

ICG-14

**New Russian High Precision
Navigation Module**

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Designed Bureau of Navigation Systems (JSC «NAVIS Inc.»)



JSC «Navis Inc.» was established in 1996.

Main line of business: Development, production and servicing of mass-market navigation equipment for GNSS:GLONASS, GPS, GALILEO, BEIDOU, SBAS, SDCM.

In the enterprise structure:

Development Center - Provides a complete navigation user equipment development cycle

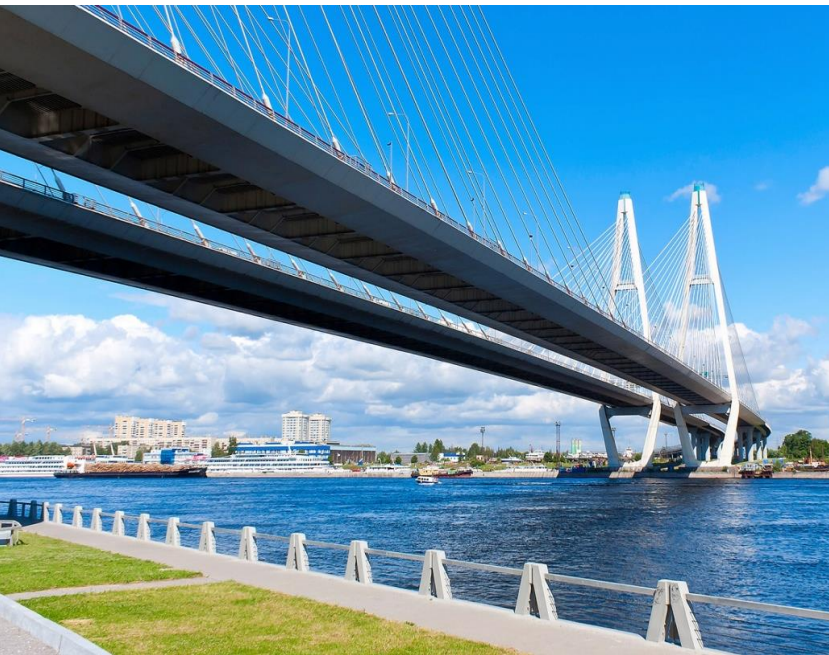
In-house production - including microelectronic, allows to manufacture serial navigation user equipment according to the highest requirements

Testing Laboratory - provides certification tests, as well as experimental and serial samples of navigation user equipment

Service - performs commissioning works, warranty and post-warranty servicing of navigation user equipment



Designed Bureau of Navigation Systems (JSC «NAVIS Inc.»)



For more than 20 years NAVIS Inc. has been producing commercial modules, which are used in navigation equipment in a variety of areas

OEM modules of previous generations

The line of commercially produced receivers is quite wide and has been running for several generations.



NAVIOR-24/24S
24 Channels
GLONASS/GPS



SN-4706
24 Channels
GLONASS/GPS



NV08C-CSM
32 Channels
GLONASS/GPS/GALILEO/BEIDOU



NV08C-MCM

The company has not only extensive experience of developing navigation equipment of different types, but also experience of creating different infrastructure. During 2000-2011, a step-by-step complex creation of differential GNSS GLONASS/GPS subsystems providing a high-precision radio navigation field was carried out.

New generation NV08C modules line

NV08C-
MCM



NV08C-
CSM



NV08C-
miniPCI



NV08C-
CSM-
BRD



NV08C-
RTK



NV08C-
RTK-A



	NV08C-MCM	NV08C-CSM	NV08C-miniPCI	NV08C-CSM-DRD	NV08C-RTK	NV08C-RTK-A
Number of tracking channels	32					2 x 32
Coordinate accuracy (RMS)	< 1.5 m				RTK: 1 cm + 1 ppm	
Heading Mode	-				Supported	0.1° @ 2 m
Date rate	1, 2, 5, 10 Hz					
Raw data	Pseudorange, phase measuring, Doppler, signal/noise				-	
RAIM	Supported				Enhanced RAIM for RTK and 3D modes	
Protocols	NMEA 0183, BINR, RTCM 2.x				NMEA 0183, RTCM 3.x	
1PPS	15 ns(RMS), 38.5 ns discreteness, Data Rate up to 10 Hz					
Filtering	Coordinate filtering	Calman filter, secondary filter, phase differential filter			Coordinate filtering, Calman filter, secondary filter, phase differential filter	
GNSS Assisted	Supported					

Real Conditions Testing

Together with our partners and customers we carry out many thousands of high-precision navigation measurements every year in relative and absolute modes of determining coordinates, in conditions of different ionosphere perturbations, at different distances from the base station in order to develop methods of testing navigation modules.

Taking into account the versatility of the developed module and the possibility of its application in the widest areas, we constantly expand the fields of application for which our equipment is being tested.

The equipment of NAVIS Inc. is part of mobile laboratories moving through the vast spaces of our country, in conditions of dense urban development the equipment is tested in large cities, walks on the harsh seas of the Northern Sea Route, flies by aircraft and even by balloon.

All this is done to constantly improve and develop new technologies to meet modern and promising consumer requirements.

Real Conditions Testing

STOREGIS 8.4.6.3 (Release Jul 25 2018)

POSITION

dev: RTM RC 31 CSMS4 P5 15
 file: RTM_01_20180919_185956.mpg
 size: 43.1 MB
 error: 0
 timer off

PROTOCOL
 NONE

NMEA
 4800

DBG data

POSITION

B: 55°46.876376N mms2D: 0.000 Speed: 000 0 km/h UTC: 16:51:16 40
 L: 049°08.037636E mmsH: 1.4 Course: 348.1° Date: 19.09.18
 H: +0048.12 VDOP: 1.3 Diff Age: 001 Status: RTK Int

STATISTIC

B: 55°49.914760N mms2D: 0.000 N: 15512 max HDOP: 0.0 DIFF:
 L: 049°59.097361E mmsH: 19.042 Nalt: 15527 max VDOP: 0.0 OBS: 7
 H: +0067.875 mmsV: 15.944 Nancor: 0 freq: 5 Hz 3D: 3

PVT STATUS & USED SATELLITES

Status: BSS all: 7901 err: 9 valid: 7892 dist: 15125.235 m
 GPS: 6 - 03 06 09 16 22 23
 GLN: 5 - 01 02 08 11 17
 GLL: 0
 BDS: 0

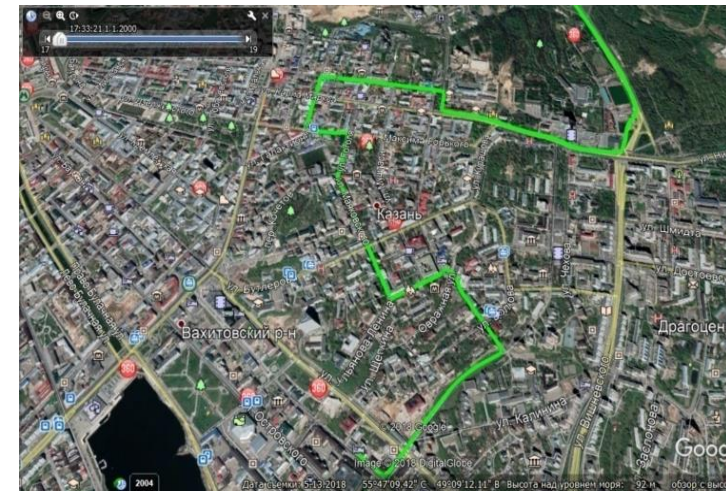
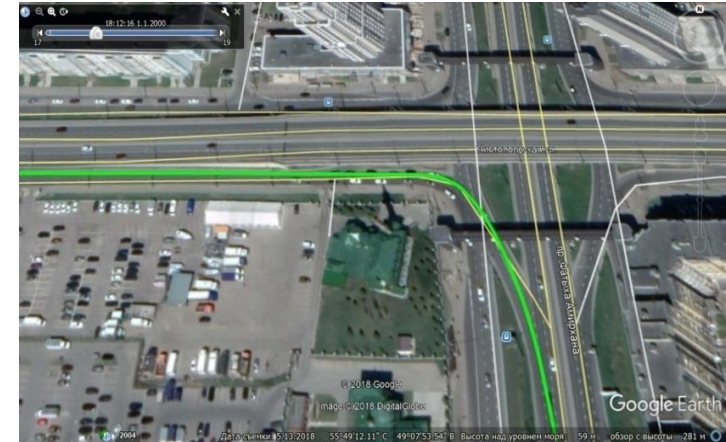
HEIGHT

+1 m
 -1 m

SIGNAL-NOISE RATIO

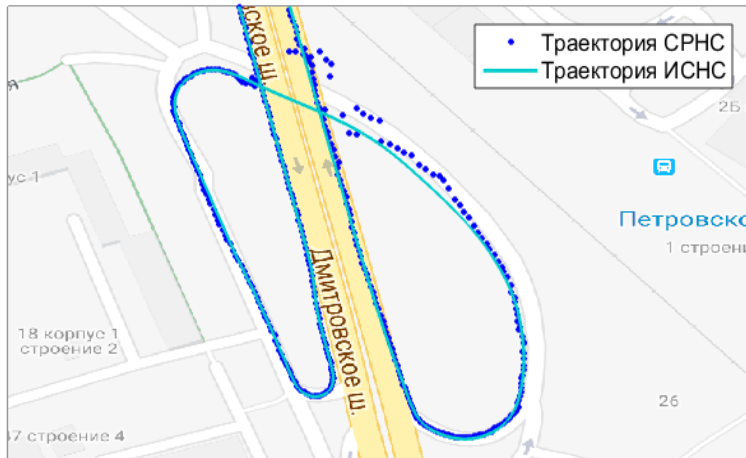
40 dB
 20 dB
 0 dB

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



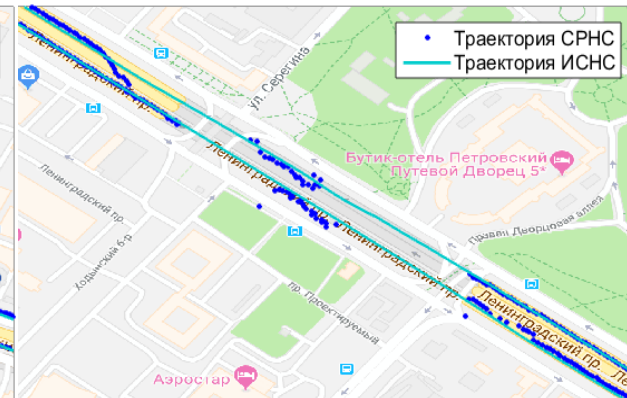
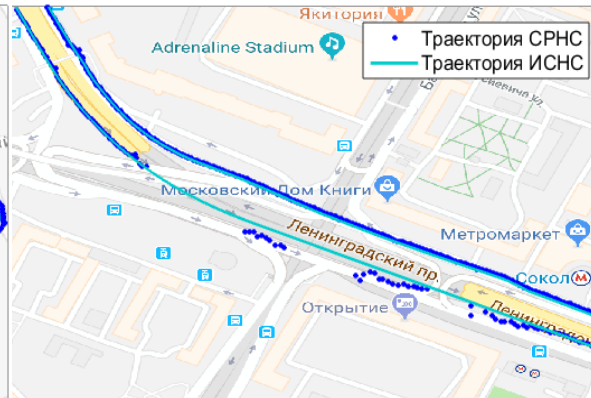
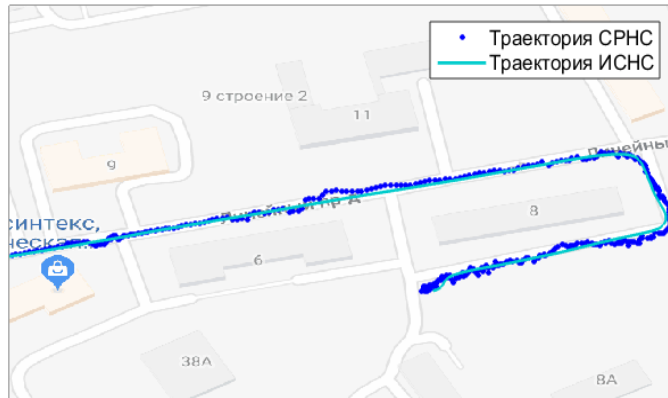
Integration algorithms

GNSS + INS



- ✓ Integration has improved the reliability and reliability of navigation definitions.
- ✓ Accuracy of estimation of speed and orientation angles is increased.
- ✓ Frequency of navigation determinations output is increased to 500 Hz.
- ✓ The delay of issue of the decision is reduced (latency ≈ 2 ms)

Relevant even when using the smallest ($< 3 \times 3$ mm) and cheapest (< 10 \$) sensors



The Latest Russian Module

NAVIS Inc. has developed a new processor of digital processing of navigation signals NP216C. It is the latest domestic three-core processor at 270 MHz, with 512 KB of RAM. Dimensions of 17x17 mm allowed to accommodate 415 million elements per electrical circuit. The chip weight does not exceed 1.5 g. The chip operates in a wide range of climatic conditions, while providing operating time to failure of not less than 120 thousand hours. The processor is designed for use in electronic equipment as a device for multichannel digital signal processing of GLONASS, GPS, GALILEO and BEIDOU navigation systems, signal tracking, obtaining primary and secondary navigation definitions and output of received data according to standard exchange protocols.

The Latest Russian Module



NV216C-RTK-A Module Development Objectives:

- Development of small-size RTK-module in order to correspond to the current state of the high-precision modules market;
- Support of existing consumers of line modules NV08C-RTK.

The purpose of the Latest NV216C-RTK-A module

The dual-frequency NV216C-RTK-A module is designed to receive GNSS signals in L1 & L2 bands, to provide information on raw data and consumer coordinates in autonomous and relative modes (DGNSS/RTK/PPP). The NV216C-RTK-A module provides connection of two antennas and along with RTK mode supports angle-meter mode (Heading).

The Latest OEM Module NV216C-RTK-A

- Multi-frequency GLONASS, GPS, GALILEO, BeiDou, SBAS
- Support for baselines up to 30 km
- RTK angle gauge mode (heading/roll or heading/pitch)
- Extended multi-frequency RTK algorithm
- Integrated GNSS INS algorithm
- Base and rover mode
- Rate of solutions output up to 500 Hz (in complex mode)
- Centimeter accuracy in RTK mode
- Individual GLONASS group delay calibration
- GLONASS automatic inter-frequency calibration
- Extended RAIM algorithm for stand-alone and RTK mode
- Low Power Consumption < 1W
- Simple integration, pin2pin compatibility with the NV08C line
- NMEA 0183, RTCM 3.1 Protocols
- Service conditions from -40 to 85 °C



The Latest OEM Module NV216C-RTK-A

Coordinate error (RMS, plane/height):

Offline - 1.2 / 1.6 m

In DGNSS mode - 0.6 / 0.8 m

In SBAS mode - 0.8 / 1.0 m

In RTK mode - 5 / 10 mm 1 mm/km

In RTK mode - 10 / 15 mm 1 mm/km

Speed error (RMS, plane/height): 2/3 cm

Error of PPS generation: < 20 ns

Time of obtaining the first coordinates (maximum):

Cold/warm start - 36 s

Hot start - 5 s

Restart - 1 s

RTK (from the moment of 3D solution receipt) - < 10 s

Overall dimensions

46 x 35 x 9.9 mm

Input voltage 3.3... 5.0 V

Power

consumption < 1W



Conclusion

Successful development of domestic navigation technologies, improvement of GLONASS system and the need for import substitution opens up huge opportunities for system integrators and manufacturers to create and promote their own samples of equipment on the Russian market.

Combining the accumulated technological experience in various fields with domestic production provides a unique opportunity to create advanced domestic solutions demanded in various spheres, which are not inferior in their capabilities to the best world analogues.

Application of multi-system multi-frequency navigation module NV216C-RTK-A in domestic samples of high-precision navigation equipment will allow to fully realize on the Russian market the potential of modernizing GLONASS system, including in terms of commercialization of domestic satellite navigation technologies.

THANK YOU FOR ATTENTION !

