

## 6.01. MODELING OF ELECTROMAGNETIC AND MULTIPHYSICAL PROCESSES IN ELECTRIC DEVICES AND ELECTRIC POWER EQUIPMENT

*New and improved modern methods of modeling are offered* for the development of optimal design solutions for electric devices and electric power equipment, increase of their electromagnetic compatibility and safety, ensuring dielectric, thermal and mechanical strength of active elements.

### *Basic methods and processes for the research*

Based on the methods of multiscale and multi-physical modeling, developed and implemented in the Matlab / Simulink and Comsol environments, the processes of various physical nature are investigated, i.e. electric, magnetic, electromagnetic, thermal, electrothermomechanical, mechanical, hydro- and gas-dynamic processes that simultaneously occur in devices and are interconnected.

### *Objects for modeling:*

- electrophysical processes in power cables, cable couplings and cable lines with voltage of 35-330 kV;
- high-frequency electromagnetic processes in overhead transmission lines;
- electric and magnetic fields in power transformers and reactors;
- working processes in technological installations of electromagnetic processing of materials (installations of induction heating, continuous casting and melting of metals, laser processing);
- biological systems in the electromagnetic field.

### *Tasks that are solved:*

- multiphysical field, chain and circle-field tasks;
- related multiphysical tasks at the different structural levels of devices.



*On the basis of computer modeling and comprehensive study of electric devices and electric power equipment, the recommendations are given regarding the optimal design of new technical solutions, optimization of the modes and work efficiency improvement.*