Referee report on the Project "ARIeL: Physics at Future e^+e^- colliders"

Though the LHC projects are ongoing and about to start the large upgrade during the long shutdown, there are already at least four projects of next-generation colliders. One of the most discussed proposals is the e^+e^- machine that are best suited for the precision studies of the newly discovered particles and has several advantages like considerably well known kinematics of the initial state and low QCD background. The current Project suggests kind of combination of theoretical and experimental extension to the existing in JINR experimental project "Detector and Physics at CLIC collider".

The LHC experiments from time to time meet the problem of experimental data description with existing Monte-Carlo tools, thus the Projects of a kind are of a great importance for nowadays. The team has more than 20 years expertise in the field. They have participated in experiments DELPHI (LEP-1 and LEP-2), ATLAS (LHC), CMS (LHC), BESIII (BEPCII). Moreover the team has participated in the following projects for theoretical support of experiments: ZFITTER (LEP-1 and LEP-2), HECTOR (HERA), MCSANC (LHC). As a result of all projects mentioned above 2 doctoral and 9 candidate dissertations have been defended. More than 50 papers have been published by the group alone (and more than 1000 papers in the framework of different collaborations). This impressive strong background allows to be sure that the new symbiosis of theoretical and experimental experts will become one more step towards the successful realization of the future collider.

Among four colliders (FCC, CEPC, ILS and CLIC) currently under consideration by the world scientific community the Project authors decided to concentrate their efforts on the CLIC. For referee this choice looks very well argued and there is a very high level of compatibility between Project's physics program and projected CLIC operation and physics program. The CLIC project offers the richest spectrum of physics

research. The energy of 350 and 380 GeV makes this collider suitable for “ttbar threshold scan” and make it “top factory” as well as provides possibility for Higgs properties studies due to the high luminosity and BSM searches at 1.5 and 3.0 TeV. The suggested in the Project experimental physics program covers QED process $e^+e^- \to \gamma\gamma$, precision measurement of the Higgs boson mass (with the novel technique apllied), top quark polarization measurement and study of the quartic couplings WWγγ and Zzγγ. The theoretical part of the Project provides full support to the experimental one with expected predictions for processes $e^+e^- \to e^+e^-$ (μμ, ττ, tt, HZ, Hγ, Zγ, ZZ, Hνν, Hμμ , ffγ, γγ) at the level of complete one-loop and leading multiloop radiative corrections and taking into account both longitudinal and transverse polarization. Thus, the Project realization will allow to significantly improve the accuracy of theoretical predictions challenged by the experimental data.

Finally the core of the Project team is from the DLNP JINR (18 participants, 10.65 FTE) but there are also participants from BLTP and LIT as well as participants from non-JINR organizations Uni. “Dubna”, RAN, INP BSU, Minsk, Uni. Hannover, DESY, Hamburg, DESY, Zeuthen, Lund University, INP, Katovice/Krakow. There are 32 participants total including 3 students, 2 postgraduate students, 4 researchers, 15 candidates of sciences ans Ph.D. and 8 doctors and professors. The referee has no doubt that the such a team will fulfill successfully all proposed tasks during the period of 3 years.

In general, the Project is very perspective, promising and of a very hight importance for the JINR participation in future colliders. The requested resources look reasonable and ideally fit the proposed program.

Considering foregoing the referee recommend to approve the project with the first priority.

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