

**Referee report
on prolongation of BES-III project**

The project proposes to continue investigations in the BES-III experiment at BEPC-II collider (Beijing, China). The experiment took data for more than ten years at the electron-positron annihilation energies 2.0-4.95 GeV. At least five years of further data taking is foreseen, and an increase in collision energy is under consideration.

In its energy domain, BES-III has collected unique data samples which exceed the statistics from its competitors by an order of magnitude or even more. This one allowed the experiment to produce high-accuracy results in many fields, including open charm, charmonium, light hadron spectroscopy, low-energy QCD, etc. In particular, BES-III pioneered the study of $Z_c(3900)$ tetraquark candidate which was followed by discoveries of many tetraquark and pentaquark candidates in BES-III and other experiments.

The JINR team contribution is a very visible in the BES-III collaboration. The main activity is data analysis. Dubna physicists obtained outstanding results in partial-wave analysis of light mesons, studies of charmonium states and open charm production. JINR team is also a key developer of the BES-III offline software. In my opinion, the participation of JINR is very necessary for the experiment. At the same time, JINR is achieving an invaluable experience of participation in a modern collider experiment and producing first-class physics results.

The investigation program proposed in this project looks very reasonable and well-grounded. It includes starting new studies and continuing and extension of the ongoing ones. In particular, recently collected record-large statistics of J/ψ will be used to search for glueballs. The inclusive production of charmonium will be studied as a function of energy allowing a deeper understanding of the non-perturbative QCD. Charm quark fragmentation into D meson will be studied providing important input for the charms studies at the future NICA collider. The BES-III data will be used to develop a general mathematical method of data analysis, in particular the ones based on machine learning.

I conclude that both JINR and BES-III will mutually benefit from the continua of JINR participation in the experiment. I estimate the project to be of the highest quality. My only concern is that the number of JINR participants is too low for such an excellent activity. In my opinion, more candidate and diploma theses would need to be defended based on BES-III data. The requested resources look reasonable and very modest. I recommend approving the BES-III project with the highest priority.



Prof. Vladimir Saleev (saleev.va@ssau.ru)

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