

NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

DIRECTOR'S CORNER

Driving cooperation projects forward

The 38th US-Japan HEP meeting

by Harry Weerts



The US and Japan work together on a long list of projects in high-energy physics, from current experiments to future plans. At an annual meeting of the “Joint Committee” in Japan, four new projects were added to the list of joint activities, and Harry Weerts, regional director for the Americas, reports that he sees progress on ILC work in Japan, but that US authorities are waiting for a sign from their Japanese counterparts before the project can go ahead.

AROUND THE WORLD

From metal sheet to particle accelerator (Part 1 of 3)

Passing the halfway point: 50 XFEL accelerator modules have been tested at DESY

by Ricarda Laasch



If you're an electron, a ride in a cavity is pretty much the coolest thing that can happen to you. If you're an accelerator and you need huge numbers of cavities you better make sure they're all of outstanding quality – which is what the X-ray free-electron laser European XFEL under construction in Hamburg has just finished. In a series first published in DESY inForm, we look at how a niobium sheet turns into a curvy beauty.

AROUND THE WORLD

French linear collider days review Linear Collider status

by Roman Pöschl (CNRS/LAL)



For their 4th edition, the **French Linear Collider Days** brought participants to Paris to review recent national development on accelerator, physics and detectors as well as to hear about the global progress of the project at the international level. Local organiser Roman Pöschl summarises.



Advertising past and future sights

Iwate Prefecture in Japan is advertising the attractions of its region in four Tokyo subway lines. It proudly presents the world heritage site of Hiraizumi – as well as its possible future attraction, the ILC! Some things are more likely to happen in Japan than in any other country...

IN THE NEWS

from *Kahoku Shinpo*

31 March 2016

< I L C > 東北誘致の早期決定を文科相に要望

「東北 I L C 推進協議会」代表の里見進東北大総長と高橋宏明東北経済連合会会長は 31 日、文部科学省を訪れ、馳浩文科相に国内誘致の早期決定などを求める要望書を手渡した。(Susumu Satomi, President of Tohoku University and Hiroaki Takahashi, Chair of Tohoku Economic federation visited Minister of MEXT, Horofumi Hase on 31 March, and handed a petition asking for the government's positive reaction for inviting the ILC to Japan)

from *IN2P3 news*

31 March 2016

Physique des particules : premiers tours dans SuperKEKB

Le CNRS apporte une contribution importante à ce projet via des activités à l'interface entre machine et détecteur (...) Les équipes françaises acquièrent ainsi de l'expertise dans des domaines touchant les futurs projets de collisionneurs d'électrons et/ou de positons à plus haute énergie (comme l'International Linear Collider – ILC – au Japon, le futur collisionneur circulaire du Cern et Circular Electron Positron Collider – CEPC – en Chine).

from *Iwate Nippo*

30 March 2016

地方創生への知の拠点を 県立大学長が I L C 講演会 (Knowledge Hub for Regional Revitalization: Iwate Pref. University President's ILC Lecture in Ofunato)

県立大（滝沢市）の鈴木厚人学長による国際リニアコライダー（ I L C ）講演会は 29 日、大船渡市内のホテルで開かれた。鈴木学長は東北、日本の真の復興の象徴となりうる国際的な「知の拠点」形成が、地方創生につながると訴えた。(...) 欧州合同原子核研究所（ C E R N、スイス）に毎年 10 万人の観光客が訪れていることを踏まえた経済効果や誘客効果にも言及。「 I L C 誘致は地方都市をグローバル都市に変革させ、経済活性化につながる」と強調した。(A lecture by Iwate Prefectural University president Atsuto Suzuki about the International Linear Collider was held at a hotel in Ofunato City on March 29th. President Suzuki stated that the formation of the international “knowledge hub,” which could become the symbol of true recovery for Tohoku and Japan, would lead to regional revitalization (...) He also mentioned economic benefits and bringing more visitors to the region based on the 100,000 visitors coming to CERN in Switzerland every year, emphasizing that “Bringing the ILC will transform regional cities into global cities, and lead to an invigorated economy.”)

Read full translation provided by *Iwate & the ILC* website [here](#).

from *Iwate Nippo*

26 March 2016

I L C 誘致、欧州議員と関係構築 ザンビアで I P U 会議 (Attracting the ILC, Building Relations with European Members of Parliament: IPU Assembly at Zambia)

約 170 の国や地域の議会が加盟する「列国議会同盟（ I P U ）」の会議が 16 ~ 23 日までザンビアで開かれ、 I L C の実現へ、欧州の国会議員との関係構築を進めた鈴木氏は「 I P U の場を活用し、欧州などの枠組みづくりを進めたい」と今後を見据える。(The assembly for the Inter-Parliamentary Union, (...) was held in Zambia from March 16th to 23rd, with Liberal Democratic Party House of Representatives member Shunichi Suzuki participating as the head of the group of Diet members from Japan. Mr. Suzuki, who built relationships European members of parliament towards realizing the ILC, stated his plans for the future that “I want to make use of the IPU to establish frameworks with Europe and other countries.”)

Full translation provided by *Iwate & the ILC* website [here](#).

from *Kahoku Shinpo*

23 March 2016

被災地から地方創生 復興やまちづくり議論

被災地の復興やまちづくり、防災対策を考えるシンポジウムが 2 日、仙台市青葉区のウエスティンホテル仙台であった。経済評論家の三橋貴明氏が東北復興と日本の経済成長をテーマに基調講演。デフレ脱却策として公共投資の重要性を説き、「東北の復興事業や世界中の知性が集まる国際リニアコライダー（ I L C ）に、政府は積極的に投資するべきだ」と語った。(A symposium to discuss the urban development and disaster prevention was held in the hotel in Sendai on 22 March. Takaaki Mitsuhashi, an economic analyst and a speaker at the symposium stressed the importance of investment in public sector as a deflation-fighting measures and said “Japanese government should invest aggressively into the earthquake reconstruction projects and the ILC, where the intelligence from all over the world will gather”)

from *passionate-about.com* (Art Project)

19 January 2016

Moving mind portrait of Philip Burrows

The other main purpose [of building the ILC] would be to produce copious quantities of the Higgs Boson, something like 20,000 Higgs Bosons a year, every one of which we could study and analyze. So this is the ideal place to pick apart the Higgs Boson. And of course we're hoping to see evidence for new physics processes, maybe supersymmetric particles.

CALENDAR

Upcoming events

[ECFA Linear Collider Workshop](#)

Santander, Spain

30 May- 05 June 2016

[View complete calendar](#)

PREPRINTS

ARXIV PREPRINTS

[1604.02420](#)

Displaced vertex searches for sterile neutrinos at future lepton colliders

[1604.02069](#)

Synergy between measurements of the gravitational wave and the triple Higgs coupling in probing first order phase transition

[1604.01994](#)

Conceptual Design Studies for a CEPC Detector

[1604.01921](#)

Study of the performance of a compact sandwich calorimeter for the instrumentation of the very forward region of a future linear collider detector

[1604.01640](#)

Diphoton resonance at e+e- and photon colliders

[1604.00935](#)

A Time Projection Chamber with GEM-Based Readout

[1604.00333](#)

Prospects for Future Collider Physics

[1604.00276](#)

Results from the October 2014 CERN test beam of LumiCal

[1604.00123](#)

Higgs exotic decays in general NMSSM with self-interacting dark matter

[1603.09431](#)

Physics Accomplishments and Future Prospects of the BES Experiments at the BEPC Collider

[1603.08681](#)

Measurement of the Higgs decay to electroweak bosons at low and intermediate CLIC energies

[1603.08525](#)

Cosmological constraints on Dark Matter models for collider searches

[1603.08228](#)

A global fit of the γ -ray galactic center excess within the scalar singlet Higgs portal model

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Driving cooperation projects forward

The 38th US-Japan HEP meeting

[Harry Weerts](#) | [14 April 2016](#)



Meetings during cherry blossom time means coffee breaks are spent outside more often.

On 4 and 5 April last week, during the peak of the cherry blossoms in Japan, I attended the 38th US-Japan Joint Committee for High Energy Physics meeting at the KEK laboratory in Tsukuba, Japan as part of the US delegation. These meetings happen annually and the location alternates between Japan and the US. The total attendance this year was about thirty, with 13 members from the US and 17 from Japan. The meeting was chaired jointly by Glen Crawford from the DOE HEP office and Yasuhiro Okada from the KEK directorate. US attendees were mostly from national labs in the US and from KEK and universities in Japan. Okada opened the meeting mentioning the new bi-lateral framework for cooperation in HEP between the two countries that was signed in October 2015 in Tokyo, and that ensures the existence of the US-Japan Joint Committee.

In his talk, Glen Crawford reminded us that the US is implementing the P5 plan and that an important recommendation of that plan is that HEP is global and the US supports the global programme. He pointed out that one of the steps in the P5 plan is support for the ILC and expressed concern about no decision about the ILC in Japan, especially in light of other options becoming available.

The core purpose of the annual meeting is the presentation of the status of currently supported work under the US-Japan agreement and newly proposed work. This year there were 16 projects that received continued support and four new ones were added from the ten proposals submitted to this year's competition. It is a very diverse and rich programme and reflects the areas where there is collaboration between the HEP programmes in both countries.



Confirming 38 years of cooperation: the US-Japan Joint Committee for High-Energy Physics. Image: KEK

The following three experiments are supported: the Heavy Ion program at RHIC, GLAST and CMB measurements with POLARBEAR II. On the accelerator side support is given to R&D for SuperKEKB and next-generation colliders, superconducting coils for the interaction region of SuperKEKB, high-gradient research, development of a superconducting solenoid for a superconducting ion linac, as well as Linear Collider Accelerator Technology for a total of five projects. There are a total of eleven areas of supported detector R&D, including support for GEANT4 development, R&D for Kaon, rare muon, ILC, neutrino, RHIC and Belle II experiments as well as support for a data center for Belle II and development of new magnetic horns for neutrino beams. It should be noted that the Particle Data group is also supported by this programme. All these projects are done jointly in Japan and the US.

We also heard an overview of the KEK DG, Masanori Yamauchi of the KEK programme. Yamauchi emphasised that the new fiscal 2016 year had just

started on 1 April in Japan, that SuperKEKB has circulating beams at about 10% of its nominal current that are being used to “scrub” the machine, that the Belle II detector upgrade is on track for beam in 2017, at JPARC the Kaon hall runs three charged and one neutral kaon beam, the rare muon decay experiment, COMET, has had a commissioning run and is scheduled to start taking data in 2010. The ILC was mentioned on several slides describing ATF, the expanded Superconducting Test Facility (STF), detector work on ILC and describing the ILC working groups at KEK.

After this Andy Lankford described the progress on the implementation of the P5 plan in the US, including the signing of the DOE-CERN agreement, the formation of the LBNF/DUNE collaboration and engagement in the global discussion about the ILC. He went through the list of projects supported by the programme and described their status.

Yasuhiro Okada summarised the status of the ILC in Japan, starting with a brief history and then describing the panels that have been set up to advise the MEXT ministry on next steps. He repeated the need for discussions with other countries about foreign contributions and that LHC results need to be monitored closely and taken into account. KEK will continue accelerator R&D at its facilities, provide the MEXT ILC Advisory Panel with requested information and has developed an action in preparation for a positive decision by MEXT.

Dimitri Denisov from Fermilab described the status of LBNF/DUNE neutrino programme. The Long-Baseline Neutrino Facility LBNF will provide the 1.2-2.4MW neutrino beam, as well as caverns and infrastructure at the Sanford Site in South Dakota. DUNE is the collaboration operating the four planned 10-kT liquid argon TPC detectors at the far side and the near detectors. DUNE has 805 collaborators from 27 nations and 146 institutes. R&D on liquid argon detectors continues and an important ingredient is the protoDUNE detector being built at CERN.

Regarding the ILC at this meeting, for me the take-away message was that there is progress in Japan, in terms of funding R&D on SRF, directed at possibly reducing the cost and enable SRF cavity and cryomodule production in Japan. Working groups for ILC have been set up at KEK, there is an action plan for ILC at KEK and that MEXT is waiting for reports from the several committees that have been setup. A decision or green light on the ILC from MEXT is a complex process in Japan and my sense, which may be wrong, is that it will take another two years before such a step can be announced.

It should be noted that both Andy Lankford and Glen Crawford mentioned that the US is waiting for a sign on ILC from Japan.

[ACCELERATOR R&D](#) | [DETECTOR R&D](#) | [DOE](#) | [JAPAN](#) | [KEK](#) | [MEXT](#) | [US](#)

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AROUND THE WORLD

From metal sheet to particle accelerator (Part 1 of 3)

Passing the halfway point: 50 XFEL accelerator modules have been tested at DESY

[Ricarda Laasch](#) | [14 April 2016](#)



Cavity production at Zanon in Italy. Image: DESY, Heiner Müller-Elsner

In September 2015, the 50th accelerator module for the X-ray free-electron laser European XFEL was tested at DESY. One hundred accelerator modules are needed for the two-kilometre-long electron accelerator of the X-ray free-electron laser. Each module consists of eight cavities, the actual accelerating structures. This is the first of a three-part series (first published in DESY inForm) about how these technological masterpieces are manufactured. Part 1 is about cavities; their production has now been completed.

Two companies have been commissioned with the cavity production: Research Instruments (RI) in Germany and Zanon in Italy. "This is the first time we have ordered cavities virtually ready for operation from industry," emphasises Axel Mattheisen who together with Waldemar Singer leads a team of engineers and technicians at DESY supervising these firms. In the past, industry had only carried out the mechanical production steps. "For that

reason, our greatest concern was whether we would manage to convey the necessary knowledge in a way that the companies are able to produce complete cavities," says Mattheisen. The tested cavities prove that this knowledge transfer worked perfectly.

At the beginning of the long production process, there is a square niobium sheet with an edge length of 26.5 centimetres and a thickness of 2.8 millimetres. For the construction of the accelerator, the purity of 14 700 sheets is tested at DESY before being dispatched to the two production firms. There, the sheets are deep-drawn to so-called half cells which gives them the appropriate shape for further processing. A stamp is used to obtain the required hollow pattern ... the cavity.

Subsequently, 18 half cells are welded together to form one cavity. Since niobium oxidises very easily, this cannot be done with a flame. Instead, the half cells are welded together with an electron beam in a vacuum chamber. The advantage: this procedure is very clean. For this reason, the nine-cell cavity must be protected from new contamination during further processing.

For accelerator operation, the quality of the cavity's inner surface is extremely important. It must not only be hyper clean but also exceptionally smooth. "In the past, the cavities were delivered to us and we did the rest. This went quite well with ten or occasionally with 30 cavities per year. But it was clear that this would not be possible with some 100 cavities per year," Mattheisen says. For the construction of the European XFEL, the firms had to learn to carry out the surface treatment according to the "DESY recipe" and to work in a nearly dust-free cleanroom. "This was completely new for them and therefore, communication was extremely important," Mattheisen points out. The most important steps in this process are pickling, baking, tuning, dressing and rinsing.

For pickling, various different acid mixtures are led into the cavity. The acid reacts with the metal surface of the cavity and removes processing residues and polishes the surface. The acids' mixture ratio and the extent of the pickling procedure have been optimised during many years of research at DESY. Baking follows pickling: the cavity is heated at 800 degrees centigrade for several hours in a humidity-free vacuum environment. During this treatment, tensions in the metal originating from shaping and welding are released and the ne crystal structures of niobium are newly arranged.

After getting out of the oven, the cavity is tuned. In order to accelerate particles during operation, electromagnetic fields are induced to oscillate in the cavity and, eventually, the oscillation will turn into resonance. For this aim, however, the shape of each cavity cell must be exactly tuned to the accelerator frequency of 1.3 gigahertz. In the process of tuning, the resonance frequency is measured and when it diverges from the desired frequency, the cavity must be retuned. For this purpose, the cavity shells are pressed and pushed accordingly. Slight shape alterations can significantly improve the resonance.

The next step is dressing: the cavity is welded into its helium tank. Liquid helium cools down the cavity in operation to minus 271 degrees centigrade to generate superconductivity and remove heat. Subsequently, a total of four antennae are to be mounted onto the cavity. One of it feeds the electromagnetic field into the cavity, the others recover it at the opposite end. "Doing this kind of mounting in a cleanroom is not the average, not even for industry," says Mattheisen. "It is not usual work to set bolts and nuts in a cleanroom; it requires practice and, above all, patience since all procedures must be carried out slowly."

The production is completed with rinsing: the inner surface of the cavity is sprayed off for some hours with high pressure ultrapure water of 100 bar. Now, the cavity with a vacuum inside leaves the cleanroom. Packed in a special case, it is shipped to DESY by lorry. However, the cavity is not yet ready for installation into a European XFEL module. It will first have to demonstrate its qualities.

[CAVITY](#) | [DESY](#) | [EUROPEAN XFEL](#) | [RI](#) | [SCRF](#) | [ZANON](#)

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AROUND THE WORLD

French linear collider days review Linear Collider status

Roman Pöschl (CNRS/LAL) | [14 April 2016](#)



Group photo of the French Linear Collider Days on March 2016, Paris. Photo: Romain Andrieu (CEA/Irfu)

The annual and 4th edition of the [French Linear Collider Days](#) (JCL2016) workshop happened in Paris on 23-24 March 2016 (after Lyon 2013, Saclay 2013 and Grenoble 2014). About 70 participants reinforced the dedication of the French Linear Collider Community to remain a strong partner during the next steps towards the realisation of the project. This is true for all three fields – accelerator R&D, detector R&D and physics studies. Among the participants were eminent international guests from Japan, US and Europe, showcasing the important role that France is expected to play in the forthcoming years.

The international session started with opening notes from the management of CNRS-IN2P3 and CEA-Irfu. The international context was reviewed in three dedicated talks about Japan (by Saturo Yamashita, Tokyo University), US (by Mike Harrison, BNL) and Europe. The attendance's attention was particularly triggered by recent encounters of Japanese and US representatives. For Europe, François Le Diberder (Paris Diderot University/LAL) stated that Europe is a strong partner in the Linear Collider Collaboration with a wide

range of activities are supported by European, national or even local funding grants.

The JCL2016 workshop gave a broad floor to presentations of recent accelerator R&D developments. Sessions started with an overview of the ILC design including ongoing design changes, as for instance the re-establishment of a vertical shaft or a common L^* for the two ILC detectors (L^* is the distance between the last quadrupole magnet and the interaction point). A highlight was the production of cryomodules for the European XFEL project, with significant French contributions from CEA-Irfu and LAL (CNRS-IN2P3, Paris-Sud University). Beyond the current status extrapolations for the case of the ILC construction were also made. French groups play a leading role in the experimental programme of the ATF2 test facility at KEK, keywords are beam halo monitoring and beam stabilisation. Furthermore, the status of the studies towards a (conventional) positron source was summarised. The latter in particular is considered intensively for the CLIC project. This and the review of the CLIC/CTF3 status underlines the broad scope of activities on Linear Collider R&D in the French laboratories. The accelerator sessions closed with an overview on the R&D into superconducting RF cavities in Japan.

Review of the latest LHC results is always a key part of the French Linear Collider Days. Naturally, most excitement has been caused by the newest preliminary results on the 750 GeV-bump presented by the ATLAS and CMS experiments. The workshop came timely right after the electroweak week of the [Moriond Conference](#). Attendants agreed that whether or not the “bump” gets confirmed in 2016, the linear-collider physics case remains strong since it is presumably the only tool that can decipher with sufficient precision the origin of electroweak symmetry breaking. A linear collider facility that provides different operation modes including photon-photon collisions could also play a crucial role in case of a discovery.

The detector R&D for the linear collider was also reviewed. French groups are mainly engaged in the ILD detector concept and hold positions in the management and technical coordination. Within the various R&D collaborations, the French groups have been making significant contributions to calorimetry, gaseous tracking and vertex detectors with a scope that goes often beyond the needs of a linear collider for more than 10 years. Smart and state-of-the-art reconstruction algorithms complement the hardware activities.

Communication is a central task to gather support for major projects like the Linear Collider. At the JCL2016 the launch of the

[Collisionneur Linéaire France website](#) was announced. It aims at providing relevant linear collider information for the French community. In 2015 representatives of the French Linear Collider community embarked on a considerable list of actions such as a meeting with Japanese Diet members and the Japanese consul in Strasbourg that were summarised in a dedicated talk. As local organiser and participant I surely believe this edition was a success! We are all looking forward to the next edition in 2017.

[ACCELERATOR](#) | [CEA](#) | [CNRS](#) | [EUROPEAN XFEL](#) | [FRANCE](#) | [PHYSICS AND DETECTORS](#)

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IMAGE OF THE WEEK

Advertising past and future sights

14 April 2016



If you've ever taken the metro in Tokyo you know that it can be an adventure with earwormy jingles for every station and wonderfully colourful advertising in the cars. The cars of four lines of Tokyo Toei Subway currently display a very special ad featuring the ILC.

It's an ad placed by [Iwate Prefecture](#) to highlight the past, current and future attractions of the prefecture. It says "Iwate prefecture, home of culture and science" and introduces the world heritage sites Hiraizumi, Hashino Iron Mining and Smelting Site and the ILC. Tokyo Toei Subway had offered ad space for the fifth anniversary of the disastrous earthquake and tsunami.

So when does particle physics take over the London underground, the Paris metro or the New York subway?

Thanks to Rey.Hori for spotting this in [Toei Mita Line](#).

[#ONLYINJAPAN](#) | [HIRAIZUMI](#) | [IWATE PREFECTURE](#) | [TOKYO](#)

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