



SYNTHETIC REPORT OF THE ICG-17 - MADRID - 16-20 OCTOBER 2023

The ICG-17 was hosted by the European Commission in Madrid, in the period 16-20 October 2023.

The meeting was opened by a recorded video-message of Timo Pesonen, Director General of Defence Industry and Space of European Commission. There was a keynote presentation from Brad Parkinson (USA), one of the fathers of GPS, who sketched the History of the American Global Positioning System, which in 2023 has the 50th anniversary since the initial approval in 1973.

The ICG-17 started on 16th October 2023 with the First Plenary Session in which the major global satellite navigation systems, Galileo, GPS, Beidou, Glonass, were presenting their status. It is worth note the following.

Galileo system (Europe) has now 28 satellites in orbit, of which 23 in service. 24 satellites embark the Search & Rescue service. The Open Service Navigation Message Authentication (OSNMA) is now in public testing phase with the aim to have initial services in 2024. Galileo SOL (Safety of Life) service had a final adoption by ICAO in march 2023. The Galileo Emergency Warning Service has a demo phase ongoing. The Initial services are foreseen by 2025. The Galileo Space Service Volume (SSV) is higher than the GPS one thanks to its higher orbits. Galileo is currently acting R&D actions to study options for LEO orbits PNT.

GPS -III-F (USA) satellites will be launched starting from 2026.

Among the advances of Beidou system (China) it is worth to notice the implementation of Global and Regional (China area) Short Message Communication and the Search & Rescue service.

The Glonass system (Russia) has 26 satellites in orbit. It is providing basic service, service of improved reliability and accuracy, relative navigation service, high accuracy service. The Glonass-K2 launches are foreseen in the period 2023-2026. Glonass will launch six new satellites in 3 orbital planes on higher orbit in the period 2027-2030 to improve system's accuracy. The current Glonass high Accuracy Service is obtained with SDCM, a system for differential correction and monitoring. The cooperation Russia-China grows.

Among the Regional Navigation satellite systems, the status was presented for NavIC and GAGAN (India), QZSS (Japan), KPS (Korean Positioning System) and KASS (Korean Augmentation Satellite System) (Korea), SouthPAN (Southern Positioning Augmentation Network) (Australia).

After that, there have been various presentations among which it is worth to mention Italy's perspective on GNSS, ESA NAVISP, GENESIS and LEO-PNT Programs, and a number of presentations of the status of various Lunar programs: LunaNET (USA), LCRNS (Lunar Communications Relay and Navigation Systems) (USA), Lunar Pathfinder and MoonLight (ESA), The ILRS (International Lunar Research Station) (led by Russia-Roscosmos and China National Space Administration (CNSA)).

On 17th and 18th October 2023, the various ICG's WGs met in parallel. I could follow the WG-B. Concerning WG-S, WG-C and WG-D for details please refer to the ICG Joint Statement (attached to this Report).



The WG-B, titled “Enhancement of GNSS Performance, New Services and Capabilities” was essentially focussing on the work of the two subgroups: the space users subgroup and the applications subgroup.

The space users subgroup of the Working Group B organized a joint working group session on Lunar PNT to provide a consolidated introduction and overview of lunar PNT activities to the ICG working groups.

Presentations included:

- (1) a condensed overview of the current status of systems being proposed, including by China, ESA, the Japan Aerospace Exploration Agency (JAXA) and the National Aeronautics and Space Administration (NASA);
- (2) an overview of lunar spectrum considerations and the Space Frequency Coordination Group (SFCG);
- (3) an introduction and status of the LunaNet Interoperability Specification and lunar reference frame and time system coordination; and
- (4) the introduction of a recommendation for ICG to jointly organize with the Interagency Operations Advisory Group (IOAG) a multilateral workshop on cislunar PNT.

It was noted that the LunaNet Interoperability Specification (LNIS) defined a framework of mutually agreed standards aimed toward creating an interoperable network of compliant services, including PNT, around the Moon. It was highlighted that the current draft of the LNIS was publicly available, and encouraged all parties to review and provide comments by 30 November 2023.

The application subgroup has been working on an initiative entitled “GNSS applications: for present and future”. The activities focused on studying cases of operational GNSS applications that are in the market or are under final development before market release. The initiative would lead to a research report entitled “GNSS applications for sustainable development: case studies”. Further, it was recognised the potential impact of the rising solar activities of the 25th solar cycle on GNSS services and satellites.

On the 18th October 2023 there was a Working Groups Joint Meeting which addressed the following topics:

1. Disaster Risk Reduction, dealt by a Joint Disaster Reduction Task Force and presenting a Report contributed by IGS, China and Japan, which was addressing the ionospheric sensing of Natural Hazards, the AI-based automatic detection of ionospheric disturbances, multi-GNSS Near real Time ionospheric monitoring.
2. Multi-GNSS interoperability on Timing
3. Precise Point Positioning (PPP) Interoperability.
4. International GNSS Performance Monitoring.

The Second Plenary Session of ICG, which was held on 19th October 2023, was based on synthetic reports of the four Working Groups WG-C, WG-D, WG-B and WG-S.

The WG-C (Information Dissemination and Capacity building) continue to collaborate with the regional centres to further develop the GNSS curriculum and provide support in carrying out seminars and training



courses on GNSS and its applications. The space weather monitoring using low-cost receivers continued to explore use of low-cost receivers (for computing TEC (Total Electron Content) and scintillation).

The WG-D (Reference Frames, Timing and Applications) thanked GNSS Providers for their continued efforts to align their reference frames to ITRF (International Terrestrial Reference Frame). Acknowledged the release of metadata for Galileo, Beidou, QZSS and GPS. Recalled that a new naming convention has been decided for the broadcast prediction of UTC by GNSS: bUTC GNSS. Recalled that Resolution 4 of 2022 Conference Générale des Poids et Mesures (CGPM), decided for an increased maximum value for the difference (UT1-UTC) in or before 2035. The possibility for a negative leap second in the next ten years calls for a quicker implementation of the UT1-UTC tolerance increase. Therefore, a draft resolution will be prepared to decide on the new tolerance.

The WG-S (Systems, Signals and Services) through its subgroup on compatibility and spectrum protection, had continued its campaign to promote adequate protection of the GNSS spectrum by reviewing relevant RNSS related ITU activities. It will be conducted a future further workshop on interference detection and mitigation, mainly to look at the aviation and maritime sector. The performance standard Task Force (IGMA) organised a workshop on future LEO PNT systems, including private providers. The PPP Interoperability Task Force continued to put together information from service providers on their precise point positioning services. Various presentations were given by service providers on the message authentication of their open services. Concerning the space debris problem, the collaboration with IADC (Inter-Agency Space Debris Coordination Committee) produced a recommendation including practices relevant to MEO orbits and Inclined GEO orbits. A recommendation to include LEO PNT providers in ICG discussions on this topic was issued.

The third Plenary Session of ICG was held on 20th October 2023. It was mainly focussed on two requests:

- A. Request of some members of ICG to change the status
- B. Request of new states to join ICG as Members

The request A. was done by Korea, Australia and New Zealand who requested to be listed as Regional Providers. The ICG's Providers Forum did not reach a consensus. China has proposed to merge the Members categories and there will be only an alphabetical list. There has been no decision yet on this proposal. Therefore, there has been no agreement yet on the request made by Korea, Australia and New Zealand.

The request B. done by Algeria, Türkiye and Pakistan was examined by ICG. The opposition of India to the entering of Pakistan remained (Pakistan is requesting to be Member of ICG since 2021). China asked that this situation should be brought to the attention of UN COPUOS. Algeria and Türkiye were accepted as new ICG Members. The ICG Terms of Reference 2023 was amended accordingly.

At the end of the Plenary Session, New Zealand presented its proposal to host ICG-18 in 2024 in Wellington, New Zealand. Korea made the proposal to host ICG-19 in 2025 in their country.



Recommendations issued at ICG-17

From WG-B : “Joint ICG-IOAG organization of multilateral workshop on cislunar PNT “

From WG-D: “Development of GNSS-based techniques for applications related to disaster risk reduction and natural hazards monitoring. “

From WG-D together with WG-B and WG-S : “ On the use of the broadcast prediction of UTC to determine the offsets between GNSS times for non-space-based users. “

From WG-S:

“Recommended Survey into GNSS Time Offset for Receiver Manufacturers “

“ Approval of the IGMA Joint Trial Project Terms of Reference (ToR) revision “

“ Incorporation of Emerging Low Earth Orbit (LEO) PNT Providers into ICG “

Please, for detailed information on each presentation, refer to:

Presentations made at the ICG-17 are available at:

<https://www.unoosa.org/oosa/en/ourwork/icg/meetings/icg-17/icg-annual-meeting-2023-presentations.html>

22nd October 2023

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