



## THE QUANTUM AND OPTICAL SYSTEM OF SATELLITE LASER RANGING, OF ANGULAR AND PHOTOMETRIC MEASUREMENTS QOS «SAZHEN-TM-BIS»

PURPOSE: ENHANCEMENT OF QUALITY OF NAVIGATION SUPPORT OF THE GLOBAL NAVIGATION SATELLITE SYSTEM «GLONASS» USERS IN THE LATIN-AMERICAN REGION



One-way Station

- Data Features OWS**
- Up 1 Hz update rate for real time raw data (code and carrier)
  - 30 cm code phase and 1.5 mm carrier phase precision
  - RTSM SC104 versions 3.x and RAW measurements UDP, NTRIP, FTP Output
  - Two Duplex 10BASE-T/100BASE-TX Ethernet port
- Tracking Features OWS**
- Total 340 channels: all-in-view
  - GLONASS (L1/L2/C/A, L3/C/P1/P2/L3/Q)
  - Galileo (E1/E5/C, E5A/E5-Q, E5B/E5-Q)
  - BeiDou B1/B2
  - SBAS L1



OWS structure



Ranging
Orbit height ..... up to 36000 km
NP RMS errors less than ... 5 mm

Photometry
Star magnitude ..... up to 13 <sup>m</sup>
RMS errors less than ..... 0,2 <sup>m</sup>

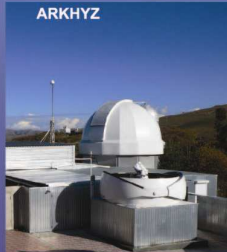
Angular measurements
Star magnitude..... up to 14 <sup>m</sup>
RMS measurement ..... 1 - 2 arcsec
For SC ang. velocity ..... up to 40 arcsec/sec

## COMPACT MODULAR SLR SYSTEM «SAZHEN-TM»

The small-size SLR system is currently in serial production. Three such stations use in combination with the VLBI systems in sites: Svetloe, Badari, Zelenchukskaya



TELESCOPE



ARKHYZ



SVETLOE

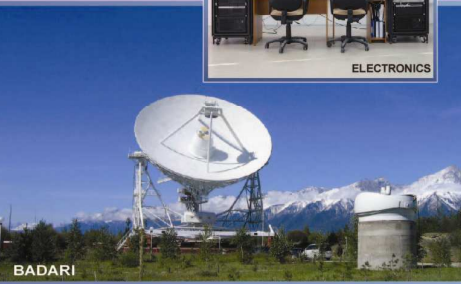


ELECTRONICS

Ranging
SC orbit height ..... up to 23 0000 km
NP RMS errors ..... 0,5 to 1 cm

Angular measurements
Star magnitude up to ..... 12 <sup>m</sup>
RMS of measurement ..... 1 - 2 arcsec
SC angular velocity .. up to 40 arcsec/sec

Photometry
Star magnitude up to ..... 11 <sup>m</sup>
Brightness measurement RMS error less than ..... 0,2 <sup>m</sup>



BADARI



ZELENCHUKSKAYA

## TITOV ALTAI OPTIC/LASER CENTER (AOLC)



Lower site



Telescope

Altay,  
 Zmeinogorsky district,  
 Savvushka village.  
 Mean number of cloudless nights: 178  
*(one of the best places in Russia or cloudless time).*  
 Lower site height is 300 m;  
 there is the SLR station  
 with a 60 cm telescope



Upper site, height 650m.  
 The telescope dia 3,12 m will be installed

## UNIFIED TRANSPORTABLE SLR SYSTEM «SAZHEN-TOS»

Platform with the installed equipment, containers and a telescope



System in the off position (in container)

Angular measurements
Star magnitude..... up to 14 <sup>m</sup>
RMS measurement ..... 1 - 2 arcsec
For SC ang. velocity ..... up to 40 arcsec/sec



In operation

Ranging	Photometry
Orbit height ..... up to 36000 km	Star magnitude ..... up to 13 <sup>m</sup>
NP RMS errors less than ... 5 mm	RMS errors less than ..... 0,2 <sup>m</sup>