LC NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

FEATURE

LHC's two-year shutdown drawing to a close

Two years after the team in the CERN Control Centre switched off the beams in the Large Hadron Collider (LHC) on 14 February 2013 the LHC is set to start up again at the end of March. Hundreds of engineers and technicians have been repairing and strengthening the laboratory's accelerators and experiments in preparation for running the LHC at the higher energy. So what has the work achieved?

LIVE FROM JAPAN

Pounding in the New Year

by Bill Lewis

Two members of the ILC Support Committee took part in a traditional rice ball making and eating contest in the potential future home of the ILC. Here is their report.

DIRECTOR'S CORNER

Evaluating technology spinoffs from ILC in Japan, and visits to Americas

by Harry Weerts

A group of Japanese researchers is on a world tour of research institutes. They are working on a study of the technological and economic spin-offs of the ILC project and trends in research around the world in the fields of particle and nuclear fields, commissioned by Japanese funding agency MEXT. Harry Weerts, LCC Director for the Americas, reports from their visit to the US.

IMAGE OF THE WEEK

Tech transfer from linear collider to LHC detector

by Barbara Warmbein

The CMS detector at CERN's Large Hadron Collider is very much a detector at work. It co-found the Higgs particle in 2012 and, although still in Lang-Shutdown-1 mode, it's ready for the second LHC run. In it: a piece of linear collider technology. Stay tuned for the whole story in a future issue of LC NewsLine.

IN THE NEWS

from *helmholtz.de*
12 February 2015
Serie Wissenschaft und Gesellschaft: „Deutschland hat sich gewandelt“
Der Brite Brian Foster ist ein Weltreisender in Sachen Teilchenphysik. Als er vor 30 Jahren erstmals nach Hamburg kam, wunderte er sich über geschlossene Geschäfte und endlos lange Antragsformulare. Jetzt lebt er wieder in Deutschland, und die Leute kommen ihm entspannter vor.

from *Fermilab Today*
11 February 2015
Fermilab contributes to SLAC LCLS-II with cutting-edge technology and expertise
In 2015, Fermilab will intensify its LCLS-II contribution in the overlapping areas of superconducting radio-frequency (SRF) accelerator technology and cryogenics, critical components that distinguish LCLS-II from SLAC’s current LCLS facility, whose laser production has enabled noted scientific investigations in cancer treatment and other important areas.

from *Fermilab Today*
11 February 2015
Two new test stands for the Fermilab SRF program
The project scope included two large cryostats, four complicated top-plate assemblies, a new preparation area to install and instrument accelerating cavities for tests, expansion of the radio-frequency power and instrumentation systems, and extension of radiation shielding and safety interlocks.

from *Scientific American*
7 February 2015
Cocktai Party Physics: Physics Week in Review: February 7, 2015
Scientists take to YouTube for a video campaign shows international support for construction of the International Linear Collider.

from *symmetry magazine*
5 February 2015
Scientists take to YouTube for #mylinearcollider
A video campaign shows international support for construction of the International Linear Collider.

CALENDAR

Upcoming schools

Joint Universities Accelerator School (JUAS)
Archamps, Haute Savoie, France
12- 20 March 2015

View complete calendar

PREPRINTS

ARXIV PREPRINTS

1502.04564
Furry picture transition rates in the intense fields at a lepton collider interaction point

1502.04127
Supergravity gauge theories strike back: There is no crisis for

SUSY but a new collider may be required for discovery

1502.04115
Majorana Neutrino and WR at TeV scale ep Colliders

1502.03959
Footprints of Supersymmetry on Higgs Decay

1502.02581
Off-shell Higgs signal and total width determination at the LHC

1502.02060
Studies of the superconducting traveling wave cavity for high gradient LINAC

1502.01701
Future tests of Higgs compositeness: direct vs indirect

CERN's two-year shutdown drawing to a close

Cian O'Luanaigh

Posted by Cian O'Luanaigh on 13 Feb 2015. Last updated 17 Feb 2015, 12.01.

Voir en français

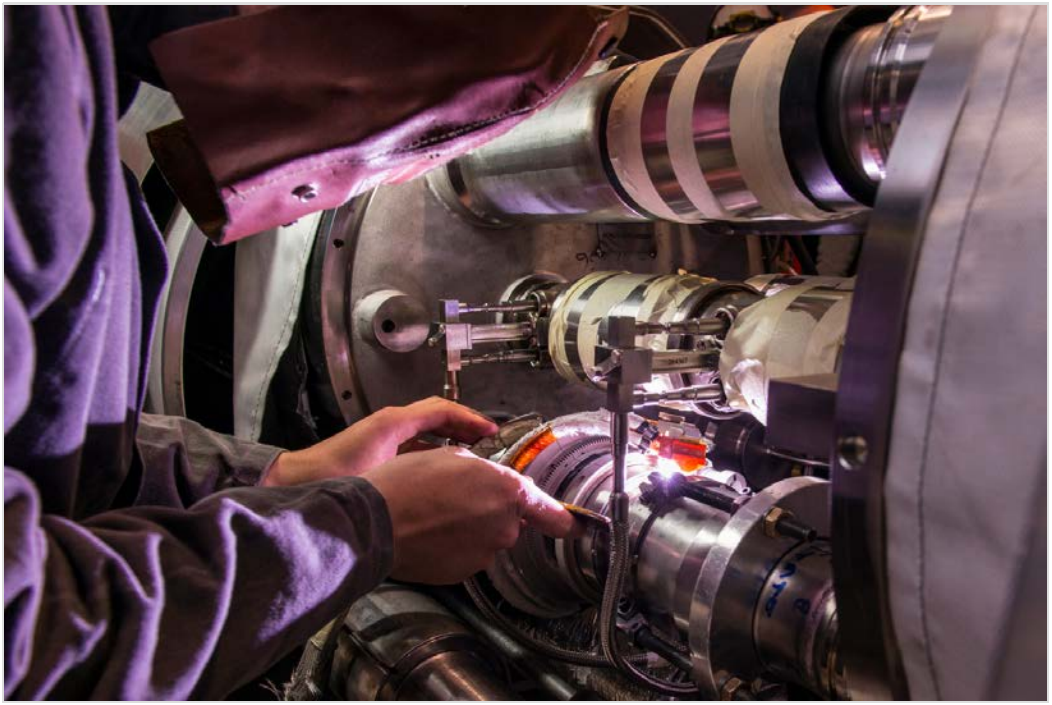
A welder at work consolidating interconnections between dipole magnets on the Large Hadron Collider (Image: CERN)

It's almost two years to the day since the team in the CERN Control Centre switched off the beams in the Large Hadron Collider (LHC) at 7.24am on 14 February 2013, marking the end of the accelerator's first three-year run. Hundreds of engineers and technicians have been repairing and strengthening the laboratory's accelerators andexperiments in preparation for running the LHC at the higher energy. So what has the work achieved?

When the LHC restarts this year, the energy of particle collisions will be 13 TeV (or 6.5 TeV per beam) compared to 8 TeV (4 TeV per beam) in 2012. This higher energy will allow physicists to extend

their searches for new particles and to check previously untestable theories.

To prepare the machine for this new energy frontier, 18 of the LHC's 1232 superconducting dipole magnets, which steer particle beams around the accelerator, were replaced due to wear and tear. More than 10,000 electrical interconnections between dipole magnets were fitted with shunts – pieces of metal that act as an alternative path for the 11,000 amp current, saving the interconnection if there is a fault. The machine will operate at a higher voltage to run the higher energy beams, and has been fitted with new sets of radiation-resistant electronics. The vacuum system that keeps the beam pipe clear of stray molecules has been upgraded, and the cryogenics system for the LHC's superconducting dipole magnets has been refurbished.



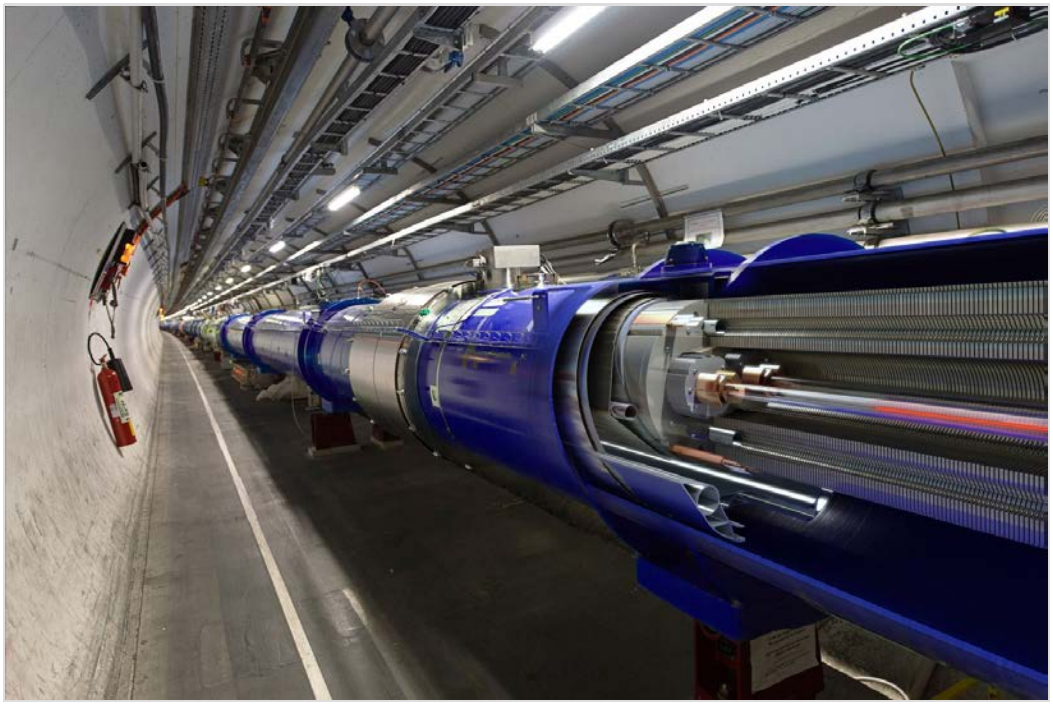
A welder uses a custom-made orbital welding tool to seal an interconnection between dipole magnets on the LHC (Image: Maximilien Brice/CERN)

Bunches of protons in the accelerator will be separated in time by 25 nanoseconds compared to 50 nanoseconds. The LHC will thus deliver more particles per unit time, as well as more collisions, to the experiments. To prepare for the challenges of more collisions, the LHC experiments, including ALICE, ATLAS, CMS and LHCb,

underwent full consolidation and maintenance programmes, including upgrades to their subdetectors and data-acquisition systems.

The CERN IT department purchased and installed almost 60,000 new cores and over 100 petabytes of additional disk storage to cope with the increased amount of data that is expected from the experiments during run 2. Significant upgrades have also been made to the networking infrastructure, including the installation of new uninterruptible power supplies.

When the LHC starts up again this spring, CERN's accelerators and experiments will be ready.



A 3D artist has dissected the LHC in this composite image, showing a cut-out section of a superconducting dipole magnet. The beam pipes are represented as clear tubes, with counter-rotating proton beams shown in red and blue (Image: Daniel Dominguez/CERN)

For more about the LHC and its restart at higher energy, check out these infographics:

- "LHC Season 2: A stronger machine"
- "LHC Season 2: New frontiers in physics"

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LIVE FROM JAPAN

Pounding in the New Year

Bill Lewis | 19 February 2015

Makin' mochi: local experts and LCC directors pound the rice. Image: Rika Takahashi

Every season in Japan has its special treats that people look forward to, and the New Year is no exception. Mochi is not only a treat, but can be a fun activity as well. Though it can be found all year round, it is a traditional New Year's food.

Basically, mochi is made from sticky rice. After the rice is cooked, it is pounded into a sticky paste, divided into individual serving sizes and shaped. Various toppings are available, and some people like it best in soup.

Of course, you can buy mochi already set for consumption, but one great activity is a "mochi-tsuki taikai" in which you make your own mochi along with family and friends. The Oshu International Relations Association (OIRA) held a "mochi-tsuki taikai" on 13 January for foreign residents with the help of Japanese supporters. Mochi master Kidao Tokui and his wife Misako brought their usu (traditional mortar) and kine (wooden mallet) to ASUPIA, a regional community center which is a home of OIRA. They started us out by pounding the rice. While Tokui pounded to a certain rhythm, his wife kept wetting the water and turning the rice. When you take a turn, be careful not to hit your partner's hand!

People from various countries, Canada, China, Indonesia, Korea, Russia, Thailand, the U.K. and the U.S. took turns pounding the rice into Mochi. Those around cheerfully called out "Yoisho!", a kind of rallying cry, each time the mallet came down. Children got their turns as well. When it was all over, there was a nice round ball of Mochi. Time to eat our efforts.

On the menu that day were two toppings and a soup. Anko is a sweet red-bean paste. It is traditionally used in Japanese confectionaries, made by boiling and mashing the azuki beans, seasoned with sugar. When I first tried Anko, I hated it, even spit it out of my mouth, so perhaps it is a bit of an acquired taste, but once you like, you love it. The other toppings were Kinako, which literally means "yellow powder" and is roasted soybean flour, and the third option available that night was a soup. The Mochi is balled and added to a zoni, a soup made with various vegetables. Zoni is traditionally eaten in New Year's day as an auspicious food, and each region in Japan has its special recipe. Iwate's zoni is usually made with julienne daikon radish and carrots, diced chicken and Japanese parsley. Everyone had a great time eating their work.

Once you get a taste for mochi, you can head on down to Ichinoseki in southern Iwate. Ichinoseki is known for its mochi culture, and one of the things they do to promote mochi is hold a "wanko mochi taikai," a mochi eating contest. The term wanko (Iwate's dialect meaning a bowl) comes from wanko soba, another delicacy of Iwate, best known for people trying to eat as many bowls of soba (buckwheat noodles) as one can in one sitting. Contests are held to see who can eat the most in a certain amount of time. Using that same type of competition, Ichinoseki held their Eighth Annual Wanko Mochi Taikai on 1 February. Participants are given a five-minute time limit to see how much mochi they can eat. Two members of the ILC Support Committee (ISC) participated this year for the first time. We were given a platter of nine bowls with mochi in them, with three different toppings. One was the above-mentioned anko. Shoyu, or soy sauce, was also on hand. Finally, there was zunda, or mashed boiled edamame soybeans. Past records for number of

bowls eater were 122 for a team, and 74 for an individual. The daring duo from ISC fought hard to swallow down as many chewy morsels as they could to beat those records, but in the end we could only get 21 down all together, far short of record making.

It's the taking part that counts, say ISC members Bill Lewis and Nathan Hill

Before I came to Japan I was one of the pickiest eaters around. I actually even had a hard time with anko. But thanks to the good food in Iwate, I have grown to love all kinds of food, especially that from here. When you come to help build or do research with the ILC, be sure to be open to new experiences. You are going to love it!

ISC | JAPANESE CULTURE | KITAKAMI SITE

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Harry Weerts | 19 February 2015

The Nomura delegation also visited Fermilab. From left to right: Dmitri Denisov, Fermilab, Robert Kephart, Fermilab, Masashi Sato, Nomura Research Institute, Mike Harrison, BNL and LCC, Mark Palmer, Fermilab, Nigel Lockyer, Fermilab Director, Sergei Nagaitsev, Fermilab, Yoshitaka Kuno, Osaka Univ., Swapan Chattopadhyay, Northern Illinois Univ., Susumu Kamada, KEK (emeritus) Hasan Padamsee, Fermilab, Peter Garbincius, Fermilab. Image: Peter Garbincius, Fermilab

A group of Japanese researchers is on a world tour of research institutes. They are working on a study of the technological and economic spin-offs of the ILC project and trends in research around the world in the fields of particle and nuclear fields, commissioned by Japanese funding agency MEXT. Harry Weerts, LCC Director for the Americas, reports from their visit to the US.

The Ministry of Education, Culture, Sports, Science & Technology (for short MEXT) of Japan is responsible for making the case to the Japanese government for realising the ILC in Japan. MEXT is approaching this complex undertaking in a very deliberate way. They have sought initial input on the the ILC from the Science Council of Japan, which was positive, but also recommended that additional questions should be addressed: a) about the scientific case and 2) how to realise such a large international project in Japan, with contributions from many countries. MEXT has also received input on the site selection from a committee of scientists, which evaluated the sites, based on technical considerations. Currently MEXT has formed a committee with two subcommittees , one to study in more details the ILC physics case and an ILC TDR verification committee, to translate the TDR estimates for cost and manpower into Japanese-based estimates that can be used by the Japanese government.

In addition MEXT has initiated a study of the technological and economic spin-offs of the ILC project and trends in research around the world in the fields of particle and nuclear fields. MEXT commissioned the Nomura Research Institute (NRI) to undertake this study. The study consists of two main elements:

(1) A survey and analysis of how the technologies used to produce the accelerator for the ILC project may be used by society in the future and their expected effects

(2) A survey of research plans and programs in particle and nuclear physics in leading countries in North America, Europe, and Asia, and investigation and analysis of the positions that they and their anticipated outcomes occupy in these countries' science and technology policies.

Several of us were contacted about this survey at the last ICFA seminar in Beijing in the fall of 2014. NRI contacted laboratories and funding agencies in several countries at that meeting. NRI put together a small visiting committee consisting of Yoshitaka Kuno, Professor at Osaka University, Susumu Kamada, professor emeritus at KEK and Masashi Sato, manager at NRI.

In the first two weeks of February this committee visited the following laboratories: Argonne, Fermilab, SLAC and TRIUMF in the Americas and also met with funding agencies in Canada and the US. Another Nomura delegation visited European labs and agencies in January.

The committee spent about half a day at each laboratory and had sent beforehand a list of questions/topics that they wished to address. The list is too long to reproduce here. However after the visits it was clear that they were mainly interested in learning about how large laboratories function, what role they play in a country, about the use of superconducting RF technology now and in the future, and last but not least gauge the interest in the ILC. The visits were all perceived as very useful, with good information exchange. We received a note expressing appreciation for productive interviews with the committee. It also stated that the will continue their interviews in other parts of the world during March and then wrap up. It is expected that NRI will produce a report for MEXT, which will be another step in the process of understanding what it will mean for Japan to host an international project of the scale of the ILC. We are all looking forward to the report.

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IMAGE OF THE WEEK

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Barbara Warmbein | 19 February 2015

Image: CERN

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CMS | DETECTOR R&D | LHC | LS1