Referee report on the project:

**Mathematical methods, algorithms and software for modeling physics processes and experimental facilities, processing and analyzing experimental data**

The project proposal is focused on organizing and providing computational support for various physics research programs in collaboration with the Joint Institute for Nuclear Research (JINR). The project aims to develop mathematical methods, software, and research tools to enhance the modeling, experimental analysis, and data processing capabilities in several physics disciplines, including elementary particle physics, nuclear physics, neutrino physics, condensed matter, and radiobiology.

The primary objectives of the project are as follows:

a. Development of Mathematical Methods and Software: The project aims to develop modern methods and algorithms for simulating physical processes, modeling experimental facilities, and analyzing data. This includes utilizing neural networks for machine learning and data analytics, creating scalable algorithms for processing large-scale, multidimensional data sets, and optimizing the software environment for experiments.

b. Collaboration and Support: The project seeks to strengthen collaborations with JINR, CERN, BNL, and other prominent accelerator centers, as well as research groups in neutrino physics, astrophysics, and radiobiology. The goal is to foster international collaborations, exchange knowledge, and contribute to major research infrastructure projects such as the NICA accelerator complex and the Baikal-GVD neutrino telescope.

c. Distributed Processing and Analysis: The project aims to create systems for distributed processing and analysis of experimental data. This involves developing information and computing platforms that support research activities at JINR and other global centers. Specialized databases and information systems will be designed to facilitate efficient data processing and analysis.

The project is organized into three main directions, each focusing on a specific aspect of the research:

a. Simulation of Physical Processes and Experimental Facilities: This direction emphasizes developing and applying modern methods and algorithms for simulating physical processes and modeling experimental facilities. The interaction of unstable particles with nuclei is of particular interest, where enhancements to the DCM-QGSM-SMM heavy ion collision generator will be explored.

b. Reconstruction of Physical Objects and Analysis of Experimental Data: The project aims to develop algorithms and software for reconstructing physical objects and analyzing experimental data. This includes the development of algorithms for data reconstruction, particle track reconstruction, and data analysis techniques. The goal is to optimize the accuracy and efficiency of data analysis procedures.

c. Software Environment for Experiments: The project focuses on supporting and developing the software environment for experiments. This involves creating research tools, software, and systems to facilitate experimental planning, data processing, and research collaboration. The project also aims to improve the software environment for experiments conducted in modern physics facilities, incorporating specialized databases and information systems.

The anticipated outcomes of the project include:

a. Revision and Development of Interaction Generators: The project aims to revise and develop interaction generators to improve the accuracy of simulations and enhance understanding of physical processes.

b. Algorithms and Software for Particle Track Reconstruction: The project seeks to develop advanced algorithms and software for reconstructing particle tracks from experimental data. These tools will contribute to the precise analysis of particle interactions and improve our understanding of fundamental physics phenomena.

c. Improvement of the Software Environment for Experiments: The project intends to optimize the software environment for experiments by developing specialized databases, information systems, and research tools. This will enable efficient data processing, analysis, and collaboration among researchers working in modern physics facilities.

In conclusion, this is a comprehensive project proposal focused on organizing and providing computational support for various physics research programs in collaboration with JINR. By focusing on mathematical methods, software development, and research tools, the proposal aims to support major infrastructure projects, enable international collaborations, and contribute to understanding physical phenomena in various fields of physics. It is a well-written and detaily planned, the personnel and the budget are reasonable, and scientific goals are relevant and timely. Thus, I strongly recommend the proposal for funding.

Magdalena Djordjevic