

# Opening Comments

2020/09/10

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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.

- The MEXT showed its position on March 7, 2018 with three bullet points, one of which suggested necessity to discuss ILC in the SCJ Master plan process. The MP process finished with ILC listed in its long list though not in its short. The next point was ESU, which was published on June 18, 2020 with ILC mentioned favorably. Meanwhile, LCB/ICFA met on Feb. 20, 2020 at SLAC with participation of a MEXT representative and a key diet member from Japan, made a statement outlining the timeline towards ILC realization including International Development Team hosted at KEK, which was established on Aug.2 and marked a new step towards the ILC realization. In parallel, the U.S. Snowmass process is on-going.

# Current Status

- *Because of COVID19, it is not an appropriate time to bring up a big scientific project like ILC.*
- *However, the political environment about ILC is now very good, thanks, in particular, to strong US support (Jim Siegrist, Abid Patwa, at a recent DOE-HEP PI meeting). 1st Science and Technology Diplomatic Circle Webinar on ILC on Sep.8.*
- *The climate change: The first stage of the ILC is 250 GeV but, now studies on energy upgrade even above 1 TeV is encouraged.*
- *Although the number of infection cases is increasing,*
  - *KEK is operating in the new normal mode,*
  - *and various ILC promotion activities are on-going, through the federation of diet members for ILC. Political environment improving.*
  - *Tohoku upgraded its ILC promotion organization on Aug.6.*
- *Various strategy discussions are on going in KEK (KEK Roadmap) and JAHEP (Future HEP Project Committee). Note: 1st complete draft of KEK RM, recommending further enforcement of ILC promotion effort.*
- *The International Development Team to take over LCC/LCB:*
  - *LCB's proposal was approved on Aug. 2 and IDT started.*
  - *A new ICFA statement issued on Aug. 4.*

ICFA  
ILC International Development Team  
August 20, 2020

At its 86th meeting held on August 2, 2020, ICFA approved the formation of the International Linear Collider International Development Team (ILC-IDT, referred to here as the Team) with a mandate to make preparations for the ILC Pre-Lab in Japan, which is the next step in the ILC project.

The Team has commenced its work and is expected to complete its mandate by the end of 2021.

**Structure and function of the ILC-IDT**

The Team is hosted by KEK and consists of the Executive Board (EB) and three Working Groups (WG1, WG2 and WG3).

The EB comprises:

- a Chair;
- a member from each of the three regions contributing to the ILC effort (Americas, Asia-Pacific and Europe); and
- three ex-officio members (KEK liaison officer and Chairs of WG2 and WG3, whereas WG1 is chaired by the EB Chair).

The EB members are appointed by ICFA. The EB has the overall responsibility for the Pre-Lab preparation.

The EB and WG1 will carry out the key tasks of developing the function and organisational structure for the Pre-Lab. They will support the preparation of Memoranda of Understanding among the national laboratories and other interested parties for the operation of the Pre-Lab and will support discussions at the national authority level.

WG1 membership is established by the EB, includes the EB members and is chaired by the EB Chair.

WG2 conducts the ILC accelerator and facility work.

WG3 carries out the ILC physics and detector activities.

The members of WG2 and WG3 will be appointed by the EB.

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Executive Board and Working Group 1 (WG1):

Chair – Tatsuya Nakada (EPFL)

Regional Representatives:

Europe – Steinar Stapnes (CERN)

Americas – Andy Lankford (University of California, Irvine)

Asia/Oceania – Geoffrey Taylor (University of Melbourne)

Working Group 2 (WG2):

Chair – Shinichiro Michizono (KEK)

Working Group 3 (WG3):

Chair – Hitoshi Murayama (University California Berkeley/ IPMU-University of Tokyo)

KEK Liaison - Yasuhiro Okada (KEK)

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Contacts:

Geoffrey Taylor (ICFA, Chair) - The University of Melbourne;

Tatsuya Nakada (Chair, Executive Board, ILC-IDT) - EPFL, Lausanne

***IDT Membership now  
open (to the research  
community)***

# ***IDT Phys/Det WG (WG3)***

***now preparing for Snowmass***

***Aug. 31: Snowmass Lol deadline: many from us!***

***Aug. 28: 1st Snowmass Tutorial***

***<https://indico.fnal.gov/event/45031/overview>***

***Oct. 5-8: Snowmass Community Planning Meeting***

***<https://indico.fnal.gov/event/44870/overview>***

***Registration is open. Please register.***

# Our Group's Activities

# Status & Next Step

## Symmetry Breaking & Mass Generation Physics

- ZH :  $H \rightarrow bb, cc, gg \rightarrow$  EPJ C (2013) 73:2343, Ono+Miyamoto: IDR: Kurata  
 $H \rightarrow WW^*$  anomalous coupling: publication: Takubo  $\rightarrow$  P.R.D88,013010(2013)  
 $\rightarrow H \rightarrow WW^*$  to be reexamined: Liao Libo, Mila, Uli  
 $H \rightarrow$  other modes (AA,  $\mu^+\mu^-$ ) + Kawada/Tanabe/Suehara/Daniel, ( $\tau^+\tau^-$ )  $\rightarrow$  publication  $\rightarrow$  EPJC (2015) 75:617.,  $H \rightarrow Z\gamma$  : Kazuki Fujii
- Recoil mass: Jacqueline  $\rightarrow$  P.R.D94,113002(2016), Suehara (qq), CP mixing in  $h \rightarrow \tau^+\tau^-$ : Daniel  
 $\rightarrow$  accepted for publication in PRD, HVV couplings:  $H\gamma$  : Yumi Aoki
- direct mH reconstruction: Junping
- EFT: EFT vs BSM, EFT fit on top EW couplings (NLO SMEFT): 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)  $\rightarrow$  New analysis with improved analysis tools: Junping + Claude + Suehara + Tanabe, Jet-clustering: Masakazu, Shaofeng Ge, LCFIPlus: Suehara, Yonamine; Vertex Finder: Kiichi Goto  
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  $\rightarrow$  publication
- nnH, eeH : precision measurements of HVV couplings,  $m_h=125\text{GeV}$ : Junping  
BR measurements: Ono, Christian
- TTH : quick simulation studies with NRQCD corrections  
 $\rightarrow$  P.R.D84,014033(2011)  $\rightarrow$  full sim. @ 0.5 & 1 TeV: (Yonamine left) Tanabe + Sudo
- TT Threshold : Top Yukawa measurement: Horiguchi + Ishikawa + Tanabe, Theory: Kiyo + Sumino  $\rightarrow$  publication? (cf. a recent significant theoretical development!): Ozawa  $\rightarrow$  Yuto Eda
- W mass ( $m_W$ ) : Koya Tsuchimoto  $\rightarrow$  Kotera (controlling systematic uncertainties)  $\rightarrow$  Kotera
- AA  $\rightarrow$  HH : quick simulation studies, so far  $H \rightarrow bb$  and  $WW$  BG  
 $\rightarrow$  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 : P.R.D101, 095026 (2020)
- 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) , **New analysis**: Yonamine, Jurina, Daniel
- 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, yagyū (th)
- **Generic DM search (mono-photon)**: Tanabe → Yonamine  
**(exotic higgs decay)**: Kurata, **Special theory guest**: Shigeki Matsumoto
- Other projects
  - Heavier Higgs bosons?: Yokoya, (Abhinav) → Christian Drews
  - X(750) : Junping → published in PRD (Phys.Rev. D94 (2016) no.9, 095015)
  - **h→cc, bb, bs QFV decays**: Hidaka
  - **Kinematical Fitter** : kajiwara
  - **pair monitor** : Ahmed

# Short Term Schedule

- Weekly Meeting
  - Every Fri. at 14:00 (conf. ID: to be announced)
- General Meeting
  - 10:30 on **Wed. Dec. 16, 2020 ?**
- **ILC Summer Camp: Sep. 23-25**
- **Snowmass meeting on Oct. 5-8**
- **Snowmass Tutorials: Sep. 28 (Whizard)  
: Mid October (Analysis Walkthrough)**
- **ALCW2020 in October 19-22**