STATUS AND PROSPECTS OF THE RUSSIAN PPP SYSTEM FOR HIGH-PRECISION DETERMINATION OF NAVIGATION AND EPHEMERIS-TIME INFORMATION

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FIJI
GLOBAL NAVIGATION SATELLITE SYSTEMS SERVICES

1 BASIC SERVICE
- Glonass-M
- Glonass-K

2 RELIABILITY AND ACCURACY IMPROVEMENT SERVICE
- Glonass-M
- Glonass-K
- Luch-M

3 RELATIVE NAVIGATION SERVICE
- Glonass-M
- Glonass-K

4 HIGH PRECISION SERVICE
- Glonass-M
- Glonass-K2
- Luch-M
HIGH-PRECISION SERVICE

- Convergence time reduction
- Integration in portable devices

Error

by 2030
up to 0.04 m

Availability increase

by 2030
up to 100 % (Russia)
HIGH-PRECISION SERVICE AUGMENTATION ARCHITECTURE

DATA TRANSFER FACILITIES
- GEO
- L1/L5 SBAS
- L3 GLONASS
- Internet
- NTRIP

DATA PROCESSING SYSTEM
- Master Center
- Standby Center

GNSS CONSTELLATION
- Global Monitoring Network
GNSS FREQUENCIES AND SIGNALS

- Delivery subsystem Satellites
  - L3CBO

- GLONASS Satellites
  - L1OF, L2OF, L1OC, L2OC, L3OC

- GPS Satellites
  - L1, L2C, L5

- Galileo Satellites
  - E1, E5

- BeiDou Satellites
  - B1, B2, B3

User’s Navigation Equipment
SERVICE COVERAGE AREAS

Depend on the GEO Luch-5M SC coverage area
The information of the System for High Precision Determination of Ephemeris and Time Information (HPS) is converted into blocks having duration of 0.5 s and consisting of 2000 bits in length.

Data transmission rate: \( R = 3424 \text{ bps} \)
**SERVICE SPECIFICATIONS**

<table>
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<tr>
<th></th>
<th>PPP</th>
<th>PPP-AR</th>
<th>SSR-RTK</th>
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<td>Satellite clocks</td>
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<tr>
<td>Code biases</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Phase biases</td>
<td>✗</td>
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<td>Ionospheric delay</td>
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<td>Tropospheric delay</td>
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**Basic PPP service implemented**

**Reference frames: PZ90.11, WGS84, GTRF, CGCS2000**

**Time scales: UTC(SU), GPS Time, GST, BDT**
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<td>Positioning error in the State geocentric reference frame through the space segment with augmentations in real time with primary initialization (of meters)</td>
<td>0.09</td>
<td>0.04</td>
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Trial operation (by 2020)

Data transmission through ground links with authenticated access to the data (positioning error: 0.09 m)

Commercial use (by 2030)

Data transmission through space links with data coding (positioning error: 0.04 m)
RECOMMENDATIONS FOR DEVELOPMENT AND HARMONIZATION

- Create a joint Target Group Subgroup within ICG-14 (we are ready to chair the group/subgroup)

- Generate unified templates containing data on PPP service providers and publish those templates at the ICG site

- Define unified terms and definitions describing the PPP services

- Establish unified standard requirements for assessment and monitoring of performance for PPP service providers

- Workout a roadmap for the activities aimed at interoperability and compatibility of PPP service providers
Thank you for your attention!