

# Opening Comments

2018/04/14

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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.

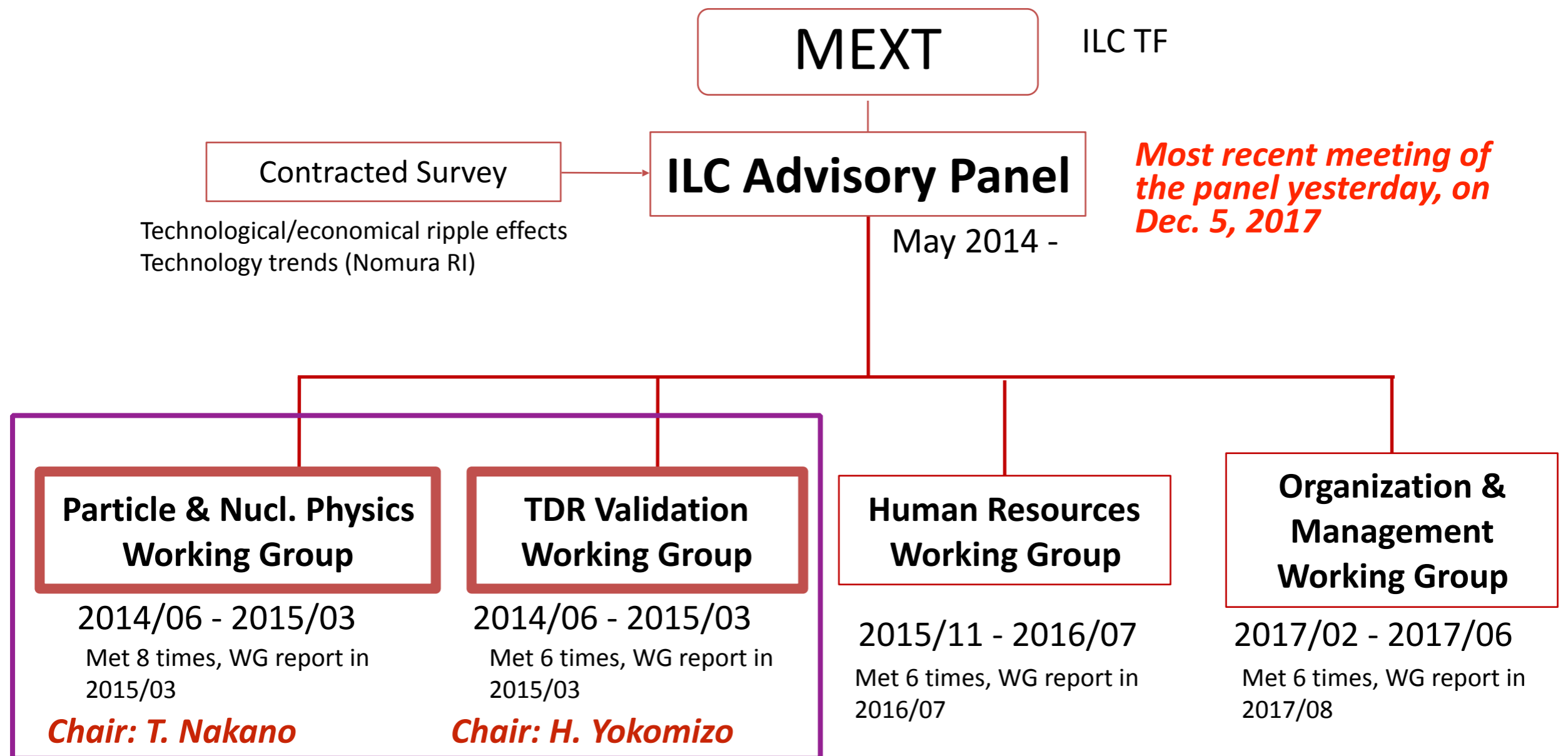
We need to demonstrate that ILC will advance our understanding of particle physics qualitatively beyond the information that will be available from the results expected from the future stages of the LHC. The MEXT ILC Advisory Panel says "it is necessary to closely monitor, analyze and examine the development 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 restarted its Physics and TDR working groups to review ILC250 physics case and cost/technological readiness. We need to support this process. The next target for us to show our activities at ALCW2017 on May. 28 to June 1, 2018 in Kyshu.

# **MEXT Review**

# ILC Advisory Panel

Set up in May 2014 under MEXT ILC Task Force to investigate various issues concerning the possibility of hosting the ILC in Japan



*New round started from January 2018, each met 3 times so far.*

# ***MEXT Particle and Nuclear Physics WG***

## **Charge**

***Taking into account the recommendations made in the interim report by the MEXT ILC Panel, review the 250 GeV ILC physics case and clarify potential issues if any.***

## **Members**

1. **Takaaki Kajita (deputy chair) : Cosmic Ray Research**
2. **Sachio Komamiya : HEP**
3. **Hideyuki Sakai : Nuclear Physics**
4. **Seiji Tanabashi : HEP (theory)**
5. **Eiji Chin : Accelerator**
6. **Katsuo Tokushuku : HEP**
7. **Takeshi Nakano (chair) : Nuclear Physics**
8. **Tsuyoshi Nakaya : HEP**
9. **Tetsuo Hatsuta : Nuclear Physics (theory)**
10. **Ryugo Hayano : HEP**
11. **Shigeki Matsumoto : HEP (theory)**
12. **Taku Yamanaka : HEP**
13. **Hiromi Yokoyama : Scientific Communication**

## ***1st meeting on Jan. 18***

- **General remark from the secretariat (WG charge, history)**
- **Development of the LHC experiment: K. Hanagaki**
- **On the revision of the ILC project (Physics Case of the 250 GeV ILC): K. Fujii**  
LCC Physics WG Report (arXiv: 1710.07621)

## ***2nd meeting on Feb. 5***

- **Discussions in JAHEP: S. Asai**  
Asai committee's report (arXiv: 1710.08639)
- **Physics potential of the ILC at 250 GeV: G. Weiglein**

## ***3rd meeting on March 1: discussions on skeleton draft***

- **Main points in the discussions so far**
- **Comparison of scientific case of 500 GeV ILC and 250 GeV ILC (Comparison Table)**

***The 4th Meeting of the Particle & Nuclear Physics WG happened yesterday on***

***April 13, 2018***

- *Hearings on XFEL/FAIR*
- *Discussions on the draft WG report*

***The 4th Meeting of the TDR Validation WG will happen on***

***April 19, 2018***

# 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 (today on  $dE/dx$ )  
 $H \rightarrow$  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 -> draft being reviewed by ILD, HVV couplings: Ogawa, Yumi Aoki (Hgamma)  
EFT: Junping , direct mH reconstruction: Junping
- ZHH : full simulation of the  $H \rightarrow bb \& Z \rightarrow$  all modes, fast simulation of  $n\nu HH$ : 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 -> 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 -> 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 to be finished soon?
- 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 for LOI → ditto
  - **2f: full simulation study**: Hiroaki Yamashiro
- 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 (Tokyo)
- W-H+/W+H-: (Shinzaki), Ishikawa (exp) + Kanemura, yagyu (th)
- **Generic DM search**: Tanabe
- 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 **Sat. May 23, 2018 ?** (KEK MCU2 conf. ID:XXX)
- **AWLC 2018, Kyushu, May 28 - June 1**
- **Top@LC 2018, Sendai, June 4-6**
- **LCWS 2018, Arlington, Oct. 22-26**