

## Report on the project “Complex Materials”

The project represents a continuation of the research activity within the JINR Theme 01-3-1137-2019/2023 “Theory of Complex Systems and Advanced Materials” in the Bogoliubov Laboratory of Theoretical Physics (BLTP) for the next five-year period 2024-2028. The main goal of the project is the theoretical study of physical phenomena in condensed matter. The project is based on recent progress in collecting large and reliable sets of experimental data, opening route to a thorough analysis and understanding of the fundamental properties of various complex materials, relating their atomic structure to their properties.

The project specifies a list of typical systems for study that attract their attention from the point of view of both fundamental research and applications. It includes low dimensional layered structures with atomically thin layers, systems with colossal magneto-resistance and heavy fermions, topological insulators as well as smart composite materials, fractals, biological macromolecules.

The principal approaches to the project research are presented by theoretical and computing means combined with experimental techniques such as neutron and X-ray scattering, materials irradiation technologies.

The scientific novelty and project relevance is summarized in the list of main directions of their proposed research and the analysis of wide variety of physical characteristics of complex materials under study. It outlines the scientific merits and timely nature of the research. The continuity with the previously approved JINR Theme is clearly perceptible. The project inscribes well in the Seven-Year Plan for the Development of JINR in 2024-2030 and should fully contribute to the general success of JINR.

The group of the researches to be involved in the project includes well-qualified staff and younger scientist that should obviously follow the well-known BLTP traditions and heritage in creative output of high-quality research. The available technical computational means in the BLTP secure advances in the calculation domain of their research ensuring feasibility of the project within the proposed time-scale. The collaboration with four different Laboratories at JINR will certainly enrich the project production and achievements. The presented international collaboration will certainly extend and intensify the positive output of the project.

The project does not explicitly request excessive funds going beyond the listed personnel costs and existing computation resources so that its budget may be considered as fully compliant with the objectives of the project.

In view of important expected output and sound impact within the frame of general research at JINR in the next five-year period I can suggest that the PAC-57 recommends to support the present project “Complex Materials” within the proposed continuation of the Theme “Theory of Complex Systems and Advanced Materials” that should be fully funded with adequate resources.

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