

Opening Comments

2019/07/06

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WG Objectives

- On July 4, 2012, ATLAS and CMS announced the discovery of a Higgs-like boson with a mass of about 125GeV and the data that followed strongly indicates that it is a Higgs boson indeed. The world has changed since then. The discovery has vaulted the question of its properties on the top of the list of questions in HEP. The 125GeV boson is a window to BSM physics and ILC is the best machine to use it.

So far no additional new particles or new phenomena have been found in the LHC Run 2, suggesting that there seem to be no easily discoverable new particles, which enhanced the importance of the precision measurements of H125 and loophole-less searches at ILC more than ever. There can be a zoo of new uncolored particles or new phenomena that are difficult to find at LHC but can be discovered and studied in detail at ILC.

We need to demonstrate that ILC will advance our understanding of particle physics qualitatively beyond the information that will be available from the results expected from the future stages of the LHC. The MEXT ILC Advisory Panel says "it is necessary to closely monitor, analyze and examine the development of LHC experiments". We did and proposed ILC250 as a JAHEP agreement on July 22, 2017.

- With the LCB and ICFA statements on the ILC250, together with the LCC physics case report on ILC250, the MEXT re-reviewed ILC physics case and cost/technological readiness and finally finished their review process. The SCTJ, being asked by the MEXT, reviewed it and produced their assessment of ILC250, pointing out remaining issues and concluding that they cannot support ILC250 at this point while appreciating its academic significance. The MEXT showed its position on March 7, which was discussed at the Lausanne meeting on April 8-9. The LC community attended the Granada meeting on May 13-16 together with a Lausanne statement and a set of new inputs. The next important event for us is LCWS2019 in Sendai on Oct.28 to Nov.1.

Situation in Japan

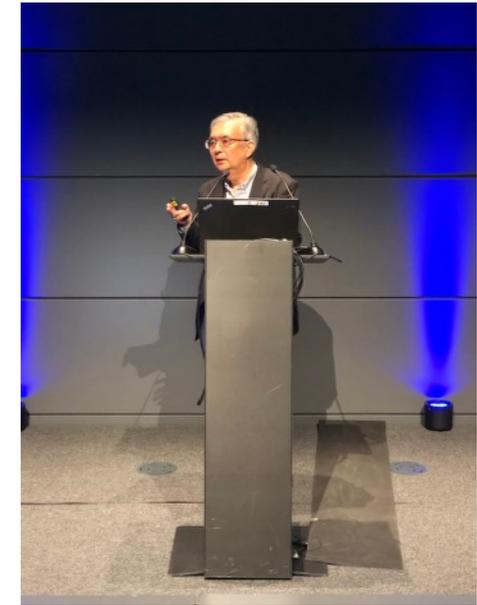
KEK presented its plan for the ILC project in Lausanne

2019/04/12

<https://www.kek.jp/en/newsroom/2019/04/12/1700/>

Masanori Yamauchi, Director General of KEK, made a presentation regarding KEK's plan for the ILC, at the international conference held on 8-9 April 2019 in Lausanne, Switzerland.

About 100 scientists from around the world who aim for the realization of electron-positron linear colliders gathered at the Linear Collider Community Meeting, to discuss the future linear collider activities.



Masa explaining his plan in a Lausanne session

In the conference, Yamauchi presented KEK's plan for the ILC for the upcoming year, summarized as follows:

- **Organize the *international working group* with close consultation with the Ministry of Education, Culture, Sports, Science and Technology (MEXT).**
- **Promote activities to gain a better understanding of the broader academic community in Japan (Propose the ILC project to *the Science Council of Japan's Master Plan*; Organize a symposium)**
- **Cooperate with MEXT to establish the *governmental level discussion groups with France and Germany*. Also, strengthen the discussion group with the US DOE.**
- **Conduct *R&D program at ATF, STF and CFF facilities* collaborating with the international teams**

.....

KEK's plan is in accord with the ICFA statement and MEXT's view, and illustrates the specific steps that will be taken by KEK toward an early realization of the ILC. The result of the discussions at the Lausanne conference will be used as an input for the discussions of the Update of the European Strategy for Particle Physics.

ILC International Working Group Established -- First Meeting Held in Granada

2019/05/21

<https://www.kek.jp/en/newsroom/2019/05/21/1900/>

KEK established the International Working Group on the International Linear Collider (ILC) project to discuss issues such as international cost sharing. The First Meeting of the Working Group was held on Friday, 17 May, in Granada, Spain.

At the LCB meeting on March 7, MEXT expressed anticipation for establishing an International Working Group, to be led by KEK, in order to advance the discussions by domestic and international communities of researchers on issues such as international cost sharing.

Following this statement, KEK established the International Working Group, consisting of 2 members from Europe, 2 members from North America, and 3 members from Asia (including Japan)



The Working Group will use [the PIP \(rev.C\) issued on July 2015](#) as a starting point and will further investigate and update the following points:

- **Model of international cost-sharing for construction and operation**
Study the ILC250 construction cost and propose a model for the construction describing: (a) items that are appropriate for the host responsibility, and (b) items that should be shared by all partners. Propose a model for sharing the operational and decommissioning cost.
- **Organization and governance of the ILC Laboratory**
Propose an organizational and governance model of the ILC Laboratory as well as the ILC Pre-Lab.
- **International sharing of the remaining technical preparation**
Present a technical preparation plan in the preparation phase to solve the technical issues pointed out by the MEXT ILC Panel and the SCJ committee, including the possibility of international cooperation.

The WG is requested to submit a report to the KEK DG by the end of September 2019. The report will be submitted to MEXT and will be used by MEXT for discussions with other governments.

ILC International Working Group Members

○Klaus Desch Professor, University of Bonn

○Andrew J. Lankford Professor, University of California at Irvine

○Kajari Mazumdar Professor, Tata Institute of Fundamental Research

○Patricia McBride Distinguished Scientist, Fermi National Accelerator Laboratory

○Shinichiro Michizono Professor, KEK, Accelerator Laboratory

○Yasuhiro Okada Executive Director, KEK *Chair

○Claude Vallée Senior Researcher, CNRS/IN2P3/CPPM

- ***The KEK International WG is meeting monthly since its 1st meeting on May 17 in Granada.***
 - ***Will produce its draft report in time for the LCB meeting on August 7 in Toronto. Final report in September, 2019.***
 - ***A preparatory group in KEK doing homework for the International WG.***

SCJ Mater Plan Process On-going

- ***The Physics Subcommittee***
***11 members: 4 from material science, 3 from astronomy,
3 from particle physics, 1 from nuclear physics***
- ***Schedule***
June 17: ***deadline for the physics subcommittee to score
individual projects***
July 8: ***a prioritized list to the upper committee***
Late July: ***the long list***
selection of projects to go to the hearing stage
Sep. 14-16: ***hearing to make the short list***
Oct.: ***the short list***
Jan. 2020: ***approval of the lists***

Activities in Political Sector

- *A General Meeting of the Advance Accelerator Association.*
 - *Hon. Kawamura and Hon. Shionoya from the Federation of Diet Members for ILC, Mr. Isogai from MEXT Research Promotion Bureau, Masa and Yasuhiro from KEK attended the meeting.*
 - *PM Abe's cabinet has just approved its Basic Policies which mentions "strategic promotion of large scale research facilities including those pushing back international academic frontiers" with a footnote quoting particle physics as such a frontier.*
- *LDP's general policy book explicitly mentions ILC.*
- *Preparation on-going for establishing governmental level Discussion Groups with France and Germany. Japanese delegation visited Berlin and Paris on July 1-2.*

LCC Physics WG

LCC Physics WG have submitted

- a paper on ***ILC Capabilities for Precision EW Measurements*** that include
 - ***the machine parameters for the Giga-Z option,***
 - ***on-shell and off-shell Z-ff couplings (g_L and g_R) at Giga-Z,***
 - those using ***radiative return to Z events at 250 GeV,*** and
- a paper on ***Higgs couplings with 1 TeV data, including top Yukawa and cubic self-coupling***
- yet another paper on ***ILC Capabilities on Resonances and New Strong Interactions***

to the relevant ESU working groups

→ We will produce an arXiv paper summarizing the three above.

Our Group's Activities

Status & Next Step

Symmetry Breaking & Mass Generation Physics

- ZH : $H \rightarrow bb, cc, gg$ → EPJ C (2013) 73:2343, now working on $m_h=125$ GeV case: Ono+Miyamoto
 $H \rightarrow WW^*$ anomalous coupling: publication: Takubo → P.R.D88,013010(2013)
→ $H \rightarrow WW^*$ to be reexamined: Liao Libo, Mila, Uli
 $H \rightarrow$ other modes (AA, $\mu^+\mu^-$) + Kawada/Tanabe/Suehara/Daniel, ($\tau^+\tau^-$) → publication → EPJC (2015) 75:617., $H \rightarrow Z\gamma$: Kazuki Fujii
- Recoil mass: Jacqueline → P.R.D94,113002(2016), Suehara (qq), CP mixing in $h \rightarrow \tau^+\tau^-$: Daniel
→ accepted for publication in PRD, HVV couplings: Ogawa, Yumi Aoki (Hgamma)
direct mH reconstruction: Junping
- EFT: EFT vs BSM, EFT fit on top EW couplings: Junping
- Zgamma: Takahiro Mizuno
- ZHH : full simulation of the $H \rightarrow bb$ & $Z \rightarrow$ all modes, fast simulation of $nnuHH$: finished: Junping + Takubo (Ph.D thesis: done) → New analysis with improved analysis tools: Junping + Claude + Suehara + Tanabe, Jet-clustering: Kurata, Shaofeng Ge, LCFIPlus: Suehara, Yonamine
New analysis: $ZHH \rightarrow ZbbWW^*$: dE/dx: Kurata, Systematic Error: Tim, EFT: Junping, ZHH paper draft: Junping, Masakazu, Claude
- nnHH : full simulation @ 1TeV, done for DBD: Junping → publication
- nnH, eeH : precision measurements of HVV couplings, $m_h=125$ GeV: Junping
BR measurements: Ono, Christian
- TTH : quick simulation studies with NRQCD corrections
→ P.R.D84,014033(2011) → full sim. @ 0.5 & 1 TeV: (Yonamine left) Tanabe + Sudo
- TT Threshold : Top Yukawa measurement: Horiguchi + Ishikawa + Tanabe, Theory: Kiyo + Sumino → publication? (cf. a recent significant theoretical development!): Ozawa → Yuto Eda
- W mass (m_W) : Koya Tsuchimoto → Kotera (controlling systematic uncertainties) → Kotera
- AA → HH : quick simulation studies, so far $H \rightarrow bb$ and WW BG
→ P.R.D85,113009(2012) : Kawada, Theory: Harada

Status & Next Step

Beyond the Standard Model

- SUSY : full simulation studies for LOI → publication
 - **EWkino** (Compressed Spectrum Case): Jacqueline→Tomohiko →analysis finished.
- Extra U(1) (Z' tail), Compositeness, Extra Dimensions, etc.
 - **TT** : full simulation studies for LOI → **New study with MELA**: Yo Sato, **vertex charge**: Okugawa
 - **tau tau** : full simulation studies (benchmark process) → **Keita Yumino**
 - **2f: full simulation study**: Hiroaki Yamashiro → Yuto Deguchi, Uesugi
- Hidden Sector / XD : **P.R.D78, 015008 (2008)**
- LHT : **P.R.D79, 075013 (2009)**
- Model discrimination: Saito + Suehara .. : **P.R.D84, 115003 (2011)**
- R-handed neutrinos: Saito : **P.R.D82, 093004 (2010)**
- LHT: Kato (exp) + Harigaya (th): ZHZH finished, working on eHeH, nHnH, ..: Draft (n-1)?
- Very light gravitino: Katayama (Master's thesis), Tanabe (exp) + Matsumoto (th)
--> 1st Draft --> Takuaki Mori (Tokyo) → ?
- Quasi stable stau: Yamaura (Master's thesis) + Kotera + Kasama → reactivated?
- **Higgs portal/h→Invisible**: Honda → Yamamoto → Ishikawa, Ogawa, Junping → Yu Kato
- W-H+/W+H-: (Shinzaki), Ishikawa (exp) + Kanemura, yagyu (th)
- **Generic DM search (mono-photon)**: Tanabe → **Yonamine**
- New projects?
 - AMSB: Tanabe
 - Heavier Higgs bosons?: Yokoya, (Abhinav) → Christian Drews
 - X(750) : Junping → published in PRD (**Phys.Rev. D94 (2016) no.9, 095015**)
 - Correlation btw h→gamma gamma & h→gg in mSUGRA: Hidaka
 - m_nu, DM, baryogenesis: Machida

Short Term Schedule

- Weekly Meeting
 - Every Fri. at 14:00 (conf. ID: to be announced)
- General Meeting
 - 10:30 on **Thu. Sep. 26, 2019 ?**
- **LCWS 2019 in Sendai, Oct. 28 - Nov. 1, 2019**

LCWS 2019 to be held in Sendai

Oct. 28 - Nov. 1, 2019

at Sendai International Center

<http://newsline.linearcollider.org/2019/05/30/linear-collider-workshop-to-be-held-in-sendai/>

The next annual meeting of world scientists working on the linear collider development will be held in Sendai, Japan.

On 21 May, Lyn Evans, Director of Linear Collider Collaboration announced at the press conference held in Sendai City, Miyagi Prefecture, Japan.

Evans, together with Hitoshi Yamamoto from Tohoku University, and Atsuto Suzuki, President of Iwate Prefectural University and former Director General of KEK explained about the conference and the environment surrounding the ILC.



*Press conference announcing LCWS2019 in Sendai.
From left: Hitoshi Yamamoto, Lyn Evans, Atsuto Suzuki*

“The discussion of the ILC project is in a fully matured state. With the positive statement from the Japanese Government on 7 March, I am rather optimistic about the realization of the ILC”, said Evans. “However, ***it is important for the Japanese government to make a more positive statement later this year to give the project the green light,***” he said.