

### **Recommendations of the 57th PAC on Condensed Matter Physics**

on the report of M. V. Bulavin " State of work on the project of a new neutron source at JINR"

The PAC took note of the proposal to open a project "New advanced neutron source at JINR" presented by M. Bulavin. In accordance with the work plans, the following research and development work is being carried out: study of the pulsed reactor dynamics, development of neptunium nitride fuel and the fuel rods based on it, optimization of the design of the reactivity modulator and the reactor vessel in terms of reducing thermal loads and shape changing, development and implementation of a list of R&D to support the development of a preliminary design, including the main systems of the reactor facility, a complex of cryogenic moderators, development of a scientific programme, and a complex of spectrometers based on it. The PAC is satisfied with the detailed description of the work plans for the implementation of the project.

Recommendation. The PAC recommends opening the project "New advanced neutron source at JINR" for the period 2024–2028.

#### Implementation of recommendations of the 57th PAC on Condensed Matter Physics

As part of the implementation of the project "A new advanced neutron source in JINR" for the period 2024-2028, in accordance with the problem-thematic plan in 2024, it is planned to obtain the following results:

1. Preparation of materials for the development of the scientific program and the concept of the neutron instrument base of the NEPTUNE reactor;
2. Preparation for conducting experiments in accordance with the JINR–RFNC-VNIITF work program on the creation and verification of a mathematical model of the dynamics of the pulse NEPTUNE reactor;
3. Obtaining the first batch of neptunium oxide for testing the technology of manufacturing fuel for experimental fuel rods and conducting pre-reactor studies of fuel compositions within the framework of the contract on the development of nitride-neptunium fuel and fuel rods based on it between JINR and JSC VNIINM (SC Rosatom);
4. Preparation of materials for the technical specification for the preliminary design based on the results of optimization of the reactor vessel and its reactivity modulator;
5. Analysis of the efficiency of using hydrogen-containing materials (methane, triphenylmethane, liquid hydrogen, deuterium, etc.) as a cryogenic moderator at the new NEPTUNE reactor and their comparison with mesitylene. Development of a design documentation for a simulator of a chamber of the cryogenic moderator based on mesitylene with a system for fast loading and unloading of working material.