 and pass peer review. The papers must be available to meeting attendees in AMP to be eligible for ION Best Presentation Awards.
- A pre-recorded video presentation will be required of all presenters. The pre-recorded video presentation and Media Authorization License Form, must be submitted to AMP by September 4 to be eligible for ION Best Presentation Awards.
- Authors must pay registration fees.
- Authors presenting as part of the in-person program (both primary and alternate) are required to attend the Speakers' Breakfast the morning of their presentation.

Failure to meet any of these requirements may result in the cancellation of your paper from the program.

**Proceedings Publication:** Only papers passing peer review will be included in the technical conference proceedings. Presentations (typically the slides used for presentation), or papers presented in the Commercial Track that were not peer reviewed but submitted through AMP by September 25, will be included in the supplemental material that accompanies the conference proceedings provided to registrants. Manuscripts not representative of the original abstract submitted, or manuscripts not presented for any reason, will NOT be included in the conference proceedings.



## ION GNSS+ 2026

GNSS + Other Sensors in Today's Marketplace

Abstracts Due March 3

Non-profit  
U.S. Postage  
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Permit No. 425  
Southern, MD



# ION GNSS+ 2026

SEPTEMBER 14-18, 2026  
HYATT REGENCY GRAND CYPRESS  
ORLANDO, FLORIDA  
[WWW.ION.ORG/GNSS](http://WWW.ION.ORG/GNSS)



## CONFERENCE INFORMATION

### CONFERENCE LOCATION

All ION GNSS+ conference functions will take place at the Hyatt Regency Grand Cypress, located at 1 Grand Cypress Blvd., Orlando, FL 32836.

### REGISTRATION INFORMATION

Full registration includes access to technical sessions, the exhibit hall, conference meal functions and events, on-demand conference content, and conference proceedings. Individual registration benefits are non-transferable. Register online at [ion.org/gnss](http://ion.org/gnss) beginning in Summer 2026.

| REGISTRATION RATES | In-Person*        |               | On-Demand Access Only |               |
|--------------------|-------------------|---------------|-----------------------|---------------|
|                    | On/Before Aug. 14 | After Aug. 14 | On/Before Aug. 14     | After Aug. 14 |
| Full, ION Member   | \$1,100           | \$1,300       | \$699                 | \$899         |
| Full, Non-Member   | \$1,180           | \$1,380       | \$779                 | \$979         |
| Single Day         | \$600             | \$700         | N/A                   | N/A           |
| Student            | \$700             | \$800         | \$499                 | \$699         |

\*For attendees staying at an official conference hotel, and claiming hotel discount. If not staying in at the Hyatt Regency Grand Cypress, add \$300 to the above fees.

### HOTEL RESERVATIONS

For hotel rates and reservations, go to [ion.org/gnss/hotel.cfm](http://ion.org/gnss/hotel.cfm). Click the "reserve now" button and follow the directions to reserve your room. You will receive an immediate online confirmation. Remember to make your hotel reservation (and provide your hotel confirmation number when registering) by August 14 to get the discounted ION GNSS+ conference rates!

### EXHIBITOR INFORMATION

The ION GNSS+ conference is the largest GNSS-related trade show in the world! For exhibit information, email [mandrews@ion.org](mailto:mandrews@ion.org). You can also visit [ion.org/gnss](http://ion.org/gnss).

September 14-18, 2026  
Short Courses: Sept. 14 • Tutorials: Sept. 15 • Exhibit Hall: Sept. 16-17

### 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 request form located at [ion.org/gnss](http://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

**NEW:** Submission deadlines have now been aligned with the conference deadlines, including abstract and full manuscript submission. Faculty and industry co-authors are now acceptable. An ION GNSS+ Student Paper Competition Form, signed by the student's faculty advisor, must be received by June 30. One entry will be accepted from each accredited academic institution. For further information and eligibility, visit [ion.org/governance/student-paper-awards.cfm](http://ion.org/governance/student-paper-awards.cfm)

### JOURNAL PUBLICATION

Outstanding technical papers are reviewed for possible publication in the ION's open access archival journal, *NAVIGATION: Journal of the Institute of Navigation*. *NAVIGATION* is indexed and abstracted in the Advanced Technologies & Aerospace Database (ProQuest), COMPENDEX (Elsevier), Current Contents: Engineering, Computing & Technology (Clarivate Analytics), Earth, Atmospheric & Aquatic Science Database (ProQuest), Electrical & Electronics Abstracts (IET), Google Scholar, Inspec (IET), Materials Science & Engineering Database (ProQuest), Natural Science Collection (ProQuest), Science Citation Index Expanded (Clarivate Analytics), SciTech Premium Collection (ProQuest), SCOPUS (Elsevier), Technology Collection (ProQuest), and Web of Science (Clarivate Analytics). As of 2023, it has a 3.1 Journal Impact Factor (JIF). For more information, visit [www.ion.org/publications/arc.cfm](http://www.ion.org/publications/arc.cfm).

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

# ION GNSS+ 2026

The 39<sup>th</sup> International Technical Meeting of the Satellite Division of the Institute of Navigation



DISCOVER

NETWORK

COLLABORATE

IN-PERSON and ON-DEMAND

CALL FOR ABSTRACTS ABSTRACTS DUE MARCH 3, 2026

# COMMERCIAL AND POLICY TRACKS – Program Co-chair: Dr. Andrew Neish, Reliable Robotics

## TRACK A: Mass-Market Applications

Track Chair: Dr. Joy Jiao, Trimble

### High Accuracy Positioning and Correction for Mass Market Devices

Methods and technologies enabling precise positioning on consumer platforms such as smartphones, wearables, and IoT devices. Utilization of correction services, such as PPP, RTK, PPP-RTK and SBAS, via broadband, 5G, satellite links, or other emerging approaches to improve positioning accuracy, reliability, and integrity for mass-market users. Algorithms for error modeling, bias estimation, real-time correction, as well as multi-constellation and multi-frequency processing techniques suitable for mass market devices. Strategies to overcome limitations in hardware, antenna design, and power constraints.

**Chairs:** Dr. Alain Geiger, ETHZ and Xifeng Wen, Fugro

### Indoor Navigation

Advances in technologies and algorithms enabling reliable positioning and navigation within indoor environments where GNSS signals are limited or unavailable. Utilization of alternative signals such as Wi-Fi, Bluetooth, UWB, 5G, and RFID, as well as sensor fusion technologies using data from cameras, inertial sensors, LiDAR/RADAR, etc. Development of mathematical or machine learning methods for mapping, environmental modeling, and adaptive indoor navigation.

**Chairs:** Dr. Li-Ta Hsu, The Hong Kong Polytechnic University and Dr. Christian Gentner, German Aerospace Center (DLR)

### Latest Advancement from GNSS Receiver and Localization Algorithm Manufacturers (10-Minute Presentations)

Brief technical updates showcasing recent innovations in GNSS receivers, localization algorithms, and related technologies. Highlights in hardware design, signal processing, and system integration. Developments in multi-constellation, multi-frequency, and multi-sensor solutions. A concise overview of state-of-the-art commercial progress shaping the future of PNT.

**Chairs:** Zhenlan Cheng, u-Blox and Jason Kun, Applanix

### Navigation in Challenging Environment with Mass Market Devices, Smartphones, and Wearables

Techniques and applications for achieving accurate and reliable positioning using consumer-grade devices in difficult environments such as urban canyons, indoors, and under foliage. Utilization of GNSS, Wi-Fi, Bluetooth, 5G, and other signals of opportunity to enhance localization. Algorithms for sensor fusion leveraging inertial, barometric, magnetic, and vision-based inputs from smartphones and wearables. Approaches for mitigating multipath, interference, and non-line-of-sight conditions. Use of machine learning, cooperative navigation, and networked data to improve positioning accuracy and robustness in challenging environments.

**Chair:** Dr. Esther Anyaegbu, Spirent and Dr. Kirsten Strandjord, University of Minnesota

### Navigation and Positioning Using AI

Application of artificial intelligence and machine learning methods to improve positioning accuracy, reliability, and adaptability across diverse environments. Use of deep learning, reinforcement learning, and interpretable AI for modeling navigation signals and sensor data. Development of hybrid systems combining AI with traditional estimation and filtering techniques. Integration of multi-sensor and multi-constellation data through AI-driven fusion strategies, such as those exploring foundation models and multi-modal architectures using heterogeneous data sources. Approaches leveraging crowd-sourced and contextual data for navigation. Exploration of new architectures, algorithms, and frameworks that bring robustness, scalability, and efficiency to AI-based navigation solutions

**Chairs:** Dr. Adyasha Mohanty, Harvey Mudd College and Dong-Kyeong Lee, Qualcomm

**PANEL: AI/ML in PNT: Opportunities, Challenges and Future Trends**  
AI and ML are transforming PNT through jamming/spoofing management, sensor fusion, or GNSS-denied navigation. This panel brings together experts to discuss the opportunities and challenges of deploying data-driven methods, and foster a dialogue on robustness, generalization, integrity, explainability and certification, to ensure trustworthy, resilient, and intelligent next-generation PNT systems.

**Moderator:** Dr. Juliette Marais, University Gustave Eiffel

### PANEL: Trends in Cybersecurity and PNT

Exploring the intersection between the broad fields of cybersecurity and PNT by presenting questions like: "How do we secure PNT and/or assure location-based privacy as cloud computing, universal connectivity, pervasive low-cost devices such as wearables, and geolocated IoT devices continue to proliferate?" Embedded PNT can create cyber vulnerabilities within a system, but on the flip side, "Can PNT, properly managed, improve a system's cyber security posture?" On both sides of the conversation, challenges like AI, autonomy, privacy, and enterprise management are changing the dialogue.

**Moderators:** Dr. Joe Rushanan, The MITRE Corporation and Renee Yazdi, Canyon Consulting

## TRACK B: Transportation

Track Chair: Dr. María Caamaño Albuerne, German Aerospace Center (DLR)

### AI and Machine Learning for GNSS Signal Processing, Error Modeling, and Threat Detection

The application of AI and ML techniques to advance sensors and GNSS signal processing, error modeling, and threat detection with a clear focus on integrity assurance and certification readiness. AI/ML algorithms for signal acquisition and tracking, error characterization (including ionospheric and tropospheric effects), multipath and interference mitigation, and real-time anomaly and spoofing detection. The development of approaches that are not only innovative, but also robust, reliable, and suitable for certification in safety critical applications. The session aims to bridge the gap between theoretical and operationally deployable solutions for resilient GNSS systems.

**Chairs:** Dr. Nadezda Sokolova, SINTEF Digital and Dr. Simona Circiu, European Space Agency (ESA)

### Applications Using Communication Technologies, Opportunistic Signals, or Collaborative Positioning

Concepts, innovation, and emerging solutions integrating GNSS, PNT and communication technologies. Synergies and holistic approaches to communication and navigation technologies. Innovations in satellite constellation design for navigation and integrated communication/navigation. Uses of new signals, services and multi-constellation systems, including LEO constellations. Relative and cooperative positioning. Short range and cellular positioning and combinations with GNSS and other sensors. Synergies with V2V and V2X technologies. Autonomous accuracy, integrity, continuity, and availability performance and requirements to guarantee robust and resilient PNT with communications solutions.

**Chairs:** Dr. Ramsey Faragher, Royal Institute of Navigation and Dr. Michael Angermann, Google

### Aviation, Aeronautics, and Uncrewed Aerial Applications

Technologies to enhance safety, robustness, assurance, and efficiency of airborne operations and space missions. Integration of GNSS technologies for aviation, rockets, and remotely piloted or unmanned aircraft systems. Airborne GNSS and sensor integration for current and novel applications, including VTOL operations. Adoption and impact assessment of modernized GNSS, SBAS, GBAS and ARAIM. Robustness of augmentation systems to signal degradation, including ionospheric scintillation, multipath, jamming, and spoofing. Navaid modernization and spectrum optimization (e.g., VOR, DME, LDACS). Requirements for onboard performance monitoring and alerting. Advancing integrity, availability, accuracy, continuity, and security requirements. Navigation challenges with integrated low-altitude, air and space traffic.

**Chairs:** Esther Delgado Pinedo, Eurocontrol and Daniel Gerbeth, German Aerospace Center (DLR)

### GNSS Modernization and Market Trends: From Aviation, Railway, and Maritime to Urban Air Mobility and Autonomous Systems

The ongoing modernization of positioning solutions and the evolving market trends driving their adoption across safety-critical and emerging applications. Advancements in solutions' design (including algorithms, infrastructure, communications, etc.), evolution of services, standardization, and certification processes that enable GNSS integration in Sol. domains such as aviation, railway, and maritime. The challenges and opportunities of extending GNSS reliability and integrity to fast-growing sectors such as autonomous driving, smart mobility, agriculture, and urban air mobility, where robust navigation solutions are essential for safe and scalable deployment.

**Chairs:** Matt Harris, Reliable Robotics and Irma Rodríguez Pérez, GMV

### High-Precision GNSS Positioning with Integrity

Advancements in high-precision GNSS positioning, encompassing topics such as carrier-phase ambiguity resolution, integrity monitoring, and the integration of multi-constellation and multi-frequency signals. Challenges and solutions pertinent to achieving centimeter-level accuracy and ensuring the reliability required for Safety-of-Life (SoL) applications.

**Chairs:** Dr. Sunil Bisnath, York University and Rebecca Wang, Stanford University

### PANEL: Aviation PNT Risks and Resilience: Experience from the Cockpit

GPS interference has become a persistent operational reality, prompting new technologies and procedures, yet their effectiveness and long-term adequacy remain open questions. Industry, operators, research, and academia will explore how real-world pilot experience can inform more robust, system-wide resilience strategies against evolving GNSS disruptions.

**Moderators:** Bulent Attas, Turkish Airlines and Dr. Michael Felix, ZHAW

### PANEL: Complementary PNT: Flight Plan for the Future

Aviation depends on GNSS, but it is increasingly under threat. DME and inertial are already available as backups, but newer technologies offer more promise. What is the flight plan to the future for alternative and complementary position and navigation for aviation?

**Moderator:** Ellen McGaughy, Collins Aerospace

## TRACK C: Secure Constellations

Track Chair: Stefan Wallner, European Space Agency

### Fielding Alternative Technologies in GNSS-Denied Environments

New methods, systems, and results from navigation systems that do not rely on GNSS. Robust and precise inertial navigation. Use of communication signals for navigation, fused PNT, antenna technology. Visual navigation. LiDAR, Terrain matching. Solar and celestial navigation. Alternative PNT. Sensor fusion. DMEs, Opportunistic signals.

**Chairs:** Nunzio Gambale, Locata and Dr. Samer Khanafseh, Illinois Institute of Technology

### Future Augmentation Systems, Correction Services, and Integrity

Enhanced precision integrity, robustness and trust for safety critical and autonomous needs. Integer ambiguity resolution, bandwidth efficient communication, meta signal processing, multi-GNSS/frequency solutions, and resilient integrity solutions. Integrity for PPP, PPP-RTK and RTK positioning. High performance and safety critical applications using SBAS, GBAS, H-ARAIM and V-ARAIM. Integrity algorithm at system and user level. Navigation systems for assisted and autonomous vehicles and mobile platforms. Integrity monitoring for safety critical applications using GNSS and additional sensors. Innovative integrity algorithms. Status evolution of correction services and SBAS.

**Chairs:** Dr. Adria Rovira, Universitat Politècnica Catalunya (UPC) and Dr. Santiago Perea, European Space Agency

### Navigation Resilience to Interference and Cyber-Attacks

Detection and mitigation methods for interference and spoofing events at all levels of the navigation system and user segment. Classification and characterization of jamming, interference and spoofing. Mitigations applied at: the antenna or multi-element antenna; the GNSS receiver (including analogue and digital signal processing and authentication schemes at data and ranging level); and at the downstream navigation applications, including further integration with complementary sensors (independent stable clocks, altimetry, speed, IRS, etc.).

**Chairs:** Emilio Pérez Marcos, German Aerospace Center (DLR) and Gerhard Berz, Eurocontrol

### Precise, Secure Timing and Time Transfer

Advances in Timing service creation, dissemination, resiliency, security and monitoring. GNSS-based and alternative timing services. Time transfer and security using quantum methods. Algorithms for timescale generation and time synchronization. Advancement and utilization of time transfer techniques including White Rabbit, ELSTAB, and others. Fiber and free-space optical time distribution. Robust timing backbone networks. Resilient and traceable infrastructures and emerging applications in telecommunications, energy, finance, and data centers.

**Chairs:** Stephen Mitchell, Johns Hopkins /APL and Dr. Laura Agazzi, German Aerospace Center (DLR)

### Safety Assurance of AI-Enhanced PNT Systems for Autonomous Platforms

Integration of AI in safety-critical navigation systems. AI techniques for security and robustness. Monitoring and control of AI. AI governance and policy. AI in navigation signal processing, PVT estimation, and sensor fusion. PNT fault monitoring and anomaly detection using AI. ML-based estimation with AI. Human oversight. Data security. Risk assessment.

**Chairs:** Dr. Jason Rife, Tufts University and Dr. Ilaria Martini, Leonardo

### PANEL: PNT from LEO Satellites

Industry, government, and academia explore how LEO constellations are reshaping PNT. Panelists will discuss dedicated and hybrid PNT payloads, integration with traditional GNSS and terrestrial networks, and emerging signal processing and security innovations. The session will examine constellation architectures, user applications, and system performance, highlighting benefits such as enhanced resilience, precision, and coverage. Attendees will gain insight into how LEO constellations, alone or combined with GNSS, dedicated or standalone systems, are enabling next-generation PNT services for autonomous systems, communications, and critical infrastructure.

**Moderator:** Matteo Paonni, European Commission, JRC

### PANEL: Status of GNSS

The latest and greatest from the constellation providers. Learn about what is new in Galileo and where GPS stands. What launches are coming up and which ones got canceled.

**Moderators:** Dr. José Ángel Avila Rodríguez, European Space Agency and Dr. Chris Hegarty, The MITRE Corporation

# RESEARCH TRACKS – Dr. Okuary Osechas, Zurich University of Applied Sciences

## TRACK D: Navigation for Autonomy

Track Chair: Dr. Yiping Jiang, The Hong Kong Polytechnic University

### Advanced Receiver Design for GNSS: New Architectures, and Multipath Mitigation

Next-generation GNSS receiver architectures and signal processing for harsh environments. Topics include vector/ultra-tight GNSS-INS, advanced correlators, array beamforming, meta-signal/BOC processing, 3D map-aided shadow matching, ML-aided multipath/NLOS detection, interference coexistence, and low-power SDR/SoC implementations with quantified accuracy, robustness, and integrity.

**Chairs:** Dr. Gregor Möller, TU Vienna and Kana Nagai, Illinois Institute of Technology

### GNSS Integrity in Aviation: ARAIM, GBAS, SBAS and their New Advancements

Recent advances in aviation GNSS integrity across ARAIM, GBAS, and SBAS. Topics include multi-constellation/multi-frequency integrity, evolving threat models, CAT II/III operations, DFMC SBAS, urban and low-altitude airspace applications with validation results, flight tests, and standardization updates.

**Chairs:** Dr. Zhipeng Wang, Beihang University and Dr. Eugene Bang, Gyeongsang National University

### Joint Comm/Nav Signal Design and Constellation Design: Applications in 5G/6G, LEO, and Opportunistic PNT (System Design)

Joint communication–navigation signal and system co-design across 5G/6G, LEO non-terrestrial networks, and signals of opportunity. Topics like ambiguity-function shaping, OTDOA/RTT/AoA, integrity and authentication, high-Doppler tracking for LEO, RIS-aided positioning, user receiver customization and integration with GNSS, application-oriented design such as lunar communication–navigation signal and constellation design, and scalable standards-aligned architectures enabling robust low-latency PNT.

**Chairs:** Dr. Xu Bing, The Hong Kong Polytechnic University and Dr. Felix Antreich, Aeronautics Institute of Technology

### Multi-Sensor PNT Optimization: Algorithms for Efficiency and Trustworthy

Optimization-centric algorithms that make multi-sensor PNT robust, efficient, and scalable in real time. Topics include certifiable and robust estimation, factor-graph and incremental solvers, outlier handling, asynchronous/time-offset calibration, resource-aware and GPU-accelerated pipelines, distributed/co-operative localization, spanning GNSS, INS, vision, lidar, radar, UWB, 5G/LEO, and map priors.

**Chairs:** Dr. Young-Hee Lee, German Aerospace Center (DLR) and Dr. Jeremy Vezinet, ENAC

### Precise Positioning and its Integrity: Architecture and Algorithm Design

Architectures and algorithms for precise positioning (RTK, PPP, PPP-RTK) with quantified integrity. Topics include precise positioning integrity monitoring for kinematic users: integrity for ambiguity resolution; robust estimation and FDE, SSR/OSR service integrity; and certification-oriented validation for automotive, rail, UAS/UAM/AAM, maritime, and robotics.

**Chairs:** Dr. Shizhuang Wang, Virginia Tech and Dr. Mi Xiaolong, The Hong Kong Polytechnic University

### PANEL: Advancing Autonomy in Aviation

A discussion on the cutting edge of autonomous and highly automated flight and the future of aerial mobility. Industry leaders, researchers, and policymakers will explore how autonomy is reshaping aviation- commercial aviation and next-generation air traffic systems to fully autonomous cargo aircraft, air taxis and drone operations. What technological breakthroughs are driving autonomous flight? How can we ensure safety, reliability, and certification for highly autonomous aerial vehicles? What role will autonomy play in enabling seamless integration of smaller autonomous aircraft, drones, and eVTOLs into our airspace?

**Moderators:** Tim Murphy, Boeing and Dr. Maarten Uijt de Haag, TU Berlin

## SATELLITE DIVISION'S 40TH ANNIVERSARY TRACK: STUDENT SESSIONS

**Session Organizer:** Dr. Penny Axelrad, University of Colorado Boulder, and the Satellite Division's first Student Chair (1988)

The presenting student authors (one per abstract) accepted in this session will receive a full complimentary conference registration if they meet the following criteria:

- The presenting student author shall obtain the sponsorship of a previous ION GPS/GNSS/GNSS+ student award winner that will be required to attend the meeting and introduce the student. The sponsor shall agree to provide a peer review of the student's paper. The second reviewer shall be coordinated by the Publication Committee, with assistance by invited session chairs.
- Sponsored students shall present in person in Orlando, Florida.
- No on demand sponsorships will be granted.
- Sponsored students shall submit abstracts, papers, and virtual presentations according to the published peer review criteria and deadlines to maintain eligibility.
- The presenting author must be a full-time student at an accredited university or military academy, and a current ION student member at the time of submission.
- Students acknowledge travel expenses will be the responsibility of the student's supporting university/institution.
- Students in this session are also eligible to compete in the Best Student Paper Competition (additional application and university endorsement required). For additional information on the ION GNSS+ Student Paper Competition, visit [ion.org/governance/student-paper-awards.cfm](http://ion.org/governance/student-paper-awards.cfm)

**Session Organizer:** Dr. Penny Axelrad, University of Colorado Boulder, and the Satellite Division's first Student Chair (1988)

**To submit an abstract to this session follow regular abstract submission instructions and navigate to the 40th ANNIVERSARY STUDENT SESSION.**

## TRACK E: Frontiers of Navigation

Track Chair: Dr. Sriramya Bhamidipati, NASA Jet Propulsion Laboratory

### Atmospheric Modeling and Mitigation with GNSS and LEO-PNT Systems

Tropospheric and ionospheric modeling, measurements, and algorithms to compensate for atmospheric errors. Novel methods for data collection, processing and analysis. AI and data-driven approaches to modeling of atmospheric disturbance and space weather events. Characterization of propagation environments. Ionospheric scintillation studies and impacts on GNSS/LEO-based PNT services and applications. LEO-PNT/GNSS signatures and impact of travelling ionospheric disturbances, equatorial plasma bubbles, and geomagnetic storms – including applications. Space weather and terrestrial weather applications. New ground-based and space-based GNSS and LEO-PNT networks and experiments such as GNSS reflectometry and Radio occultation for atmospheric monitoring.

**Chairs:** Dr. Shrivathsan Narayanan, Collins Aerospace and Dr. Anthea Coster, MIT Haystack Observatory

### Beyond GNSS: LEO-Based and Terrestrial Signals of Opportunity for PNT

Algorithmic innovations and advances enabling robust and accurate PNT from dedicated LEO-based constellations, as well as LEO and other terrestrial signals of opportunity. This session examines these PNT techniques, their expected performance, the technical and policy challenges yet to be overcome, and when we can expect operational capabilities. Topics include constellation geometry optimization and visibility modeling; data-driven and physics-based PNT algorithms; multi-constellation and multi-sensor fusion; error modeling and performance prediction; resilience and integrity algorithms for degraded environments; and scalable architectures for real-time processing and analytics.

**Chairs:** Neeti Sonth, University of Colorado, Boulder and Pietro Giordano, European Space Agency

### Cislunar, Lunar and Martian Positioning, Navigation, and Timing

Cislunar, lunar, and Martian PNT methods and technologies vital for exploration beyond Earth. Topics include orbit and constellation design for satellites providing PNT services, orbit determination, and time synchronization for cislunar and interplanetary missions. Discussions on modulation techniques and navigation signal structure for cislunar, lunar, and Martian radionavigation services. Fault-tolerant sensor fusion methods, end-user performance analysis, and emerging global partnerships and standards for space PNT. Additional topics include the application of terrestrial GNSS to cislunar and lunar missions, emerging navigation technologies, and the role of surface and orbital PNT augmentation systems enabling resilient, interoperable navigation beyond Earth.

**Chair:** Keidai Iiyama, Stanford University and Dr. Fabio Dovis, Politecnico di Torino

### Novel Paradigms in Navigation

Advancements and modernization of navigation systems, focusing on innovative technologies in magnetic, quantum, lunar, and celestial navigation. Application of cutting-edge quantum technologies for precise PNT; including quantum-based inertial navigation, quantum Rydberg receivers, fusion of GNSS with emerging quantum sensors such as magnetometers and gravimeters, miniaturization of quantum sensors such as NV-diamond receivers for portable and compact devices, and the development and use of quantum clocks. Emerging celestial navigation techniques, including those using pulsars, leveraging optical sensors, or using AI. Utilization of planetary magnetic fields for GNSS-denied PNT. Novel methods exploiting particles like muons and neutrinos.

**Chairs:** Ryan McKnight, Ohio University and Stefano Binda, European Space Agency

### Remote Sensing, Timing, Space and Scientific Applications

Scientific and engineering uses of GNSS, including terrestrial and space applications. GNSS Earth observation techniques such as: reflectometry for environmental remote sensing of land, ocean and ice; atmospheric and ionospheric remote sensing; and detecting geophysical events such as earthquakes, tsunamis, volcanic eruptions, and man-made events. GNSS metrology, including emerging quantum technologies, and its applications. Advances in precision timing, time and frequency transfer, and multi-GNSS for timing applications. Space applications, including high sensitivity signal processing algorithms; integration solutions with sensors and orbital filters; antenna technologies for space; multi-GNSS receivers, technical advances of both COTS and specialized systems for space applications; orbit determination, including precise orbit determination algorithms, constellation navigation, and spacecraft attitude determination.

**Chair:** Dr. Seebany Datta-Barua, Illinois Institute of Technology

### PANEL: Extraterrestrial PNT

The expanding frontier of PNT beyond Earth. Experts will discuss architectures and technologies enabling reliable PNT in LEO through GEO and onward to lunar environments. Topics include cislunar navigation networks; lunar surface and orbital positioning concepts; interoperability with Earth-based GNSS; and integration of optical, radiometric, and crosslink techniques. The panel will explore challenges in timing synchronization, signal design, and interplanetary scalability, highlighting how extraterrestrial PNT capabilities are shaping the next era of space exploration and infrastructure.

**Moderators:** Dr. Oscar Pozzobon, Qascom

### PANEL: Synergistic Services: Fusing PNT and Communications

Positioning and timing services within existing wireless communications networks are becoming a vital component of modern PNT infrastructure. Leveraging large bandwidths and widespread deployment, these systems offer high-accuracy alternatives to traditional GNSS. LEO non-terrestrial networks (NTNs) are particularly promising for providing near-global, high-strength, wideband PNT signals. This panel will explore the fundamental tension at the heart of any joint PNT–communications system: PNT favors deterministic, low-entropy signals with high temporal coherence, while communications require randomized, high-entropy data for high throughput. Experts will discuss the present reality and future promise of integrated communications and PNT systems, including techniques to optimize one service while meeting minimum operational requirements for the other. Discussions will span system design, waveform development, resilience to GNSS outages, and spectrum-sharing policies.

**Moderators:** Dr. Todd Humphreys, University of Texas at Austin and Dr. Florin Catalin Grec, European Space Agency

## TRACK F: Processing Methods

Track Chair: Dr. Andrea Nardin, Politecnico di Torino

### Data-Driven and Learning-Based Methods for Satellite Navigation and PNT Systems

Data-driven and learning-based approaches to advance satellite PNT systems. Invites contributions employing machine learning and artificial intelligence techniques to address fundamental PNT challenges through physically informed modeling, signal processing innovation, and rigorous performance analysis. Topics include data-driven modeling, error and uncertainty characterization, and adaptive signal processing for PNT; receiver-side learning algorithms for acquisition, tracking, multi-sensor fusion, and anomaly detection; and system-level optimization using learning-based methods, e.g., for constellation design, resource allocation, and network management. Cross-domain research leveraging data-rich environments (e.g., 5G/6G networks, signals of opportunity, remote sensing) to enhance PNT robustness and situational awareness. Submissions emphasizing algorithmic insight, explainability, and interpretability over purely empirical results are particularly encouraged.

**Chairs:** Dr. Nesreen Ziedan, Zagazig University and Dr. Lotfi Massarweh, Delft University of Technology

### LEO-Based PNT and Integrated Communication and Navigation (Signal Design)

LEO-based PNT and the integration of communication and navigation functions in emerging space systems. Will connect the GNSS and wireless communication communities, focusing on both dedicated LEO PNT services and integrated communication–navigation concepts, rather than opportunistic signal use. Topics include robust LEO signal and waveform design, processing algorithms, and receiver challenges such as synchronization, estimation, interference management, and sensor fusion. Contributions addressing security and resilience, including anti-spoofing, and interference-resistant signal designs, are also encouraged. Hosted or fused approaches that advance reliable, secure, and globally accessible next-generation PNT and communication services are desired.

**Chairs:** Dr. Gonzalo Seco-Granados, Universitat Autònoma de Barcelona and Dr. Aurore Sibois, Xona Space Systems

### Next-Generation GNSS: Signals, Architectures, and Receiver Processing Advances

Contributions on innovative signal designs; waveform structures; optimized modulation schemes such as quasi-pilot signals; advanced multiplexing methods enhancing spectral efficiency, interoperability, and resilience; and new constellation architectures with inter-satellite links, flexible payloads, and hybrid multi-orbit or multi-technology segments. Receiver-focused research including novel acquisition, tracking, and processing techniques, along with meta-signals, robust synchronization, interference mitigation, and adaptive methods. Submissions analyzing performance and implementation trade-offs of future GNSS signals and systems are likewise of interest. Cross-cutting research that bridges system-level innovations with user equipment capabilities is especially valued, fostering a comprehensive view of GNSS evolution from signal generation through receiver processing.

**Chair:** Dr. Daniele Borio, European Commission /Joint Research Center

### Open-Source Data and Tools for PNT Research and Development

Open-source resources that advance GNSS and broader navigation applications, including datasets, processing libraries, simulation environments, software-defined radio (SDR) frameworks, and benchmarking tools. Topics include open datasets for GNSS and multi-sensor fusion; open-source algorithms; APIs, frameworks, and visualization tools for analysis and testing; and collaborative platforms supporting reproducible research and community validation. This session also aims to showcase and exchange open-source tools and datasets, contributing to resources that supports both research and system development.

**Chairs:** Dr. Mohammed Khider, Google and Dr. Alex Minetto, Politecnico di Torino

### Resilient and Secure PNT Against Interference and Emerging Threats

Challenges to GNSS integrity and resilience posed by intentional and unintentional threats such as spoofing, jamming, and meaconing. Advances in authentication and signal protection (e.g., OSNMA, Chimera, TESLA-based schemes), cryptographic and non-cryptographic approaches to secure PNT, and interference detection, characterization, and mitigation techniques. Contributions on resilient signal and receiver design, experimental and simulation-based analyses of interference scenarios, and receiver- and system-level countermeasures are encouraged. Welcomes cross-domain perspectives linking GNSS with cybersecurity, secure communications, multi-sensor PNT, and emerging policies for robust and trusted navigation.

**Chairs:** Katrin Dietmayer, Fraunhofer Institute (IIS) and Dr. Xin Chen, Shanghai Jiao Tong University

### PANEL: Emerging Scientific Use Cases for PNT Signals

Emerging applications that leverage precise timing and location from geophysics, climate, and space weather monitoring to Earth observation, ionospheric science, and autonomous environmental sensing. Panelists will highlight how modern GNSS and alternative PNT sources (such as LEO and lunar constellations) are advancing data fidelity, synchronization, and global accessibility and share current research frontiers and future directions where PNT technologies underpin transformative science and interdisciplinary innovation.

**Moderators:** Dr. Lucilla Alfonsi, INGV and Dr. Jade Morton, University of Colorado, Boulder

### PANEL: Navigation and Spatial Intelligence in Embodied AI

Leading AI and navigation scientists to address the critical challenges facing navigation in embodied agents such as drones, humanoids, and quadrupeds. Effective autonomy is currently constrained by two key factors: the operation in perceptually-degraded environments (e.g., indoor, subterranean, dense canopy, low-light) and the strict size, weight, power, and cost (SWaP-C) limitations of onboard sensors and computation. We will dissect the most pressing open problems in navigation, mapping, and perception. The discussion will highlight recent advancements in: Vision-and-Language Navigation (VLN), AI-driven 3D Reconstruction, Reinforcement Learning, and Visual and Navigation Foundation Models. Furthermore, the panel will examine the evolving role of GNSS, its integration with other sensing modalities, and the strategies for achieving robust localization in signal-denied environments.

**Moderator:** Dr. Michael Fu, HyperHit AI Inc.

# ABSTRACTS DUE

# MARCH 3

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