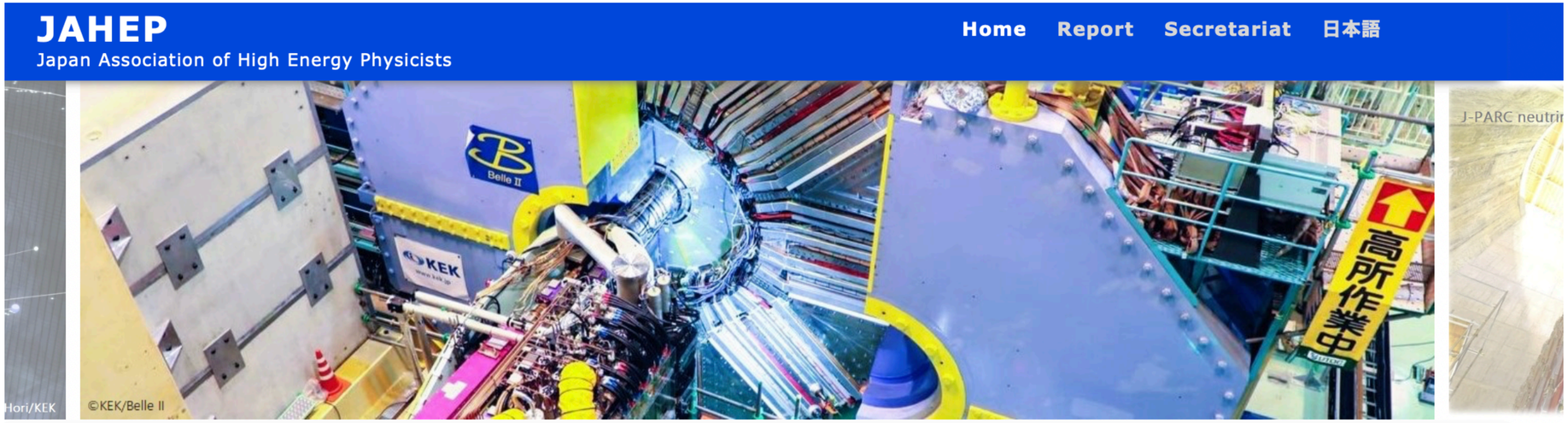
Strategy in Japan (for realising ILC)

Tsuyoshi NAKAYA (Kyoto U.)
on behalf of the JAHEP HEP committee

2024.7.11 @ LCWS2024, Tokyo

JAHEP: High Energy Physics community in Japan

https://www.jahep.org/en/index.html



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High energy physics to study the origin of matter and mysteries of the universe

High energy physics is a research field to study the origin of matter, fundamental interaction and the space-time structure by investigating reactions of high energy particles made in an accelerator.

In Japan, many researchers from all over the world carry out the forefront research, such as Belle II experiment with SuperKEKB accelerator which is the world's highest luminosity electron and position collider (left picture), T2K neutrino oscillation experiment with J-PARC high intensity proton accelerator producing neutrino beam which is directed toward Super-Kamiokande detector. Researchers are also vigorously working on international experiments using accelerators all over the world, and development of next-generation accelerator technologies.

Japan Association of High Energy Physicists (JAHEP) was established as a forum where all the high energy physics researchers in Japan exchange their opinions and express their ideas.

What's new!

JAHEP HEP committee

High Energy Physics Committee

https://www.jahep.org/en/committee.html

2023.9~2025.8		
Chairperson	Tsuyoshi NAKAYA	Kyoto University
Secretary	Masaya ISHINO	The University of Tokyo・ICEPP
	Yutaka USHIRODA	KEK・IPNS
	Toshinori MORI	The University of Tokyo・ICEPP
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	Masao KURIKI	Hiroshima University
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	Satoru YAMASHITA	Iwate Prefectural University
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	Yasuhiro OKADA(~2024.3) Kazunori HANAGAKI(2024.4~)	KEK・Executive Director
	Naohito SAITO	KEK・Director, Institute of Particle and Nuclear Studies
	Tadashi KOSEKI	KEK・Director, Accelerator Laboratory

JAHEP Future Projects Committee

The last report in 2017

Final report of the committee on Future Projects in High Energy Physics

Masaki Ishitsuka, Hirokazu Ishino, Masaya Ishino, Wataru Ootani, Takashi Obina, Masaaki Kitaguchi, Ryuichiro Kitano, Hiroshi Sakai, Tomoyuki Sanuki, Nanae Taniguchi, Makoto Tomoto, Takeshi Nakadaira, Hajime Nanjo, Takeo Higuchi, Shigeki Matsumoto, Shigetaka Moriyama, Tamaki Yoshioka

06 September 2017

Ishino-san

Masaya Ishino is

- the chair of Future Projects committee in 2017
- the ILC-Japan spokesperson.

Recommendation

will be updated in 2025

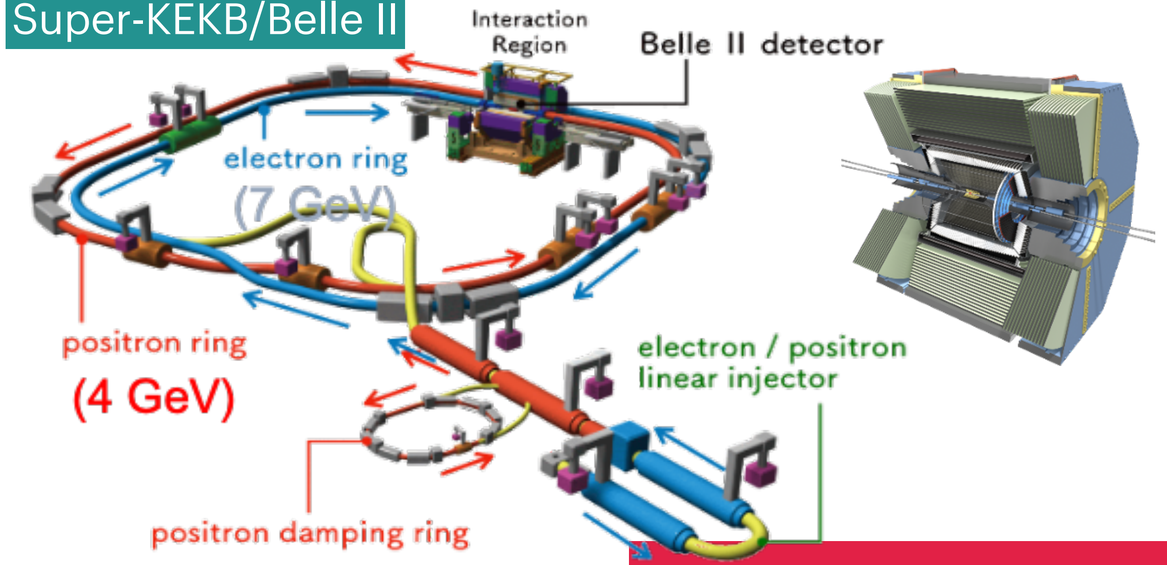
In 2012, not only was a Higgs boson with a mass of 125 GeV discovered at the LHC, but three-generation neutrino mixing was also established. Taking full advantage of the opportunities provided by these discoveries the committee makes the following recommendations concerning large-scale projects, which comprise the core of future high energy physics research in Japan.

- With the discovery of the 125 GeV Higgs boson at the LHC, **construction of the International Linear Collider (ILC) with a collision energy of 250 GeV should start in Japan immediately** without delay so as to guide the pursuit of particle physics beyond the Standard Model through detailed research of the Higgs particle. In parallel, continuing studies of new physics should be pursued using the LHC and its upgrades.

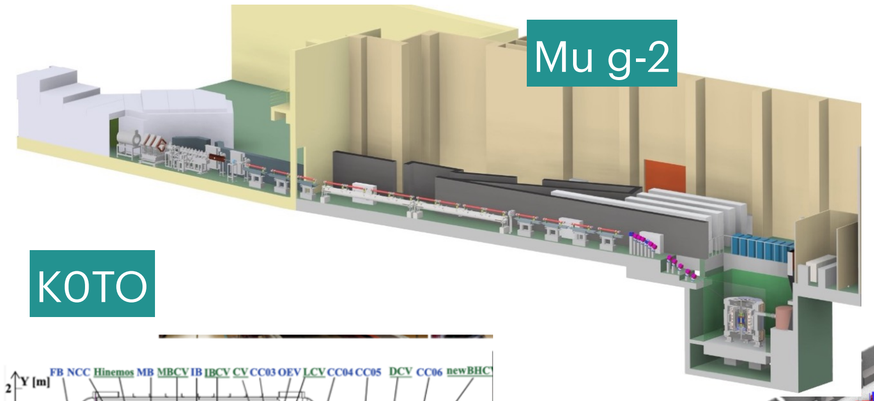
- Three-generation neutrino mixing has been established and has provided a path to study CP symmetry in the lepton sector. Therefore, **Japan should promote the early realization of Hyper-Kamiokande as an international project** due to its superior proton decay sensitivity, and should continue to search for CP violation with the T2K experiment and upgrades of the J-PARC neutrino beam.

HEP Situation in Japan

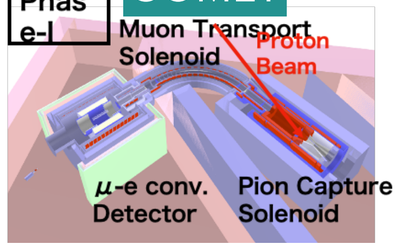
Super-KEKB/Belle II



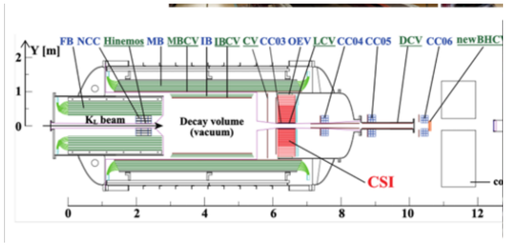
Mu g-2



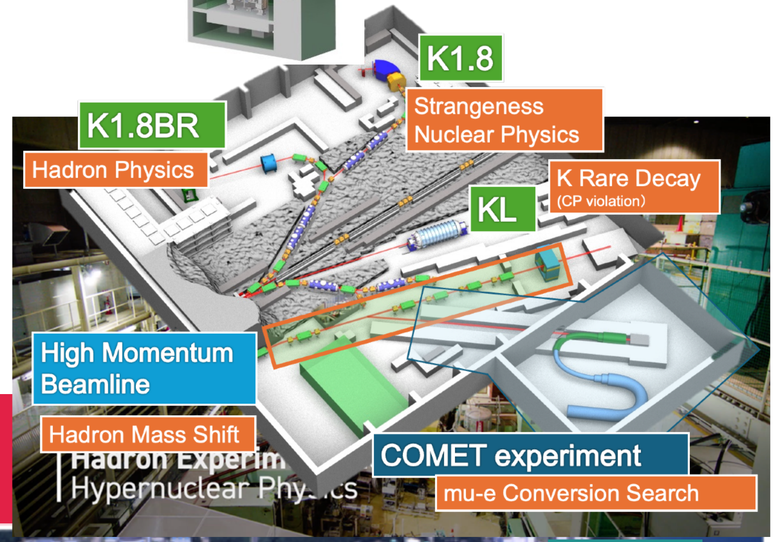
COMET



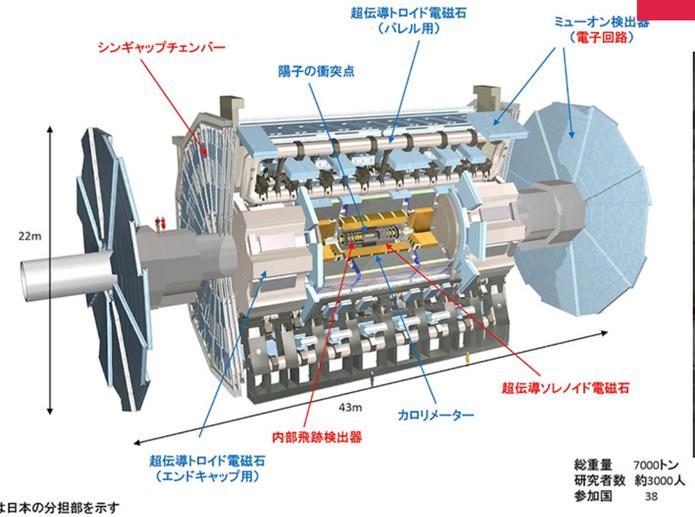
KOTO



K1.8 / K1.8BR



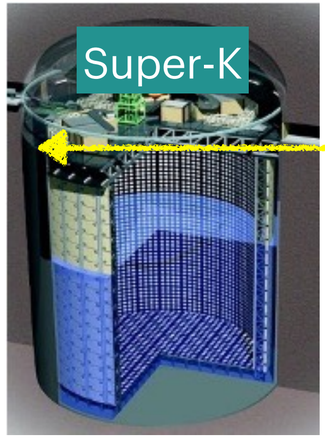
LHC/ATLAS



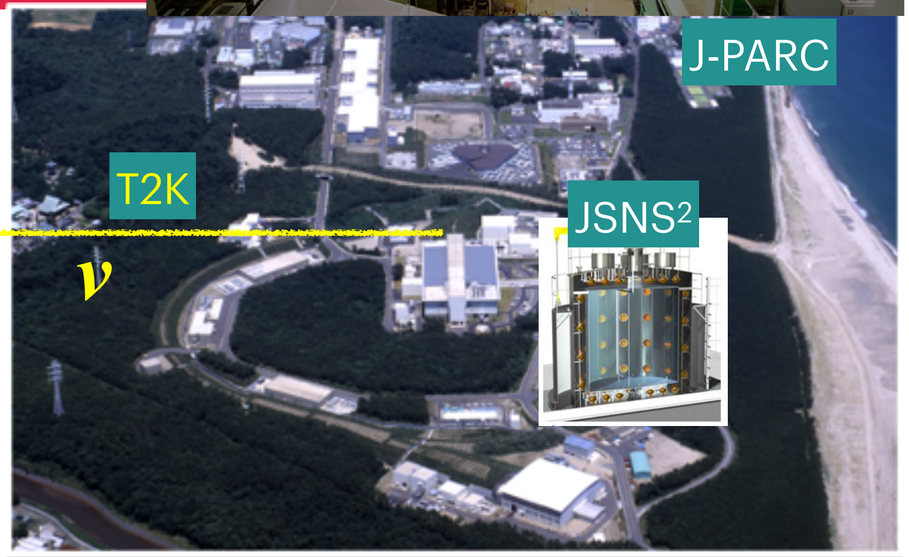
Various experiments are being conducted!

Hyper-K

Super-K



J-PARC



ILC History

- Before 2000, there was three LC proposals
  - JLC (Japan), NLC (US), and Tesla (Germany)
- **In 2004, ITRP (International Technology Recommendation Panel) recommended ILC with superconducting RF technology. ICFA supported the ITRP recommendation.**
- In 2013, ILC TDR was completed under the leadership of GDE (Global Design Effort)
  - The Japanese HEP community proposed to host ILC in Japan
- In 2017, Re-baseline of ILC with 250 GeV as a Higgs Factory.
- **In 2023, ILC-Technology Network (ITN) was established to**
  - *improve the reliability and completeness of ILC technology*
  - *make international cooperation tighter and dependable between government levels*

Message from Diet members

Report by S. Asai (KEK DG) at the ICFA meeting in April 2024

by Federation of Diet Members to Promote a Construction ofInternational Laboratory LC
March 21, 2024

1. Further activities should be promoted to attract the ILC project to Japan by “All-Japan Structure” with the research community, industries,promoting organizations of the ILC site candidate, related ministries and politics including the Federation of Diet Members.
2. The ILC project should be further promoted as a global project by furtherstrengthening the international collaboration where International Development Team (IDT), an international promoting organization established underInternational Committee for Future Accelerators (ICFA), and theresearch community of Japan should play a leading role.
3. The Ministry of Education, Culture, Sports, Science and Technology should actively collaborate with the international research community to discuss the realization of the global accelerator project, using the framework of the liaison group for the futureadvanced accelerators, in cooperation with the Ministry of Cabinet and otherrelated ministries.

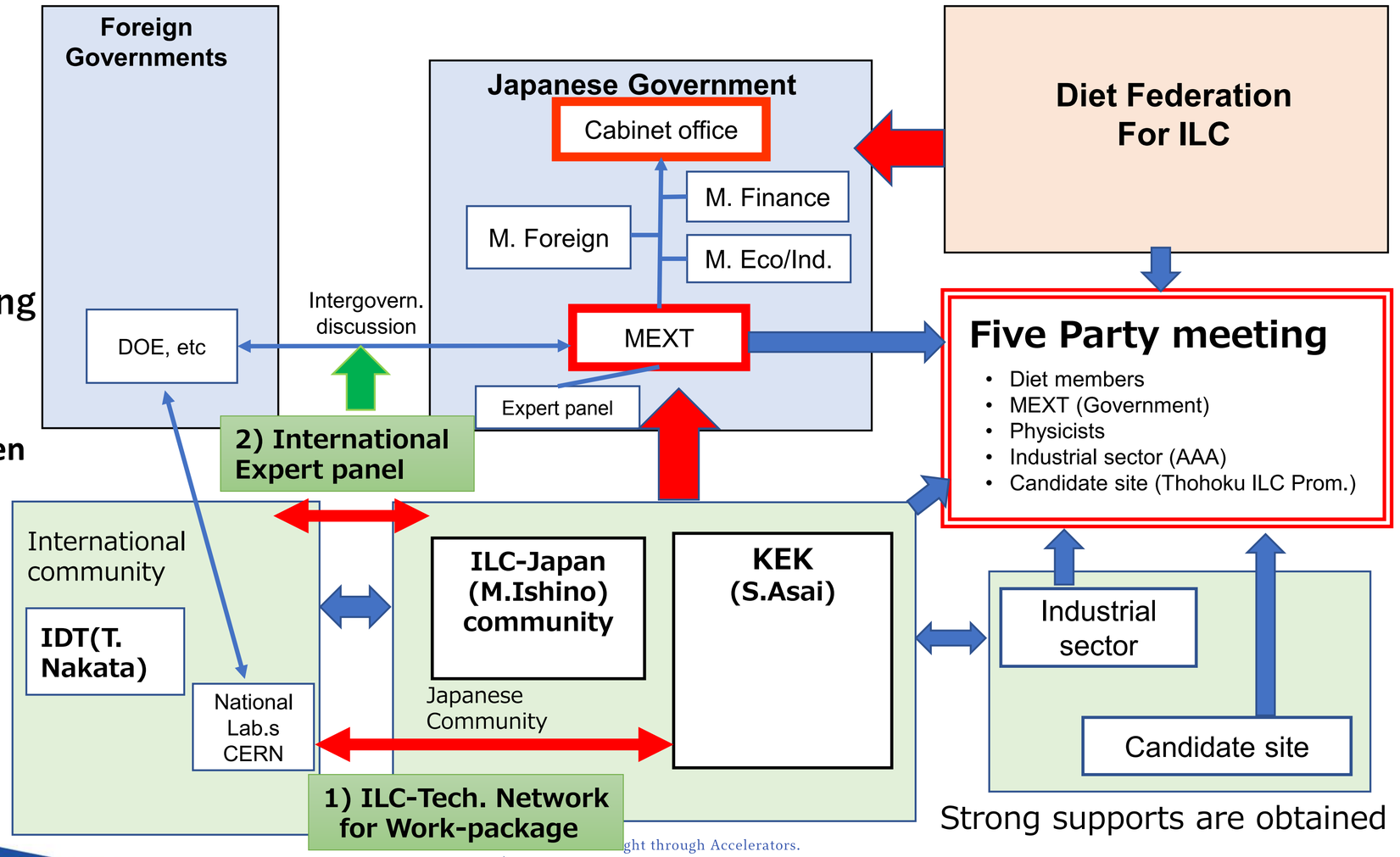
Promotion scheme of ILC / relation of Stakeholder

Opening remarks
by S. Asai (KEK DG)

1. KEK& Community & IDT

2. Five Party Meeting

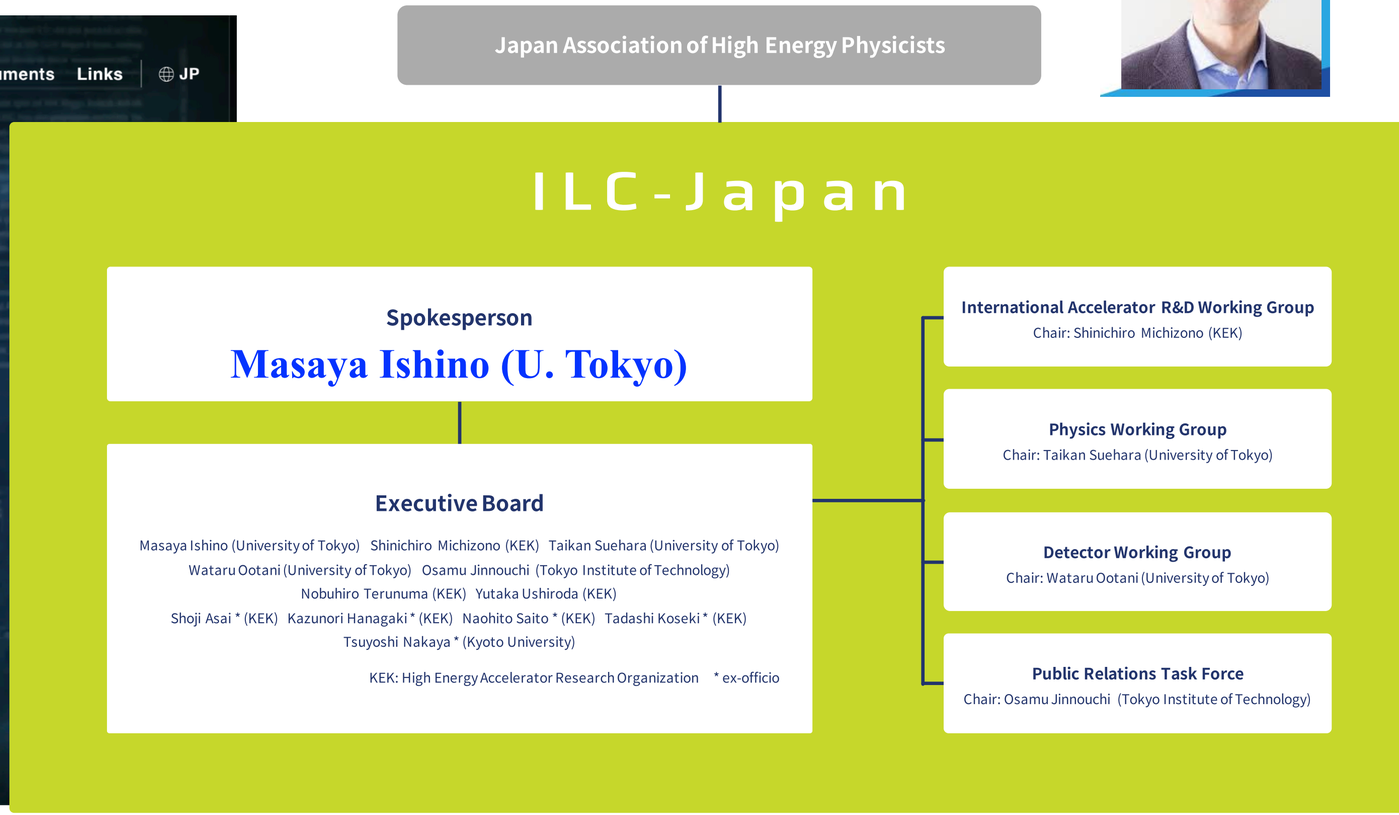
3. liaison office between MEXT and Cabinet office starts



ILC-Japan

https://ilc-japan.org/en/

Ishino-san

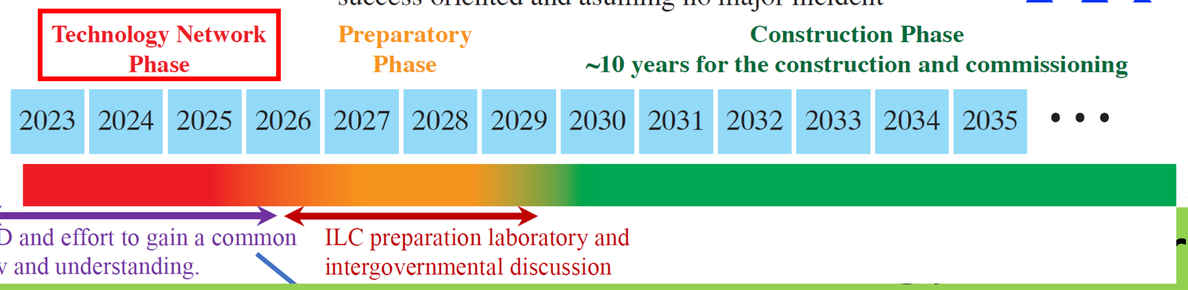


ILC-Japan leads activities aimed at realizing the International Linear Collider (ILC).

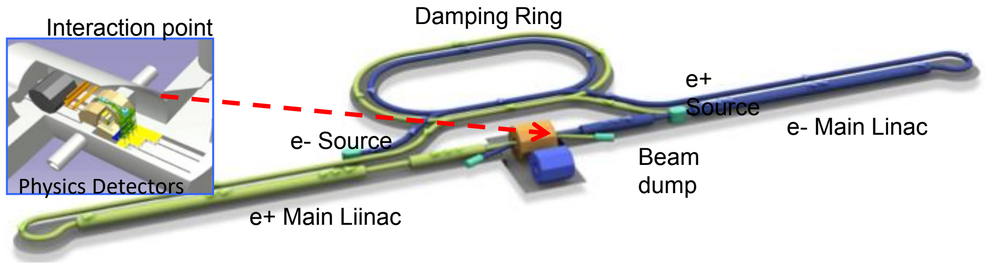
As a representative of the community of researchers involved in ILC promotion activities, ILC-Japan takes responsibility for promoting the realization of the ILC, working with KEK and coordinating with stakeholders.

ITN: ILC Technology Network

-success oriented and asuming no major incident-



ITN: accelerator developments by Dr. S. Michizono



Not only for the **ILC** but also for **various application**

- Creating particles — ***Sources***
  - polarized elections / positrons
- High quality beams — ***Damping ring***
  - Low emittance beams
    - Small beam size (small beam spread)
    - Parallel beam (small momentum spread)
- Acceleration — ***Main linac***
  - superconducting radio frequency (SRF)
- Getting them collided — ***Final focus***
  - nano-meter beams
- Go to ***Beam dumps***

SRF

e-, e+ Sources

Nano-Beam

WPP	1	Cavity production
WPP	2	CM design
WPP	3	Crab cavity
WPP	4	E- source
WPP	6	Undulator target
WPP	7	Undulator focusing
WPP	8	E-driven target
WPP	9	E-driven focusing
WPP	10	E-driven capture
WPP	11	Target replacement
WPP	12	DR System design
WPP	14	DR Injection/extraction
WPP	15	Final focus
WPP	16	Final doublet
WPP	17	Main dump

KEK and CERN Conclude Agreement on R&D for International Linear Collider

Topics

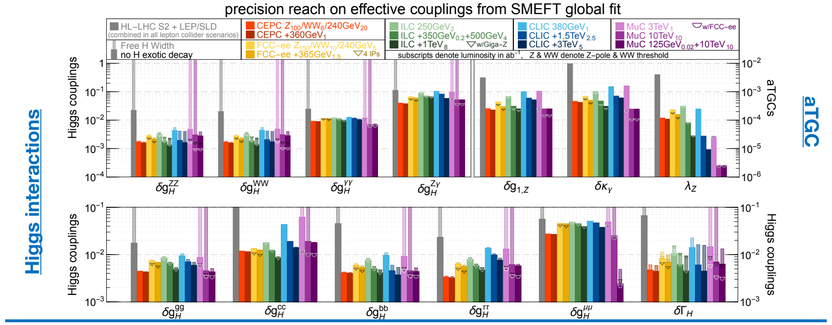
2023/07/08

Dr. Masanori Yamauchi and CERN Director General Dr. Fabiola Gianotti (left to right) (courtesy of CERN)

Higgs Factory is NEXT!

— *There is no question* —

Global precision at e^+e^- EW/Higgs factories

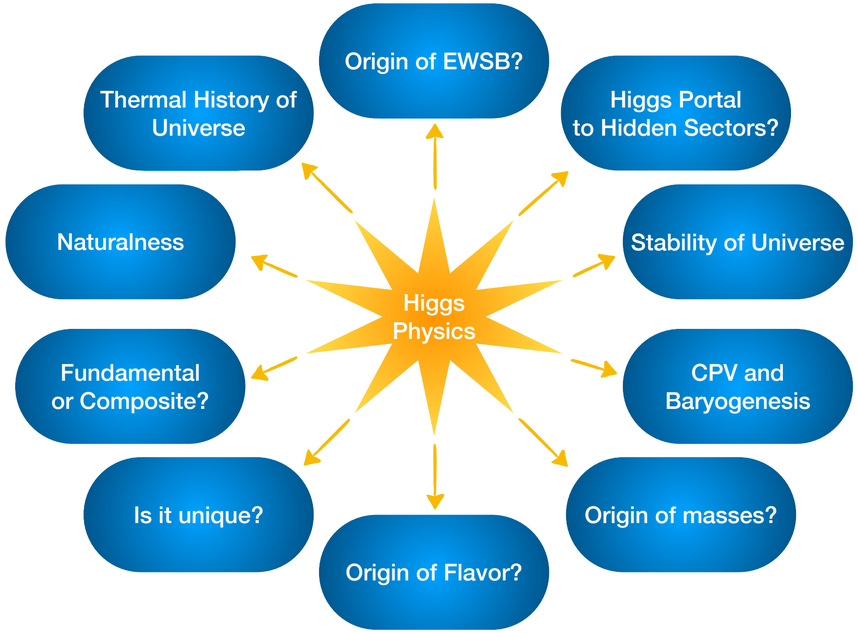


Physics case for Higgs and Electroweak precision by J.D.B. Mateo

Physics Goals of the Full Higgs Factory Program

M. E. Peskin
LCWS 2024
LC Vision
July 2024

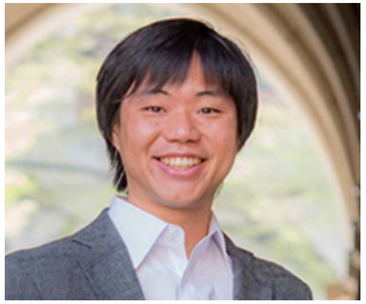
- **The bigs questions:**



New JAHEP Future Projects Committee

https://www.jahep.org/en/fproject.html

- **The global HEP situation is changing dramatically.**
  - New recommendations from US P5.
  - New European Strategy is launched.
  - Progress of the CEPC project in China
- The importance of the Higgs boson is growing.
  - Higgs Factory is the next collider as a consensus of the HEP community.



- New Future Projects Committee was launched in 2024.
  - Dr. Y. Okumura is chair of the committee.
- The Japanese HEP community is updating its strategy for future projects.
  - An input to European Strategy

Your input is very welcome and important.

2024.1~		
Yasuyuki OKUMURA	The University of Tokyo・ICEPP	Chairperson
Yoshinori ENOMOTO	KEK・ACCL	Secretary
Hideyuki OIDE	KEK・IPNS	Secretary
Kazuyuki SAKAUE	The University of Tokyo	Secretary
Tsunayuki MATSUBARA	KEK・IPNS	Secretary
Kazuki UENO	Osaka University	
Kenta UNO	KEK・IPNS	
Yuji ENARI	The University of Tokyo・ICEPP	
Hidetoshi OTONO	Kyushu University	
Shusei KAMIOKA	KEK・IPNS	
Ryuichiro KITANO	KEK・IPNS	
Takayuki KUBO	KEK・ACCL	
Koji SHIOMI	KEK・IPNS	
Taikan SUEHARA	The University of Tokyo・ICEPP	
Yu NAKAHAMA	KEK・IPNS	
Natsumi NAGATA	The University of Tokyo	
Koji TSUMURA	Kyushu University	
Junping Tian	The University of Tokyo・ICEPP	
Kaori HATTORI	AIST	
Shigeki HIROSE	University of Tsukuba	
Megan Friend	KEK・IPNS	
Yasuhiro FUWA	JAEA	
Takahiko MASUDA	Okayama University	
Kodai MATSUOKA	KEK・IPNS	
Kenji MISHIMA	KEK・IMSS	
Gaku MITSUKA	KEK・ACCL	
Roger Wendell	Kyoto University	
Hiroko WATANABE	Tohoku University	

Summary

with my personal view

- The **Higgs Factory (HF)** is the NEXT HEP project with global consensus.
  - There are three proposals: the CEPC, the FCCee, and the ILC.
    - Upgrade possibilities, energy extendability and an option to switch to a hadron collider, will be considered.
  - As the HF is a long-term project, it is vital to keep ongoing projects with high physics outputs and steady R&D for future HEP technologies.

- In Japan, **ILC-Japan** is the core of the ILC activities. The Japanese HEP community would like to play a leading role in making the ILC a reality.
  - The ILC should be further promoted as a global project by strengthening the international collaboration with IDT and ICFA.
  - We are making every possible efforts for the Japanese government to consider expressing their interest in hosting the ILC.

- In the International framework, **ILC-Technology Network (ITN)** is established by networking with a number of foreign laboratories and institutes to strengthen the international cooperation in the ILC accelerator R&D.

- The Japanese HEP community has set up **the New Future Projects Committee** to update the strategy for future projects in Japan. Your input is essential for HEP projects in Japan, along with close communication with the global HEP community.