Realization of high-precision navigation mode

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Headquarter - in Moscow

NAVIS company operates in the market of satellite navigation GLONASS/GPS since 1996

Company “NAVIS Group" includes:

- NAVIS Inc. - Moscow & St. Petersburg, Russia [www.navis.ru](http://www.navis.ru)
- NVS Navigation Technologies Ltd. - Moscow, Russia [www.nvs-gnss.ru](http://www.nvs-gnss.ru)
- NVS Technologies AG - Montlingen, Switzerland [www.nvs-gnss.com](http://www.nvs-gnss.com)
- NVS Telematic Systems Ltd. - Moscow, Russia [www.nvs-ts.ru](http://www.nvs-ts.ru)
- NAVIS Ukraine Ltd. - Smela, Ukraine [www.navis-ukraine.com.ua](http://www.navis-ukraine.com.ua)
Main problems for quick determination of the object location:
- Low GNSS signal level at the time of start of the equipment (conditions of measurements)
- Limited number of "visible" satellites (conditions of measurements)
- Time for allocation of navigation information from a satellite board of 30 seconds (features of system creation)

Main problems of exact determination of the object location:
- Mistakes due to ephemeris and time providing (control segment)
- Signal ionosphere and troposphere delays (distribution environment)
- Multipath errors – reception of the reflected signals (conditions of measurements)
- Radio noise from sending devices of space and land infrastructure (conditions of measurements)
- Non compensated group delay errors for GLONASS signals (features of system creation)
Methods of solving problems for quick and accurate positioning on GNSS

- Assisted
- SBAS/DGNSS
- RTK
Methods to improve the accuracy of navigation

Methods of wide area differential correction

Methods of local differential correction

Base station

Methods of relative navigation
The creation of the GLONASS / GPS-infrastructure "TNK-BP"

4 stations deployed in Krasnodar region

Reference network of Tver region, providing services for RTK corrections

GLONASS / GPS-infrastructure of "Municipal Institute of the General Plan" of Sochi

4 stations deployed in the Arkhangelsk region

GLONASS / GPS-infrastructure for the mayoralty of Arkhangelsk

NET reference stations for utilities TUMEN REGION

The creation of the GLONASS / GPS-infrastructure "Gorkastrprojekt"

8 stations deployed in Samara and Orenburg regions

Reference station precise positioning

GLONASS / GPS-infrastructure for the company "Surgutneftegaz"

4 stations deployed in the fields near Surgut

Развернуто 4 stations GLONASS / GPS-infrastructure of "Municipal Institute of the General Plan" of Sochi

GLONASS / GPS-infrastructure for the mayorality of Arkhangelsk

7 stations deployed in the fields near Surgut

NETWORK of "ROSVENTARIATSIYA-Federal BTI" Tula branch

NET reference stations for utilities TUMEN REGION

Reference Network of Tver region, providing services for RTK corrections

- Действующие референсные станции СТП ТО (1 этап)
- Гленируемые референсные станции СТП ТО (2 этап)
- Действующие референсные станции СТС ОО
Scopes of application

- Transport - monitoring, improving of security
- Agriculture sector
- Cartography, construction
The navigation
OEM NV08C-RTK module

Characteristics:

- Built-in RTK mode (Base and Rover)
- 32 channel GLONASS tracking (in the range L1 1602.0 MHz), GPS and SBAS (within the range L1 1575.42 MHz)
- Exchange protocols NMEA 0183, BINR, RTCM SC-104 v 3.0, 3.1
- Positioning accuracy in respect of (MSD)*:
  - Autonomous mode 2.5 m
  - RTK-condition (2D) 0.01+ 1ppm
- The accuracy of speed determination (MSD)*: 0.05 m/s
- Sensitivity:
  - The tracking mode –160 dBm
  - Cold start–143 dBm
- Coordinate system: WGS-84, PZ-90, SC-42, SC-95
- The frequency of the decision issue 1, 2, 5, 10 Hz
- Individual calibration of group time delays of GLONASS path
- Three-level signal filtering to improve noise immunity
- Autonomous integrity monitoring receiver (RAIM control)
- Monitoring of antenna-feeder path condition
- Support of Assisted GNSS (A-GNSS) Technology
The telematic SN-5707 terminal with support of the RTK mode on the basis of the NV08C-RTK receiver providing high-precision on-line monitoring of object on GSM communication networks, and also possibility of receiving coordinates/course/speed and angles of heel and pitch through the built-in RS232 under the NMEA 0183 protocol with speed to 5 Hz.

- Determination of location of object with high precision, about 0.01 m, in the RTK mode
- Monitoring of a condition of the vehicle (V), control of its situation and movement, and also run and fuel consumption
- The emergency notification about assault on the driver or on passengers and other emergency situations
  - Remote control connected devices and systems of the HARDWARE
  - Voice communication with the driver of the HARDWARE
  - Accumulation of information in non-volatile memory not less than 200,000 events in the absence of a communication channel
- The built-in function of "the virtual odometer" according to GNSS and the accelerometer
- Full compliance to the Order No. 285 of Ministry of Transport of the Russian Federation "About the approval of requirements to the means of navigation functioning with use of navigation signals of GLONASS system or GLONASS/GPS and intended for obligatory equipment of the vehicles of category M used for commercial transportations of passengers, and the categories N used for transportation of dangerous freights"
The results of comparative testing of receivers SN-5707 and Leica GS10

- Geodetic satellite receiver GPS/GLONASS/GAL/COMP L1+L2+L5 Leica GS10
- Telematic terminal SN-5707
- The receivers work with a single source of corrections (RTCM v3, the base station Ramenskoye)

The results of travel with the antenna NV2410 with a distance of 3 km from the base

<table>
<thead>
<tr>
<th>Total Points:</th>
<th>1728</th>
<th>1728</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTK Float:</td>
<td>0 (0.00%)</td>
<td>48 (2.78%)</td>
</tr>
<tr>
<td>RTK Fixed (INT):</td>
<td>1594 (92.25%)</td>
<td>1680 (97.22%)</td>
</tr>
<tr>
<td>RTK Fixed Validated / VALID:</td>
<td>1594 / 1594 (100.00%)</td>
<td>1546 / 1539 (99.55%)</td>
</tr>
</tbody>
</table>
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- Telematic terminal SN-5707
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The results of travel with the antenna Leica AS10 with the removal of 15 km from the base
SN-5707 as the Rover works with base stations (BS)

NV08C-RTK supports BS SN-3500, NVS-BS01, own production, and BS third party, due to the adjustment of the phase characteristic
Equipment

Station the Exact Positioning of the production of "NAVIS"

The equipment manufactured by "NAVIS" received positive reviews from the largest state-owned Companies, has been certified and recommended for installation on the vehicle for critical applications.

The equipment -based modules NV08C series has a "Certificate of type approval of measuring instruments, which allows the use of data obtained with its help as a legitimate evidence base."
Thank you for your attention!

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