

International Committee on GNSS Recent Developments



Key responsibilities:

Executive Secretariat

Int'l Committee on GNSS (ICG) (37)

- **Est. 2005** - meets annually
- Voluntary cooperation, coordination, promoting utilization **of multiple GNSS signals**

4 Working Groups

- Systems, Signals, Services; Enhancement of GNSS Performance, New Services and Capabilities; *Information Dissemination & Capacity-building*; Reference Frames, Timing and Applications

Provider's Forum

- **Compatibility & interoperability**

ICG Membership

System Providers: Global and Regional Constellations

China (BDS, 27+3IGSO+5GEO), Russian Federation (GLONASS, 24+), United States (GPS, 24+), European Union (Galileo, 24+), India (NavIC, 7), Japan (QZSS, 7)

Services and Applications (15)

Algeria, Australia, Italy, Malaysia, New Zealand, Republic of Korea, Türkiye and United Arab Emirates

Augmentation Systems

India, Japan, Nigeria, Russian Federation, United States and European Space Agency

Assoc. Members + Observers: IGO, NGO, UN entities (22)

18th meeting of ICG

	AM		PM	
Sunday 6 October			1 st Providers' Forum Meeting (chaired by the United States)	Meeting with the Working Groups Co-chairs
Monday 7 October	1 st Plenary Session of ICG - Welcome Remarks - GNSS Systems Updates	Lunch Break	Presentations by Members, Associate Members, Observers, Invited observers, etc. on matters of interest to ICG	Experts Seminar
				Welcome Reception
Tuesday 8 October	(in parallel) Working Groups Meetings		(in parallel) Working Groups Meetings (Continued)	
Wednesday 9 October	(in parallel) Working Groups Meetings (Continued)		Technical Tour	
Thursday 10 October	(in parallel) Working Groups Meetings (Continued)		2 nd Plenary session of ICG	2 nd Providers' Forum Meeting (Chaired by the United States)
Friday 11 October	3 rd Plenary Session of ICG			

- Hosted by Australia and New Zealand
- 6 – 11 October 2024, Wellington, New Zealand



- ❑ **Systems, Signals and Services** (*United States & Russian Federation*): Compatibility and spectrum protection; interoperability and service standards; system-of-system operations
- ❑ **Enhancement of GNSS Performance, New Services and Capabilities** (*India, China & ESA*): Future & novel integrity solutions; implementation of interoperable GNSS Space Service Volume (SSV) examination of performance of atmospheric models, *establish dialogue with space weather/RS communities and its evolution*;
- ❑ **Information Dissemination and Capacity Building** (*UNOOSA*): Focused on education and training programmes, promoting GNSS for scientific exploration (incl., *space weather and its effects on GNSS*)
- ❑ **Reference Frames, Timing and Applications** (*IAG, IGS & FIG*): Focused on monitoring and reference station networks

ICG: Working Group S Recommendations

Emerging Low Earth Orbit (LEO) PNT Workshops

The WG S has conducted two workshops focused on emerging LEO PNT systems in 2023/2024. These workshops were aimed at better understanding what systems are being developed and how they might interact with GNSS

- To consider holding annual workshops focused on LEO PNT topics supported by WGS, including compatibility and interoperability

Working Group S Workshops in 2025

The WG S made good progress on the issues outlined in its workplan in 2024. At the ICG-18 meeting, the need for additional in-depts discussions on several areas of work was identified

- To organize the following workshops:
 - Timing Interoperability
 - PPP interoperability
 - IGMA and Performance Standards
 - IDM
 - LEO PNT Compatibility and Interoperability

Update to the WG S Work Plan

Updates to the work plan will include adding four new topics. These topics fit within the scope of the WG and have already been discussed on a regular basis. The updated work plan will reflect the work that is already taking place within the WG

- The detailed workplan will include the following areas of work:
 - PPP Interoperability
 - Civil Signal Authentication
 - LEO PNT Compatibility and Interoperability
 - Lunar PNT Compatibility (With GNSS/RNSS)

The workshop on ionospheric impacts on GNSS and international collaboration to meet current and future solar activity period challenges

The ionosphere is one of the key factors affecting the performance of all navigation satellite systems.

- ❑ The ICG encourages international GNSS and ionospheric space weather communities, including ICG members to:
 - ❑ work together by conducting a workshop aimed at discussing the ionospheric impacts on GNSS, and
 - ❑ Joint actions to be undertaken to mitigate the ionospheric impacts on GNSS during current and future solar activity period through international collaborations

ICG: Working Group B Recommendation

Participation in Joint ICG-IOAG Multilateral Cislunar PNT Workshop

The goal of the workshop is to provide an open international coordination forum for lunar PNT services providers, including GNSS providers, to foster interoperable, compatible, and available lunar PNT systems for the future

- ❑ Lessons learned from GNSS community will be needed to ensure compatibility and interoperability between GNSS and Lunar PNT systems and services
- ❑ Coordination on the topics of lunar spectrum management, common lunar reference frames, and lunar time systems are essential

- ❑ **Workshop on Cislunar Positioning, Navigation, and Timing (PNT), 11 – 13 February 2025, VIC, Vienna**

<https://www.unoosa.org/oosa/en/ourwork/icg/working-groups/b/CislunarPNT2025.html>

ICG: Working Group L - Workshop

- **GOAL:** to provide an open international coordination forum to foster interoperable, compatible, and available lunar PNT systems of the future
- **FOCUS:** the lunar PNT systems and services planned and under development, spectrum compatibility, lunar reference systems and time systems, aspects and models for international governance, lessons learned from the Earth-based GNSS community, and driving needs from the user segment

Objectives:

- Outline the scope, depth, use cases, and status of lunar PNT systems being developed
- Identify lessons learned from the GNSS community that are applicable to lunar PNT service providers and users
- Foster advancement in interoperability, compatibility, and availability between lunar PNT systems, including GNSS
- Propose recommendations that may be taken up by the lunar PNT community

New Working Group Establishment: Working Group L

ICG WG B Space Use Subgroup Work Plan 4 was formed in 2021 to understand how the GNSS Space Service Volume could be used in concert with future Lunar PNT systems to support lunar operations. Since that time, through active execution of its workplan, WP-4 has gained significant insight into the scope of such PNT systems and use cases that are under development, as well as the meaningful role GNSS will serve in lunar PNT, particularly for vehicles in transit between the Earth and Moon.

- ❑ To establish the Working Group on Lunar PNT (WG L) as a new working group within the ICG
 - ❑ Serve as a mechanism to better understand the scope, depth, users, and status of lunar PNT systems being developed
 - ❑ Propose recommendations that may be taken up by the international lunar PNT community
 - ❑ Facilitate development of interoperable, compatible, and available lunar PNT systems

SCOPE

- ❑ To focus on achieving reliable PNT solutions derived from radiometric signals available in the cislunar space, including GNSS
- ❑ To accomplish this by coordinating with current and emerging lunar PNT service providers, ICG working groups and Providers' Forum, and international organizations relevant to lunar PNT systems and services

TASKS

- ❑ **Lunar PNT systems:** Collect and document the scope, plan, and status of lunar PNT systems being developed. These include details of the systems, signals, and services from initial deployment through full operational capability
- ❑ **Lunar PNT signal compatibility:** Coordinate with the Space Frequency Coordination Group and ICG WG S to ensure compliance with ITU radio regulations, signal compatibility and avoidance of harmful interference to and among lunar PNT systems and GNSS

TASKS

- ❑ **Lunar PNT applications:** Collect and document current and future lunar PNT applications, use cases, and user needs
- ❑ **Lunar PNT flight experiments:** Encourage flight experiments employing lunar PNT systems and/or GNSS, to gain an understanding of the benefits and limitations of these systems and their use in the lunar environment
- ❑ **Lunar reference frames:** Coordinate with appropriate international organizations and ICG WG D to support standardization of lunar reference frames and their relationships
- ❑ **Lunar time systems:** Coordinate with appropriate international organizations and ICG WG D to support standardization of lunar time with traceability to UTC
- ❑ **Lunar PNT international cooperation models:** Work with appropriate international organizations to investigate and recommend international cooperation models that enable sustainable development and operations of lunar PNT systems

Publication of a Policy Brief on the Uses of GNSS for Disaster Risk Reduction

The “Applications of GNSS for Disaster Risk Reduction” Task Force is exploring how GNSS technology can enhance disaster risk reduction strategies and bolster natural hazard early warning systems. Currently, TF focuses on four GNSS-based techniques, which have broad applications, spanning for instance earthquakes, tsunamis, floods and solar storms

- *Precise Point Positioning (GNSS-PPP)*
- *Reflectometry (GNSS-R)*
- *Radio Occultation (GNSS-RO)*
- *Ground based Total Electron Content (GNSS-TEC)*

❑ To publish the policy Brief on the Uses of GNSS for Disaster Risk Reduction

ICG: Information Dissemination & Capacity Building



- ❑ Cooperation ICG & The University of Tokyo, Japan: *To focus on GNSS data types, GNSS errors, coordinate systems and applications, and low-cost receiver system data*
 - ❑ GNSS Training Programme, Nepal (The University of Tokyo), 12 - 16 January 2024
- ❑ Cooperation ICG, ICTP, Italy and Boston College, US: *To enhance capacity building on GNSS for Space Weather monitoring*
 - ❑ GNSS and Space Weather, Italy, 22 - 31 October 2024
- ❑ Cooperation ICG, FIG, IAG and IGS: *To focus on reference frames in general with a specific focus on UN initiatives, global and regional frames as well selected national case studies*
 - ❑ Technical Seminar on Reference Frames in Practice, Accra, Ghana, 18 - 19 May 2024
- ❑ Workshop on GNSS, 10 - 13 December 2024, Hanoi, Vietnam

African Capacity Building
Workshop on Space Weather and
Ionospheric Research

FIG Working Week 2024
19-24 May Accra, Ghana

Your World, Our World: Resilient Environment and Sustainable Resource Management for All

Thank you



UNITED NATIONS
Office for Outer Space Affairs