

## TABLE OF CONTENTS

### GENERAL PROBLEMS OF ELECTROMECHANICS

---

**Talov V.V.** (JSC «NIEM»)

ON SERVO DRIVE SLIDING MODE FOR ELECTRICAL SPINDLE ROTOR POSITIONING.....3

*An introduction of isodromic negative feedback according to electrical spindle rotor position, as well as necessary and sufficient conditions for selecting its parameters to provide a servo drive sliding mode operation for electrical spindle positioning are justified. A mathematical model of servo drive and results of its research are represented.*

**Key words:** sliding mode, servo drive, electrical spindle rotor positioning, lineal electromagnetic motor, two-positron relay, isodromic negative feedback, degenerate secular equation, mathematical model, milling and drilling of printed boards.

**Deeva V.S., Slobodyan S.M.** (ENIN NITPU)

**Slobodyan M.S.** (High technology physics Institute NITPU)

A PERIODIC SLIDE CURRENT COLLECTION MODEL.....9

*A valuation problem of survivability of sliding periodic contact – commutator machine brushes. A Markov wear model of brushes at sliding on commutator machines lamellar structure appreciating peculiar properties of brush assembly functionality is proposed.*

**Key words:** diagnostics, electrical sliding contact, casual model.

### SPACE ELECTROMECHANICS. SPACECRAFT

---

**Afonskaya S.A., Afonsky S.A., Dultsev A.A., Sheptalin D.S.** (JSC «VNIEM Corporation»)

DEVELOPING A NONCONTACT ENERGY TRANSFER UNIT FOR

SPACECRAFT SOLAR BATTERIES ORIENTATION SYSTEM.....15

*A unit of noncontact energy transfer (BBPE) that can improve mass, sizes and energy data of solar batteries orientation system, raise operational reliability and mission life of individual units and entire system in whole is under consideration. A computation algorithm of individual elements of BBPE with regard to results and FE modeling is represented.*

**Key words:** spacecraft, noncontact energy transfer, finite element model, finite elements method, calculation and system simulation.

**Fadeev A.S.** (FSUE «TsENKI»)

SPACEPORT «VOSTOCHNY» ACTIVITIES ECOLOGICAL CONSEQUENCES FORECASTING.....21

*Vital problems on appraisal of ecological resource of perspective spaceport are under consideration. A new methodology to monitor ecological consequences after fall of separated boosters parts within allocated area taking into account not only current leasehold and penal damages, but expenses in the future at recovery of ecological situation is proposed in this article as well. Differential models for forecasting values of biological productivity in the area of fall in the longer term are developed.*

**Key words:** ecology, rocket-and-space activity, impact area, safety, ecological sustainability, forecasting.

**Fadeev A.S.** (FSUE «TsENKI»)

**Arsenyev V.N.** (Military space academy n.a. A.F. Mozhaysky)

DETERMINATION OF INITIAL PARAMETERS OF MOVING COMPONENTS AT SEPARATION

FROM THE BOOSTER BASING ON LIMITED NUMBER OF LAUNCHES.....33

*Basing on limited quantity of launches and model experiments results the author of the article considers on estimation of initial movement characteristics of dispersion of components at their separation from the booster. A new approach to its solution has allowed to improve appraisal accuracy of dispersion characteristics.*

**Key words:** booster, separating part, dispersion area, initial parameters spread, priori information, limited number of launches, estimating methods, likelihood ratio, posterior estimations, accuracy appraisal.

### PRODUCTS AND EQUIPMENT TEST PROCEDURES

---

**Gusarov S.V., Dosko S.I.** (FGBOU VPO MSTU «STANKIN»)

**Badanin V.V., Isaev S.A.** (JSC «VNIEM Corporation»)

COMPARATIVE ANALYSIS OF UNIMODAL AND POLYMODAL APPROACHES

AT PROCESSING VIBRATION SURVIVAL DYNAMIC TESTING RESULTS.....37

*An unimodal and polymodal approaches at processing dynamic testing results on vibration survival by way of example of dynamic dummy instrument platform of SC «Meteor-M» testing, as well as identification results of frequency responses of the dummy are compared.*

**Key words:** vibration survival, identification, frequency response, modal analysis.

**Afromeev E.V., Krasova N.A., Ruzakov A.A., Khiblin I.N.** (JSC «VNIEM Corporation»)

MATHEMATICAL SIMULATION OF CONTROL AND PROTECTION SYSTEM FACILITIES

OF NPP AND ITS TESTING FOR AIRCRAFT AND AIR WAVE IMPACTS EFFECTS.....49

*Results of tests of control protection system (CPS) of the equipment of Novovoronezh NPP for aircraft and air blast impacts by single pulses method are brought up. Requirements for CPS NPP hardware are analyzed, main test modes are justified. Results of identification of mathematical models of the standard equipment based on testing results are represented.*

**Key words:** CPS electrical equipment of NPP, aircraft impact, air blast, impact spectrum, test mode.

### ELECTROMECHANICS AND SOCIOECONOMIC DEVELOPMENT OF THE COUNTRY

---

**Khvalin A.L.** (Saratov State University)

DISTRIBUTION OF MAGNETIZATION IN «FINE TEXTURE» OF STRIP DOMAINS

IN YTTRIUM IRON GARNET FILMS.....55

*A stripe domain structure model is proposed. It enables to explain appearance of periodic «fine texture» (FT), which appears as dark transversal lines crossing the strip domain. The research is of great practical importance as enables to explain a magnetic microstructure of strip domains and specify parameters of yttrium iron garnet films at design of some devices (resonators, filters, noise suppressors and others).*

**Key words:** strip domain structure, yttrium iron garnet, magneto-optic methods, magnetization vector.

**Boyarchuk K.A.** (JSC «NIEM»)

**Kim V.P., Hegai V.V.** (IZMIRAN)

**Karelin A.V.** (FSUE «TsNIImash»)

CUMULATIVE EFFECT OF RADIOACTIVE CONTAMINATION OF THE SEA OF

JAPAN AQUATORY DUE TO MANY YEARS OPERATION OF JAPANESE NPPs

AND POSSIBILITY OF ITS IONOSPHERIC MONITORING.....59

*In consequence of day-to-day operation of Japanese NPPs a continuous release of radioactive particles into atmosphere takes place resulting in a large-scale radioactive contamination of the troposphere above all the Sea of Japan aquatory.*

*Structurally this contamination could have a view of strips outstretched along the predominate winds direction (generally summer monsoons blowing in the direction of Asiatic continent). Basing on models calculations, it was demonstrated that such lines of radioactive contamination of the troposphere can contribute appearance of specific changes of electron concentration in ionospheric E-region. These changes of electron concentration can be registered with the aid of standard radiophysical observation methods of ionosphere and so to perform a real remote monitoring of overall picture of radioactive contamination degree of the troposphere due to operation of NPPs, besides practically at a time and on large areas that have a special significance.*

**Key words:** radioactive contamination, cumulative effect, thunderstorm activity, ionospheric irregularities, radiophysical monitoring.