Opening Comments

2018/11/17

Keisuke Fujii

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. Their final report is now being reviewed by the SCJ. Assuming that a green light will be given, we should now get ready for ESU. The next target for us to show our activities is Annual ILC Physics & Detector Meeting on Dec. 20 to 21, 2018 at KEK.

SCJ Review

SCJ Review Committee for ILC250

1st meeting on Aug. 10 (Joint Upper&Subcommittees Mtg.)

- **ILC 250 Physics Case: KF**
- **ILC 250 Machine: Shin Michizono**
- **LCB: Tatsuya Nakada**
  - **MEXT ILC Physics WG: Takashi Nakano**
- **MEXT ILC TDR Validation WG: Hideaki Yokomizo**
- **MEXT ILC HR WG: Takashi Nakano**

2nd meeting on Aug. 21

- **PIP: Masa Yamauchi (KEK DG)**
- **MEXT ILC Organization & Management WG: Shoken Miyama**
- **MEXT Due Process for Project Prioritization : Yoshiyuki Chihara from MEXT**

3rd meeting on Aug. 29:

- **KEK's future plan and ILC: Masa Yamauchi (KEK DG)**
- **JAHEP's consensus on ILC: Hiroaki Aihara (JAHEP chair)**
- **Particle Accelerator Society of Japan and ILC: Ryoichi Hajima (PASJ chair)**

4th meeting on Sep. 11: closed

5th meeting on Sep. 18 (joint with the subcommittee): list of main issues

→ KEK ILC Planning Office submitted written answers to all of them

6th meeting on Oct. 1 (13:00-16:00):

- **Significance of Higgs studies and communities consensus: Shoji Asai (Asai Committee Chair)**
- **KEK's mission and ILC, international cooperation, cooperation in Asia: Masa Yamauchi (KEK DG)**

7th meeting on Oct. 10 (13:00-16:00) : joint with the subcommittee

- **Particle Physics and ILC: Yutaka Hosotani (theory)**
- ***Closed discussions*** **on points to be addressed in the final report**
  → KEK ILC Planning Office submitted
  a) written answers to additional questions from the committee,
  b) a supplementary document to clarify issues discussed in the meeting.

8th meeting on Oct. 16 (13:00-16:00) : joint with the subcommittee

- **ILC in Particle Physics: Tsuyoshi Nakaya (neutrino)**
- ***Closed discussions*** **on points to be addressed in the final report**

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Excerpt from
The summary of the draft SCJ report on the ILC 250

- **Scientific significance of the (rivised) ILC project, its position in elementary particle physics**

  The ILC project is an advanced research project in the field of particle physics. Its revision from 500 GeV to 250 GeV made the objective of the ILC to be focused on precision measurements of Higgs couplings. In current elementary particle physics, there is no doubt for the importance of searches for "physics beyond the standard model". There are, however, various experimental approaches to exploring "physics beyond the standard model", including both accelerator- and non-accelerator-based experiments. Although precision Higgs study is recognized as one of the most important research targets, there is no consensus even within the particle physics community that the precision Higgs study has outstanding advantage over other research subjects in elementary particle physics.

- **Position of the (revised) ILC project in the whole academic fields**

  The ILC project is a purely scientific experimental project in the field of particle physics. The ILC accelerator is designed specifically for high energy particle physics experiments and is incapable of shared use for other purposes. The ILC project is a super-big project whose cost is far greater than any of the research facilities proposed and reviewed in formulating the SCJ's master plan so far, and whose time span from the start of construction to the end of experiments is as long as 30 years. Before proposing such a project to the general public it is necessary to get understanding and support from the whole academic community. As for the ILC project, however, there has been obvious lack of dialogue with academic communities in various fields including the nearby fields. More thorough and continuous explanation and communications are necessary.

- **Significance of hosting the ILC project in Japan to the public and society**

  Like other purely academic research projects, the ILC induces people's intellectual interest in the sense of quest for knowledge. Despite the significance of Japan's contribution to international collaborative research projects in the field of basic science, whether Japan should be a host country bearing a substantial portion of its cost will have to be judged, after consideration of various conditions including its sustainability.

  On the other hand, the technical and economic ripple effects other than academic significance by the ILC are considered to be rather limited. Regarding matters advertised in the context of regional promotion and issues concerning the environmental impact of civil engineering works and production of radioactive materials, it is vital that the scientific community provides people, those in the vicinity of the candidate site in particular, with accurate information and dialogue

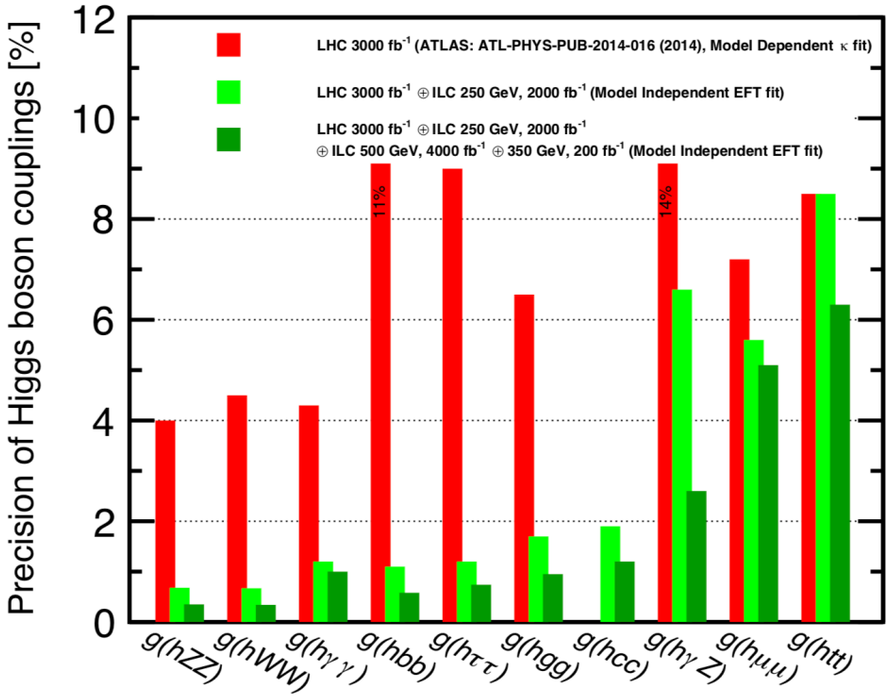
- **Preparation status towards implementing the (revised) ILC project, and various necessary conditions such as securing budget and human resources needed for its construction and operation**

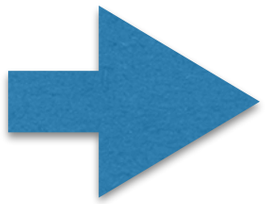
  Given the sizes of the budget and the human resources necessary for implementation, it is obvious that the ILC project is not feasible unless it is based on unprecedentedly strong international cooperation. At present, however, there is no prospect for proper international cost sharing. It is also unclear whether it is possible to secure necessary human resources for the construction of the ILC accelerator facility. Especially, accelerator-related human resources are absolutely in deficit now in Japan, and it is quite uncertain whether it can be covered by fostering new human resources and by participation from overseas as explained by the proponents of the ILC project.

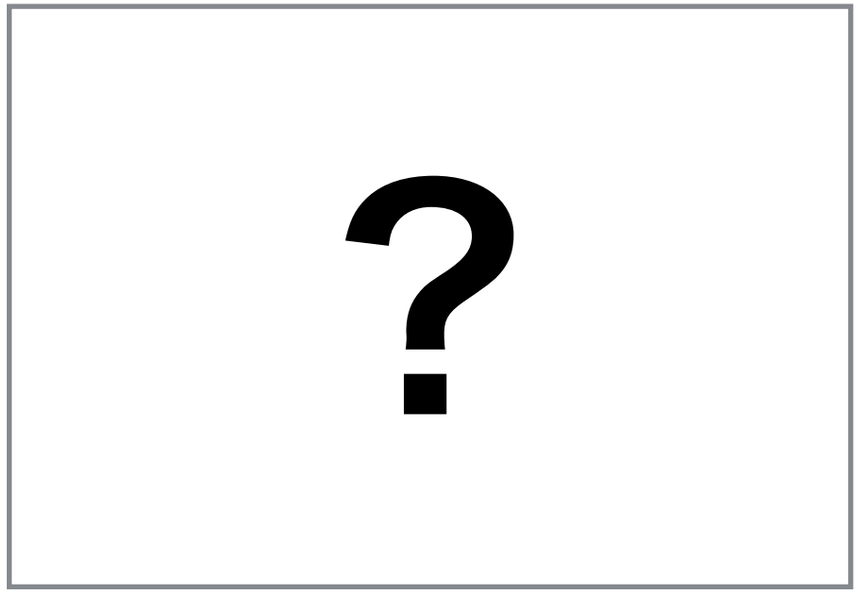
LCC Physics WG

New Manhattan Plots

for comparison with new HL-LHC projections







- **ILC scenario 2 and EFT analysis**

  → ***Junping's talk today***

Our Group's Activities

Status & Next Step

Symmetry Breaking & Mass Generation Physics

- ZH : H->bb,cc,gg -> EPJ C (2013) 73:2343, now working on mh=125 GeV case: Ono+Miyamoto
  H -> WW* anomalous coupling: publication: Takubo -> P.R.D88,013010(2013)
  -> H -> WW* to be reexamined: Liao Libo, Mila, Uli
  H->other modes (AA,mu+mu-) + Kawada/Tanabe/Suehara/Daniel, (tau+tau-)->publication -> EPJC (2015) 75:617., H->Z γ : Kazuki Fujii

  Recoil mass: Jacqueline -> P.R.D94,113002(2016), Suehara (qq), CP mixing in h->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->bb&Z->all modes, fast simulation of nunuHH: 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 couplingsm, mh=125GeV: 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 (enW) : Koya Tsuchimoto -> Kotora (controlling systematic uncertainties)->Kotera
- AA->HH : quick simulation studies, so far H->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 (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. Feb. 9, 2019 ?

- HPNP 2019, Univ. Osaka, Feb. 18-22, 2019
- ILD Benchmarking Days, KEK, Feb. 23-27, 2019
- Annual Meeting 2018, KEK, Dec. 20-21