

Programme Advisory Committee for Condensed Matter Physics

60th meeting, 27 January 2025

Recommendations

I. Preamble

The Chair of the PAC for Condensed Matter Physics, D. L. Nagy, welcomed the PAC members, in particular, the new member Ravi Kumar, the ex officio members from JINR and the members of the JINR Directorate. The Chair presented an overview of the implementation of the recommendations made at the previous PAC meeting concerning the JINR research in the area of condensed matter physics.

JINR Vice-Director L. Kostov informed the PAC about the resolution of the 136th session of the JINR Scientific Council held in September 2024 and the decisions of the Committee of Plenipotentiaries of the Governments of the JINR Member States in November 2024.

II. Progress of work at IBR-2 in preparation for the resuming of operation of the reactor

The PAC took note of the information on the completion of repair work at IBR-2 and the receipt of authorization for resuming of operation of the reactor, presented by E. Lychagin. The PAC supports the plans and efforts of the FLNP Directorate to resume regular cycles for users, as well as its efforts to extend the operation of the reactor with high-performance parameters by loading new fuel.

Recommendation. The PAC recommends that in the time remaining until the resumption of regular cycles, work with potential users be intensified in order to attract the maximum number of researchers to JINR, primarily from the Member States.

III. Development of a mathematical model for the dynamics of pulsed fast reactors

The PAC took note of the results and prospects for the development of a mathematical model of pulsed fast reactor dynamics, presented by M. Bulavin. The PAC is pleased with the calculations made using this model, which indicate that exceeding the stability limits of a pulsed reactor may be caused by at least two factors: thermal expansion of the fuel and dynamic bending of the fuel rods or bending of the fuel assemblies during a pulse.

Recommendation. The PAC recommends the continuation of the activity on modelling the dynamics of pulsed fast reactors and considers this work essential both for the operation of IBR-2 and the development of the new neutron source at JINR.

IV. Status of work on the project of the new neutron source

The PAC took note of the implementation of the recommendations of the previous PAC meeting concerning work on the project of the new neutron source, presented in written form.

The PAC is satisfied with the recent progress made in the development of a mathematical model for reactor dynamics.

The PAC notes the continuation of developing new advanced devices and technologies for cryogenic moderators of the new high-flux neutron source.

Recommendation. The PAC welcomes the intention of FLNP (1) to continue the development of the conceptual design for an advanced pulsed reactor, (2) to proceed with the development of a mathematical model for reactor dynamics and determining the parameters of stable and reliable operation of both IBR-2 and the new pulsed high-flux reactor, (3) to continue developing the scientific programme for the new neutron source and the concept of its instrumentation, (4) to proceed with the development of new advanced devices and technologies for cryogenic moderators.

V. Current state and recent developments of FLNP instruments

The PAC was informed by D. Kozlenko about progress in the IBR-2 instrumentation development during the technical shutdown of the IBR-2 reactor. These activities are important for the successful realization of the FLNP scientific programme and the User programme at a level competitive with other world neutron centres.

VI. Scientific reports

The PAC heard with interest the scientific reports “Neutron tomography for structural analysis of cement materials, rocks and meteorites” and “Analysis of the A β 42 conformational dynamics in lipid membrane mimetics: spectroscopic and atomistic study”, presented by I. Zel and H. Esawii, respectively. The PAC thanks the speakers for the excellent reports.

VII. Virtual presentations by young scientists

The PAC reviewed 14 virtual presentations made by young scientists in the field of condensed matter physics and related fields. The virtual poster presentation "Structural and

vibrational properties of the $\text{Cu}_3\text{Bi}(\text{SeO}_3)_2\text{O}_2\text{Cl}$ francisite at high-pressure" made by A. Rutkauskas was selected as the best presentation of the session. The PAC also noted two more virtual poster presentations of a high level: "The influence of phospholipid composition on membrane interaction with amyloid beta peptides within molecular dynamics simulations" by D. Badreeva and "Polymer brushes synthesized by the "Grafting-through" approach: characterization and scaling analysis" by M. Avdeev. All three authors will be awarded diplomas of the PAC.

Recommendation. The PAC recommends the poster "Structural and vibrational properties of the $\text{Cu}_3\text{Bi}(\text{SeO}_3)_2\text{O}_2\text{Cl}$ francisite at high-pressure" to be presented at the session of the JINR Scientific Council in February 2025. The PAC Chair will also inform the JINR Scientific Council on the broad range of posters presented at this meeting.

VIII. Next meeting of the PAC

The next meeting of the PAC for Condensed Matter Physics is scheduled for 26–27 June 2025.

The preliminary agenda for the next meeting of the PAC includes:

- report by the PAC Chair on the implementation of the recommendations above;
- report by the JINR Directorate on the sessions of the Scientific Council in February 2025 and of the Committee of Plenipotentiaries in March 2025;
- information about resuming the IBR-2 operation and plans for the IBR-2 User Programme;
- status reports on the FLNP instruments;
- information about scientific meetings;
- scientific reports (not more than three);
- poster (or virtual presentation) session.



D. L. Nagy
Chair of the PAC
for Condensed Matter Physics



O. Belov
Scientific Secretary of the PAC
for Condensed Matter Physics