# PROGRAM

**MONDAY, 27 MAY**

10.00–10.15    **O P E N I N G   C E R E M O N Y**

### SESSION I – INTEGRATED NAVIGATION AND CONTROL SYSTEMS

Chairmen    **Dr. B.S. Rivkin**, *Russia*
**Prof. G.F. Trommer,** *Germany*

**P L E N A R Y   P A P E R**

10.15–10.35    1.  **S.V. Bronnikov, D.Yu. Karavaev, A.S. Rozhkov, D.N. Rulev**
(*S.P. Korolev Rocket and Space Corporation Energia, Korolev, Moscow Region, **Russia***), **O.S. Rurin, A.K. Kalifatidi** (*ruCap LLC, Moscow, **Russia***)
Development of the RS ISS Local Positioning Systems

**P O S T E R   P A P E R S** [1]

10.35–10.55    2.  **Ye.I. Somov, S.A. Butyrin,  S.E. Somov** (*Samara Federal Research Scientific Center of RAS, **Russia***)
Regional Earth Survey Planning and Control of Mini-Satellites in Low-Orbit Constellations

3.  **E.A. Kasulin** (*S.P. Korolev Rocket and Space Corporation Energia, Korolev, Moscow Region, **Russia***)
Testing the Methods for GNSS-Based Relative Navigation of Moving Objects

4.  **Yu.V. Fadeeva, E.E. Vorobyova, V.Yu. Emelyanov, I.D. Kostin, A.M. Popov** (*D.F. Ustinov Baltic State Technical University Voenmeh, St. Petersburg, **Russia***)
Attitude Coordination for Small Satellites Constellation

5.  **E.V. Barinova, I.V. Belokonov, N.A. Elisov, I.A. Timbai** (*Samara University, **Russia***)
Dynamic Design of a Small-Sized Spacecraft with a Passive Stabilization System

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6. **D.V. Pershin** (*D.F. Ustinov Baltic State Technical University Voenmeh, Special Technology Center, St. Petersburg, **Russia***), **V.I. Kulakova, A.S. Lysenko** (*Special Technology Center, St. Petersburg, **Russia***)
Attitude Determination and Control Algorithms to Support Optical Payload of an Earth Observation Nanosatellite

7. **Yu.M. Zabolotnov, Zhengzheng Min** (*Samara University, **Russia***)
Control during the Approach of the Tether System to a Passive Space Object

10.55–11.10    **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

11.10–11.40    C O F F E E   B R E A K

## P L E N A R Y   P A P E R

11.40–12.00    8. **D.N. Sevastyanov, Yu.R. Banit** (*JSC Gazprom Space Systems, Shchelkovo, Moscow Region, **Russia***), **M.Yu. Belyaev** (*S.P. Korolev Rocket and Space Corporation Energia, Korolev, Moscow Region, **Russia***)
Applying Procedures Used for Space Experiments on board Orbital Stations to Attitude Control of Geostationary Communication Satellites Yamal

## P O S T E R   P A P E R S [1]

12.00–12.30    9. **Zhong Wang, K.A. Neusypin, Bin He, Hao Chen** (*Bauman Moscow State Technical University, **Russia***)
A Quality Evaluation Algorithm of Target Tracking Model Based on Observability

10. **Bin He, K.A. Neusypin, Zhong Wang, Mingming Zhang** (*Bauman Moscow State Technical University, **Russia***)
Feedback Linearization and Adaptive Sliding Mode Control System for UAV

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11. **A.M. Popov, V.Yu. Emelyanov, D.G. Kostrygin, A.A. Shevchik**
(*D.F. Ustinov Baltic State Technical University Voenmeh,*
*St. Petersburg, Russia*)
Controlling the Guidance of Quadrotor UAVs Group towards
Moving Target

12. **I.V. Belokonov, N.A. Elisov, A.V. Kramlikh, I.A. Lomaka,**
**P.N. Nikolaev** (*Samara University, Russia*)
Adaptive Fault-Tolerant Attitude Control System for Small
Spacecraft

13. **N.A. Elisov, A.V. Kramlikh, I.A. Lomaka** (*Samara University,*
*Russia*)
Active Aerodynamic Stabilization of the Nanosatellite Angular
Motion at Very Low Earth Orbit

14. **A.M. Popov, E.E. Vorobyova, D.G. Kostrygin, I.A. Yakovlev**
(*D.F. Ustinov Baltic State Technical University Voenmeh,*
*St. Petersburg, Russia*)
Algorithm for Guiding Quadrotor UAV to Maneuvering Target

15. **D.V. Akulin, M.V. Mentyukov** (*Special Technology Center,*
*St. Petersburg, Russia*), **R.B. Goncharov** (*St. Petersburg*
*Electrotechnical University, Russia*)
Nadir Finding System with Infrared Temperature Sensors for
CubeSat Satellites

16. **P.K. Kuznetsov, B.V. Martemyanov** (*Samara State Technical*
*University, Russia*)
Technique for Detecting and Determining Ship Motion Parameters
from Images of Wakes in Stormy Conditions

17. **G.M. Dovgobrod, V.V. Khanychev, K.A. Dvornikov,**
**D.S. Bakhtin** (*CSRI Kurs, Moscow, Russia*)
Combating Saturation of the Ship Motion Control System Using a
Hybrid Algorithm

18. **Chunfeng Gao, Wanqing Liu, Guo Wei, Chengzhi Hou, Wenjian Zhou, Jiayi Cheng, Xu Zhu, Xudong Yu** (*National University of Defense Technology, Changsha, China*)
Indoor High Dynamic Positioning Technology of UWB/MIMU Integrated Navigation System with Extended Kalman Particle Filter

12.30–13.00    **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

13.00–14.00    L U N C H

Chairmen    **Prof. I.V. Belokonov,** *Russia*
**Dr. D.A. Koshaev,** *Russia*

**P L E N A R Y   P A P E R**

14.00–14.20    19. **M.Yu. Belyaev, P.A. Borovikhin, D.Yu. Karavaev** (*S.P. Korolev Rocket and Space Corporation Energia, Korolev, Moscow Region, Russia*)
Refining the Methods for Determining the Orbital Parameters from Planetary Images in the Vektor-T Space Experiment on board the ISS

**P O S T E R   P A P E R S**[1]

14.20–15.00    20. **N.P. Starostin** (*Ramenskoye Design Company, Ramenskoye, Moscow Region, Russia*), **A.V. Chernodarov** (*NaukaSoft Research & Production Association, Ltd., Moscow, Russia*)
Optical-Inertial Positioning of Remotely Piloted Aircraft during GNSS Signal Outages

21. **A.V. Chernodarov, P.S. Gorshkov, A.P. Patrikeev, A.A. Polyakova** (*NaukaSoft Research & Production Association, Ltd., Moscow, Russia)*
Flight Testing of an Integrated Navigation System Based on MEMS Sensors, Resistant to Unstable Satellite Information

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22. **A.A. Golovan** (*Lomonosov Moscow State University, **Russia**)*,
**D.I. Smolyanov** (*Lomonosov Moscow State University, JSC Cognitive, Moscow, **Russia***)
On the Navigation of Unmanned Wheeled Agricultural Machinery Using MEMS-based INS, GNSS and Odometry

23. **B.F. Zhu** (*Jimei University*), **L.N. Chen** (*University of Science and Technology of China (USTC)*), **G.Y. Shi** (*Peking University; Chinese University of Hong Kong, **China***)
An Accurate Method Applying Inertial Sensors for Axial Calibration of Spherical PTZ Camera

24. **K.K. Veremeenko, M.V. Zharkov, R.Yu. Zimin, I.M. Kuznetsov, A.N. Pronkin** (*Moscow Aviation Institute, **Russia***)
Navigation Systems of Unmanned Aerial Vehicles with Artificial Intelligence Units

25. **N.N. Vasilyuk** (*Electrooptika LLC, Moscow, **Russia***)
Receiving Astronomical Measurements in a Strapdown Astroinertial Navigation System for Atmospheric Applications

26. **Mingming Zhang, K.A.Neusypin, Bin He** (*Bauman Moscow State Technical University, **Russia***)
Research on GPS-Assisted Inertial/Starlight High-Precision Information Fusion Algorithm

27. **V.P. Lopatin** (*Russian Metrological Institute of Technical Physics and Radio Engineering VNIIFTRI, Mendeleevo, Moscow region, **Russia***), **V.B. Pudlovsky** (*VNIIFTRI; Moscow Power Engineering Institute, **Russia***), **O.V. Denisenko** (*VNIIFTRI, **Russia***)
Assessing the Influence of Temperature on the Zero Offset of Silicon Accelerometers

28. **V.A. Pogorelov** (*Don State Technical University, Rostov-on-Don, **Russia***)
Algorithmic Support of a Tightly Coupled Navigation System of a Ground-Based Mobile Object

29. **A. Chuiko** (*Samara University, **Russia***)
Analysis of Chaotic Modes of Perturbed Motion of Solids under the Action of Piecewise Continuous Perturbations

*The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

30. **A.S. Samokhin, M.A. Samokhina** (*V.A. Trapeznikov Institute of Control Sciences of RAS, Moscow, **Russia***)
The Problem of Intercepting a Group of Targets in Sun Synchronous Orbits of an Artificial Earth Satellite Taking into Account the Second Zonal Harmonic in Pulse Formulation

31. **A.S. Samokhin, M.A. Samokhina** (*V.A. Trapeznikov Institute of Control Sciences of RAS, Moscow, Russia*)

15.00–15.20     **Discussion of poster papers**

15.20–15.50     COFFEE BREAK

# PLENARY PAPER

15.50–16.10   32. **V.I. Baburov, S.V. Baburov, K.V. Koshelev, V.V. Khudoshin** (*Navigator JSC, St. Petersburg, **Russia***)**, N.V. Ivantsevich** (*Navigator JSC, D.F. Ustinov Baltic State Technical University Voenmeh, St. Petersburg, **Russia***)
Application of Artificial Intelligence to Prevent Aircraft Collisions on the Airfield Surface

# POSTER PAPERS[1]

16.10–16.55   33. **I.V. Kotov, A.A. Arzhannikov, V.D. Glotov** (*Information and Analysis Center for Positioning, Navigation and Timing (IAC PNT), TsNIIMash, Korolev, **Russia***)
Estimation of Characteristics for Different GNSS Augmentation Systems

34. **V.D. Glotov, A.A. Arzhannikov, S.I. Baturin, E.V. Bakaeva, V.L. Lapshin, S.D. Zhilenko** (*Information and Analysis Center for Positioning, Navigation and Timing (IAC PNT), TsNIIMash, Korolev, **Russia***)
Current IAC PNT Information Support Services Based on Internet Technologies for GNSS Users

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35. **J. Li, X. Jiang, C. Liao** (*Marine Design and Research Institute of China, Shanghai, China*)
Carrier Phase-Based Ionospheric Gradient Monitor for Dynamic Platform

36. **T.A. Brovko, A.P. Malyshev, V.B. Pudlovsky** (*Moscow Power Engeneering Institute, Russia*)
Comparison of Methods for Evaluating Navigation Support for the GLONASS System

37. **S.S. Smirnov**, **S.D. Petrov** (*St. Petersburg State University, Russia*)**, I.V. Chekunov** (*Bauman Moscow State Technical University, Russia*), **D.A. Trofimov** (*St. Petersburg State University, Russia*)
Independent Navigation Solutions in GLONASS

38. **K.I. Starikov, S.D. Petrov, P.V. Movsesyan** (*St. Petersburg State University, Russia*)**, I.V. Chekunov** (*Bauman Moscow State Technical University, Russia*), **D.A. Trofimov** (*St. Petersburg State University, Russia*)
Integer Phase Ambiguity Resolution for GLONASS Measurements

39. **D.A. Trofimov, S.D. Petrov** (*St. Petersburg State University, Russia*), **I.V. Chekunov** (*Bauman Moscow State Technical University, Russia*)
Ionospheric Model for GLONASS Navigational Observations

40. **I.A. Kopylov**, **Ye.G. Kharin, V.A. Kopelovich, A.F. Yakushev, Ye.B. Gorskiy, V.B. Ilyin (***Gromov Flight Research Institute, Zhukovsky, Russia*)
Assessing Radio Navigation Systems through Flight Tests

41. **S.S. Golubev, A.V. Nemov** (*Radar MMS, St. Petersburg, Russia*)
About the Construction of a GLONASS/GPS/BDS DAA for an Onboard Navigation System of a Light Unmanned Aerial Vehicle

42. **A.V. Nemov** (*Obukhov Plant, St. Petersburg, Russia*)
On the Use of Perceptron for Signal Classification in a Spatial Sample of GNSS Signals

43. **V.I. Baburov, N.V. Vasilyeva** (*Navigator JSC, St. Petersburg, Russia*), **N.V. Ivantsevich** (*Navigator JSC, D.F. Ustinov Baltic State Technical University Voenmeh, St. Petersburg, Russia*)
Information Characteristics of Working Satellite Constellations in Relative Positioning Using Two GNSS under the User Rolls

44. **A. Voronov** (*The United Institute of Informatics Problems of National Academy of Sciences, Minsk, **Belarus)**, **A. Moroz, P. Zhuk** (*Belarusian State University, Minsk, **Belarus***) Research of Neural Network Model for Predicting Satellite Emergency Situations Based on Telemetry Data

45. **P.A. Khmarski, A.O. Naumov** (*Institute of Applied Physics of the National Academy of Sciences of Belarus, Minsk, **Republic of Belarus***) Algorithms for Three-Dimensional Reconstruction of Electron Concentration Fields in the Ionosphere Using Data from the Global Navigation Satellite System

    *The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

46. **S.V. Dolin, L.A. Lipatnikov** (*Siberian State University of Geosystems and Technologies, Novosibirsk, **Russia***) Collaborative Positioning with Global Navigation Satellite Systems

    *The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

16.55–17.10    **D i s c u s s i o n   o f   p o s t e r   p a p e r s**


**TUESDAY, 28 May**

**SESSION II – INTEGRATED NAVIGATION AND CONTROL SYSTEMS**

Chairmen: **Dr. E.V. Karshakov,** *Russia*
**N.G. Skidanov, PhD,** *Russia*

**P L E N A R Y   P A P E R**

10.00–10.20    47. **N.S. Guzhva, R.N. Sadekov** (*Cognitive Technologies, National University of Science and Technology MISIS, Moscow, **Russia***) Traffic Lights Localization and Matching Algorithms for Tram ADAS

**P O S T E R   P A P E R S** [1]

10.20–10.50    48.   **Shanwu Wang, Bingchuan Zhang, Qing Guo, Shichao Li, Chuang Xu** (*Aerospace Times Feipeng Co., Ltd., Beijing, China*)
The Research Progress of Autonomous Navigation Technology for Unmanned Transport Aircraft in Satellite-Denied Environments

49.   **V.V. Matveev, A.N. Khomyachkova, I.A. Bekhler, M.G. Pogorelov, M.D. Kirsanov** (*Tula State University, Russia*)
Information-Measuring System of a Rotation-Stabilized Spacecraft

50.   **I.D. Kostin, Yu.V. Fadeeva, A.A. Shevchik, I.A. Yakovlev** (*D.F. Ustinov Baltic State Technical University Voenmeh, St. Petersburg, Russia*)
Adaptive Control of Small Satellites Constellation in Projection Orbits Using Implicit Reference Model

51.   **D.G. Gryazin, O.O. Belova** (*Concern CSRI Elektropribor, JSC, St. Petersburg, Russia*)
Experimental Estimation of the Dynamic Error of Navigation Aids Using the Spectral Method

52.   **R.R. Bikmaev** (*Institute of Engineering Physics, Serpukhov, Russia*)
Algorithm for Constructing a Digital Model of the Subsurface Layer of a Vehicle's Route Using a Neural Network in a Georadar Measurement Model

53.   **V.N. Kovregin, G.M. Kovregina** (*St. Petersburg State University of Aerospace Instrumentation, Russia*)
Method of Combined Micronavigation Measurements in a Quasi-Continuous Wave Radar during a Survey of Airspace against the Background of the Earth

54.   **V.N. Kovregin, G.M. Kovregina** (*St. Petersburg State University of Aerospace Instrumentation, Russia*)
Methods and Algorithms for Active Adaptive-Robust Tracking of an Aerial Object and Accompanying (Micro) Navigation Measurements with Quasi-Continuous Wave Radars

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55. **A.V. Rybalko, A.R. Sagatdinov** (*Institute for Problems in Mechanical Engineering of RAS, St. Petersburg, **Russia**)*
Modeling of Movement-Related Evoked Potentials by Identification of the Fitzhugh-Nagumo Model

*The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

56. **A.A. Prut'ko** (*S.P. Korolev Rocket and Space Corporation Energia, Korolev, Moscow region, **Russia***)
The Introduction of Optimal Propellant Maneuvers of the International Space Station into Regular Operation

*The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

10.50–11.00     **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

11.00–11.30     C O F F E E   B R E A K

## P L E N A R Y   P A P E R

11.30–11.50   57. **D.B. Pazychev** (*Integral Ltd, Moscow, **Russia***), **K.S. Bakulev** (*National University of Science and Technology MISIS, Moscow, **Russia***)
Navigation Complex for UAV

## P O S T E R   P A P E R S [1]

11.50–12.20   58   **E.V. Dranitsyna, A.V. Motorin, O.A. Stepanov** (*Concern CSRI Elektropribor, JSC, ITMO University, St. Petersburg, **Russia***), **A.A. Krasnov** (*Concern CSRI Elektropribor, JSC, St. Petersburg, **Russia***)
Comparing the Gravity Anomaly Estimation Algorithms Using a Strapdown Scalar Gravimeter

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59. **T.V. Sazonova, M.S. Shelagurova, E.G. Korneva** (*Ramenskoye Design Company, Ramenskoye, Russia*)
Study of Accuracy Characteristics of Aircraft Navigation Using Micro-Relief with Artificial and Natural Object Composition

60. **Tijing Cai, Shuaipeng Gao, Zhiqian Lu, Ying Liu** (*Southeast University, Nanjing, China*)
Gravity Matching Method Based on Optimized Particle Filtering

61. **V.V. Deryabin** (*Admiral Makarov State University of Maritime and Inland Shipping, St. Petersburg, Russia*)
Depth-Aided Vessel Navigation with the Use of a Neural Network

62. **Wenjian Zhou, Chunfeng Gao, Guo Wei, Hui Luo, Chengzhi Hou, Jiayi Cheng, Xu Zhu** (*National University of Defense Technology, Changsha, China*)
A Refinement Method of Ocean Gravity Datum Map Based on Improved Kriging Algorithm

63. **R.M. Antonov, M.O. Kalinina, A.V. Nekrasov, A.N. Pushkin** (*Inertial Technologies of Technocomplex, Ramenskoye, Russia*)
Correction of a Strapdown Inertial Navigation System Using Information about Geolocated Landmarks

64. **Da Li** (*Harbin Engineering University, Tianjin Navigation Instrument Research Institute, China*), **Wei Gao, Chengsuo Li, Zhong Li** (*Tianjin Navigation Instrument Research Institute, China*), **Lin Zhao** (*Harbin Engineering University, China*), **Rui Li** (*China Aero Geophysical Survey and Remote Sensing Center for Land and Resources, Beijing, China*)
Method of Constructing Gravity Gradient Map Based on the Earth's Gravity Field Model

65. **L.A. Martynova, I.V. Pashkevich** (*Concern CSRI Elektropribor, JSC, St. Petersburg, Russia*)
Increasing the Navigation Safety of an Autonomous Underwater Vehicle during Observation in Ice Conditions

66. **I.A. Smirnov, N.V. Sudakov** (*Central Research Institute of Chemistry and Mechanics, Moscow, Россия*)
Application of Generative Machine Learning Methods in Solving Underwater Vehicle Navigation Problems by Hydroacoustic Data

67  **Chengzhi Hou, Jiayi Cheng, Wenjian Zhou, Xu Zhu, Mailun Chen, Guo Wei, Chunfeng Gao, Xudong Yu** (*National University of Defense Technology, Changsha, **China***)
Vehicle Vector Gravimetry Method Based on SINS/GNSS/LDV Integrated System

12.20–12.40    **D i s c u s s i o n  o f  p o s t e r  p a p e r s**

12.40–13.40    L U N C H

## SESSION II – INERTIAL SYSTEMS AND SENSORS

Chairmen  **Prof. A.A. Golovan, *Russia***
**O.V. Zaitsev, PhD, *Russia***

**P L E N A R Y  P A P E R S**

13.40–14.00    68. **S.E. Perelyaev** (*Ishlinsky Institute for Problems in Mechanics of RAS, Moscow, **Russia**),* **B.P. Bodunov, S.B. Bodunov** (*MEDICON, Miass, **Russia***)
Solid-State Wave Gyro in Whole Angle Mode: Experimental Research of The Basic Parameters

14.00–14.20    69. **Ang Li, Hong Yi, Min Meng, Shengwei Dong, Jie Zhang, He Li, Kai Yang, Xi Wang** (*Microsystem & Terahertz Research Center, China Academy of Engineering Physics (CAEP), Chengdu, **China***), **Wei Su** (*China Academy of Engineering Physics (CAEP), Mianyang, **China***)
Hemispheric Resonator with Q-Factor over 22-Million Prepared by Precisely Controlled Blow-Torch-Molding Process

**P O S T E R   P A P E R S** [1]

14.20–15.00     70.   **M.A. Basarab, B.S. Lunin,** (*Bauman Moscow State Technical University, Russia*)
Dissipation of the Oscillation Energy in Adhesive Joints of Mechanical HRG Resonators

71.   **D.I. Martynenko, A.S. Malyugin, L.E. Kochegizova, S.V. Fetisov** (*Inertial Technologies of Technocomplex, Rameskoye, Russia*)
Development of a Methodology for Analysis of Vibration Damping of a Hemispherical Resonator Gyroscope Cluster

72.   **Ning Wang, Guoxing Wang, Zhennan Wei, Yan Huo, Lishan Yuan, Yiwei Sun** (*Space Control and Inertial Technology Research Center,* Harbin*, China*)
Suppression of Anchor Loss in Hemispherical Resonator Based on Vibration Mode Optimization

73.   **A.A. Maslov, D.A. Maslov, I.V. Merkuryev** (*Moscow Power Engineering Institute, Moscow, Russia*)
Electrical Balancing of Wave Solid-State Gyroscope with Flat Electrodes

74.   **Yungfeng Tao, Kaixin Deng, Yao Pan, Wei Wu, Kaiyong Yang, Hui Luo** (*National University of Defense Technology, Changsha, China*)
Simulation of the Frequency Mismatch Caused by the Inclined Errors of the Assembly of the Hemispherical Resonator Gyroscope

75.   **S.E. Perelyaev** (*Ishlinsky Institute for Problems in Mechanics of RAS, Moscow, Russia*), **A.V. Alekhin** (*Inertial Technologies of Technocomplex, Ramenskoye, Russia*)
Estimation of the Resonant Frequency of Vibrations of a Solid-State Wave Gyro

76.   **A.N. Korolev, P.A. Ivanov, Yu.V. Filatov** (*St. Petersburg Electrotechnical University LETI, Russia*), **A.Ya. Lukin** (*Peter the Great St. Petersburg Polytechnic University, Russia*)**,**

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**E.D. Bokhman** (*St. Petersburg Electrotechnical University LETI, Russia*)
Investigation of the Accuracy Characteristics of Matrix Methods of Linear-Angular Measurements

77. **A.V. Frolov, Yu.V. Mikhaylov, P.A. Shapovalov** (*Central Research Institute of Automation and Hydraulics TsNIIAG, Moscow, Russia*)
A Technique for Calculating the Transient Temperature Profile in the Internal Cavity of a Strapdown Inertial Navigation System

78. **S.V. Smirnov, Yu.G. Egorov, G.Yu. Kiryachenko, G.S. Taranenko** (*Central Research Institute of Automation and Hydraulics TsNIIAG, Moscow, Russia*)
Synthesis of Calibration Programs for a Triad of Accelerometers

79. **S.V. Topilskaya** (*Experimental Design Bureau Mars, Moscow, Russia*)
Equation of Motion of a Protection System with Nonlinear Dynamic Damper for Strapdown Inertial Navigation System

80. **L.E. Kochegizova, A.S. Malyugin, D.I. Martynenko, S.V. Fetisov** (*Inertial Technologies of Technocomplex, Rameskoye, Russia*)
Refinement of Hemispherical Resonator Gyroscope Actuation Algorithm

*The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

15.00–15.20    **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

15.20–15.50    C O F F E E   B R E A K

**P L E N A R Y   P A P E R S**

15.50 – 16.10    81. **Yu.Yu. Broslavets, E.A. Polukeev, A.A. Fomichev, V.G. Semenov** (*Moscow Institute of Physics and Technology (MIPT), JSC Lasex, Dolgoprudny, Russia*), **D.S. Redichkina, A.R. Pokrovskaya** (*MIPT, Dolgoprudny, Russia*)
Noise Suppression in the Output Signal of a YAG:$Cr^{4+}$ Solid-State Laser Gyroscope with Cavity Length Control and Mode- Locking

16.10–16.30    82. **M.A. Basarab** (*Bauman Moscow State Technical University, Russia*), **B.S. Lunin** (*Lomonosov Moscow State University, Russia*) Study of Noise Characteristics of Signals from Navigation System Units Using Wavelet-Like Generalized Allan Estimators

## P O S T E R   P A P E R S [1]

16.30–17.00    83. **Yu.Yu. Broslavets, A.A. Fomichev, E.A. Polukeev, V.G. Semenov** (*Moscow Institute of Physics and Technology, JSC Lasex, Dolgoprudny, Russia*), **D.S. Redichkina, A.R. Pokrovskaya** (*Moscow Institute of Physics and Technology, Dolgoprudny, Russia*) Four-Frequency Zeeman Laser Gyroscope: System for Separating Counterpropagating Waves Beat Signals for Orthogonal Polarizations and Control of the Cavity Perimeter Using the Co-Directed Wave Beat Signal

84. **I.N. Khokhlov, Yu.D. Golyaev, E.A. Petrukhin** (*POLYUS Research Institute of M.F. Stelmakh, Moscow, Russia*) Measurement Method, Statistics and Sources of the Lock-In Zone in a Zeeman Laser Gyroscope

85. **Shaojun Du, Lili, Lin Zhang, Jiangang Guo, Lei Wang, Shitao Huang** (*Beijing Aerospace Times Laser Navigation Technology Co., Ltd Beijing, China*) Simulation of Initial Error Calibration of Uniaxial Rotating Laser Inertial Navigation System Assisted by Total Station

86. **D.G. Gryazin, T.V. Paderina** (*Concern CSRI Elektropribor, JSC, St. Petersburg, Russia)* Magnetic Compass with a New Correction System: Field Test Results

87. **V.A. Smirnov, A.V. Prokhortsov** (*Tula State University, Russia*), **V.A. Zarubin (***VNII Signal, Kovrov, Russia)* Quaternion Algorithm for Strapdown Gyro Vertical

88. **D.V. Furtas, A.V. Nekrasov, I.H. Shaymardanov, E.V. Babaev, A.A. Dzuev, A.N. Kostornoy** (*Inertial Technologies of Technocomplex, Ramenskoye, Russia*) Estimation of Possibilities of Building a Block of Sensing Elements on the Basis of an Array of Micromechanical Inertial Sensors

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89. **V.M. Bogolyubov, O.V. Tsyganov, L.U. Bakhtieva** (*Kazan National Research Technical University named after A.N. Tupolev (KNRTU-KAI), Russia*)
Three-Component Angular Velocity Sensor Based on a Modulation Micromechanical Gyroscope

90. **S.Yu. Perepelkina, A.A. Fedotov** (*Academician N.A. Semikhatov Scientific and Production Association of Automatics*, *Yekaterinburg, Russia*)
Usage of Differential Optical Measurements for Mutual Binding of Navigation Devices by Angular Position

17.00–17.20        **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

18.00–20.00        **Boat trip along the Neva river and drink reception**


**WEDNESDAY, 29 May**

### SESSION III – INERTIAL SYSTEMS AND SENSORS

Chairmen: **Prof. Yu.V. Filatov, *Russia***
**Yu.A. Litvinenko, Ph.D., *Russia***

**P L E N A R Y   P A P E R**

9.00 – 9.20     91. **L.V. Vodicheva, Yu.V. Parysheva, V.L. Yakimov, D.I. Kabanova** (*Academician N.A. Semikhatov Scientific and Production Association of Automatics, Yekaterinburg, Russia*)
Gyrocompassing Technique for a Strapdown Inertial Measurement Unit with Two Angular Rate Sensors

**P O S T E R   P A P E R S**[1]

9.20–9.55     92. **Gang Wang, Bo Xie, Yunjiao Li, Honggang Chen, Wei Hong** (*No.16 Institute The 9th Academy, China Aerospace Science and Technology Corporation, Xi'an, China*), **Hanrui *Yang (Northeast Electric Power University, Jilin, China)***
The Influence of Power Supply Switching Frequency Noise on Zero Bias of Fiber Optic Gyroscope

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93. **Longgang Li, Bin Ren, Yihua Wang, Ruifeng Xu, Yu Liu, Jiawei Li, Fengjun Li** (*XI'an Aerospace Precision Electromechanical Institute, China Aerospace Science and Technology Corporation, Xi'an; China*)
Research on Input Axis Misalignment Angle Error Suppression Technology for FOGs Using the Fiber Coil with Skeleton

94. **Pei Zhang, Yichen Wu, Honggang Chen, Wei Hong, Bo Huang, Longgang Li, Wei Jiang, Yu Bai** (*XI'an Aerospace Precision Electromechanical Institute, China Aerospace Science and Technology Corporation, Xi'an, China*), **Wei Ding (***Beijing Institute of Control and Electronic Technology, China Aerospace Science and Industry Corporation Limited, China)*
Research on the Technology for Improving Scale Factor Stability of High Precision Fiber Optic Gyroscope

95. **Yichen Wu, Pei Zhang** (*XI'an Aerospace Precision Electromechanical Institute, China Aerospace Science and Technology Corporation, Xi'an, China*), **Wei Ding (***Beijing Institute of Control and Electronic Technology, China Aerospace Science and Industry Corporation Limited, Beijing, China),* **Wei Hong, Zewei Pan, Bo Huang, Yunjiao Li, Hui Cao, Yu Bai** (*XI'an Aerospace Precision Electromechanical Institute, China Aerospace Science and Technology Corporation, Xi'an, China*)
Research on the Technology for Suppressing Magnetic Field Error of High Precision Fiber Optic Gyroscope

96. **Yun-Jiao Li, Bo Huang, Wei Hong, Yong-Liang Zhao, Shao-Feng Lou, Gang Wang, Yi-Chen Wu** (*XI'an Aerospace Precision Electromechanical Institute, China Aerospace Science and Technology Corporation, Xi'an, China*)
Improvement of Precision of High-Accuracy Fiber Optic Gyroscope Based on the Application of "Three-Self Motion" Inertial Measurement Unit

97. **Wei Jiang, Honggang Chen, Zewei Pan, Binjie Lin, Wei Hong** (*No.16 Institute The 9th Academy China Aerospace Science and Technology Corporation, Xi'an, China*)
Mathematical Model of Polarization Error in Fiber Optic Gyroscope

98. **M.A. Belousov, A.I. Krivosheev** (*PJSC Perm Scientific-Industrial Instrument Making Company, Russia*)
Evaluating Temperature Stability of Power Balance in Fiber-Optic Gyroscope with Compensation of Relative Intensity Noise of a Light Source

99. **D.M. Kalikhman** (*Yu. A. Gagarin State Technical University of Saratov, Branch of Academician Pilyugin Center – Production Association Korpus, Saratov, **Russia***), **V.A. Turkin, A.A. Akmaev, V.V. Skorobogatov** (*Branch of Academician Pilyugin Center – Production Association Korpus, Saratov, **Russia***)
Principles of Software Development for Inspecting Parameters of Inertial Measurement Units with Nonorthogonally Oriented Measuring Axes

100. **D.M. Kalikhman, E.A. Deputatova, N.V. Tarakanov** (*Yu. A. Gagarin State Technical University of Saratov, Branch of Academician Pilyugin Center – Production Association Korpus, Saratov, **Russia***), **S.V. Pchelintseva** (*Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, Moscow, **Russia***)
Investigating the Effect of Structural Nonrigidity of a Precision Test Bench with Inertial Sensing Elements for Testing the Angular Rate Sensors on its Accuracy Characteristics

101. **A.V. Polushkin, I.V. Slistin, N.A. Kaldymov, A.A. Ivanov, I.A. Nazarov, V.F. Vasil'ev, A.K. Gerte, A.V. Pugovkin** (*Branch of Academician Pilyugin Center – Production Association Korpus, Saratov, **Russia***)
Improving Accuracy Characteristics and Functionality of a Rotary Turntable for Testing of Navigation Devices and Their Elements

102. **P.A. Pavlov, E.M. Ivashchenko** (*St. Petersburg Electrotechnical University LETI, **Russia***)
The Goniometric Stand for Angle Encoder Calibration. Research Methods and Results

103. **A.E. Morozov** (*Perm Scientific-Industrial Instrument Making Company, **Russia***)
Optimal Deadband Estimation Algorithm for Fiber Optic Gyroscopes

    *The paper is recommended by the Program Committee of the 26th Conference of Young Scientists "Navigation and Motion Control"*

9.55–10.15  **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

10.15–10.45  C O F F E E   B R E A K

## SESSION IV – RELEVANT ISSUES OF THEORY

Chairmen:   **Dr. Yu.A. Litmanovich,** *Russia*
**A.V. Motorin, Ph.D.,** *Russia*

# P L E N A R Y   P A P E R S

10.45–11.05   104.   **O.A. Stepanov, A.M. Isaev, A.V. Motorin,**
**Yu.A. Litvinenko, V.P. Zolotarevich** (*Concern CSRI Elektropribor, JSC, ITMO University, St. Petersburg, **Russia***)
Recursive and Nonrecursive Algorithms Applied to Navigation Data Processing: Differences and Interrelation with Factor Graph Optimization Algorithms

11.05–11.25   105.   **S.E. Perelyaev, V.F. Zhuravlev** (*Ishlinsky Institute for Problems in Mechanics of RAS*, *Moscow*, ***Russia***),
**A.A. Skripkin** (*Yuri Gagarin State Technical University of Saratov, **Russia**),*
Equations of Elastic Oscillations of a Solid Symmetrical Body in the Basis of Eigenmodes. Three-Axis Solid-State Wave Gyro

11.25–11.45   106.   **A.V. Molodenkov, Ya.G. Sapunkov** (*Institute for Problems of Precision Mechanics and Control of RAS, Saratov, **Russia***),
**T.V. Molodenkova** (*Yuri Gagarin State Technical University of Saratov, **Russia***)
Quasi-Optimal Angular Acceleration of Spacecraft Obtained on the Basis of the Poinsot Concept

# P O S T E R   P A P E R S [1]

11.45–12.30   107.   **O.A. Stepanov, V.P. Zolotarevich, A.V. Motorin, M.S. Ivanov** *(Concern CSRI Elektropribor, JSC, ITMO University, St. Petersburg, **Russia**)*
Comparing Recursive and Nonrecursive Bayesian Estimation Algorithms in Trajectory Tracking Using Bearing-Only Measurements

108.   **D.A. Cherginets, A.A. Vedyakov** (*ITMO University, St. Petersburg, **Russia***)
Design of Visual-Inertial Odometry Algorithm for a Four-Legged Walking Robot with a Stereo Camera

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109. **V.G. Karaulov** (*ITMO University, Concern CSRI Elektropribor, JSC, Petersburg, Russia*), **A.M. Gruzlikov** (*Concern CSRI Elektropribor, JSC, Petersburg, Russia),* **Yu.A. Litvinenko** (*ITMO University, St. Petersburg, Concern CSRI Elektropribor, JSC, Petersburg, Russia*)
Solution of the Problem of AUV Positioning Relative to a Stationary Docking Station Using a Factor Graph Optimization Algorithm

110. **Yu.N. Chelnokov, A.V. Molodenkov, M.Yu. Loginov** (*Institute for Problems of Precision Mechanics and Control of RAS, Saratov, Russia*)
Biquaternion Quasi-Optimal Analytical Solution for the Problem of Time-Optimal Programmed Control of Spatial Motion of Spacecraft

111. **I.A. Pankratov** (*Saratov State University, Institute for Problems of Precision Mechanics and Control of RAS, Saratov, Russia*)**,** **Yu.N. Chelnokov** (*Institute for Problems of Precision Mechanics and Control of RAS, Saratov, Russia*)
Biquaternion Solution to the Problem of Energy-Optimal Control of Spacecraft Spatial Motion

112. **A.V. Doroshin, M.M. Krikunov** (*Samara University, Russia*)
Study of the Stabilizing Properties of a Jet in Spacecraft Angular Motion

113. **V.M. Nikiforov, A.V. Soloviev, M.L. Simakov, A.A. Gusev, K.A. Andreev, A.V. Shevchenko** (*Academician Pilyugin Scientific-Production Center of Automatics and Instrument-Making, Moscow, Russia*)
Controlling the Sensing Element of a Pendulum Compensation Accelerometer Using a Static Modal Combined Controller $H_2/H_\infty$

114. **V.M. Kotlov** (*State Research Institute of Aviation Systems, Moscow, Russia*), **S.E. Perelyaev** (*Ishlinsky Institute for Problems in Mechanics of RAS, Moscow, Russia*)
Derivation of the Dynamics Equations for a HRG resonator by d'Alembert-Suslov Method

115. **A.Yu. Knyazhsky, A.V. Nebylov, V.A. Nebylov** (*St. Petersburg State University of Aerospace Instrumentation, Russia*)
Relative Navigation of Aircraft Using an Optical Surveillance System

116. **A.V. Nebylov, V.A. Nebylov** (*St. Petersburg State University of Aerospace Instrumentation, Russia*)
Features of the Synthesis of a Robust Radio-Inertial Integrated Speed Meter

117. **E.V. Barinova, I.A. Timbai, E. Mironov** (*Samara University, Russia*)
Numerical-Analytical Determination of Equilibrium Positions of a CubeSat Nanosatellite under Aerodynamic and Gravitational Moments

118. **L.I. Sinitsyn, I.V. Belokonov** (*Samara University, Russia*)
Studying the Effectiveness of Using Nanosatellite Pre-Spin Technology to Improve Maneuvering Accuracy

119. **Shen Xin, Jin Jun, V.V. Lukyanov** (*Bauman Moscow State Technical University, Russia*)
Adaptively Maximum Correntropy Based Robust Cubature Kalman Filter under Non-Gaussian Noise

120. **F.S. Dubrovin, A.Y. Rodionov** (*Institute of Marine Technology Problems of FEB RAS, Vladivostok, Russia*), **A.F. Shcherbatyuk** (*Institute of Automation and Control Processes of FEB RAS, Vladivostok, Russia*)
On Improving the Accuracy of the Acoustical Navigation System with a Short Baseline for AUV Group Positioning

12.30–12.45    **D i s c u s s i o n   o f   p o s t e r   p a p e r s**

12.45–13.45    L U N C H

### PANEL DISCUSSION
### Artificial Intelligence. Applications to Navigation and Control

Chairmen: **Prof. O.A. Stepanov, Corresponding member of RAS,** *Russia*
**Prof. N.V. Kuznetsov,  Corresponding member of RAS,** *Russia*

13.45–14.15    121. **A.M. Bukhanovskii** (*ITMO University*, St. Petersburg, *Russia*)
Generative Artificial Intelligence Technologies for Industrial Applications

14.15–14.35    122. **D.A. Novikov** (*V.A. Trapeznikov Institute of Control Sciences of RAS*, Moscow, ***Russia***)
Artificial Intelligence in Control

14.35–14.50    123. **К.К. Veremeenko** (*Moscow Aviation Institute*, ***Russia***)
On the Experience of Applying Neural Network Approaches to Navigation Data Processing

14.50–15.05    124. **O.V. Zaitsev** (*Concern CSRI Elektropribor, JSC, St. Petersburg, Russia*)
Application of Artificial Intelligence to Some Problems in Navigation Data Processing

15.05–15.45    **D i s c u s s i o n**

15.45–16.00    **C L O S I N G   C E R E M O N Y**