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COMPANY



IMPROVEMENT OF GLONASS ACCURACY WITH MORE STABLE ON-BOARD CLOCKS

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ISS – Reshetnev Company





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RECENT LAUNCH: GLONASS-M #52



Glonass-M #52

Launch date: 22.09.2017

Operation: 16.10.2017.



Mass	1415 kg
EPS Power	1400 W
ADCS	Three-axes, active
Lifetime	7 years
Orbit type	MEO circular, inclined
Orbit height	19100 km
Clocks	3 Caesium clocks (1×10^{-13})
FDMA signals	L1OF, L1SF, L2OF, L2SF

6 more Glonass-M SCs are being stored at ISS-Reshetnev.

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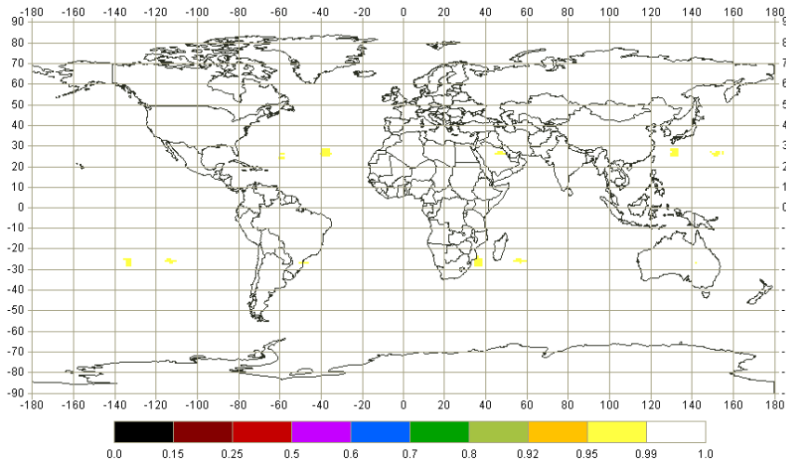
GLONASS AVAILABILITY



РОСКОСМОС



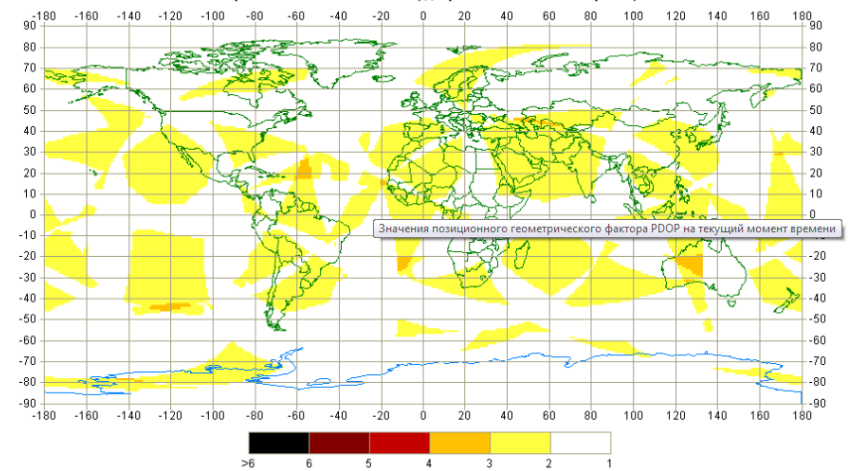
Global Average Availability 100%



Интегральная доступность глобально: 100.0%
Интегральная доступность по России: 100.0%

<https://www.glonass-iac.ru/GLONASS/CumulativeAvailability.php>

PDOP Map
5° elevation mask



<https://www.glonass-iac.ru/GLONASS/MomentaryAvailability.php>

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GLONASS PERFORMANCES

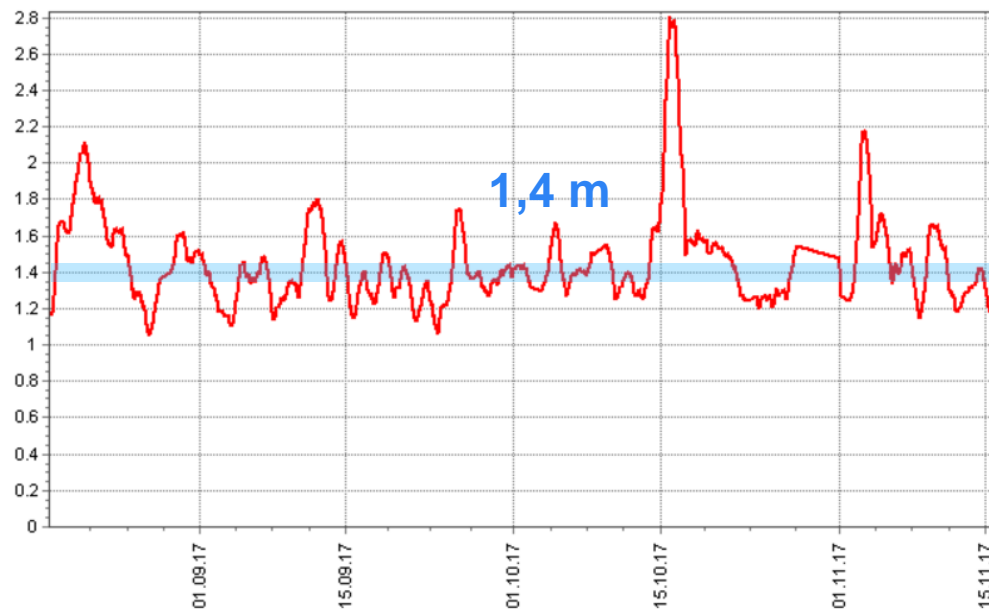


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Daily Averaged SISRE, m



https://www.glonass-iac.ru/GLONASS/technical_characteristics.php

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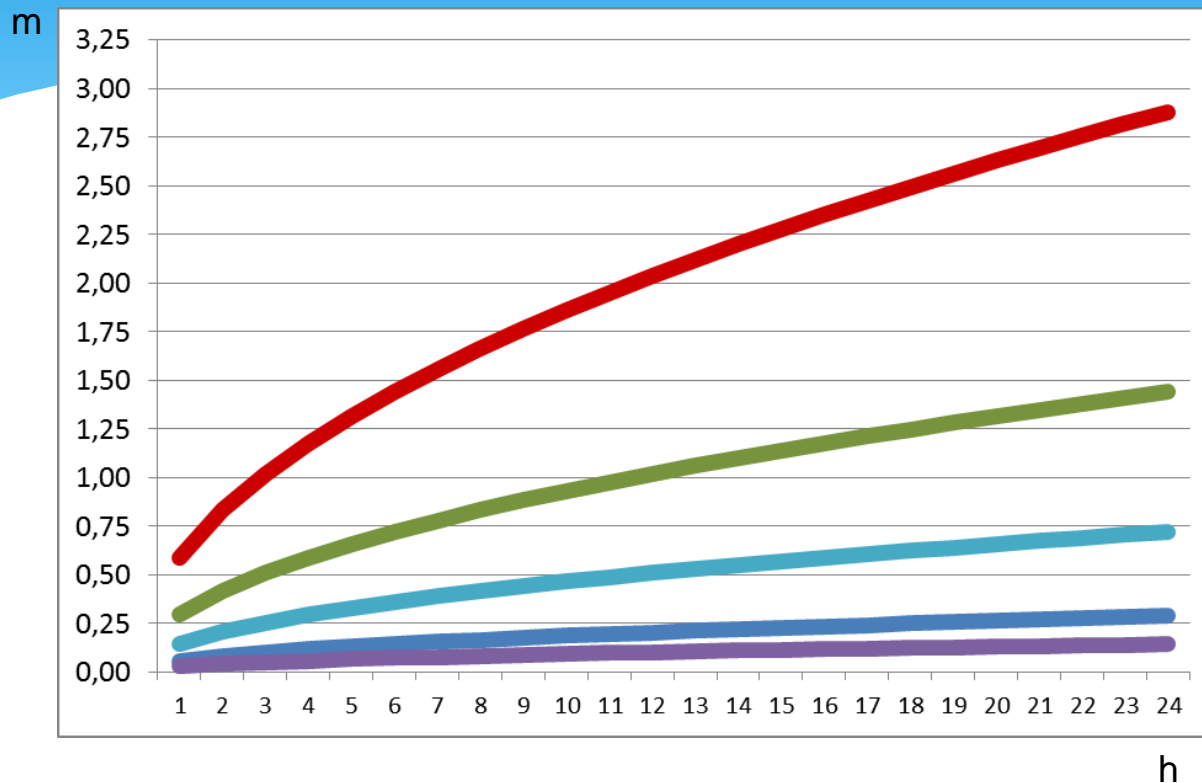
EXISTING GROUND CONTROL SEGMENT





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SIS RANGE ERRORS (CLOCK ERROR PREDICTIONS) (M) DUE TO CLOCK INSTABILITY



*On-board Clock
daily instability*

1×10^{-13}

5×10^{-14}

$2,5 \times 10^{-14}$

1×10^{-14}

5×10^{-15}

***With On-Board Clock stability equal or better 1×10^{-14}
the 12-hour prediction error is negligible.***

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CLOCK DEVELOPMENT FOR FUTURE GLONASS-K2 SPACECRAFTS



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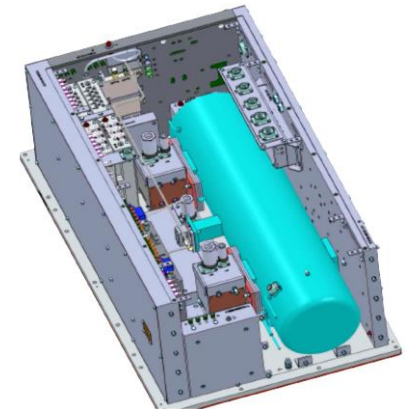
Passive H-maser



Passive H-maser
Light version



Optically pumped
Cs atomic clock



Expected daily clock instability in flight: better than 1×10^{-14}

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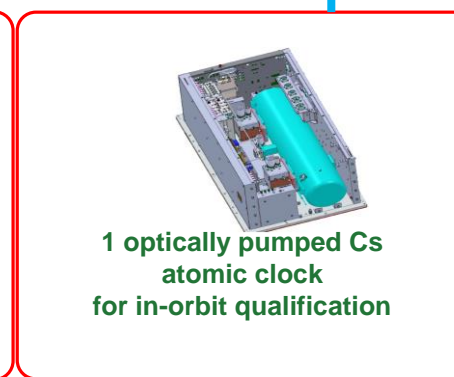
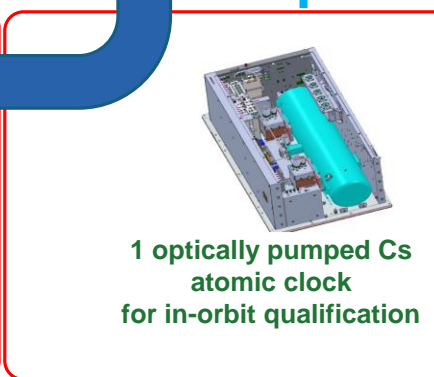
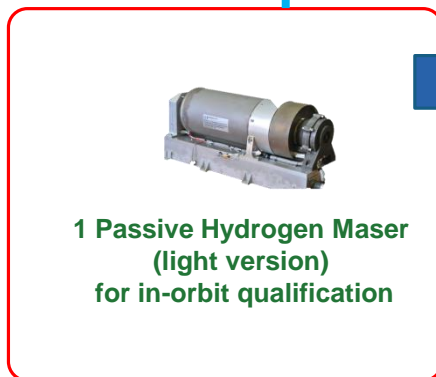
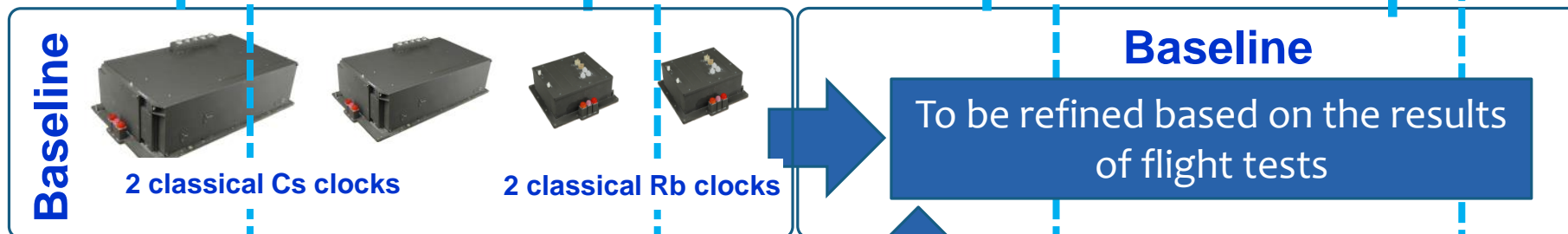
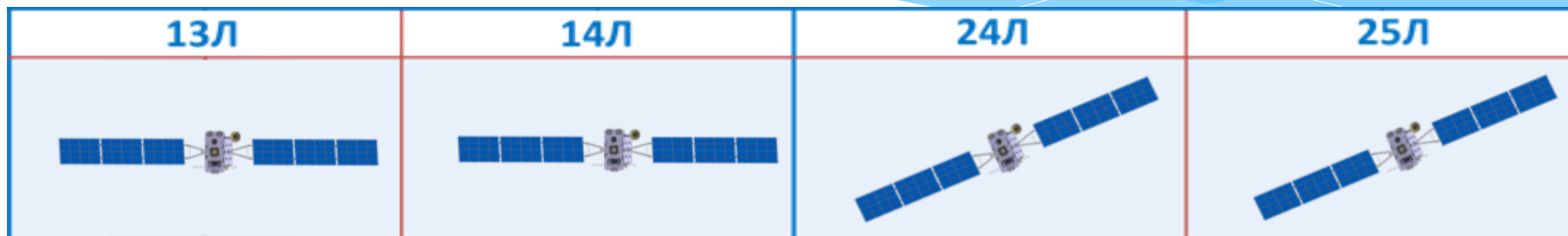


CLOCK DEVELOPMENT FOR FUTURE GLONASS-K2 SPACECRAFTS



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Thank you !

Eremenko Natalia, ISS-Reshetnev

JSC "M.F. Reshetnev "INFORMATION SATELLITE SYSTEMS"

