

# **Referee report on the ARIel project (JINR participation)**

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The report given to the Program Advisory Committee of JINR on 18 June 2018 outlines the proposal submitted by JINR researchers to carry on activities within the ARIel project on the physics at future electron-positron colliders.

The main goal of the group is to carry on experimental and theoretical studies using as test bench the CERN CLIC project, but being open to other possible implementations of the accelerator technique, namely FCC, CEPC and ILC. The experimentalists of the group are already members of the CLICdp collaboration at CERN.

The approach followed by the group matches the expected performance of CLIC for a center of mass energy of nearly 350 GeV, finalized to the study of the top quark and to a lesser extent of the Higgs boson (high energy option).

The main goals of the proposed three-year project will be, respectively for the experimental and theoretical sub-groups:

- 1) Study of the electron-positron annihilation, measurement of the Higgs boson mass, measurement of the top polarization, study of the WW and ZZ couplings.
- 2) Development of a Monte Carlo generator at the level of one-loop and leading multi-loop radiative corrections, including longitudinal and transverse polarization, interfacing NLO EW corrections with the PYTHIA infrastructure.

Both sub-groups have a long-standing experience with past projects and have an excellent scientific track record and productivity. They proposed to carry on the project together with other associated European scientists. There are 18 JINR participants with a good FTE quota exceeding 10.

However, the referee considers that there are some points that could lead to concerns:

- 1) At the moment is very difficult predicting what the future machine beyond LHC HL will be.
- 2) The weak point of CLIC is the limited capability of addressing Higgs studies, which might be eventually considered of high priority by the community.
- 3) The international competition on the studies being proposed is very harsh and one

- could argue about the expected impact of the research.
- 4) Given the very long time scale of the realization of the future machine, the contribution from young researchers is (naturally) severely depressed.
  - 5) The financial request looks reasonable. However, cuts could be applied, in particular to the funds to be used to host external scientists.

All in all, the referee considers that the project is worth to be pursued, although taking into account the higher relative priority of both experimental and theoretical studies to be conducted, at least for the next decade, in the framework of the approved LHC HL.



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