LC NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

AROUND THE WORLD

ILC constructed in Tokyo's Roppongi area

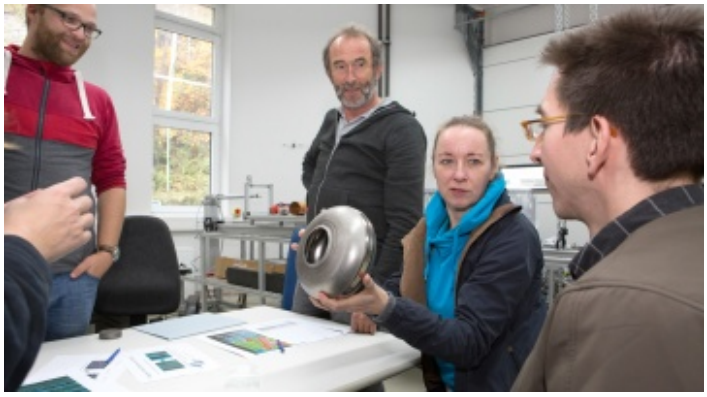
by Rika Takahashi

A not-to-be-missed event in Tokyo this autumn was a 15-metre-long original art work representing the ILC. Designed by famous architect Jo Nagasaka, the exhibition was built with the help of more than 300 students in a traditional Japanese way with rammed earth. In one week, more than 40,000 enthusiastic visitors had the chance discover the ILC project in a unique way.

AROUND THE WORLD

German teachers get a taste of ILC R&D

by Nikolai Promies, DESY



Teachers in the test beam! ILC cavitiy testing and test beam life played a major role at a recent teacher training held at DESY. It was the first time that the German lab invited high school teachers for a week focused on particle physics.

DIRECTOR'S CORNER

CLIC – optimising the initial 380-GeV stage

by Steinar Stapnes

In August this year, the CLIC collaboration published an updated baseline-staging scenario that places emphasis on an optimised first-(and lower-) energy stage that can be extended to higher energies in further stages.

IN THE NEWS

from *Iwate Nichi Nichi*
18 November 2016
ＩＬＣ誘致は最重要課題　奥州商議所新会頭　海鋒守氏に聞く
ＩＬＣ誘致実現は商議所としても最重要課題であり、県レベル、市レベルの講演会などを開催して市民に周知を図ってきた。誘致実現にはこれまで以上に地元の熱意が必要と感じる。熱意が伝わるような運動に取り組まなければいけない。岩手だけでなく東北全体の課題でもあるので関係団体と相談しながら率先して取り組みたい。

from *Iwate Nippo*
15 November 2016
会長に谷村氏再任　県商議所連合会
谷村会長は総会後の取材に対し「第一に東日本大震災津波からの復興を全面的に支援する。国際リニアコライダー（ＩＬＣ）の実現に向け、今まで取り組んできた受け入れ態勢の準備を加速させたい」と２期目の抱負を語った。

from *Iwate Nippo*
7 November 2016
宇宙と世界探るILC特別授業　県内各地で開催
独マインツ大の斎藤武彦教授（原子核ハドロン物理学）の国際リニアコライダー（ＩＬＣ）特別科学授業（県ＩＬＣ推進協議会、ＳＡＶＥ　ＩＷＡＴＥ主催）は６日、盛岡市のもりおか復興支援センターで始まった。１３日まで各地の小中学校などで最先端科学の授業を行う。(Guest talks by Professor Takehiko Saito of JGU in Mainz, Germany (Nuclear Physics) about the International Linear Collider (hosted by Iwate ILC Promotion Council and Save Iwate) started on November 6th, with the first class held in the Morioka Reconstruction Support Center in Morioka City. He will give cutting-edge guest classes for elementary and middle schools in Iwate until the 13th.)

from *My Navi News*
5 November 2016
国際リニアコライダーのスケールを体感できる、15mの巨大ジオラマを展示
六本木・東京ミッドタウンの庭先ともいえるコートヤードに、巨大な土の塊のようなものが。これは、国際リニアコライダー誘致計画(ILC)を表現した作品だ。(In the court yard of Tokyo Midtown, Roppongi, huge chunk of soil emerged. This is a art work to present the ILC)

from *Roppongi Keizai News*
4 November 2016
国際リニアコライダーの巨大ジオラマ模型が六本木に出現　「サローネ・イン・ロッポンギ」
今年は建築家の長坂常氏が、今回のテーマである現在誘致活動中の「国際リニアコライダー」(ILC)をモチーフに難解な物理学の世界をデザインの力で読み解き、より多くの来場者に知ってもらうことに挑戦した。(Architect Jo Nagasaka gave a challenge to gain understadings of particle physics in the theme of the ILC using design approach)

from *Kahoku Shinpo*
4 November 2016
＜ＩＬＣ＞東北誘致へ　キティとコラボ
超大型加速器「国際リニアコライダー（ＩＬＣ）」の東北誘致を広くＰＲしようと、官民でつくる東北ＩＬＣ推進協議会は、仙台市青葉区の仙台国際センターに展示コーナーを設けた。１２月１９日まで。(Tohoku ILC Promotion Council set up a special booth to gain support for ILC realisation at Sendai International Center until 19 December.)

from *Tanko Nichi Nichi*
4 November 2016
ＩＬＣ実現へ日欧連携の必要性強調（IEEE NSS/MICで階議員ら講演）
フランス北東部の都市、ストラスブルグで開催している放射線技術に関する国際会議「２０１６　ＩＥＥＥ　ＮＳＳ・ＭＩＣ」で、国際リニアコライダー（ＩＬＣ）に関する講演が行われ、ＩＬＣ議連の階猛氏（衆院岩手１区）や県立大学の鈴木厚人学長らが登壇。ヨーロッパの科学技術関係者ら対し、ＩＬＣ実現に向けた協力関係の構築を求めた。同会議会場には、東北ＩＬＣ推進協議会（事務局・東北経済連合会＝東経連）によるＰＲコーナーも設置された。(Emphasizing the Importance of Japan-Europe Cooperation for the ILC (Diet Member Shina, others Talk at IEEE NSS/MIC) A lecture was held about the International Linear Collider at IEEE NSS/MIC 2016, an international conference on radiation technology held in Strasbourg, northern France. Speakers included diet Member Takeshi Shina of the ILC diet member federation and Iwate Prefectural University President Atsuto Suzuki. The speakers asked European involved in science and technology to help form a cooperative framework or the ILC. A PR booth for the ILC by Tohoku ILC Promotion Council was also at the conference venue.)

CALENDAR

Upcoming events

International Workshop on Future Linear Colliders (LCWS2016)
Morioka, IWATE (Japan)
05- 09 December 2016

Upcoming schools

Tenth International Accelerator School for Linear Colliders
Susono, Shizuoka, Japan
08- 19 December 2016

View complete calendar

PREPRINTS

ARXIV PREPRINTS

https://arxiv.org/abs/
Electroweak precision constraints at present and future colliders

1611.05228
Development of Radiation Hard Scintillators

1611.05000
The seesaw path to leptonic CP violation

1611.04492
Top physics at CLIC and ILC

1611.04450
SUSY model and dark matter determination in the compressed-spectrum region at the ILC

1611.03492
Self-interacting Dark Matter Without Direct Detection Constraints

1611.03433
Top Signatures From Composite Higgs Theories

1611.03399
Impact of Theory Uncertainties on the Precision of the Top Quark Mass in a Threshold Scan at Future e+e- Colliders

1611.02846
Naturalness and light higgsinos: A powerful reason to build the ILC

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AROUND THE WORLD

ILC constructed in Tokyo's Roppongi area

Rika Takahashi | 23 November 2016

From 26 October to 7 November, *Salone in Roppongi*, the biggest ILC-theme exhibition so far was open to the public in the heart of downtown Tokyo. Its parent exhibition, Tokyo Midtown Design Touch http://www.tokyo-midtown.com/jp/event/designtouch/english/ drew close to 1.5 million visitors during the duration of the event, and Salone in Roppongi was visited by more than 40,000 people.

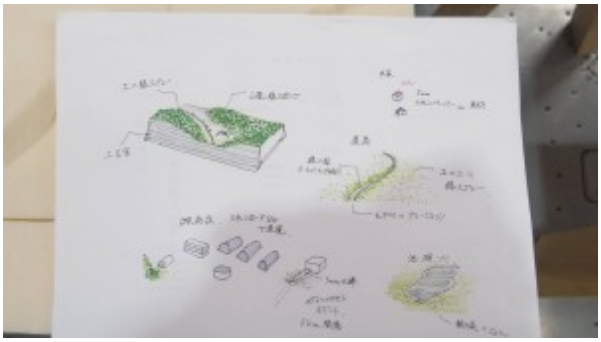
Image: Atsushi Kondo

Salone in Roppongi was started four years ago to showcase works from internationally recognised Japanese designers. This time the theme was to showcase science through design. Architect Jo Nagasaka depicted the complex world of particle physics in a unique and easy-to-understand way.

"It was a big success," said Yahoko Sasao, producer of this event. "This year's exhibition was definitely the most interesting and most exciting one."

This year's exhibition was also exciting because many young students – who might become future ILC facility designers and builders – participated in the project.

The project started in September. The students gathered at Nagasaka's office , Schemata Architects, in Tokyo, and started to build a two-metre-long wooden base for the rammed-earth mock-up. They also prepared a styrofoam topographical model of the Kitakami region to put on top of it. Both activities were supervised by Kohei Hayashi, an architect at Schemata Architects. Four days later, they moved to another architect studio, TANK, to finish up the mock-up by elaborating the geographical model to make up mountainous landscape with cement, and keep ramming and ramming the earth for three hours.



Idea sketch of 2-metre mock up of ILC exhibition. Image: Salone in Roppongi Executive Committee

"Rammed earth requires so much energy. We had a decent number of staff, but it took us three hours straight to finish only the two-metre model. I started to wonder how many hours and staff it would require to achieve the 15-metre exhibition," said Ryuichi Ozeki, first year student at Department of Architecture, Musashino Art University, one of the leaders of the student team.

The team discussed and refined the design and the building method, and started to build real exhibition model in mid-October. They printed out the contour line of certain parts of the Kitakami mountains, and traced it to the form, cutting it to make mountain base, then applied the mixture of cement and soil carefully and delicately by hand.

The team started on-site construction at the courtyard venue in Tokyo Midtown on 27 October. Ramming the earth was really tough work. Many students got blisters or scraped skin on their palms.

What was worse was the weather. For the first two days of the construction, rain was pouring down. If the soil got too wet, it won't harden properly. So the artists covered all the base with plastic except the parts, where they were stomping the soil under the tent. After finishing stomping soil, they moved the tent to the next part. It was an additional huge effort.

After 24 hours of ramming by a total number of 300 people, the model was completed on 29 October, and the exhibition officially started. Again, students played another important role as science interpreter.

Each student received a small crash course about particle physics and accelerators from an ILC scientist, and explained in their words the design and project to visitors. Shiori Watanabe, first year student of Musashino Art University, felt great joy in showing their work to so many people at one of the most fashionable places in Japan.

Students working on the geographical model for the mock up with architect's supervision. Image: Salone in Roppongi Executive Committee

"It was a wonderful experience to get direct responses from visitors. I could feel the process of design attracting people and that they understood our explanations," Watanabe said. Of course, she and most of the other students did not have previous knowledge of particle physics or particle accelerators.

"I learned that you cannot communicate with other people if you don't explain something in your words.," said Momo Ohashi, who studies scenography, display and fashion design. To explain the exhibition, student team needed to learn about theILC and particle physics that were totally new information for most of students. So, they picked up the point which attracted them the most, digest it in their own way, and talked to the visitors with their passion for the art work.

Riku Matsui,another leader of student team, said that the experience at the exhibition awakened his intellectual appetite: "I learned a lot during this exhibition about various fields: architecture, leadership and particle physics. I met many people, especially foreign visitors who have a burning desire to learn, and I now also want to learn more".

With this exhibition, ILC gained many supporters from outside of its usual community by the power of design. In the near future, one of them could be leading the real construction of the ILC.

ILC | OUTREACH | ROPPONGI

NEWSLINE
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AROUND THE WORLD

German teachers get a taste of ILC R&D

Nikolai Promies, DESY | 23 November 2016

High-school teachers in the Hi-Grade lab. Image: DESY

Even if the ILC can't solve the remaining riddles of particle physics yet, its development already does some good. The latest example: two labs at DESY where components for the ILC are developed and tested helped to improve physics classes at German high schools.

Ten German teachers participated in the first teacher training programme about particle physics at DESY in Hamburg. From 25 to 28 October, they got an insight into research at DESY, the everyday lives of researchers as well as current topics in particle physics. In the programme the teachers listened to short lectures by scientists about the basics of particle physics, accelerators and detectors but also had the possibility to conduct experiments on their own at three different DESY labs.

Two of these labs are also used to develop new components for a future linear collider. At DESY II, an electron/positron synchrotron that provides three test beams with 1-6 GeV/c, prototypes for a new hadronic calorimeter were tested with the AIDA/EUDET beam telescope just recently. For the teachers, a much simpler calorimeter had been prepared. They had to calibrate it and could measure the energy of an electron beam.

At the HiGrade-Lab, new accelerating cavities made from pure niobium are examined and measured for a better understanding of how cavities should be manufactured, how they behave and what the best treatment methods are. As part of their practical training the teachers also examine and measure a cavity there.

At the third lab, scientists showed the teachers experiments that they could conduct at school, including a do-it-yourself cloud chamber built of accessible materials.

This was the third time a teacher training took place at DESY in Hamburg and for first time it was focused on particle physics, and so far, the programme is a success story. The scientists who organised the lectures and the experiments seized the opportunity to tell the teachers about their work and to influence the way how physics is taught at school.

The teachers enjoyed the opportunity to be a scientist for three days. "Some of the topics we talked about won't find the way into the classroom because they are too complicated for school. But the experiments were very interesting and we can use them to illustrate contents that are hard to understand," said one of the teachers. So, there is one riddle the ILC already helps to solve: how can teachers make physic classes more interesting?

CALORIMETER | CAVITY R&D | CLOUD CHAMBER | DESY | ILC HIGRADE | OUTREACH | SCHOOL LAB | TEACHERS | TEST BEAM

NEWSLINE
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DIRECTOR'S CORNER

CLIC – optimising the initial 380-GeV stage

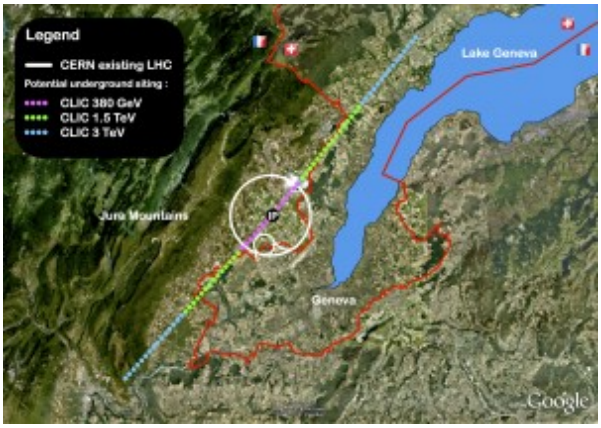
Steinar Stapnes | 23 November 2016

The CTF3 CLIC Test Facility. Image: CERN

In August this year the CLIC collaboration published an updated baseline staging scenario with emphasis on an optimised first-energy stage at 380 GeV for the accelerator. CLIC can then be extended to higher energies in further stages. The studies represent an update the staging scenario described in the 2012 *Conceptual Design Report* (CDR) for CLIC, prepared before the Higgs discovery unfolded. The CDR has a strong focus on operating the linear collider at 3 TeV, and much less information about the initial stages.

With the discovery of the Higgs boson in 2012 a clearer motivation and energy scale for the initial stage of CLIC could be defined. CLIC will provide detailed measurements of the Higgs boson and the top quark running at 380 GeV as the first step of its physics programme, and full simulations of realistic CLIC detector concepts have been used to evaluate the expected precision and to guide the choice of collision energy.

The resulting first-energy stage is based on already demonstrated performances of CLIC's novel acceleration technology and will be significantly cheaper than the initial CDR design. The recent studies have also provided an opportunity to consider in more detail performance, cost and power consumption of the CLIC accelerator as a function of the centre-of-mass energy, building on experience from technology R&D and system tests.



After the initial phase of CLIC operation at 380 GeV, the aim is to operate CLIC above 1 TeV at the earliest possible time. In the current baseline, two stages at 1.5 TeV and 3 TeV are planned, although the exact energies of these stages can be revised as new input from the LHC and HL-LHC becomes available.

To optimise the CLIC accelerator at 380 GeV, a systematic design approach has been developed and used to explore a large range of configurations for the RF structures of the main linac. For each structure design, the luminosity performance, power consumption and total cost of the CLIC complex are calculated. For the first stage, different accelerating structures operated at a somewhat lower accelerating gradient of 72 MV/m will be used to reach the luminosity goal at a cost and power consumption similar to earlier projects at CERN – while also not inflating the cost of the higher-energy stages. The design should also be flexible enough to take advantage of projected improvements in RF technology during the construction and operation of the first stage.

When upgrading to higher energies, the structures optimised for 380 GeV will be moved to the beginning of the new linear accelerator and the new structures optimised for 3 TeV will take their place. The RF pulse length of 244 nanoseconds is kept the same at all stages to avoid major modifications to the drive-beam generation scheme. Data taking at the three energy stages is expected to last for a period of

seven, five and six years, respectively. The stages are interrupted by two upgrade periods each lasting two years, which means that the overall three-stage CLIC programme will last for 22 years from the start of operation. The duration of each stage is derived from integrated luminosity targets 500 fb^{-1} at 380 GeV, 1.5 ab^{-1} at 1.5 TeV and 3 ab^{-1} at 3 TeV.

An intense R&D programme is on-going pursuing further important improvements. For instance, the CLIC study recently proposed a novel design for klystrons that can increase the efficiency significantly. To reduce the power consumption further, permanent magnets are also being developed that are tunable enough to be able to replace the normal conducting magnets. The goal is to develop a detailed design of both the accelerator and detector in time for the update of the European Strategy for Particle Physics towards the end of the decade, where these technical studies can be fully integrated providing further improvements.

This corner is adapted from an article first published in the Cern Courier on 14 October 2016.

CDR | CLIC