

NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

FEATURE



Tokyo Event sneak peek

by Rika Takahashi

On 22 April, participants to the Asian Linear Collider Workshop 2015 and special guests will be invited to a special Food Festa: "Taste of Discovery". Here is a sneak peek on this unique event that will make tangible and savoury the international nature of the ILC project.

AROUND THE WORLD

From Fermilab Today: Superconducting test accelerator achieves first electron beam



Fermilab's advanced superconducting test accelerator was built to take advantage of SRF technology accelerator research and development. Last week, after more than seven years of planning and building by scientists and engineers, the accelerator has delivered its first beam.

DIRECTOR'S CORNER

The CLIC workshop: a summary of results

by Steinar Stapnes



The annual CLIC workshop took place at CERN in January. The well attended meeting covered accelerator, detector and physics studies and highlighted a year of interesting results for CLIC. Steinar Stapnes, Associate Director for the Compact Linear Collider Study in the Linear Collider Collaboration, explains.

VIDEO OF THE WEEK



Einstein's $E=mc^2$ explained in 2 minutes

by Perrine Royole-Degieux

110 years ago, Albert Einstein published four historical papers... and a very famous equation. For this special birthday, *Symmetry Magazine* succeeded to explain, in a very simple way, how $E=mc^2$, an equation "used" everyday in particle accelerators, has radically changed our way of doing physics. [Watch the animation](#) and read also *Symmetry Magazine's* [related article](#).

IN THE NEWS

from *CERN*

2 April 2015

[LHC restart update](#)

The teams are completing the final tests after having solved on 31 March the problem that had been delaying the restart of the accelerator. The first beams could be circulating in the machine sometime between Saturday and Monday.

from *Reuters*

31 March 2015

[Electrical fault corrected, 'Big Bang' collider to restart soon](#)

CERN engineers said on Tuesday they have resolved a problem that had delayed the relaunch after a two-year refit of the Large Hadron Collider particle smasher, which is probing the mysteries of the universe.

from *nature*

25 March 2015

[CERN battles short circuit behind LHC delay](#)

Evans is now director of the Linear Collider Collaboration, which is planning a next-generation collider, but he says that he is still on hand to provide advice about the LHC.

from *msn*

24 March 2015

[The Large Hadron Collider is starting back up. Here's what scientists hope to find.](#)

The proposed International Linear Collider, for instance, would be more than 20 miles...

from *SLAC today*

24 March 2015

[Event Honors SLAC Employees for Decades of Service](#)

His first job at SLAC was working on specialized electronics to trigger photographs of particle pathways in a detector called the SLAC Rapid Cycling Bubble Chamber. Freytag is now working on prototype electronics for a particle-measuring device that would be part of a proposed International Linear Collider.

ANNOUNCEMENTS

European School of High-Energy Physics

The [2015 European School of High-Energy Physics](#) will be held in Bulgaria from 2 to 15 September 2015. The deadline for applications is 8 May. The lectures will cover a broad

PREPRINTS

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[1503.09050](#)

Characteristic study of silicon sensor for ILD ECAL

range of HEP topics at a level suitable for students working for a PhD in experimental particle physics. One or two students from developing countries could be considered for financial support.

CALENDAR

Upcoming events

ALCW2015

KEK and University of Tokyo, Japan
20- 24 April 2015

6th International Particle Accelerator Conference (IPAC'15)

Jefferson Lab, Richmond, Virginia, USA
03- 08 May 2015

[View complete calendar](#)

1503.08624

Search for New Physics in SHiP and at future colliders

1503.08541

Hybrid ECAL: Optimization and Related Developments

1503.08537

Enhancing $t\bar{t}$ hh production through CP-violating top-Higgs interaction at the LHC, ILC and a 100 TeV collider

1503.08055

Measuring $BR(h \rightarrow \tau^+\tau^-)$ at the ILC: a full simulation study

1503.07830

Off-shell effects in Higgs decays to heavy gauge bosons and signal-background interference in Higgs decays to photons at a linear collider

1503.07451

The Conversion of CESR to Operate as the Test Accelerator, CesrTA, Part 1: Overview

1503.07373

The study of the photon structure function at the ILC energy range

1503.07322

Updated Results of a Solid-State Sensor Irradiation Study for ILC Extreme Forward Calorimetry

1503.06940

Optical fibre calibration system and adaptive power supply

1503.06850

The Neutron Electric Dipole Moment and Probe of PeV Scale Physics

1503.06475

Scalar Dark Matter in the light of LEP and ILC Experiments

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Tokyo Event sneak peek

Rika Takahashi | [2 April 2015](#)

On 22 April, the middle day of the [Asian Linear Collider Workshop 2015](#) to be held at KEK, Tsukuba, Japan, special events toward the realisation of the ILC, “ILC Tokyo Event” will be held. Many attendees have already signed-ups, and the organisers expect to have the honour of welcoming guests from embassies, government and bureaucracy.

This event consists of two different parts: the so-called Tokyo Symposium and a Special Food Festa: “Taste of Discovery”. Detail of those events are being fixed, and here is a sneak peek on the ILC Food Festa. This festival also serves as a banquet for ALCW2015. If you have not registered yet to the workshop, please do!

Menu

Over 2400 scientists from 48 countries participated in the *Technical Design Report* for the ILC published in 2013. For this special Food Festa, the Chef of the Hotel New Otani, the venue for this event, has come up with a very special menu, offering specialities from 48 countries. By offering a wide range of national dishes to our worldwide guests, the organisers hope to make tangible the international nature of the ILC project.

Here are some examples:



Argentina Empanadas. Image: Carlosdisogra

Argentina: Empanada

Empanadas (literally meaning wrapped in bread) are savoury pastry pockets, filled with a variety of delicious stuffings. Argentine’s empanadas are often served during parties and festivals as a starter or main course.



Canadian favorite, Poutine: Image: Yuri Long

Canada: Poutine

Poutine, Québécois slang for “mess,” consists of French fries, beef or chicken stock-based gravy and white cheddar cheese curds that have a distinct squeak to them. Image credit: Yuri Long



Serbian Burek Image: Nikola Škorić

Serbia: Burek

In Serbia, Burek is made from layers of dough, alternating with layers of other fillings in a circular baking pan and then topped with a last layer of dough. Burek is regularly available at most bakeries, and usually eaten as “fast food.”

Image credit: Nikola Škorić



Schwarzwälder Kirschtorte Image:
Mikelo

Germany: Schwarzwälder Kirschtorte

Schwarzwälder Kirschtorte means “Black Forest cherry cake” in German, typically consists of several layers of chocolate cake with whipped cream and cherries between each layer.

Image credit: Mikelo



Opening Act:

The guest of food festa will be welcomed by the sound of drumming. The event will start with dazzling performance featuring a Japanese drummer unit “[indra](#),” which combines Japanese and Western styles of drumming to make innovative sounds.



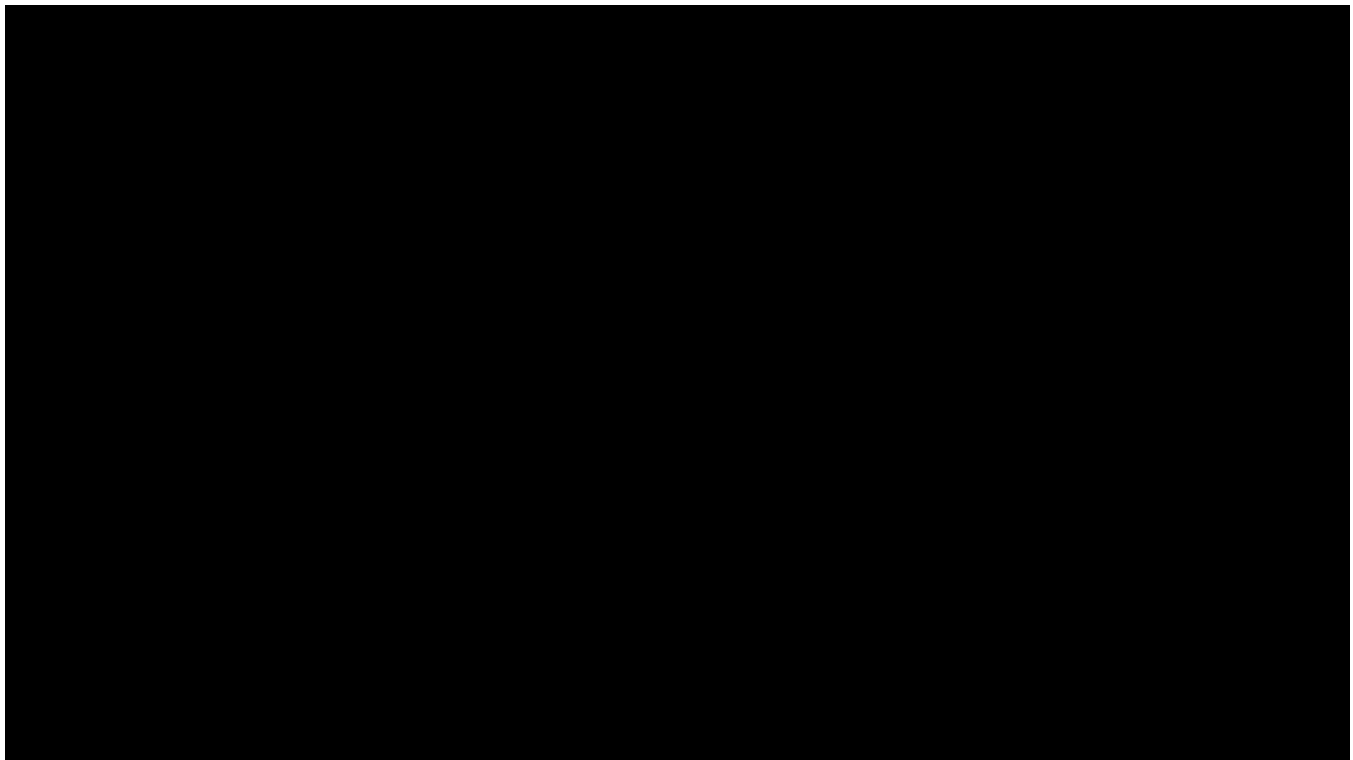
Tea Ceremony Booth

The word “tea ceremony” may remind you of turning the tea bowl and drinking powdered green tea, “matcha.” But there is also a ceremony version to enjoy a delicious cup of tea called Sencha. The Sencha ceremony booth will be set up at the Food Festa venue. Enjoy a special cup of tea served by tea master Bifu Nakatani!

Special performance

Early Japanese calligraphy originated from Chinese calligraphy and many of its principles and techniques are based on the basic writing styles. Now, calligraphy has been developed into a unique style of art. At the food festa, Tomoko Kawao will give an impressive performance you might never forget.

Watch her performance during TEDxKyoto in 2013:

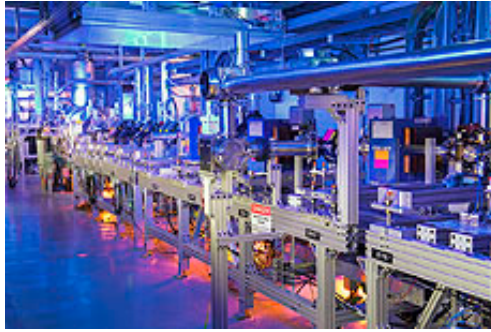


[ALCW2015](#) | [FOOD FESTIVAL](#) | [TOKYO EVENT](#)

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Superconducting test accelerator achieves first electron beam



Last week the first SRF cavities of Fermilab's superconducting test accelerator propelled their first electrons. *Photo: Reidar Hahn*

The newest particle accelerators and those of the future will be built with superconducting radio-frequency (SRF) cavities, and institutions around the world are working hard to develop this technology. Fermilab's advanced superconducting test accelerator was built to take advantage of SRF technology accelerator research and development.

On Friday, after more than seven years of planning and building by scientists and engineers, the accelerator has delivered its first beam.

The Fermilab superconducting test accelerator is a linear accelerator (linac) with three main components: a photoinjector that includes an RF gun coupled to an ultraviolet-laser system, several cryomodules and a beamline. Electron bunches are produced when an ultraviolet pulse generated by the laser hits a cathode located on the back plate of the gun. Acceleration continues through two SRF cavities inside the cryomodules. After exiting the cryomodules, the bunches travel down a beamline, where researchers can assess them.

Each meter-long cavity consists of nine cells made from high-purity niobium. In order to become superconductive, the cavities sit in a vessel filled with superfluid liquid helium at temperatures close to absolute zero.

As RF power pulses through these cavities, it creates an oscillating electric field that runs through the cells. If the charged particles meet the oscillating waves at the right phase, they are pushed forward and propelled down the accelerator.

The major advantage of using superconductors is that the lack of electrical resistance allows virtually all the energy passing through to be used for accelerating particle beams, ultimately creating more efficient accelerators.

"It's more bang for the buck," said Elvin Harms, one of the leaders of the commissioning effort.

The superconducting test accelerator's photoinjector gun first produced electrons in June 2013. In the current run, electrons are being shot through one single-cavity cryomodule, with a second, upgraded model to be installed in the next few months. Future plans call for accelerating the electron beam through an eight-cavity cryomodule, CM2, which was the first to reach the specifications of the proposed International Linear Collider (ILC).

Fermilab is one of the few facilities that provides space for advanced accelerator research and development. These experiments will help set the stage for future superconducting accelerators such as SLAC's Linac Coherent Light Source II, of which Fermilab is one of several partner laboratories.

"The linac is similar to other accelerators that exist, but the ability to use this type of setup to carry out accelerator science experiments and train students is unique," said Philippe Piot, a physicist at Fermilab and professor at Northern Illinois University leading one of the first experiments at the test accelerator. A Fermilab team has designed and is beginning to construct the Integrable Optics Test Accelerator ring, a storage ring that will be attached to the superconducting test accelerator in the years to come.

"This cements the fact that Fermilab has been building up the infrastructure for mastering SRF technology," Harms said. "This is the crown jewel of that: saying that we can build the components, put them together, and now we can accelerate a beam."

—Diana Kwon



The superconducting test accelerator team celebrates first beam in the operations center at NML. Vladimir Shiltsev, left, is pointing to an image of the beam. *Photo: Pavel Juarez, AD*

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The CLIC workshop: a summary of results

Steinar Stapnes | [2 April 2015](#)



The CLIC workshop most frost-resistant participants enduring a very cold outdoor photo-session. Image: ©2015 CERN

The [2015 CLIC workshop](#) took place at CERN from 27 to 30 January 2015, covering accelerator as well as detector and physics studies. With more than 260 participants and more than 200 talks the meeting was both well attended and full of interesting new results.

The week was built around an open high-energy frontier session filling up CERN's main auditorium. Furthermore there were accelerator sessions focusing on collaboration efforts and plans for 2015-2019, a special session for high-gradient applications for free electron lasers (FELs), for industry and for medical applications, physics and detector sessions on current and future activities and finally the Collaboration and Institute Board meetings.

As usual the meeting also provided an opportunity to make up status for 2014 and compare the goals at the beginning of the year. Some of the main points are summarised in the following paragraphs.

The 'rebaselining' of the CLIC machine parameters for cost and power performance gains, also targeting stages as needed for initial Higgs and top measurements, was pursued throughout 2014 and is now being completed. The tools used to optimise the parameters of the machine in terms of cost and power remain available if further changes and optimisation will be needed once LHC results at 13-14 TeV are available. Power-reduction studies beyond the ongoing parameter optimisation efforts are focusing on key components where changes might have a large impact, for example the drive and main beam magnets and radiofrequency (RF) power systems.

By the end of 2014, three klystron-based X-band test facilities at CERN have become operational and have successfully been used for accelerating structure conditioning and operation. One more facility is being prepared for operation in 2015. This represents an increase in capacity by a factor of three for structure evaluation. The interest in the use of the CLIC technology is rapidly increasing, for example for use in FEL linacs. Several collaboration partners are considering extension of existing linacs or new compact FEL linacs making use of the high gradients achievable with X-band technology. For CLIC, this could substantially increase the overall industrial basis for X-band and high-gradient technology.

The CLIC Test Facility (CTF3) measurements have established the two-beam acceleration principle as well as the most central drive-beam performance and deceleration parameters. During 2013, a first complete mechanical main linac module was constructed and measured in the laboratory and in 2014 a [complete two-metre CLIC module](#), currently 50% equipped, has been installed in CTF3 and performance tests are now starting. The demonstrations of beam-based alignment and emittance preserving methods have been further developed in the FACET facility at SLAC including important verifications of the CLIC wakefield models. The collaborative effort with light source laboratories related to low-emittance rings have developed further in 2014, involving ALBA, ANKA, CEsrTA and ALS to mention some.

The development programme for high-efficiency RF sources, modulators and klystrons, including studies and specification towards procurement of prototypes has been fully defined in 2014. Many collaborating institutes are now involved and industrial studies are well

underway. Other technical developments related to beam instrumentation, magnet prototypes, vacuum studies, control systems, alignment and stability are progressing well with contributions from many institutes. These technical developments address key technical performance challenges, are needed for system-test measurements, or are linked to power/cost reduction studies.

The common work with ILC has continued in areas such as civil engineering studies, RF power input couplers and cavity tuners, beam delivery systems/ATF studies at KEK, sources and damping rings. Two new collaboration partners, SINAP Shanghai and IPM Tehran, have joined in 2014 bringing the total number of collaborating institutes in the CLIC accelerator studies to 50 in 25 countries.

The CLIC detector and physics (CLICdp) studies are carried out by the twenty-five CLICdp institutes in close co-operation with the CALICE and FCAL collaborations, and with ILC studies. A comprehensive set of Higgs benchmark studies was completed in 2014, providing estimates of accuracies on Higgs couplings at different CLIC energy stages. Beam tests were carried out with various CLIC pixel detector assemblies and with a multi-layer CALICE and FCAL calorimeter prototypes. The pixel tests assessed the performance of thin sensors with new Timepix3 readout and AC-coupled assemblies of HV-CMOS active sensors and CLICpix readout. Engineering studies were performed on vertex detector supporting structures and air cooling. The data analysis of the scintillator hadron calorimeter with tungsten absorber plates was completed, providing detailed information on hadronic shower profiles. Good progress was made with a new optimised CLIC-specific detector design. At the same time, the simulations and reconstruction software is streamlined with a new geometry description package and a new all-silicon track reconstruction. Together with the new detector design it will form the basis for CLIC physics benchmark studies in the coming years.

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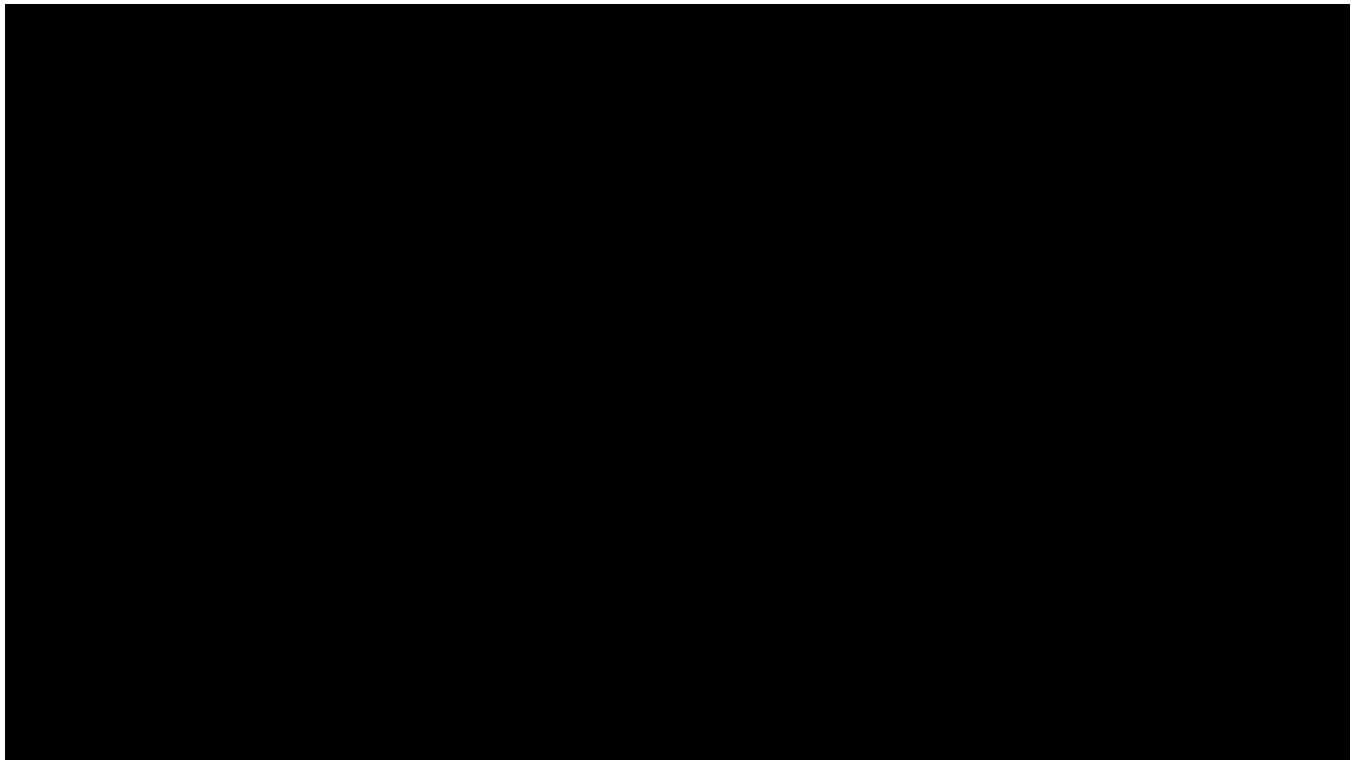
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Read also [Symmetry Magazine's related article](#)

OUTREACH

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