

Recommendation for Multilateral Cislunar PNT Workshop and International Organization Activities

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ICG-17
October 2023

International Organizations Currently Involved in Lunar PNT

LunaNet Interoperability
Specification
development

**LNIS
WG**

Space agency lunar PNT
governance coordination



Lunar PNT/GNSS
interoperability,
compatibility, availability



Space frequency
coordination



Reference system and
time system
recommendations



Exploration mission roadmaps
and performance needs



ICG-17 Proposed Recommendation —Specific Action from the ICG-16 Recommendation

ICG/REC/2023

Recommendation for Committee Decision

Prepared by: Working Group B, Space Use Subgroup (SUSG)
(Working Group, or individual Members or Associate Members)

Date of Submission: September 15, 2023

Issue Title: Joint ICG-IOAG organization of multilateral workshop on cislunar PNT

Recommendation

The ICG encourages the organization of a joint ICG-IOAG multilateral cislunar PNT workshop to be performed in the late-2024/early-2025 timeframe. The workshop shall: (1) serve as a mechanism to better understand the scope and depth of lunar PNT systems being developed, (2) propose architectural recommendations that may be taken up by international lunar PNT developers, and (3) facilitate refinement of interoperable, compatible, and available lunar PNT systems of the future. The workshop co-leaders shall also seek the collaboration of other international bodies such as the ISECG, CCSDS, and SFCG to strengthen the international coordination and standardization of lunar PNT systems.

Organization of the joint ICG-IOAG Multilateral Cislunar PNT Workshop

- In collaboration with the IOAG, the SUSG WP4 team will serve as the organizing committee of this workshop from an ICG perspective
- The workshop date is currently being planned for the late-2024/early-2025 timeframe, after the completion of NASA and ESA service procurement activities of their respective lunar PNT systems
- This workshop encourages multinational participation, not only from LunaNet service providers, but also from other countries working on their respective lunar PNT systems, aiming to provide the multilateral coordination and discussion venue on cislunar PNT

The background of the slide is a composite of two cosmic images. The top half features a dark blue and black space filled with numerous small, bright stars and a prominent, wispy blue nebula on the right side. The bottom half features a bright orange and yellow space filled with many small, bright stars and a large, glowing green and yellow nebula on the right side. A solid dark blue horizontal band runs across the middle of the slide, containing the word "Backup" in white text.

Backup

IOAG ROLE

The IOAG (Interagency Operations Advisory Group) provides a forum for **identifying common needs across multiple international agencies** for coordinating space communications policy, high-level procedures, technical interfaces, and other matters related to interoperability and space communications. Its goals are to:

- Enable safe, secure, and efficient interoperable mission operations;
- Enable higher rate throughput for space missions;
- Enable responsive networks around the Earth, Moon, and Mars to enable future exploration and science missions.

The IOAG was founded by the Interoperability Plenary (IOP) to:

- Understand issues related to interagency interoperability and other space communications matters;
- Identify common solutions complying with IOP guidance;
- Recommend resolutions to the IOP for specific actions created by the IOP and put to the IOAG.



Members



Observers





IOP-5

London, England

20 – 22 June 2023

COMMUNIQUÉ

In regard to its relationship with the International Committee on Global Navigation Satellite Systems (ICG):

The IOP acknowledges:

- that the success of many international space missions, from LEO into cislunar space, is dependent on Global Navigation Satellite Systems (GNSS) capabilities for positioning, navigation, and timing (PNT);
- the developing importance of GNSS as a contributor to robust PNT in the cislunar environment and the need for coordination between lunar PNT providers and GNSS providers to ensure interoperability, compatibility, and availability of PNT for cislunar users;
- the benefits to the IOAG observer member status to the ICG and endorses its role as the provider of the database of IOAG missions utilizing GNSS.

Therefore, the IOP resolves that:

1. the IOAG continue the liaison with the ICG and to build on the coordination it enables, including developing additional collaboration opportunities such as interoperability workshops;
2. IOAG and ICG should collaborate on the use of GNSS and future interoperable lunar PNT systems, including identification of required standards;
- the IOAG should organize a multilateral workshop with the International Committee on GNSS (ICG) to provide an international coordination venue for GNSS providers and lunar communications and navigation providers.

**“Multilateral Cislunar PNT Workshop”
named by Frank (NASA) to be held
in the mid-2024 timeframe**

ICG Proposed Recommendation: ICG-IOAG Joint Multilateral Cislunar PNT Workshop (Chart 1 of 3)

Issue Title: Joint ICG-IOAG organization of multilateral workshop on cislunar PNT

Background/Brief Description of the Issue:

- USA, Europe, China, and Japan plan to deploy satellites in lunar orbits to provide real-time Positioning, Navigation and Timing (PNT) services for missions on the lunar surface, in low lunar orbits, and within the Earth-Moon L2 Lagrange point. According to tentative timelines outlined in presentations and papers, initial operational capabilities (IOCs) of some of these PNT services are being planned for around 2028. With these initial system developments underway, it is critically important for these systems to be interoperable, compatible and available with each other to maximize their utility for lunar space users.
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- LunaNet represents a US-led framework for the standardization of lunar PNT, communications and other services. The LunaNet framework is being documented in a standardization document called the LunaNet Interoperability Specification (LNIS). The LNIS is currently being developed by teams from Europe and the USA.
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- At the recent Interagency Operations Advisory Group (IOAG) IOP-5 meeting, held June 20th-22nd, 2023, the IOP adopted a plan for the IOAG and ICG to jointly organize a multilateral forum for the coordination of cislunar PNT systems. The next step is for the ICG to adopt this multilateral coordination plan via this recommendation.

ICG Proposed Recommendation: ICG-IOAG Joint Multilateral Cislunar PNT Workshop (Chart 2 of 3)

Discussion/Analyses:

- Some elements of various lunar PNT systems architectures have been discussed in the following international coordination groups: the ICG, the IOAG, CCSDS, the International Space Exploration Coordination Group (ISECG) and the Space Frequency Coordination Group (SFCG). But a full understanding of cislunar PNT development plans, specifications, planned reference frames and timing architectures, across international space agencies and commercial entities, is currently not known. To maximize interoperability, compatibility and availability of lunar PNT signals, a multilateral communication of cislunar PNT plans and developments—early and often—is crucial. Leveraging the outstanding GNSS coordination performed by the ICG, a similar international effort, through workshops and international delegates meetings, should be performed for Lunar PNT. This multilateral cislunar PNT coordination should be co-led by the ICG and the IOAG. To kickoff this coordination effort, a proposed ICG-IOAG multilateral workshop, called the multilateral cislunar PNT workshop, should be held in the mid-2024, after the completion of NASA, ESA and Japan sensitive service procurement activities of their respective lunar PNT systems. This workshop aims to encourage multinational participation, not only from LunaNet service providers, but also from other countries working on their respective lunar PNT systems. Therefore, this workshop will provide the first-ever multilateral discussion and coordination venue on lunar PNT domains.

ICG Proposed Recommendation: ICG-IOAG Joint Multilateral Cislunar PNT Workshop (Chart 3 of 3)

Recommendation of Committee Action:

- The ICG encourages the organization of a joint ICG-IOAG multilateral cislunar PNT workshop to be performed in the late-2024/early-2025 timeframe. The workshop shall: (1) serve as a mechanism to better understand the scope and depth of lunar PNT systems being developed, (2) propose architectural recommendations that may be taken up by international lunar PNT developers, and (3) facilitate refinement of interoperable, compatible, and available lunar PNT systems of the future. The workshop co-leaders shall also seek the collaboration of other international bodies such as the ISECG, CCSDS, and SFCG to strengthen the international coordination and standardization of lunar PNT systems. This recommendation represents a specific action from the more general recommendation approved at ICG-16 (ICG/REC/2022) entitled “Coordination of GNSS and Lunar PNT systems for lunar operations.”