Russian Federation in GNSS Open Service Performance Parameters Template Creation

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Advantages of GNSS Performance Standard Template

- On national level
  - **Effective national planning in GNSS sphere - all GNSS parameters and methods of their calculation are defined, unified and are guaranteed by corresponding country-provider**
- On augmentations level
  - **Possibility of using all GNSS for Augmentations**
- On Industry and Service Providers level
  - **Possibility of creating design methods and algorithms for combined constellation**
  - **Making marketing strategies and decisions by region/country/sector easier**
- For international GNSS parameters monitoring, control and validation system

Major Challenges of GNSS PS Template Creation

- Impossible to create fully unified Template for every GNSS:
  - Possible nonconcurrence with country-provider' national regulatory framework
  - GNSS' specific features.
- A primary consideration is harmonization of parameters and methods of their calculation.

GLONASS and GNSS Open Service Performance Parameters Standards

- Creation of GLONASS Open Service Performance Parameters Standard (maximally harmonized with GNSS PS Template)
- Participation in creating unified GNSS PS Template

GLONASS Parameters in Russian Federation Regulatory Framework

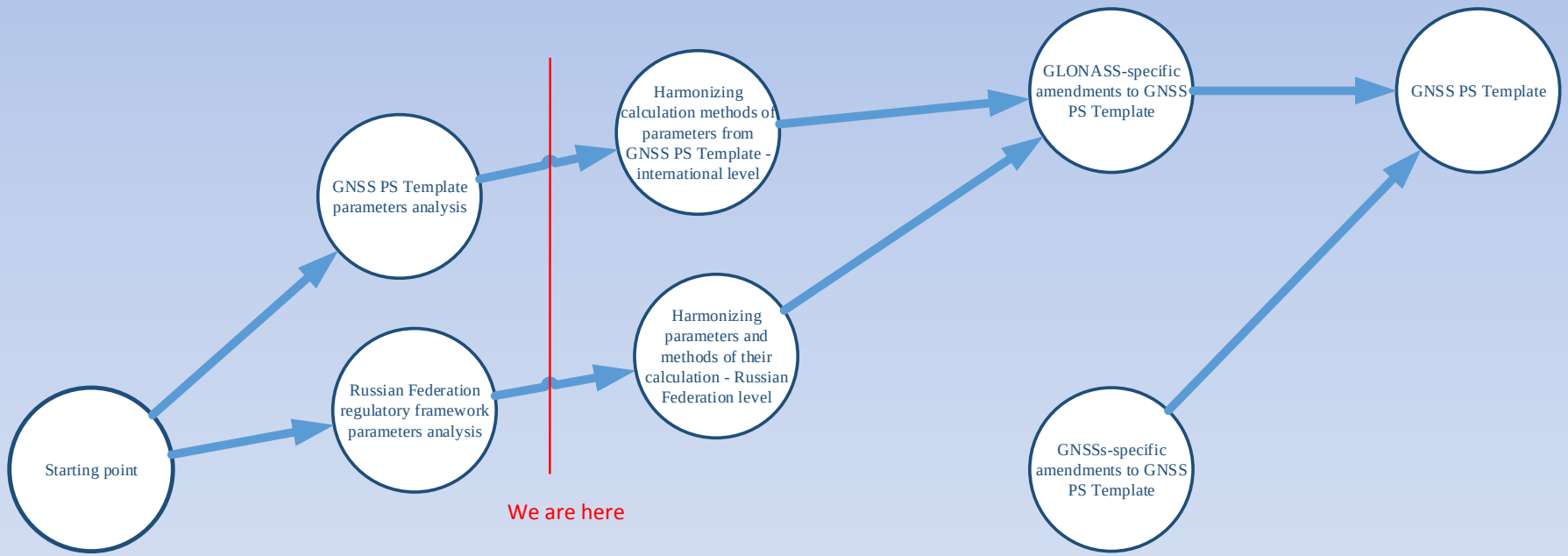
- Current Russian Federation Regulatory Framework:
  - National Standard GOST R 52865–2009 «Global Navigation Satellite System. Radionavigation Field Parameters. Specifications and Testing Methods»
  - Interface Control Document (ICD) «Global Navigation Satellite System GLONASS. Navigational radiosignal in L1, L2 bands», 5.1 edition 2007
  - Federal Target Program «GLONASS Sustainment, development and usage in 2012-2020 period»
  - GLONASS Operation Requirement
  - GLONASS Technical Requirements

- There is no document similar to GPS Open Service Performance Parameters Standard in Russian Federation now
  - Harden SDCM certification procedure
  - Harden GLONASS usage by international (air and sea) users (in safety-of-life applications)

GNSS PS Template Parameters for GLONASS

- Main parameters:
  - Constellation Structure
  - SIS Coverage
  - SIS Accuracy
  - SIS Integrity
  - SIS Continuity
  - SIS Availability
  - Position/Time Domain Standards
    - Availability standards
    - Position/Time Accuracy
- Harmonization of parameters and methods of their calculation is still needed

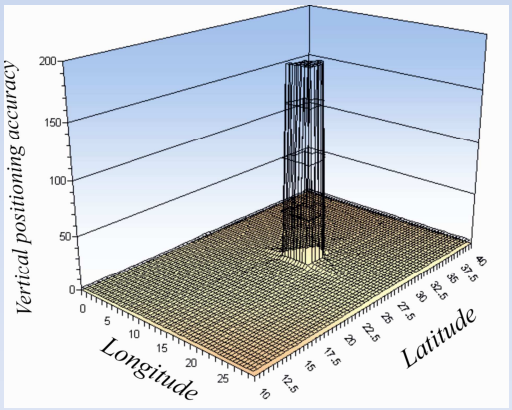
Russian Federation view for Roadmap of GNSS PS Template



Suggestions to GNSS PS Template

Proposed Template can serve as a baseline for ICG GNSS PS Template

- develop standard applicable for all open signals in all bandwidths taking into account planned advanced signals
- add section describing GNSS specific features
- create methods for harmonizing parameters computed with different methods or to create unified methods to achieve equipotential validation
- harmonize reference data used for parameters validation
- add different requirements for GNSS parameters depending on SC type
- widen GNSS Service Volume (Space Service Volume)



Vertical positioning accuracy degradation and sizes of degradation zones

Summary

- Now
  - Parameters in GNSS PS Template and in national regulations framework are analyzed
  - General parameters list is harmonized
  - Proposed Template can serve as a baseline for ICG GNSS PS Template

  - It is proposed to
  - To develop standard applicable for all open signals in all bandwidths taking into account planned advanced signals
  - Add section describing specific features for each GNSS
  - To create and harmonize methods for validating parameters calculation (both on national and international level)
  - To create methods for harmonizing parameters computed with different methods or to create unified methods to achieve equipotential validation
  - To harmonize reference data used for parameters validation
  - To add different requirements for GNSS parameters depending on SC type
  - To widen GNSS Service Volume (Space Service Volume)

- More detailed suggestions would be presented in working order to provide for the next meeting a GNSS PS Template harmonized with Russian Federation

Contacts

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Backup slides

GNSS Parameters in PS Template and in Russian Federation Regulatory Framework

Parameters	SPS PS Template	Operation Requirement	GLONASS Federal Target Program	GOST
Constellation Structure	Satellite number (baseline, surplus); orbital planes; satellite distribution by planes; reference orbit parameters	Satellite number (baseline, surplus); orbital planes; satellite distribution by planes; general orbit parameters	Satellite number	Satellite number and reference to constellation structure in ICD'
SIS Coverage	Per-Satellite (received power contour surface): Service Volume	n/a	n/a	n/a
	Constellation Coverage: Service Volume	Service volume defined	n/a	Service volume and signal power characteristics defined
SIS Accuracy	URE SIS: for different AOD, 95%)	URE SIS: 95%, 1 day interval	URE SIS: 95% for reporting period	Range error
	URRE SIS: 95%	URRE SIS: 95%, 1 day interval	n/a	User Range Rate Error
	URAE SIS: 95%	n/a	n/a	User Range Acceleration Error
UTC Accuracy	UTCOE: 95%	GLONASS Time to UTC(SU) offset with 95% probability	GLONASS Time to UTC(SU) and UTC(SU) to UTC corrections accuracy with 95% probability	UTC(SU) offset error: 95%, 1 day period, taking into account satellite offset error
SIS Integrity	Probability of exceeding URE NTE; time to alert	Time to alert message with specified probability	Time to alert message with specified probability	Probability of exceeding URE NTE globally and for standalone station
SIS Continuity	Probability of OS being healthy over specified time interval	Only definition of continuity, no standards	n/a	«Availability factor»
SIS Availability	Per-slot: probability of slot being occupied by healthy satellite	n/a	n/a	«Availability factor»
	Constellation: probability of M from N slots are occupied by healthy satellite	n/a	n/a	Availability B
Position/Time Domain Standards	PDOP availability: probability of PDOP < 6 globally and in worst site	Availability: probability of PDOP < 6 globally	Availability: probability of PDOP < 6 globally	«Service Volume Value»
	Position Service Availability: probability of errors being higher than defined, horizontal and vertical (95% on 24-days interval)	n/a	n/a	Availability A
Position/Time Service Accuracy Standards	Position domain accuracy, horizontal and vertical (95% on 24-day interval), globally and in worst site	Positioning, velocity and time errors (globally, 95%, 24-day interval, PDOP=2)	Positioning error (globally, 95%, for reporting period)	Horizontal and vertical errors (95% on 24-days interval) globally and in worst site
Additional Standards	GNSS to Inertial Reference frame Transformation parameters	Requirements for GLONASS Fundamental Maintaining Facilities	UTC (SU) to UTC; ERP to GGSK corrections accuracy; solar and bodies orbits determination accuracy	n/a