



State Scientific Center
of the Russian
Federation



National Research Institute for
Physical-Technical and Radio Engineering Measurements

Metrological support of SLR measurements.

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Federal State Unitary Enterprise (FSUE) “National Research Institute for Physical-Technical and Radio Engineering Measurements” (VNIIFTRI) is subordinated to Federal Agency on technical regulation and metrology of Russia, has the status of the State scientific metrological center and is one of the main Centers of the State standards of Russia.

At present, VNIIFTRI supports and improves 38 State standards, 19 secondary standards, 23 rigs of highest accuracy, over 120 working standards and calibration rigs for various fields of measurement.

VNIIFTRI performs the duties of the Main metrological center of the State service of time, frequency and the Earth rotation parameters determination (SSTF).

The East-Siberian branch of FSUE «VNIIFTRI» is an autonomous structural subdivision of FSUE «VNIIFTRI» and acts in accordance with The Rules of FSUE «VNIIFTRI», The Branch Regulations and Russian legal system. The major aim of foundation of the East-Siberian branch is carrying out of technical-scientific activity of measurement assurance either in the territory of Eastern Siberia or the whole country.



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National Research Institute for Physical-Technical and Radio Engineering Measurements (VNIIFTRI) was installed a new SLR system in station “Mendeleevo – 1874” and is creating new SLR station at East-Siberian Branch of VNIIFTRI in Irkutsk city.

These stations have the similar equipment, in particular:

- The laser location system produced by Company «Research-and-Production Corporation «Precision Systems and Instruments» (Moscow);
- Time and frequency standards (H-masers);
- Precise gravimeters;
- GPS/GLONASS receivers;
- Local Geodetic Network.

The metrology requirements of the present SLR systems are analyzed.



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The laser location system produced by Company «Research-and-Production Corporation «Precision Systems and Instruments» (Moscow).

Parameters :

Operating wavelength 0.532 micron;

- Frequency 300 Hz;
- Pulse duration of 150 ps;
- Pulse energy 2.5...2.7 mJ;
- Beam divergence 7...12 arcsec;
- The diameter of the receiving aperture and TV Guide 25 cm.



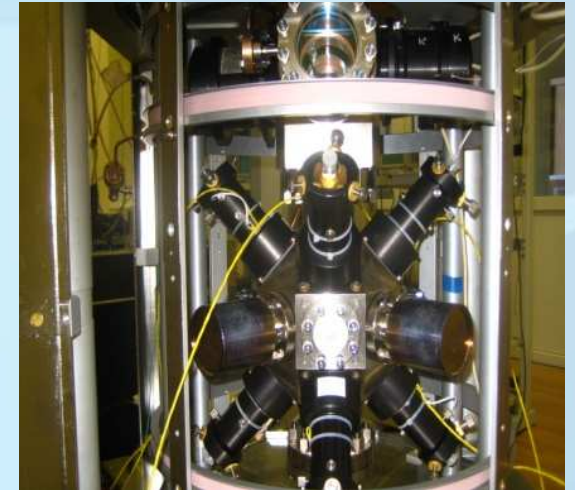
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Metrological support

National time and frequency standard in Mendeleevo UTC(SU);
National standard of length in Mendeleevo;
Secondary time and frequency standard in Irkutsk city.

Additional equipment

Mobile laboratory with mobile TWSTFT station and active H-maser;
Fixed TWSTFT station in Mendeleevo;
Standard of comparison - Leica TDA 5005;
Other accessories.



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The error of distance measurement

If

$$R = \rho + \frac{1}{2}ct + d$$

Then

$$\Delta R = \Delta\rho + \frac{1}{2}c\Delta t + \Delta d$$

- $\Delta\rho$ - the error of atmospheric correction;
- Δt - the error of measurement of the time delay;
- Δd - the error in determining of instrumental correction.

Values ρ and t are the functions of time, but value c is the function of time in less extent and value d almost does not depend on time



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Step-by-step



We produce comparison by comparison standard in several steps:
Comparison standard (Leica TDA 5005) and retroreflector are calibrate on national state standard of length;
Transfer comparison standard and retroreflector on calibrating basis;
Placing retroreflector in reference point of laser range;
Put the comparison standard on the geodetic point;
Direct the telescope to the geodetic point, and measure the distance by Leica TDA 5005;
Transfer the reflector on the geodetic point and measure the distance of the laser range
After this, final distance between reference point of laser range instrumentation and geodetic point, which determine calibrating basis, measured.

Plans and perspectives

- Metrological support of GNSS GLONASS;
- Support of reference line Mendeleevo – Irkutsk (~ 4200 km);
- Earth rotation parameters determination (SSTF);
- Time transfer;
- Work on the global SLR Network.



Thanks!!

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