Report from Physics WG

Keisuke Fujii
on behalf of the Physics WG
November 22, 2017

(Old) News

ICFA Statement

on November 8

ICFA Statement on the ILC Operating at 250 GeV as a Higgs Boson Factory

The discovery of a Higgs boson in 2012 at the Large Hadron Collider (LHC) at CERN is one of the most significant recent breakthroughs in science and marks a major step forward in fundamental physics. Precision studies of the Higgs boson will further deepen our understanding of the most fundamental laws of matter and its interactions.

The International Linear Collider (ILC) operating at 250 GeV center-of-mass energy will provide excellent science from precision studies of the Higgs boson. Therefore, ICFA considers the ILC a key science project complementary to the LHC and its upgrade.

ICFA welcomes the efforts by the Linear Collider Collaboration on cost reductions for the ILC, which indicate that up to 40% cost reduction relative to the 2013 Technical Design Report (500 GeV ILC) is possible for a 250 GeV collider.

ICFA emphasizes the extendibility of the ILC to higher energies and notes that there is large discovery potential with important additional measurements accessible at energies beyond 250 GeV.

ICFA thus supports the conclusions of the Linear Collider Board (LCB) in their report presented at this meeting and very strongly encourages Japan to realize the ILC in a timely fashion as a Higgs boson factory with a center-of-mass energy of 250 GeV as an international project1, **led by Japanese initiative**.

In the LCB report the European XFEL and FAIR are mentioned as recent examples for international projects.

Ottawa, November 2017

LCB Statement

on November 8

Conclusions on the 250 GeV ILC as a Higgs Factory proposed by the Japanese HEP community

- Short Summary -

Linear Collider Board

8 November 2017, Rev 1

Physics studies by the Linear Collider Collaboration Physics and Detector Group [1], and the Japanese Association of High Energy Physicists (JAHEP) [2] show a compelling physics case for constructing an ILC at 250 GeV centre of mass energy as a Higgs factory. The cost of such a machine is estimated to be lower by up to 40% compared to the originally proposed ILC at 500 GeV [3]. The acceleration technology of the ILC is now well established thanks to the experience gained from the successful construction of the European XFEL in Hamburg. One of the unique features of a linear collider is the capability to increase the operating energy by improving the acceleration technology and/or extending the tunnel length. For these reasons, the Linear Collider Board strongly supports the JAHEP proposal [4] to construct the ILC at 250 GeV in Japan and encourages the Japanese government to give the proposal serious consideration for a timely decision.

In recent examples of similar international projects[1], the host country made the majority contribution. A natural expectation would be that the cost for the civil construction and other infrastructure is the responsibility of the host country, while the accelerator construction should be shared appropriately. **A clear expression of interest to host the machine under these principles would enable Japan to start negotiations with international partners.** It would also allow members of the international community to initiate meaningful discussions with their own governments on possible contributions.

[1]Recent examples in the field close to the ILC are European XFEL and FAIR in Germany.

References

1. K. Fujii et. al. (Linear Collider Collaboration), “Physics Case for the 250 GeV Stage of the International Linear Collider”, DESY-17-155 / KEK Preprint 2017-31 / LAL 17-059 / SLAC-PUB-17161, arXiv:1710.07621 [hep-ex].

2. S. Asai et al, “Report by the Committee on the Scientific Case of the ILC Operating at 250 GeV as a Higgs Factory”, arXiv:1710.08639 [hep-ex].

3. L. Evans and S. Michizono (Edit.) (Linear Collider Collaboration), “The International Linear Collider Machine Staging Report 2017, Addendum to the International Linear Collider Technical Desgn Report published in 2013”, DESY 17-180, CERN, KEK Report 2017-3, arXiv:1711.00568 [hep-ex].

4. JAHEP, “Scientific Significance of ILC and Proposal of its Early Realization in light of the Outcomes of LHC Run 2”, http://www.jahep.org/files/JAHEP-ILCstatement-170816-EN.pdf.

Accompanying Documents from LCC

The most recent LCC physics WG report:

Physics Case for the 250 GeV Stage
of the International Linear Collider

LCC Physics Working Group

Keisuke Fujii[1], Christophe Grojean[2,3], Michael E. Peskin[4]
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James D. Wells[13], Jaehoon Yu[14]; Mikael Berggren[2],
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Hitoshi Murayama[8,16,17] (ex officio)

ABSTRACT

The International Linear Collider is now proposed with a staged machine design, with the first stage at 250 GeV with a luminosity goal of 2 ab^{-1}. In this paper, we review the physics expectations for this machine. These include precision measurements of Higgs boson couplings, searches for exotic Higgs decays, other searches for particles that decay with zero or small visible energy, and measurements of e^+e^- annihilation to W^+W^- and 2-fermion states with improved sensitivity. A summary table gives projections for the achievable levels of precision based on the latest full simulation studies.

has been translated into Japanese for expected MEXT review.

And one from LCC machine, just appeared on arXiv: 1711.00568

KEK 2017-3
DESY 17-180
CERN

The International Linear Collider Machine Staging Report 2017

Addendum to the International Linear Collider Technical Design Report published in 2013

Linear Collider Collaboration / October, 2017
Editors:Lyn Evans and Shinichiro Michizono

being translated into Japanese for expected MEXT review.

I expect these statements would trigger the MEXT to reactivate the ILC review process very soon. The review would be completed in a relatively short period (~3 months?).

Provided that a green light would be given, we should be prepared for the international processes that will follow, including the European Strategy discussions.

Priority No.1 = to realize ILC

What we need =

- **clear physics case**

Priority No. 2 = to realize ILD

What we need =

- **detector design, which is cost effective and technically feasible, to realize the physics**

Priority No.1 = to realize ILC

What we need =

- **clear physics case**

Priority No. 2 = to realize ILD

What we need =

- **detector design, which is cost effective and technically feasible, to realize the physics**

But we need to verify the whole simulation/analysis chain first

We strongly request all the people working on physics analyses to proactively contribute to the validation of the new analysis chain as much as possible!

We are now updating the list of on-going or planned analyses and manpower situation in order to formulate our strategy.

To be discussed further in a physics conveners' meeting on Nov. 24.

Physics focus schedule

Nov. 22: Top/QCD (Frank) Today
Nov. 24: Physics conveners' meeting
Dec. 6: Higgs/EW (Akiya)
Dec. 20: BSM/NP (KF)

Conveners' ML:

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