# Technical Consideration for PPP Interoperability

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# PPP Interoperability Considerations

- The call for the PPP Workshop contained the following topics which are of interest for the meeting:
  - PPP activity updates and plans from different GNSS/RNSS providers (addressed in previous presentation)
  - efficiency of PPP products transmission which includes the types of satellites, augmentation signal frequencies and bandwidth; as well as ground augmentation transmission
  - timing and geodetic references for satellite orbits and clock parameters
  - interoperability of PPP products in particular signal biases and atmospheric corrections
  - message data formats, structures, contents for transmission
  - definition of PPP integrity and continuity needs
  - performance level of the PPP services, e.g., minimum PPP standard

# Reflections on the Topics

- **HAS Product Transmission by Galileo**
  - Galileo HAS will be provided through the Galileo MEO constellation Galileo in the E6B signal (1278.75 MHz) with 448bits per satellite per second.
  - Complementary dissemination channels are under consideration e.g. EGNOS GEOs, terrestrial dissemination,…

- **Timing and geodetic references**
- Galileo HAS corrections will be provided in:
  - Galileo Terrestrial Reference Frame (GTRF) for the Satellite Orbits (independent realization of International Terrestrial Reference System)
  - Galileo System Time (GST) for Satellite Clock parameters

# Galileo HAS corrections

Draft HAS SIS ICD for Phase 1 is available but not yet in public domain.
Based on RTCM-CSSR adapted to the Galileo E6B channel.
Some parameters and messages are still under consolidation.

E6 Signal in Space and RTCM-CSSR structure is also used by QZSS

The following parameters are envisaged:

| Parameter | HAS Global Service Level 1 | HAS Regional Service Level 2 |
|---|---|---|
| Satellite Orbit Corrections | X | X |
| Satellite Clock Corrections | X | X |
| Code Biases | X | X |
| Phase Biases | (X) TBC | (X) TBC |
| Ionospheric delay corrections | | X |

# Reflections on the Topics - continued

## Interoperability of products

- Interesting feature for users using several different correction origins
- Not deemed to be of critical importance as long as the broadcast correction parameters are well defined in User Interface documents
- Likewise for the Atmospheric corrections a clear description of the provided corrections and the applied model is important



**Interoperability** could be ensured **by sharing a common terminology** when describing the services

# Questions to the participants

- **Question:** Should there be a common terminology used for **defining the parameters and performance** statements?

  Is there a need for a commonly agreed set of definitions similar to those currently discussed for the GNSS Open Services in the context of ICG?

- **Question:** Should users be able to account for the differences in the Atmospheric parameters or should the PPP corrections be based on the same model?

- **Question:** Are there common parameters that open PPP services could provide/broadcast to support interoperability?

- **Question:** What are the use cases that benefit from Open PPP services? What could be future complements to such services e.g.: should integrity and continuity be considered as part of the evolution of the open PPP services?

# THANK YOU

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