

# ILC Project Suspended by Japanese Government

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On the brink of survival of the International Linear Collider (ILC) project, Keisuke ISOGAI, Director-General of Research Promotion Bureau at the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, announced that MEXT has not yet reached declaration for hosting the ILC in Japan, at the meeting of the International Committee for Future Accelerators (ICFA) held in Tokyo on March 7, 2019 (Fig. 1). He said, however, MEXT still has “an interest in the ILC project” and “will continue to discuss the ILC project with other governments.” It was somewhat a confusing statement which made physicists at the ICFA meeting get disappointed. However, at least, the ILC wasn’t killed. It still survives currently.

## Negative report by the Science Council of Japan

The ILC, electron-positron collider, is positioned as complementary machine to CERN’s Large Hadron Collider (LHC). Upgraded LHC (HL-LHC) will be active in the 2020’s, after that the ILC will take turns as a Higgs factory. This is a scenario which the elementary particle physics community is eager to realize. Though there are other Higgs factory plans like the Compact Linear Collider (CLIC) plan at the CERN and a large ring collider plan in China, the ILC, which is being considered for implementation in Japan, is the most advanced and the most mature project.

On December 19, 2018, the Science Council of Japan (SCJ), the representative organization of Japanese scientist community ranging over all fields of sciences subsuming humanities, social sciences, life sciences, natural sciences, and engineering, handed over to MEXT a negative report on the ILC which said, “Judging from the plan and preparatory status of the project presented at the moment, the SCJ does not reach a consensus to sup-



**Fig. 1:** Keisuke ISOGAI, Director-General of Research Promotion Bureau at the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, answering questions from press.

port hosting the 250 GeV ILC project in Japan. The SCJ considers that government should be cautious regarding a decision to announce its commitment to host the ILC in Japan.” After appearing such negative report from the academia representative, there seemed no possibility of implementation in Japan. But according to “MEXT’s view in regard to the ILC project Executive Summary” (full text is shown in the column on page 31), the possibility is still there.

A Japanese physicist, who is pushing the ILC, stressed that it is for the first time for a senior member of MEXT to attend the ICFA meeting and declare interest in future discussion. Administratively it was a significant step forward, indeed. Prof. Tastuya NAKADA, the chair of Linear Collider Board (LCB), said at March 7th post conference press meeting, “I judged MEXT is very interested in the ILC project.” (Fig. 2)



**Fig. 2:** March 7th post conference press meeting held by the ICFA. From the left to right, Prof. Tatsuya NAKADA, LCB chair, Prof. Geoffrey TAYLOR, ICFA chair, Prof. Masanori YAMAUCHI, KEK Director General.

It was in July 2018 that the Director-General of the Research Promotion Bureau at MEXT requested the SCJ to deliberate on the Revised Plan of ILC. The Revised Plan means the 250 GeV ILC project because the ILC was originally planned as 500 GeV collider. The SCJ deliberated for about five months. The report, “Assessment of the Revised Plan of International Linear Collider Project,” admitted the importance of pursuit of “physics beyond the standard model.” Then, it pointed out, “there are various experimental approaches, both accelerator-based and non-accelerator-based,” and valued the ILC as “an important one among those approaches.” However, the discussion of the future plan “has not reached the stage to address such specific issues as allocations of human resources and the overall research budget to the different research projects in particle physics.” In conclusion, it said, “The Committee and the Subcommittee are not yet convinced that the prospective scientific outcome (possible indication of future direction) is sufficient to justify Japan’s large share of the overall cost required for the project implementation.”

At a press meeting in Tokyo last year, Lyn Evans, the director of the Linear Collider Collaboration that coordinates planning and research for the ILC and the CLIC, said, “I am not surprised other fields’ scientists oppose big projects like the ILC. It is common in Europe and the United States as well.” He was in Tokyo in order to attend the general assembly of the ILC Construction Promotion Parliament Association.

Anyway, this time MEXT requested the SCJ to discuss hosting the ILC in formal academic decision-making processes as seen in the column below. The SCJ makes

the Master Plan on large research projects every 3 years, and it is making the Master Plan 2020 now. Whether the ILC project can be included in the Master Plan 2020 as important project or not will be crucial from now on. The ball was thrown back to the SCJ from MEXT.

**Why in Japan**

The study of a linear type large-scale accelerator began in the 1980’s, and Japanese researchers originally called it “Japan Linear Collider (JLC).” The first proposal by Japanese team was published in 1986. Then the momentum of the slogan, “Let’s realize the linear collider in the Asia-Pacific region,” increased, the name changed to Global Linear Collider (GLC). Around that time, major accelerator laboratories in Europe and the United States such as CERN, DESY, FNAL, SLAC, also advanced development research on a large linear collider. It was clear that it would be hard to realize such huge project in one country. So, the world physicist community agreed to cooperate and aim for an early construction. Thus, the name became the International Linear Collider (ILC). In November 2004, Japan’s High Energy Accelerator Research Organization (KEK) hosted the first ILC workshop.

The ILC needs two key technologies: one is superconducting radio frequency (SRF) cavities which accelerate particles, and the other is Nano-beam technology which allows particles to collide. SRF technology was first applied in 1990s to TRISTAN, KEK’s first big circular accelerator. Then it has grown by physicists all over the world to the world standard. Nano-beam technology has been developed at Accelerator Test Facility (ATF) in KEK since 1997. This long history has made physicists feel reasonable to set up the ILC in Japan. Artist’s view of ILC is shown in Fig. 3.



Fig. 3: Artist's view of ILC.

There were two candidate sites in Japan: Sefuri Mountains in Kyushu Island, the southern part of Japan, and Kitakami Mountains in Tohoku region, the northern part of Japan. Because of the geological condition, the latter can have longer tunnel than the former. Kitakami Mountains, therefore, became the only one candidate site in August 2013. Since then local governments and business circles in Tohoku region have been vigorously promoting invitation activities.

### Cannot see the future

The ICFA has advanced development research on the ILC. It is an international group created to facilitate international collaboration in the planning, construction and use of accelerators for high-energy physics. ICFA's Global Design Effort announced the ILC's Technical Design Report (TDR) in 2013, in which the maximum collision energy was designed as 500 GeV. But the mass of Higgs particles found by CERN's LHC in 2012 came clear to be around 125 GeV, thereby the maximum collision energy was redesigned to 250 GeV, with capability to expand to higher energy at the later stage. The design change has shortened the tunnel length to about 20 kilometers.

However, even if it is reduced to 20 kilometers, construction of the ILC will still cost huge expenses. Japan's government budget has been in deficit for a long time, so fiscal authorities are cautious. It can be said that the SCJ is cautious because of the same reason.

Tohoku region is the area struck by the Great East Japan Earthquake in 2011. The area has recovered remarkably but not completely. There is a demand from the locality that the ILC should be constructed to revitalize the region. Though it is comprehensible demand, whether it can be realized or not is unpredictable. It seems as if we were before the clear up the universe.

### 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 in Japan 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.



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