Review of the JINR project

"Development of a physics program and detectors for experiments at CEPC"

The project is a new version of the JINR project "Development of a particle registration technique in future experiments with the participation of JINR". The previous project began in 2025 with completion of some parts of activities in 2025-2029. The goals set in the project were aimed at solving problems arising in future collider experiments at the Super c-tau factory (SCT) in Russia, at the Super tau-charm facility (STCF) and the Circular Electron Positron Collider (CEPC) in China, and at accelerators with fixed targets at intermediate and high energies, as well as in the search experiments Mu2e-II, Comet (phase 2). The new project is focused on CEPC only. According to a presentation of Yifang Wang, the director of IHEP (Beijing, China) at BNL on April 23, 2025 (https://indico.bnl.gov/event/27653/), CEPC and JUNO are 2 flagship projects of HEP of China, they will lead China to the forefront of the world next 10 years. I support and consider the decision to focus on one project to be correct. Especially because CEPC will be the largest and most important project of HEP for the next 30-40 years. However, the question arises about participation in the experiments (the SCT, for example) specified in the old version of the project.

The composition of the project participants has been changed. The new project has 2 leaders and 2 deputy leaders, while the old project had 1 leader and 1 deputy leader. There is no explanation for why it was done. I can see only that JINR core staff is increased from 32 persons (total FTE was 19.5) to 68 persons (total FTE=27.6) with changing teams and participating institutions and countries.

The old project was for period from 2025 to 2029; the new one is for 2 years. JINR budget of the project is increased from 400 K\$ to 600 K\$ with annual budget 300 K\$ (in 3 time larger than it was in the old version). Equipment and third-party services (commissioning) is a new line of the budget with 150 K\$/year. This line item of expenses should be disclosed.

"The aim of this project is to make proposals for the physics research program, to participate in software and computing development, and to carry out a series of detector R&D aimed at further use in CEPC. Thus, during the next two years, laying a keystone for future fullfledged participation of JINR in experiments at CEPC, provided the construction of this accelerator is approved by the Chinese government."

NICA project is not mentioned in the goals, but it was motioned that some results of this project could be useful for NICA detectors.

"One of the goals of the project is also to train qualified personnel. Bachelors, masters, and graduate students will participate in the project and will use the results obtained in their dissertations." This is a correct intention of the old project, and the project has quite a lot of activities for students, young scientists, engineers and technicians.

Goals and objectives of the old project were corrected within the framework of the JINR Topical Plan for 2025 with specific goals and objectives, including the development of a physics program for performing the tasks of the CEPC experiments.

The proposal provides a short description/report of achievements done in 2025. Results are impressive, but some research with LYSO crystals (longitudinal granulation and radiation resistance) are not mentioned in the report. Also, I don't see results of an optimization of a "scintillator + SiPM + front-end electronics" system with high speed and a time resolution of 40-50 ps.

Any way it is written in the new proposal, that "Work on developing methods for calibrating electromagnetic and hadron calorimeters, studying the radiation hardness of inorganic scintillators and electronic elements, creating prototypes of calorimeters and studying their parameters, optimizing muon system detectors, and developing microstructural gas detectors will be continued within the framework of the project."

The project goals for CEPC experiments:

- Development of the experimental program
- High-precision theory calculations, theory support of experiments
- Software and computing
- Detector R&D

Based on the draft of CEPC Reference Detector TDR, goals for CEPC experiments are explained very clean. There is no doubt about the correctness of this part of the proposal.

From the point of view of physics and manpower, the project looks very realistic and attractive.

From the point of view of the budget, the project is realistic but may suffer from high inflation.

I recommend approving the project for two years, 2026-2027.

Fighun

Sergey Kuleshov

Professor of UNAB, Santiago, Chile

Director of SAPHIR Millennium Institute, Santiago, Chile

kuleshov@cern.ch