

# Opening Comments

2019/04/20

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. 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 next important event for us is the Granada meeting on May 13-16.



# **Situation in Japan**

# **MEXT explains its view on the ILC to ICFA**

<https://www.kek.jp/en/newsroom/2019/03/13/2100/>

2019/03/13



LCB session

.....  
**Hon. Kawamura gave a guest speech at the reception**, and explained the Federation of Diet members' various activities toward the realisation of the ILC, including on-going political discussions between Japan and the United States since 2013, and additional political conversation with France and Germany that started in January 2018. [\(Full Text\)](#)

.....  
In the press briefing held in the evening of 7 March, Professor Nakada expressed his gratitude to the Japanese science community legislative bodies, executive bodies, industries and others who made lots of efforts to realize the ILC in Japan. **"In particular, we are grateful to MEXT who sent a delegation today to explain the position of the Japanese government on the ILC,"** he said.

.....  
Professor Taylor said that the "scientific significance of the ILC has been made very clear," and confirmed that **ICFA will continue to promote the ILC project**. **"We have been very encouraged talking with Diet members and senior-level MEXT officials, which showed that the political and executive environment in Japan is evolving quite rapidly towards the ILC,"** Taylor said. "We are also encouraged that **there has been communication about the ILC across many ministries in Japan**. We're still very hopeful that in not too long a time we will end up with a positive response to hosting the ILC from Japan", he said.



Press briefing

# MEXT's view in regard to the ILC project

## Executive Summary

March 7, 2019

Research Promotion Bureau, MEXT

- Following the opinion of the SCJ, **MEXT has not yet reached declaration for hosting the ILC at this moment.** The ILC project requires further discussion in **formal academic decision making processes such as the SCJ Master Plan**, where it has to be clarified whether the ILC project can gain understanding and support from the domestic academic community.
- MEXT will pay close attention to the progress of the discussions at the **European Strategy for Particle Physics Update.**
- The ILC project has certain scientific significance in particle physics particularly in the precision measurements of the Higgs boson, and also has possibility in the technological advancement and in its effect on the local community, although the SCJ pointed out some concerns with the ILC project. Therefore, considering the above points, **MEXT will continue to discuss the ILC project with other governments while having an interest in the ILC project.**

**highlight in red by KF**

# Excerpt from the Minutes of

The 198th National Diet Committee on Education, Culture, Sports, Science and Technology No. 2  
(Wednesday, March 13, 2010)

[http://www.shugiin.go.jp/internet/itdb\\_kaigiroku.nsf/html/kaigiroku/009619820190313002.htm](http://www.shugiin.go.jp/internet/itdb_kaigiroku.nsf/html/kaigiroku/009619820190313002.htm)

**DG Isogai:**

...

In the future, while paying close attention to the progress of discussions on the European Elementary Particle Physics Strategy, **we would like to deepen discussions with France and Germany at the governmental level, by proposing, for instance, to establish a standing discussion group similar to the one with the US.**

...

**Mr. Ryu:**

...

I would like you, as the MEXT Minister, to at least proactively work on it. Of course, the final decision would require understanding by the general public and various scientific communities, but I would like you, Minister, to do your best, from the stance that MEXT will at least develop a strategic view for the future of science and technology. Let me ask you about this point.

**Minister Shibayama:**

As I mentioned earlier, **I am also aware that this is a project of great significance both from the academic research point of view and from the perspective of regional revitalization.** Therefore, I would like to continue our investigations, closely collaborating with related communities while keeping an eye on the international situation.

# ICFA Statement



## **ICFA responds to Japan's interest in the International Linear Collider and encourages its realisation**

<https://www.kek.jp/en/newsroom/2019/03/22/0900/>

The International Committee for Future Accelerators (ICFA) has issued a statement following a declaration from the Japanese government on March 7th confirming its interest in the International Linear Collider (ILC), but not issuing a proposal to host the future project. ICFA stated its continuing support for the ILC and its encouragement of the collider's timely realisation as an international project led by Japanese initiative.

The statement was issued after the 83rd ICFA meeting held in Tokyo, Japan from 7 to 8 March 2019 with an evening reception on March 6. In the morning of the first day, in a session of the Linear Collider Board (LCB), with participation of the ICFA members, an official of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) explained Japan's view in regard to the International Linear Collider (ILC). ***Dr. Keisuke Isogai, Director-General of MEXT's Research, Promotion Bureau, handed a letter to Professor Tatsuya Nakada, Chair of LCB, stating that although the ministry has not yet reached the decision to issue a declaration for hosting the ILC, it will continue to discuss the ILC project with other governments with an interest in the project.***

***“We have been very encouraged talking with Japanese Diet members and senior-level MEXT officials, which showed that the political and executive environment in Japan is evolving quite rapidly towards the ILC,”*** said Geoffrey Taylor, Director of ARC Centre of Excellence for Particle Physics at the Terascale (CoEPP), Australia, and current chair of ICFA. ***“We're still very hopeful that in not too long a time we will end up with a positive response to hosting the ILC from Japan.”***



# **ICFA Statement on the MEXT's View with regards to the ILC Project**

On the occasion of its annual meeting in Tokyo, March 6-8, 2019, the International Committee for Future Accelerators (ICFA) thanks Dr. Keisuke Isogai, Director General, Research Promotion Bureau of Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT), for his inaugural presentation to the Linear Collider Board (LCB) and ICFA. **ICFA views the statement of continuing interest in the ILC within MEXT and related ministries and agencies as an important milestone along the path to the ILC.** ICFA also **thanks Hon. Takeo Kawamura**, Member of the House of Representatives and Chair of the Federation of Diet Members for the ILC, **for affirming support for the ILC within the Diet in his address to ICFA/LCB on March 6.**

Discovered at CERN's Large Hadron Collider in 2012, the Higgs boson has been hailed as the most important discovery in particle physics in decades of research. This unique particle offers a portal for understanding the fundamental laws of Nature and is expected to be a great new tool for discovery.

ICFA confirms the international consensus that **the highest priority for the next global machine is a "Higgs Factory"** capable of precision studies of the Higgs boson. At this ICFA meeting options for a Higgs Factory were discussed -- the ILC, as well as other collider technologies.

**ICFA reaffirms the scientific significance of the ILC and that the ILC is in a sufficient state of technical readiness for approval for construction.**

Both the European Strategy for Particle Physics Report of 2013 and the United States Particle Physics Project Prioritization Panel (P5) Report of 2014 had expressed support for the initiative of the Japanese physics community to host the ILC in Japan.

ICFA recognises that **although MEXT has interest in the ILC, and will continue to discuss the project with other governments, Japan is not yet able to declare its willingness to host the ILC. A clear statement of Japan's position towards hosting the ILC would have had significant impact in the ongoing discussions on the formulation of the European Strategy for Particle Physics Update.**

ICFA notes with satisfaction the great progress of the various options for Higgs factories proposed across the world. **All options will be considered in the European Strategy for Particle Physics Update and by ICFA.**

Tokyo, March 2019

# LCB's Letter to MEXT

Dr. Keisuke Isogai  
Director General  
Research Promotion Bureau  
Ministry of Education, Culture, Sports, Science and Technology (MEXT)  
Tokyo, Japan

Lausanne, 19 March 2019

Dear Dr. Isogai,

On behalf of the Linear Collider Board (LCB) members, I would like to express our gratitude for the letter to the LCB for its meeting on March 7, which explained the evaluation process that Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT) followed and the resulting conclusion from the process at this moment, concerning the hosting of the International Linear Collider (ILC) in Japan.

The international particle physics community has been supporting the proposal made by the Japanese colleagues to host the ILC as an international project with Japanese initiative. There is now a unanimous agreement in the community that a Higgs factory is needed as the next step in order to reveal physics beyond the current Standard Model. While the ILC at 250 GeV is at an advanced state in terms of technical and engineering readiness, alternative options for both linear and circular  $e^+e^-$  colliders, with great potential for detailed Higgs studies and beyond, have been proposed for the discussion on updating the European Strategy for Particle Physics currently underway.

In the United States of America, participation in the ILC hosted in Japan was featured in the future planning, namely in the report by the Particle Physics Project Prioritization Panel. The ILC has also a significant impact on the European Strategy. The LCB has been discussing, since the beginning of 2017, what would foster the ILC to be considered as one of the high priority projects in the European Strategy.

After several discussions, the LCB agreed on three desirable points to be mentioned in a Japanese statement on the ILC, which were also endorsed by the International Committee for Future Accelerators (ICFA) at its meeting in November 2017 in Ottawa. Those three points were reiterated in the LCB Chair's summary of the meeting on 5th December 2018, where the LCB discussed a realistic timing for the Japanese statement on the ILC. The Summary says:

“After the discussion, the LCB members reach the following conclusion. In order to adhere to the plan, it would be crucial to have a statement from the Japanese government in time for the March 2019 LCB/ICFA meeting, expressing its strong interest to host the ILC in Japan and intention to initiate international discussion, together with an indication of possible Japanese contribution along the lines suggested in the LCB conclusion endorsed by the ICFA in Ottawa in November 2017.”

The LCB is pleased to acknowledge that the MEXT positively addressed some of those points by stating its interest in the ILC project and the intention to continue the discussion with other governments, in the letter and in the March 2019 presentation.

The speech given by the Hon. Takeo Kawamura (Member of the House of Representatives and Chair of the Federation of Diet Members for the ILC), at the evening reception on March 6, on the position of the federation and their effort, particularly on the subject of Japanese contribution, was very much appreciated.

The LCB took note on the same occasion that the endorsement by the Japanese academic community, through the process conducted by the Science Council of Japan (SCJ), is important for the Japanese government to draw a positive conclusion for hosting the ILC. The LCB will pay close attention to the progress of the SCJ discussions and hopes for a positive outcome in a timely manner.

The ILC hosted by the Japan is extremely attractive and the community will continue to support the initiative. However in the present situation, the LCB expects that other collider options will also be considered in the forthcoming community discussion. While it is understood that the MEXT needs further consultation and evaluation of domestic and international development of the matter, with growing support for the ILC from various sectors in Japan, the LCB still hopes that the Japanese government could issue a statement proposing to host the ILC in sufficient time for the ILC to be well integrated into the European strategy discussion.

I would like to thank you again for kindly letting us know the present view of the Japanese government and we sincerely hope that further effort will bring the ILC to a satisfactory conclusion in the very near future. Please note that the LCB has no objection for sharing the content of this letter with relevant parties.

Yours Sincerely



Tatsuya Nakada  
Chair of the Linear Collider Board



# **KEK's Plan shown at the Lausanne Meeting**

<https://indico.cern.ch/event/789524/timetable/#20190408.detailed>

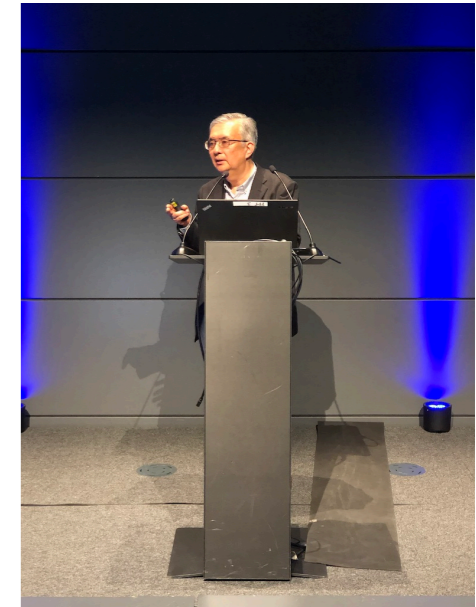
# **KEK presented its plan for the ILC project in Lausanne**

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.

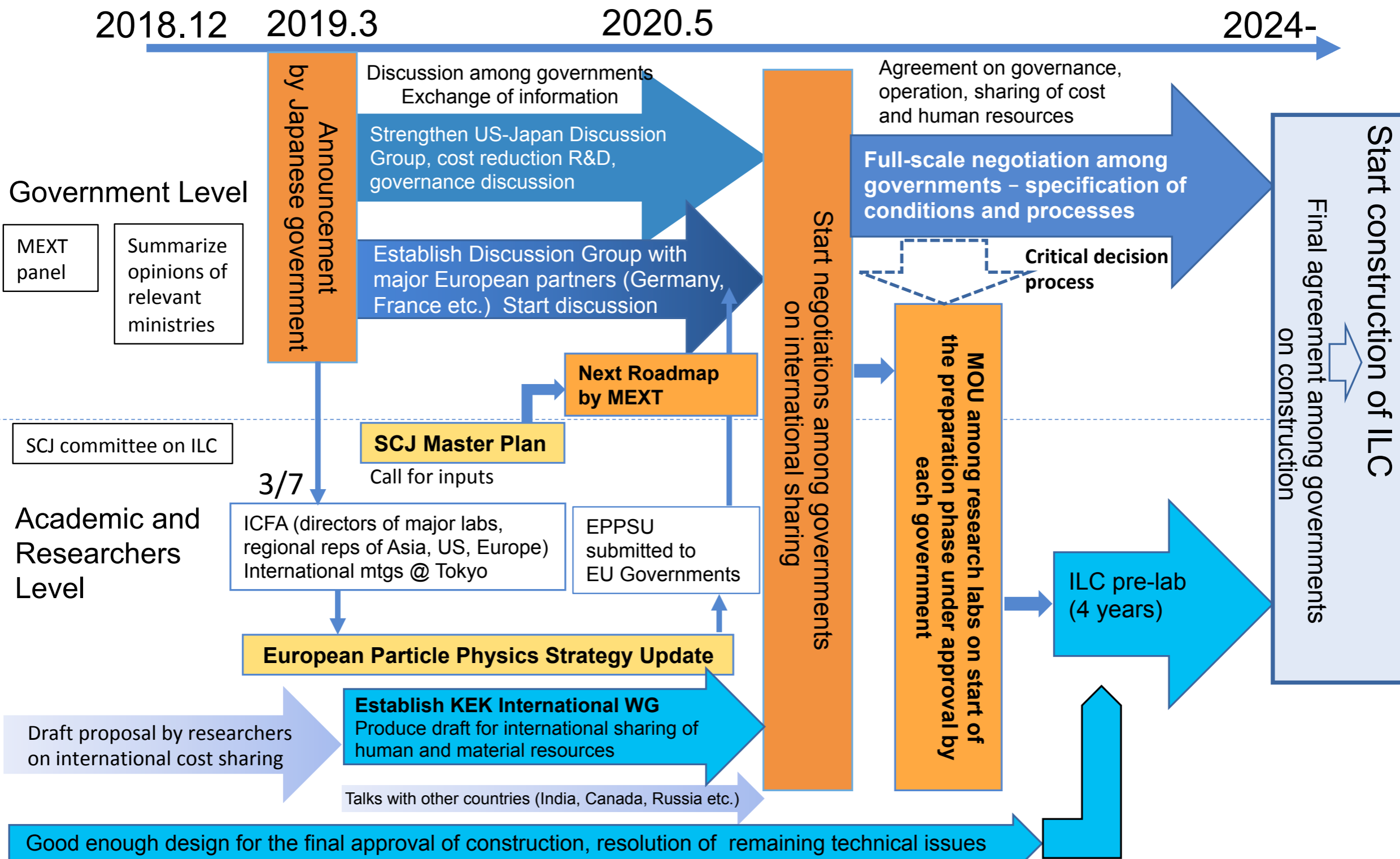


# Possible Timeline

# From Masa's presentation on March 7

Processes and Approximate Timelines Toward Realization of ILC (by researchers)

Restricted



\* ICFA: international organization of researchers consisting of directors of world's major accelerator labs and representatives of researchers

\* ILC pre-lab: International research organization for the preparation of ILC based on agreements among world's major accelerator labs such as KEK, CERN, FNAL, DESY etc.



# 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, yagy (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 Sat. Jun. 22, 2019 ?
- Granada Open Symposium for ESU, May 13-16, 2019
- LCWS 2019 in Sendai, Oct. 28 - Nov. 1, 2019