

CONTENTS

- GLONASS Government Policy
- GLONASS Constellation Status
- Modernization Plans
- Augmentations
- GLONASS Use
- International activities
- Summary

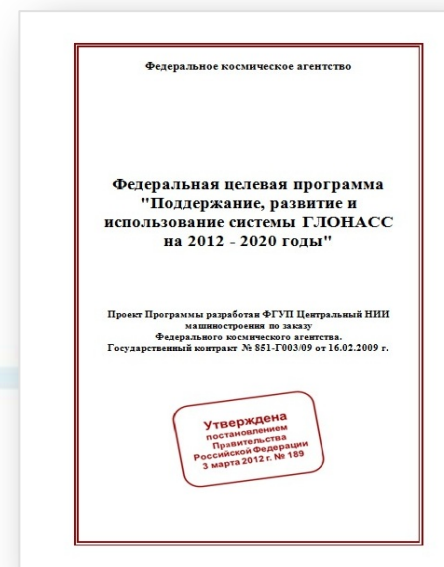


GOVERNMENT POLICY

The Presidential Decree № 638 of May 17, 2007

“On Use of GLONASS (Global Navigation Satellite System) for the Benefit of Social and Economic Development of the Russian Federation”

- GLONASS is the core element of the national PNT infrastructure ensuring national security and economic development
- PNT infrastructure sustainment and development are Government's function
- GLONASS civil services are free and unlimited globally
- GLONASS or GLONASS/GNSS user equipment is to be used for government applications
- GLONASS Federal Program is the instrument for implementing national policy in PNT
- GLONASS Federal Program 2012-2020
 - Budget for 9 years secured
 - Most contracts awarded



FEDERAL GLONASS PROGRAM IS A BASIS FOR RUSSIAN POLICY IN PNT



GLONASS MODERNIZATION GOALS

- Improving system performance in terms of accuracy and integrity
- Ensuring guaranteed positioning, navigation and timing solutions in restricted visibility, interference and jamming conditions
- Enhancing current application efficiency and broadening application domains

**KEY QUALITY INDICATOR OF PROGRAM – GUARANTEED PROVISION OF
ANNOUNCED GLONASS PERFORMANCE CHARACTERISTICS**



GLONASS PERFORMANCE IMPROVEMENT PLAN

❖ Four-fold Accuracy Improvement

by means of

- new CDMA signals implementation
- ground control segment modernization
- introduction of new onboard atomic frequency standards (2 CAFs + 2 RAFs)
- introduction of advanced satellite control and command, orbit and clock determination technologies based on crosslinks in RF and optical bands
- transition to PZ-90.11 Geodetic System aligned to ITRF with mm level
- synchronization of GLONASS Time Scale with UTC (SU) at less than 2ns while keeping UTC (SU) long-term stability at 10^{-17}

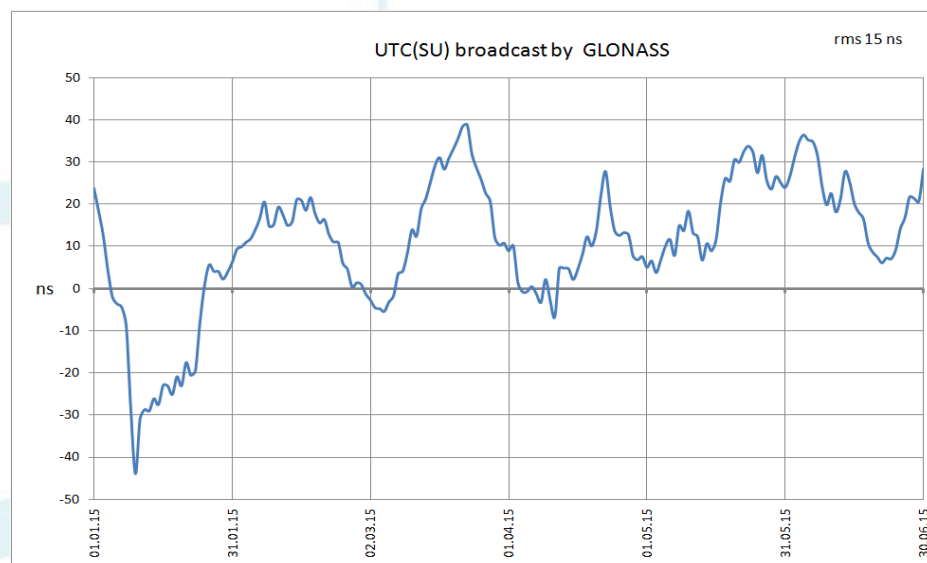




ЦНИИМАШ
TSNIIMASH



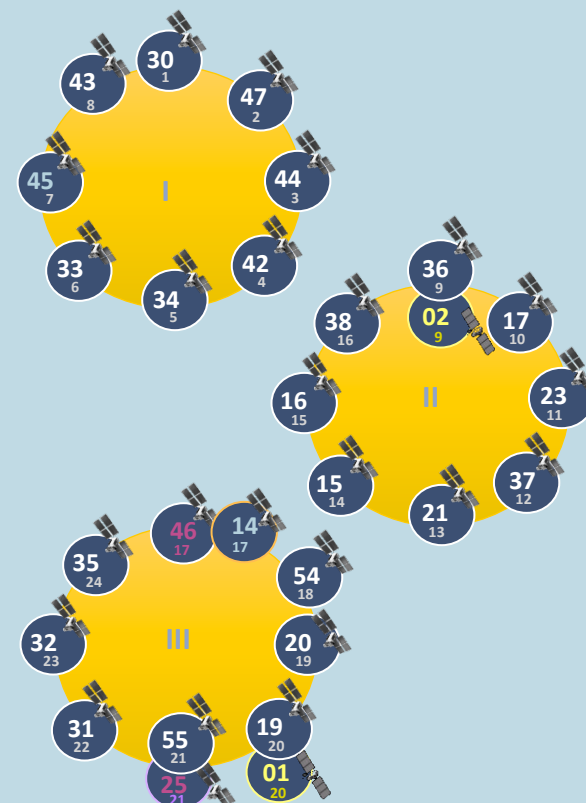
9



GLONASS ORBITAL CONSTELLATION STATUS (as of November 2, 2015)

Orbital Constellation and Satellite Status

In total	28
Glonass-M	26
Glonass-K	2
Used for navigation	22
On maintenance	2
Orbital spares	0
On-orbit flight test	2
In commissioning phase	0
Prime Contractor Check	2



THE CONSTELLATION PROVIDES GLOBAL CONTINUOUS NAVIGATION

- 
- POCKOCMOC



SPACE SEGMENT MODERNIZATION



GLONASS-M

- increase of guaranteed life-time
- evolution of satellite service systems
- more stable on-board clocks
- new control, command and ODS technologies
- introduction of SAR payload
- new signals



GLONASS-K

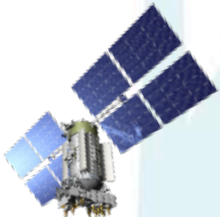
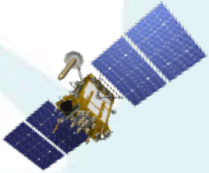
PHASED BUILD-UP OF CAPABILITIES



РОСКОСМОС



GLONASS SIGNAL IMPLEMENTATION PLAN

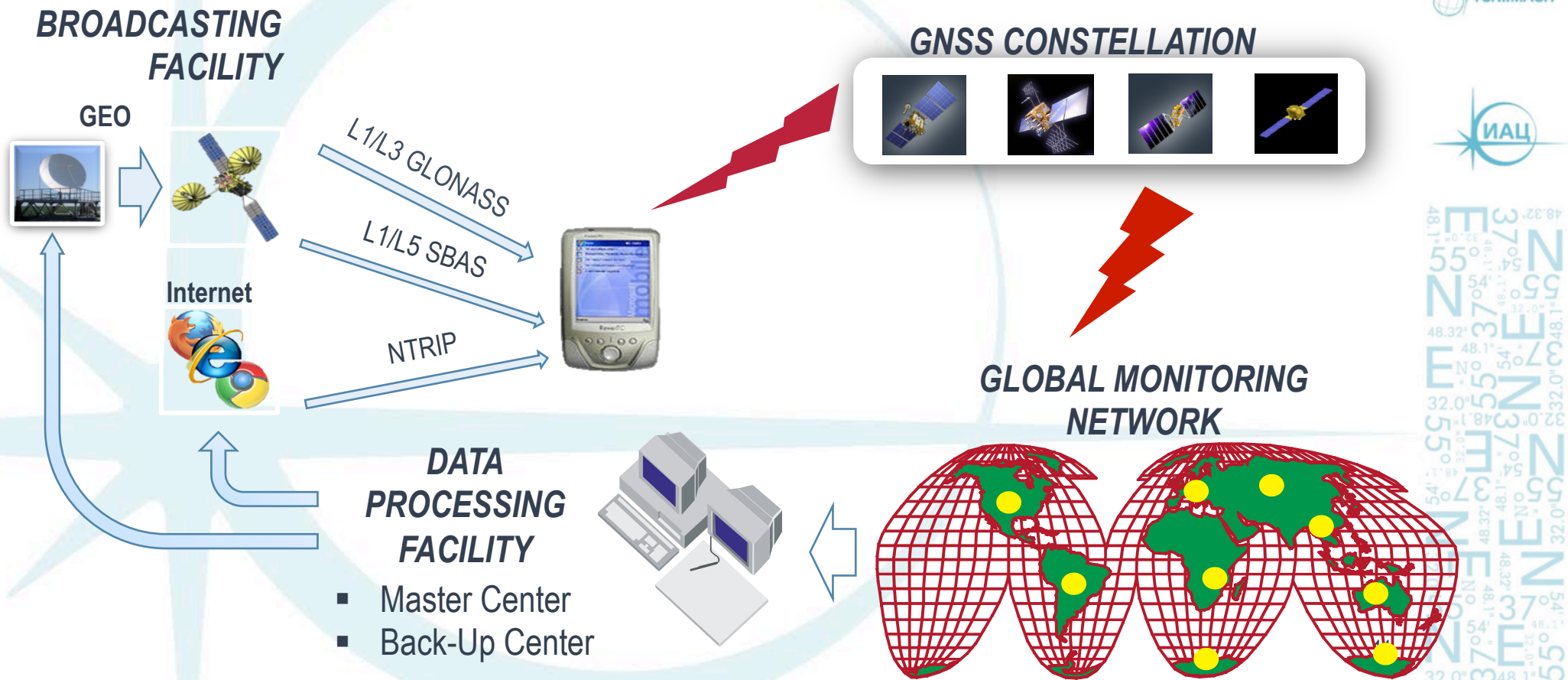
SATELLITE	FDMA Signals		CDMA Signals		
	L1	L2	L1	L2	L3
 GLONASS-M	L1OF L1SF	L2OF L2SF	-	-	L3OC (2014+) 7 SVs
 GLONASS-K	L1OF L1SF	L2OF L2SF			L3OC
MODERNIZED GLONASS-K	L1OF L1SF	L2OF L2SF	L1OC L1SC	L2OC L2SC	L3OC



GLONASS AUGMENTATIONS

Objectives:

- All types of high accuracy service
- Integrity for safety critical applications



Oil & Gas Transportation



Road accident emergency response system



High-rise buildings, bridges, roads
construction



Flowrate control

Geodesy, Cartography and Land Regulation



**High-accuracy tillage,
Fertilization optimization,
yield control**



**Land surveying, cadastral works,
land mapping**

Telecommunications and Data Transfer

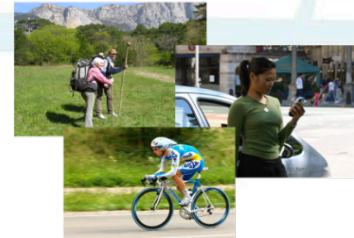


Power networks synchronization



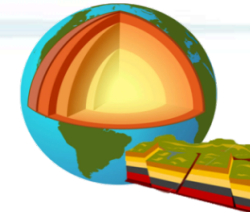
Data flows synchronization, capacity growth

Personal Navigation



Positioning, routing

Geosciences



**Earth modelling, geodynamics research,
earthquakes registration**



12



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SUMMARY

- GLONASS Program is among priorities of the Russian Government Policy
- GLONASS open service is free for all users
- GLONASS Program (2012 – 2020) approved on March 3, 2012
 - Government commitments for major performance characteristics
 - GLONASS sustainment, development, use
- GLONASS will continue
 - Keep the GLONASS traditional frequency bands
 - Transmit existing FDMA signals
 - Introduce new CDMA signals



Thank you!

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