



JOINT COMPANY  
«RESEARCH AND PRODUCTION CORPORATION  
«SPACE MONITORING SYSTEMS, INFORMATION & CONTROL AND  
ELECTROMECHANICAL COMPLEXES» NAMED AFTER A.G. IOSIFIAN»  
(JC «VNIIEM CORPORATION»)

ISSN 2500-1299

**Tome 184**

**№5  
2021**

**ELECTROMECHANICAL MATTERS. VNIIEM STUDIES**

Scientific and technical journal  
Published since 1959  
Released once every two months

**Chief Editor:**

MAKRIDENKO L. A., Director General,  
D. Sc. (Tech.)

**Editorial board:**

**Volkov S. N.**, D. Sc. (Tech.)  
**Gecha V. Ia.**, D. Sc. (Tech.)  
(Deputy Chief Editor)  
**Gorbunov A. V.**, Ph. D. (Tech.)  
**Duyshenaliev T. B.**, D. Sc. of Physics  
and Mathematics (Kyrgyz Republic)  
**Zakharenko A. B.**, D. Sc. (Tech.)  
**Zolotoy S. A.**, Ph. D. (Tech.)  
(Republic of Belarus)  
**Kazantsev S. G.**, D. Sc. (Tech.)  
**Karachun N. D.**, D. Sc. (Tech.)  
**Minaev I. V.**, D. Sc. (Tech.)  
**Nurguzhin M. R.**, D. Sc. (Tech.)  
(Republic of Kazakhstan)  
**Pinchuk A. V.**, Ph. D. of Military Science  
**Sarychev A. P.**, D. Sc. (Tech.)  
**Tyutnev A. P.**, D. Sc. of Physics  
and Mathematics  
**Fedotov A. Yu.**, D. Sc. (Tech.)  
**Hodnenko V. P.**, D. Sc. (Tech.)  
**Chunikhina O. A.**  
(Editorial board Executive secretary)

**Executive editor:**

**Gecha V. Ia.**, D. Sc. (Tech.)

**Subscription index:**

Union catalogue  
«Pressa Rossii»  
**87648**

Editorial office address:  
JC «VNIIEM Corporation», 30 Volnaia st., Moscow, Russian  
Federation. Postcode: 105187.  
Tel.: (495) 365-30-63.  
E-mail: vniiem@vniiem.ru; redactori@mcc.vniiem.ru.  
http://jurnal.vniiem.ru.

Signed for print 29.10.2021. Format: 60×84 1/8.  
Conventional printed sheet 6,53. Circulation: 150 copies.

Printed at «SAM-POLIGRAFIST» LLC6,  
Protopopovskii pereulok, Moscow. Tel.: (495) 545-37-10.  
www.onebook.ru.

The journal is registered by the Federal Service for Supervision  
of Communications, Information Technology and Mass Media,  
Registration Certificate ПИ No. 77-74183 dated 30.11.2018.

The journal is recommended by the Ministry of education and  
science of Russia for publication of scientific works reflecting  
the main scientific content of candidate and doctoral dissertations.

Full or partial use of the information published in the journal is  
allowed only after coordination with the editorial department,  
with indication of the source.

© JC «VNIIEM Corporation», 2021

**CONTENTS**

**GENERAL QUESTIONS OF ELECTROMECHANICS**

*M. V. Mikhailov, P. E. Gavrish, A. A. Bozhkov*  
Special aspects of operation of conversion  
and control system of electric rocket engine at firing.....3

**SPACE ELECTROMECHANICS. SPACE CRAFTS.  
NEAR-EARTH SPACE RESEARCH**

*D. A. Bondarenko*  
Use of rarefied gases of Earth's atmosphere  
as propellant for electric rocket propulsion system.....7

*N. I. Sidnyaev*  
Influence of aerodynamics spacecraft to the entrance corridor  
and heating in the atmosphere of planets.....14

*V. A. Tsvetkov, I. V. Aleksanova, A. O. Voronko,  
A. V. Kniazev, S. G. Kondrateva*  
Optimization of cross-dipole antenna arrays matching.....31

*N. A. Krasova, V. Ia. Gecha, I. A. Meshchikhin*  
Method of compensation of spacecraft flexible modes  
and ways of its implementation.....36

**ELECTROMECHANICS AND THE SOCIO-ECONOMIC  
DEVELOPMENT OF THE NATION**

*I. Iu. Ilina, V. K. Saulskii*  
Research of orbital configuration of forest fire detection system.....43