

# Opening Comments

2021/03/09

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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 one. 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.

- **The political environment about ILC is now very good, thanks to strong US support. A new deputy-MEXT minister, Ms. Takahashi, responsible for S&T policy, very supportive. Discussion sessions happening semi-regularly.**
  - **Remaining hurdle: how to secure financial resource outside the ordinary S&T budget.**
- **The climate change: The first stage of the ILC is 250 GeV but, now studies on energy upgrade even above 1 TeV is encouraged. Discussions on non-colliding beam experiments using the ILC facility starting.**
- **The 3rd wave of COVID19 seems peaked out, KEK is operating in the new normal mode, and various ILC promotion activities are on-going. A draft KEK RM on is out for international review on Feb.10, final version maybe in April.**
- **JAHEP ILC Steering Panel was established on Oct.28 to lead the HEP community in Japan to advance the ILC project towards its timely realization.**
  - **Background briefing to media, explanation to other fields, on going.**
- **The International Development Team (IDT) took over LCC/LCB:**
  - **IDT Membership is open to public since Sep.11, WG substructure ~complete.**
  - **Working on Snowmass process to expand the ILC community.**
  - **Preparation on-going for JFY2022 budget request to launch Pre-Lab, including documentation of Pre-Lab design and plan.**
- **Tohoku upgraded its ILC promotion organization, Tohoku ILC Project Development Center, on Aug.6.**
  - **Now actively promoting ILC, including English translation of CFS related documents, etc.**

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

***WG3 Meeting every two weeks (last one on Feb. 24)***

- Substructure almost complete.***
- Draft mandates shown to WG3 and its 4 sub-WGs.***
- LCWS2021 preparation status reviewed***
- Clarification about the Fall WS***

# LC Workshops

1. LCWS 2021 organized by Europe, with session on experiments, new ideas, ... **March 15-18(19), 2021**, fully virtual. *Registration is open and abstract calls have been made by session conveners (new deadline Feb.28):*

<https://indico.cern.ch/event/995633/>

***Please let physics conveners know if you have submitted or plan to submit an abstract, using [ild-physics-conveners@desy.de](mailto:ild-physics-conveners@desy.de). PCs will schedule your pre-talk as needed in a coming S&A meeting.***

2. A WS, ~~EOI WS~~ ***International Linear Collider WS on potential ILC experiments*** (tbc), intended for community engagement to experiments at ILC, ***October 25-29, 2021, hopefully in person in Japan.***

## LCWS 2021

### Overview

- March 15-18, fully virtually, hosted by CERN, <https://indico.cern.ch/event/995633/>
- No fee, but registration will be required for book-keeping and data protection reasons
- **currently 377 registrants**
- Overarching goal: broaden the community => healthy mix of information for newbies and opportunities to present & discuss ongoing work!

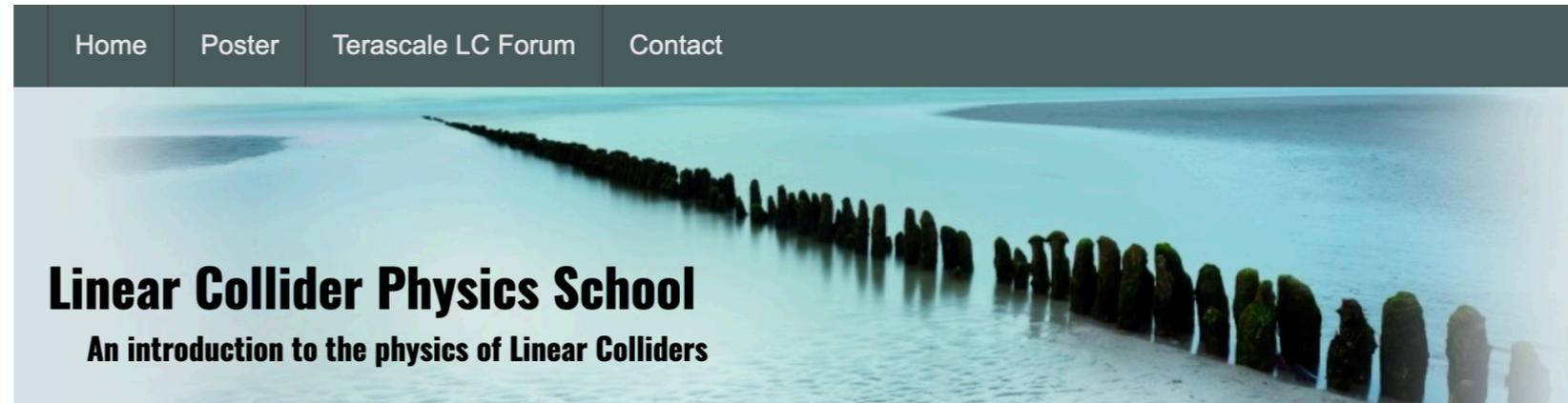
Session	PDT (GMT-7)	CET (GMT+1)	JST (GMT+9)
<b>LC School</b>	<b>March 15, 01:00-05:30</b>	<b>March 15, 09:00-13:30</b>	<b>March 15, 17:00-21:30</b>
<b>PLENARY</b>	<b>March 15, 06:00-09:00</b>	<b>March 15, 14:00-17:00</b>	<b>March 15, 22:00-01:00</b>
Parallel 1	March 15, 14:00-16:00	March 15, 22:00-24:00	March 16, 06:00-08:00
Parallel 2	March 15, 22:00-24:00	March 16, 06:00-08:00	March 16, 14:00-16:00
Parallel 3	March 16, 01:00-02:30	March 16, 09:00-10:30	March 16, 17:00-18:30
Parallel 4	March 16, 03:00-04:30	March 16, 11:00-12:30	March 16, 19:00-20:30
<b>PLENARY</b>	<b>March 16, 06:00-09:00</b>	<b>March 16, 14:00-17:00</b>	<b>March 16, 22:00-01:00</b>
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Optionally: Poster Sessions, discussion sessions, virtual coffee breaks - DESY will provide [remo.co](https://remo.co)

## **New: mini-LCSchool @ LCWS**

**pre-program for students and other newcomers**

- Monday March 15, 9:00-13:30
- three 60 min + 15 min lectures on
  - Georg Weiglein: LC physics program
  - Wolfgang Hillert: LC accelerator physics
  - Roman Pöschl: LC detectors
- targeting bachelor / master students or newcomers to ILC
- registration to LCWS required, plan to record lectures



### **Welcome to the Linear Collider School**

Following the success of the Ambleside LC Physics schools (see [here](#) for its latest instalment), a new series of LC Physics schools was started in 2013, 2014 and 2016. The next edition will take place 6-13 May 2018 at Frauenchiemsee, Bavaria, Germany.

**Many thanks to Gudi  
for organizing this on  
extremely short notice!**

# About the Fall WS

Hitoshi Murayama  
from IDT WG3 meeting

I was informed by several people that there has been a confusion about the Eol process. While the spring **LCWS** is for **the discussion on physics that can be addressed in various ways at ILC**, the **fall workshop** is about **more concrete ideas of experiments, rather than a physics idea and sketchy detector concept, and some people behind to work on them**. For the **real Eol presentation anticipated in 2022**, one has to show **expected performance of the experiments resulted from some simulation studies and technical description of the detector**. The actual call for Eols will be “due” by then, and currently written proposals are not envisioned. The call for Eols will be triggered by a concrete sign of funding for pre-lab, and Eols are presented after the pre-lab is launched.

yours      Tatsuya

***KF's comment:***

- ***Eol call by IDT after the Cabinet submits its JFY2022 budget request (incl. pre-Lab) to the diet.***
- ***Eol presentation during the Pre-Lab period.***

# 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 (enW) : 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, **bb**: Seidai Tairafune
- 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 Nakajima**, 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, yagyu (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
  - **LGAD simulation** : Mami Kuhara

# Short Term Schedule

- Weekly Meeting
  - Every Fri. at 14:00 (conf. ID: to be announced)
- General Meeting
  - 10:30 on **Wed. May 12, 2021?** (or on Saturday?)
- **LCWS 2021, March 15-19, 2021**
- **ILC WS on Potential ILC Exp., October 25-29, 2021 (Tsukuba)**
- **Snowmass Summer Study: July, 2022 (Seattle)**