EXTERNAL RESONANT MAGNETIC FIELDS CONTROL SYSTEM OF the TOKAMAK T-10 ON THE BASIS OF CONTROLLERS SIEMENS S7-400

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The diagnostic complex of the tokamak-reactor provides a measurement of the physical and technological parameters of the plasma in real time in the conditions of high radiation fields and intense microwave radiation. To service the diagnostic systems in these conditions, it is planned to use the automatic control system based on Siemens S7 programmable logic controllers on the ITER tokamak-reactor. Along with the possibility of multi-level remote control of equipment, PLC provides timely response to emergency situations without human intervention and the ability to adaptively manage in real time.

To test the control algorithms for diagnostic systems on the Tokamak T-10 installation, the elements of the multi-level control complex based on the SIMATIC S7 CPU-417-4 PLC were tested.

Controller S7 CPU-417-4 is used to control the power supplies of the system of external resonant magnetic fields on the T-10 tokamak. The system consists of eight saddle windings arranged symmetrically relative to the equatorial plane of the torus on the outside of the vacuum chamber. The system of saddle power windings is built on the basis of four controlled thyristor converters VDU-1250 with rated currents 1250 A and the ability to adjust the voltage in the range 24-44 V. The control system includes a processor module, power module, analog and digital input and output modules. To coordinate the connection between the controller and power supplies, interface modules with optronic protection and relay modules located in close proximity to power supplies have been developed. The controller is controlled remotely via the PROFIBUS protocol using the MP 370 operator panel from the T-10 console. Setting the working programs of the controller, collecting and storing data is carried out on the computer of the operator and transmitted over the Ethernet network. The developed controller allows to control independently of each of the four power supplies and to combine their operation according to the algorithm set by the operator. The system of external resonant magnetic fields with control based on S7-417-4 provides the creation of pulsating magnetic fields with a frequency of up to 10 Hz.

The report presents the results of testing the control system for external resonance magnetic fields of the T-10 tokamak in conditions of increased electromagnetic and radiation fields during plasma discharges on a tokamak.

This work was supported by ROSATOM and the RFBR (18-02-00999 and 18-32-00365).