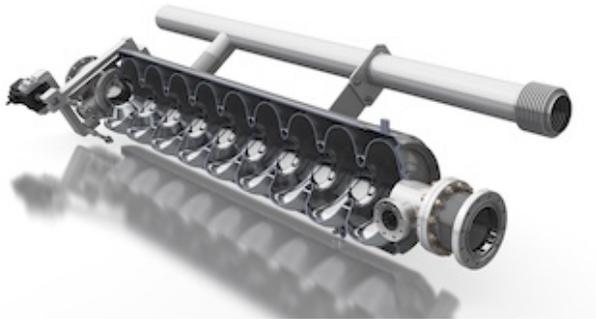




## DIRECTOR'S CORNER



### ILC Pre-Lab preparation on the accelerator

by Shinichiro Michizono

Let's talk cavities and cryomodules! Accelerator Director Shin Michizono brings us up to date with the latest developments on the ILC machine as well as plans and tests for the next phase, leading to the next big milestone, the Engineering Design Report.

## AROUND THE WORLD

### New organisation in Tohoku, the ILC's potential host region

by Rika Takahashi

Making the Tohoku area a welcoming place for the ILC and those who will live there – that is the goal of the newly established Tohoku ILC Project Development Center. It comprises 22 academic and local organisations in the north east of Japan. Atsuto Suzuki, president of the Iwate Prefectural University and former director general of KEK chairs the organisation.



## FEATURE



### From CERN Courier: ILC: beyond the Higgs

by Jenny List, Jan Strube and Tomohiko Tanabe

The high-luminosity, polarised beams of the proposed International Linear Collider and the triggerless operation of its detectors offer rich physics opportunities beyond its Higgs-factory programme.

## IN THE NEWS

### from *Iwate Nippo*

19 February 2021

[研究成果 高校生が紹介 盛岡で I L C 推進モデル校交流会](#)

国際リニアコライダー（ILC）に関わる人材育成を目指す県の「ILC推進モデル校」の成果交流会（盛岡一高主催）は18日、盛岡市内丸の盛岡地区合同庁舎で開かれた。県立9高校の生徒が、誘致実現後の波及効果や外国人研究者の受け入れに向けた研究活動を紹介した。

### from *India Educational Diary*

18 February 2021

[PNNL: PNNL's Jan Strube Among U.S. Leaders Defining New International Linear Collider Experiments](#)

Even before the Large Hadron Collider (LHC) in Switzerland detected the elusive subatomic particle known as the Higgs boson in 2012, scientists around the world were already hard at work planning for the next particle accelerator. Arguably some of the most sophisticated scientific machines on the planet, these engineering marvels take decades to plan, build, test, and start. Such is the case for the proposed International Linear Collider, or ILC.

### from *Asahi Shimbun*

12 February 2021

[昔「一家に一台」加速器が 旧式テレビの先に宇宙の起源](#)

村山齊の時空自在<45> 国際リニアコライダー（ILC）計画が注目されるのにはわけがある。この大型施設の大きな目標は二つ。一つは「母なる」暗黒物質を探すこと。もう一つは「空気のような」ヒッグス粒子の実体を詳しくつかむこと。どちらも私たちのルーツを探す旅だ。

### from *Sputnik News*

11 February 2021

[Scientists Believe Key to Dark Matter Mystery Lies in a New Particle and Fifth Dimension](#)

Although the new generation of accelerators, such as International Linear Collider, the Compact Linear Collider (CLIC), and the Future Circular Collider, may deal with this challenge, the researchers believe that it can be spotted when observing gravitational waves.

### from *KITAKAMI TIMES*

10 February 2021

[Some lesser known winter activities in Iwate!](#)

(This article introduce the Tohoku area, the candidate construction site of the ILC) Winter is here. Nothing better than the view of freshly snowcapped mountains with the backdrop of pale sunset hues of pinks and blues, or relaxing in the outdoor hot springs as the crisp air turns the water droplets on your hair to ice, or, lounging around all day watching the TV from the warmth of a “Kotatsu” (table with a heat source).

### from *ilc news*

9 February 2021

[ILC国際推進チーム 準備研究所設立へ](#)

ILC = 国際リニアコライダーの誘致実現に向けた県の推進本部会議が開かれ、国際推進チームが今年末までに準備研究所を設立することが報告されました。

### from *Physics Today*

9 February 2021

[Faxes, mascots, and manga: Science communication in Japan](#)

Higgs-kun, a ghostlike blue avatar of the boson, promotes the proposed International Linear Collider (ILC) in its planned home, Japan's northern Iwate Prefecture. Hookun and Higgs-kun appear as electronic stickers in the popular messaging app LINE, and people dressed in life-size costumes regularly visit schools and events.— The latest series of the long-running manga Kosaku Shima sees the titular businessman involved in the ILC's development.

### from *Nikkei*

8 February 2021

[岩手県、コロナ対策・復興を推進 21年度予算13%減](#)

「新しい時代を切り拓くプロジェクト」として、巨大加速器「国際リニアコライダー」（ILC）の誘致推進にも引き続き取り組む。1億円を計上し、候補地とされる北上山地での建設準備に必要な具体的な調査の検討や県内企業の加速器関連産業への参入支援、国内外への情報発信などを強化する。

### from *Film Dairy*

4 February 2021

[Want to visit a new dimension? How scientists are making it happen](#)

Now that experts have somewhat of a lead on this proposed particle that may lead to a new, fifth dimension, the search for the particle has begun. Vice announced that it “might be detectable for a new generation of proposed colliders, such as the “International Linear Collider, the Compact Linear Collider (CLIC), and the Future Circular Collider”.

**from KITAKAMI TIMES**

28 January 2021

**2020: A year of working for the ILC**

This year, Iwate kept continuing its support of preparations to bring the ILC to Japan, working with our counterparts across the world as the ILC moves towards the preparatory phase.

**from Asahi Shimbun**

28 January 2021

**日本のILCに期待 大型加速器を「直線」にする利点は**

村山齊の時空自在<44> このコラムで何度か触れた大型粒子加速器「国際リニアコライダー（ILC）」を日本に建設する話が世界で盛り上がっている。

## PREPRINTS

### ARXIV PREPRINTS

2102.12826

Heavy Neutrino Searches via Same-sign Lepton Pairs at the Higgs Factory

2102.08645

Leptophilic fermion WIMP ~ Role of future lepton colliders

2102.06236

Resolving a challenging supersymmetric low-scale seesaw scenario at the ILC

2101.11906

Development of a Vertex Finding Algorithm using Recurrent Neural Network

2101.11892

Influence of Furnace Baking on Q-E Behavior of Superconducting Accelerating Cavities

## ILC Pre-Lab preparation on the accelerator

[Shinichiro Michizono](#) | [26 February 2021](#)



*Superconducting RF cavity design for the ILC (Credit: Rey.Hori/KEK)*

The International Development Team (IDT) was established in August 2020, and its Working Group 2 has been conducting preparatory accelerator work for the ILC Pre-Lab. Working Group 2 currently has about 40 members.

In the Pre-Lab, the following accelerator-related tasks are expected to be performed:

- (1) Technical preparations.
- (2) Final technical design and documentation.
- (3) Preparation and planning of deliverables.
- (4) Civil engineering and infrastructure.

We will need more people to help us prepare for the ILC construction to carry out the above-mentioned tasks, and training and educating such staffs are necessary. In WG2, we created four subgroups: *electron and positron sources*, *ML/SRF* for accelerating beams to high energy using superconducting radio-frequency (SRF) technology mainly at the main linac (ML), *DR/BDS/Dump* for damping ring (DR) and collision point area, and *civil*

*engineering and infrastructure.*

Approximately 120 SRF cavities (corresponding to roughly 1 percent for the ILC) will be manufactured worldwide during the preparation period, and their performance will be evaluated. A total of six cryomodules will be made in Asia, the Americas, and Europe, and transported by sea to Japan, and we will ensure that there is no performance degradation and that the modules are made according to global specifications. Two schemes for the positron source are currently under consideration: the undulator scheme and the electron-driven scheme. The target to create positrons and a magnetic focusing system to efficiently collect them will be considered for both schemes, and prototypes of certain components will be made. The positron generation scheme will be down-selected during the preparation period.

A total of 18 topics were proposed and summarised in the Technical Preparation Document. Each will be evaluated in an internal review organised by the IDT Executive Board. The preparatory period efforts are expected to be in-kind contributions that will be shared by each region and institute and will be implemented with their own budgets. The Technical Preparation Document is intended to be used as reference material for budget requests.

The final design will be based on the 2013 [Technical Design Report](#) and incorporate the results of further R&D, leading to the Engineering Design Report. The ILC construction cost will also be confirmed based on the Technical Design Report.

Preparation and planning for mass production will be discussed in each region based on the technical preparation activities .

The candidate sites' [underground civil engineering plan](#), based on the geology of the Kitakami area, and a summary of discussion for the [strategic environmental assessment](#) are available to the public. Additionally, a subsequent project phase assessment and geological

survey of the construction route will be conducted during the preparation period.

The ILC is an international project. Researchers and engineers from around the world will be involved in ILC construction and its operation. It is important to develop human resources, who will play a major role in ILC construction as technical preparations and detailed designs are developed.

ILC collaborators will meet remotely in March during [the 2021 International Workshop on Future Linear Colliders \(LCWS2021\)](#). And together with the entire ILC family, our working group will help ensure a smooth transition to the ILC Pre-Lab.

[ACCELERATOR R&D](#) | [SCRF](#) | [SRF TECHNOLOGY](#) | [SUPERCONDUCTING CAVITY](#)

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AROUND THE WORLD

## New organisation in Tohoku, the ILC's potential host region

Rika Takahashi | [26 February 2021](#)



Keeping in step with the establishment of the International Development Team (IDT) in August 2020, a new organisation was formed in Tohoku, Japan, where the International Linear Collider is expected to be built.

The organisation, the [Tohoku ILC Project Development Center](#), is made up of 22 organisations, including universities, prefectural governments, cities and towns in the Tohoku area. It will deliberate on how to make the area a more welcoming place for those who will live there as they build the ILC.

"We are hoping to become the main actor to make the local region ready for receiving the ILC," said Atsuto Suzuki, the chair of the new centre, president

of the Iwate Prefectural University and former director general of KEK.

The Tohoku region in the northeast of Japan has been actively working on a variety of activities to invite the ILC to the area for decades. In the 1990s, accelerator physicists in Japan started investigating the stable bedrock in Iwate prefecture as a site to build a linear collider. In 1995, the [3rd Workshop on Physics and Experiments with Linear Colliders \(LCWS95\)](#) was held in Iwate prefecture, which was the first international conference for the linear collider held in the prefecture, and the local government took the opportunity to establish a government office that focused on scientific projects. In the early 2000s, Japanese scientists conducted an assessment that led to the identification of 10 locations in Japan that had geological characteristics suitable for the construction of a linear collider. The Kitakami mountains, the current candidate site for the ILC, was on the list. Since then, Iwate prefecture has been consistent in voicing its interest in serving as the future home of the ILC.

Activities in Iwate expanded beyond the prefecture. In 2009, the Tohoku ILC Promotion Council, a collaborative industry-academic-government body in Tohoku was established. The council worked eagerly. They organised seminars for local industry to study ILC-related technologies and hosted the outreach events to gain public support and understanding. They also wrote reports, gave recommendations and filed petitions to the central government towards the ILC realisation. The Council published the [Tohoku Master Plan](#) in 2018 together with the Tohoku ILC Preparation Office, the subsidiary organization to the council that focused on the preparation to receive the ILC. The master plan summarises what the future Tohoku region will be like with the ILC and each sector's potential responsibility regarding infrastructure development.

"Due to the great changes in the international situation around the ILC, we decided to take the next step to get ready for the ILC," Suzuki said. The new organisation, the Tohoku ILC Project Development Center, is established as the successor organisation to the Tohoku ILC Preparation Office.

The activities include listing aspects of ILC siting where people in Tohoku could take a lead, such as studying issues related to environmental preparation and construction of the facilities, town planning to receive scientists and their families to the region, and promoting an understanding of the ILC to residents. The centre will also conduct studies on how the ILC construction affects the surrounding environment and the expected social and economic impacts. The centre's members see the ILC as an opportunity to use the existing resources in the area and consider how they can make the most use of them.

Some Tohoku organisations have already looked into how they can make the time that foreign researchers and their families spend in the Tohoku area comfortable and safe.

“We are cooperating with those organisations and will conduct a serious investigation to make a realistic and concrete model plan,” Suzuki said.

They are also working towards the goal of having the local industry participate in the ILC construction and operation, which would have a positive impact on the local economy. The centre is planning to hold a series of seminars to introduce the technical and engineering needs for the ILC to Tohoku businesses and discuss how they might enter into the accelerator-related industrial sector.

Now is a difficult time to meet with people to get support for the ILC because of the COVID situation. The total number of people infected with COVID-19 in Japan is about 410,000 (as of February 2021), and those in Tohoku account for 1.8% of them. Even though the number of people infected with COVID-19 in Tohoku is much smaller than those in the metropolitan area, there are considerable restrictions to prevent the virus' spread. Despite these constraints, people in Tohoku continues to work diligently to promote the ILC project. Last summer, Iwate prefecture filed an online petition to the minister. The Hokkaido / Tohoku Region Governor's Association made an appeal to the government in August and October in writing. In September, the Tohoku ILC Promotion Council held an online lecture, and more than 600 people attended.

“We do whatever we can,” Suzuki said. “We actually visited the local governments together with researchers and explained the latest trends of the ILC and the activity status, exercising caution so as not to spread the virus.” The centre is also preparing to approach the Japanese government to secure a place for the ILC on the 2022 budget request.

“As the IDT's activities to realise the ILC Pre-Lab proceeds, we, as a candidate site, are strengthening the cooperative relationship with IDT,” Suzuki said. “This is a very important time for the ILC. We hope to help IDT to complete its mission and successfully establish the ILC Pre-Lab.”

Members of the [Tohoku ILC Project Development Center](#): Tohoku University, Iwate University, Iwate Prefectural University, Miyagi Prefecture, Sendai City, Kesenuma City, Tome City, Kurihara City, Osaki City, Iwate Prefecture, Morioka City, Ofunato City, Hanamaki City, Kitakami City, Tono City, Ichinoseki City, Rikuzentakata City, Oshu City, Kanegasaki Town, Hiraizumi Town, Sumita Town, Iwate International Linear Collider Promotion Council

Read more:

- [KITAKAMI TIMES](#)
- [The ILC guide to Kitakami \(NewsLine, 20 February 2014\)](#)
- [The Big ILC Kitakami Iwate Tohoku Glossary](#)

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