

# Abstracts

## Electrical Mashines and Apparatus

*Burkovsky A.N., Rybalko O.A.*

### **Determination of load dependence of allowed number of reverses for an asynchronous motor with a short-circuited rotor in S7 mode.**

The paper contains results of determination of allowed number of reverses for an asynchronous motor with a short-circuited rotor in S7 mode as function of load.

*Key words* – asynchronous motor, mode, reverse, determination.

*Golenkov G.M., Bondar R.P., Makogon S.A., Podoltsev A.D., Bogaenko N.V., Popkov V.S.*

### **Numerical calculation of magnetic field and basic characteristics of an electrovibrator based on a coaxial linear motor with permanent magnets.**

The design of an electrovibrator created on the basis of a coaxial linear motor with permanent magnets is considered. FEM analysis of magnetic field and electromagnetic force acting on the motor armature is carried out. Experimental data that confirm reliability of calculation results obtained are given.

*Key words* – electrovibrator, coaxial linear motor, magnetizing force, permanent magnets.

*Gurevich V.I.*

### **A simple ultraspeed overcurrent protection relay.**

Specification and results of experimental research on a high-speed hybrid overcurrent relay with a reed switch as the sensitive element are given. It is shown that this relay can be successfully used for acceleration of the basic relay protection action.

*Key words* – microprocessor relay, protective relays, high-speed relay, CT saturation, current derivatives, reed relay.

*Degtev V.G., Babushanov A.V., Lavruk I.S., Samoilov G.A.*

### **Synthesis of a three-phase winding family**

Peculiarities of arbitrary symmetric three-phase windings with similar harmonic spectrums are studied. A technique of the windings' homologous series generation is worked out. Examples of the technique application are given. It is suggested to use a feasibility of homologous series generation so as to synthesize a generalized structure of multiphase windings.

*Key words* – three-phase winding, harmonic spectrum, homologous series, generalized model.

*Zabolotny I.P., Grishanov S.A.*

### **A dynamic state control method for a synchronous generator with application of phase rotor trajectories.**

In the paper, a transient state control method for a synchronous generator is introduced. The method is based on application of phase trajectories of the rotor motion. The capabilities of the

5 control method have been investigated on an elementary power system model. Results obtained confirm efficiency of the method as compared with methods based on Lyapunov functions or those based on the theory of pattern recognition.

*Key words* – synchronous generator, control method, transient state, phase rotor trajectories.

*Zagirniak M.V., Zagirnyak V.G., Nevzlin B.I., Kirichkov A.V.*

### **8 Induction motor temperature defence characteristics under rapidly increasing overloads.**

A refined thermal equivalent circuit of an induction motor used to develop a thermal circuit of a unit, namely, an element of the stator winding outhang - thermodetector, is considered. Errors of determining the stator winding temperature at slowly and rapidly increasing temperatures have been revealed on the basis of the analysis of the isolated unit.

*Key words* – induction motor; refined thermal equivalent circuit; windings; stator; thermodetector; increasing temperature.

*Klymenko B.V., Baida E.I., Grechko A.M., Boev S.V.*

### **13 About fault current thermal action in vacuum-breaker protected middle-voltage circuits.**

A mathematical model is developed to obtain relationship between the breaker response and current distributor thermal stability in short-circuit conditions. Optimal total time of the breaker opening is calculated for the minimum value of Joule integral.

*Key words* – Joule integral, symmetric three-phase fault, total interruption time, vacuum circuit-breaker, dependence.

*Sebko V.V.*

### **17 Monitoring of four parameters of ferromagnetic products at one frequency of probing longitudinal magnetic field of a transformer eddy-current probe.**

An eddy-current method of contactless joint determination of geometric, magnetic, electric parameters and temperatures of a cylindrical ferromagnetic product is considered. The whole research has been carried out only at one frequency of probing longitudinal magnetic field which corresponds to the maximum phase angle of the total EMF of a transformer eddy-current probe taking into account the product heating.

*Key words* – cylindrical ferromagnetic product, parameters, contactless determination, eddy-current method.

*Tchaban A.*

### **21 An A-model of a turbogenerator in phase current coordinates.**

A mathematical model of a turbogenerator is developed in phase coordinates of currents. Differential equations of the electromechanical system state are given in normal Cauchy form. Utilization

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of the phase coordinates allows taking into account any type of the stator unsymmetry.

*Key words* – turbogenerator, mathematical model, phase coordinates, normal Cauchy form.

*Chepelyuk A.A.*

**Monte-Carlo calculation of scattering conductivity in a two-leg valve-type electromagnet.**

Monte-Carlo calculations of geometric scattering conductivity in a "two cylinders - one plane" system have resulted in obtaining a conductivity dependence as function of multiplicity of the studied system dimensions.

*Key words* – electromagnet, conductivity, pole, potential.

*Sharaban Yu.V.*

**42 Ways of improvement of starting characteristics of aviation asynchronous motors.**

Advantages and short-comings of ways of improving starting characteristics of asynchronous motors intended for aviation accessory drive are analyzed.

*Key words* – asynchronous motor, starting characteristics, magnetic wedges, double-cage rotor.

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## Electrical Engineering: Theory

*Boev V.M., Rogachev S.I.*

**Superconductivity in terms of Faraday concept of "electrotonic state".**

Process of magnetic field penetration into type I and type II superconductors is analyzed using Faraday concept of "electrotonic state" (vector potential).

*Key words* – superconductivity, magnetic field, vector potential, electrotonic state, Faraday conception.

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*Kanov L.N., Kostjukov V.V.*

**A method of nonsteady electrical system state modeling based on the systems' circuit factors.**

An efficient numerical-and-analytical method of modeling nonsteady and transient states of electrical systems is introduced. The method is based on circuit factors and applicable to analyzing both linear and nonlinear systems. A technique of circuit factors calculation is described. An example of the method application is given.

*Key words* – numerical-and-analytical method, electrical system, circuit factors, linear and nonlinear systems, calculation technique.

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## High Electrical and Magnetic Field Engineering

*Baranov M.I.*

**A 1D electrothermal problem for metallic skin of an aircraft under lightning action.**

Results of approximate calculations of temperature increase in the zone of the high-current spark channel of a lightning lock-in on the flat surface of the metallic skin of an aircraft are given. It is shown that a pulse 2/50 mks 200kA-amplitude component of the lightning total current causes only local burn of the external surface of the aircraft aluminum skin, while its constant 1000ms 200A-amplitude component can result in the skin through fusion penetration.

*Key words* – lightning, high-current spark channel, temperature, aircraft skin.

*Besprozvannykh A.V.*

**Analysis of a switching matrix under recovery of partial capacitance and dielectric loss tangent of multicore cables via cumulative measurements.**

At application of a method of cumulative measurements, partial capacitance and dielectric loss tangent are found as solution of a system of linear algebraic equations. With examination of multicore cables, the number of experiments rises sharply. To reduce environment action on results of measurements and speed of experiment, it is enough to analyze a switching matrix that provides solving the system.

*Key words* – cumulative measurements, partial capacitance, dielectric loss tangent, switching matrix, determinant, optimum plans.

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*Dubovenko K.V.*

**A calculation method for breakdown probability characteristics in gaseous insulation of submegavolt range high-voltage apparatus**

Taking into account a set of initial electron generation mechanisms, applicability of a numerical method for breakdown probability characteristics calculation is widened for high-voltage apparatus gaseous insulation with high values of electric field strength ( $>5 \text{ MV}\cdot\text{m}^{-1}$ ). The characteristics of gaseous insulation in real compact designs of a low-inductance high-voltage gaseous switch and a submegavolt pulse voltage generator have been calculated with the method.

*Key words* – high-voltage apparatus, gaseous insulation, breakdown probability characteristics, calculation method.

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*Petkov A.A.*

**Formalization of structure description for high-voltage pulse test device discharge circuits.**

The paper introduces techniques of formalization of high-voltage pulse test device description. The techniques provide structural synthesis of the device discharge circuits. A formal description of various test devices is presented.

*Key words* – discharge circuit, structural synthesis, high-voltage pulse test device, formal description.

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