

# NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

## DIRECTOR'S CORNER

### Field trip to a model lab

by Akira Yamamoto



A delegation from Kesen-Numa City, from Japan, led by the Mayor Mr. Shigeru Sugawara, visited CERN and the area around it from 18 to 20 May. The group consisted of 16 representatives from the city's Council, the Commercial and Industry Association, the Board of Education, the Reconstruction and Policy Planning Division and many other official bodies. They visited CERN to gather information on how a working laboratory functions and what it needs.

## AROUND THE WORLD

### Crossing technical and cultural borders

EU project E-JADE fosters exchange between European and Japanese researchers

by Barbara Warmbein



Accelerator experts from Europe and Japan have a long history of cooperation for projects such as ATF at the Japanese lab KEK, and of course the Large Hadron Collider at CERN. A new EU-funded project

makes sure that cooperation continues with future projects like the high-luminosity LHC, the Future Circular Collider FCC, CLIC, the ILC and many more. The first researcher (from the German lab DESY) has already spent nine weeks in Japan to improve simulations for site-specific machine-detector-interface questions for the ILC.

## AROUND THE WORLD

### Future large colliders in Asia – a personal perspective

by Jie Gao



With the discovery of the Higgs particle at the Large Hadron Collider at CERN in July 2012, after more than 50 years of searching, particle physics has finally entered the era of the Higgs, and the door for human beings to understand the unknown part of the Universe is wide open, says Jie Gao from IHEP in Beijing, China.

## IMAGE OF THE WEEK



## Building trust and big machines

by Barbara Warmbein

The Japanese town Kesen-Numa has large expertise in the fishing and port industry, but they have never hosted a major international lab. A delegation recently visited CERN to learn how these labs work, what they need and what benefit they bring to their neighbours.

## IN THE NEWS

from **GIZMODO Japan**

27 May 2015

実は日本ですごいプロジェクト進行中。ILC加速器ってなんだ

今以上に素粒子物理の研究を進めるにはILCの実現は必須だと研究者たちは言っています。(Scientists said that ILC is indispensable for advancing the particle physics.)

from **Tokyo Calendar**

26 May 2015

BIG BANGを解明する 日本に誘致するための48カ国料理

2020年の東京オリンピックのあと、ネオ・オリンピック事業として、いま注目され始めているのが「国際リニアコライダー計画」である。(The project which is getting recognition as “Neo-olympic” project after 2020 Tokyo Olympic is the International Linear Collider.)

from **Kahoku Shinpo**

23 May 2015

「心臓部」コスト低減へ新技術

の心臓部と言われる超電導加速空洞の製造に不可欠な「電解研磨」の大幅なコスト削減に、表面処理加工業のマルイ鍍金めっき、兵庫県姫路市の東北工場 八戸市 が挑んでいる。同社は新技術の開発により、研磨コストを少なくとも 分の、最大で 分の 程度に抑えられるとみている。(Tohoku factory of Marui Galvanizing Co. Ltd. is challenging the significant cost reduction on the electropolishing of the inner surface of the superconducting accelerating cavity for the ILC. They are aiming to reduce the cost with their new technology by half to one tenth.)

from **nature**

15 May 2015

Physics paper sets record with more than 5,000 authors

Detector teams at the Large Hadron Collider collaborated for a more precise estimate of the size of the Higgs boson.

from **HORIEMON.com**

6 May 2015

Kavli IPMU 機構長・村山斉が語る 宇宙研究の最先端とは

国際リニアコライダーの建設が日本のブレイクスルーになる (The construction of the ILC will the break through for Japan)

## CALENDAR

### Upcoming events

Meeting of the American Physical Society Division of Particles and Fields (DPF 2015)  
Ann Arbor, Michigan, USA  
04- 08 August 2015

[View complete calendar](#)

## PREPRINTS

### ARXIV PREPRINTS

[1505.06981](#)

Interference effects on Higgs mass measurement in  $e^+e^- \rightarrow H(\gamma\gamma)Z$  at CEPC

[1505.06020](#)

A precise characterisation of the top quark electro-weak vertices at the ILC

[1505.05488](#)

Singlet-like Higgs bosons at present and future colliders

[1505.05082](#)

Direct searches of extra Higgs boson at future colliders

[1505.05023](#)

Phenomenological constraints on light mixed sneutrino WIMP scenarios

[1505.04702](#)

Collider Interplay for Supersymmetry, Higgs and Dark Matter

[1505.04320](#)

Three-Loop Neutrino Mass Models at Colliders

[1505.03761](#)

Indirect reach of heavy MSSM Higgs bosons by precision measurements at future lepton colliders

[1505.03275](#)

Excited Heavy Quarkonium Production via  $Z^0$  Decays at a High Luminosity Collider

[1505.03025](#)

The Conversion of CESR to Operate as the Test Accelerator, CestrTA, Part 2: Vacuum Modifications

[1505.02929](#)

Measurement of  $\sigma(H\nu e\nu^-) \times \text{BR}(H \rightarrow ZZ)$  and Higgs production in ZZ fusion at a 1.4 TeV CLIC collider

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DIRECTOR'S CORNER

## Field trip to a model lab

Akira Yamamoto | [28 May 2015](#)



*The delegation visited facilities like the medical service, the kindergarten or, pictured here, the CERN fire brigade.  
Image: LCC*

A delegation from Kesen-Numa City, from Japan, led by the Mayor Mr. Shigeru Sugawara, visited CERN and the area around it from 18 to 20 May. The group consisted of 16 representatives from the city's Council, the Commercial and Industry Association, the Board of Education, the Reconstruction and Policy Planning Division and many other official bodies.

Kesen-Numa is one of three cities anticipating to co-host the ILC accelerator site, if it is realised in northern Japan. It would play a key role of the ship hub-port for receiving heavy devices from abroad, such as the Superconducting Radiofrequency (SRF) cryo-modules and various detector components. Kesen-Numa city is aiming at to look at the CERN activities in close cooperation with regional communities and industry.

The delegation was first welcomed by the Director of Linear Collider Collaboration, Lyn Evans, at the CERN ATLAS visitor center. A general introduction of CERN was given by a member of the ATLAS Japan team,

Taka Kondo (KEK), and then the delegation visited the Large Magnet Facility (B180), CERN control center (CCC), general service facilities like the kindergarten, the medical service, and the fire brigade, as well as the CMS site.



*John Osborne (CERN) introduces the civil engineering for the CMS experiment and how the rock from digging the cavern was integrated into the countryside in cooperation with local authorities. Image: LCC*

On the second day, a unique and special programme was coordinated by the CERN procurement officer, Cristina Lara, for them to see regional industrial partners and to recognise their contribution to the CERN activities, focusing on their daily technical support of 1500 persons, through service contracts with [ALTEAD](#), [ACTEMIUM](#), [EMTE](#), and [SERCO](#). It was a succession of very informative tours for much deeper understanding of CERN, representing the most successful international laboratory.

The Mayor Sugawara expressed his sincere thanks to all the arrangements dedicated to their visit to CERN, in these very productive two days.

I would personally like to thank all involved very much for the warm acceptance and all arrangement/hospitality provided by CERN staff members and industrial partners.

We are expecting also to receive the Governor of Miyagi Prefecture, the prefecture to which Kesen-Numa City belongs, to visit CERN in late July.

[CERN](#) | [CFS](#) | [CMS](#) | [GENERAL FACILITIES](#) | [ILC HOSTING](#) | [JAPAN](#)

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AROUND THE WORLD

## Crossing technical and cultural borders

EU project E-JADE fosters exchange between European and Japanese researchers

Barbara Warmbein | [28 May 2015](#)



*European-Japanese physics exchange can also take place in the Japanese alps. Image: Katsu Coterra*

Oskar Hartbrich is a PhD student who specialises in developing state-of-the-art calorimeters for future ILC detectors. He is also a specialist for full detectors simulations, and he has just spent nine weeks in Japan getting even deeper into this role, sitting side by side with other experts from Tokyo and Shinshu universities to further improve the machine-detector interface relative to the proposed ILC site in the Kitakami hills.

Hartbrich's trip to Japan was pioneering work – not so much for the work itself, which has been going on for a while, but for the administrative structure that helped him get to and settle in Japan. A new EU-funded project called E-JADE will make exchanges like this one easier and more common in the future.

E-JADE stands for Europe-Japan Accelerator Development Exchange programme and is coordinated by CERN. Partner institutions in Japan are KEK and the University of Tokyo; in Europe, the Universities of Oxford and Royal Holloway (UK), CNRS and CEA (F), IFIC (ES) and DESY (DE) are participating in the project. The European Commission supports it with 1.6 million Euros over 4 years, supporting secondments of researchers from Europe to Japan. Japanese researchers will also spend at CERN and other labs, albeit without being financed by the European Commission.

"E-JADE is all about people and knowledge exchange between European and Japanese institutions for future accelerators for particle physics," says Steinar Stapnes from CERN, the coordinator of the project. "The roadmaps of both regions are very similar and E-JADE is a great opportunity to make sure that the strategies become even more streamlined by making it easier for people to talk to each other." The projects on the European roadmap are the LHC and its upgrades, R&D for the new-energy frontier accelerators at CERN – FCC and CLIC –, European participation in a Japan-hosted ILC and a European neutrino programme that focuses on European participation in US- and Japan-based long-baseline projects. Japan's roadmap highlights J-PARC, the ILC and the Japanese participation in LHC upgrades as well as generic accelerator R&D.

The projects on these roadmaps are all international already. Many researchers from Japan are involved in the LHC, many researchers from Europe work on J-PARC experiments, Belle-II and the Accelerator Test facility ATF, and both communities provide experts on R&D projects for future accelerators that will be global from the start. E-JADE will not only boost technical progress in all of these projects, but is also meant as a platform for more worldly exchange: the way projects are organised and the way things are purchased in the different regions play an important role, as does the way industry works. Already in place are a [KEK office at CERN and a CERN office at KEK](#). "The researchers will be integrated in the appropriate technical groups they are visiting," stresses Stapnes.

Hartbrich thoroughly enjoyed his time in Japan. While improving the full modelling of the ILD detector according to site-specific requirements and based on test beam data – it now boasts the greatest possible precision –, he got to know two very different faces of

Japan. "Tokyo did not give me much of a culture shock, but it is very dense and very special. The video game culture that is celebrated in Akihabara electric city is unique," he says. "I therefore really enjoyed spending time at Shinshu university, which is in the "Japanese Alps" known for the Nagano Winter Olympic Games. My Japanese colleagues took me hiking and skiing, and the landscape was amazingly beautiful." What struck him most was the Japanese readiness and desire to help wherever they can.

The new ILD simulation model that emerged from the E-JADE exchange is now ready to be used. One of the next steps is to see what happens when channels fail and how to mitigate the problem, another is to combine the ILD engineering model and the physics model in order to be able to quickly adapt the simulations if the design of the detector changes because of, say, earthquake-safety requirements.

[ACCELERATOR R&D](#) | [ATF](#) | [CERN](#) | [E-JADE](#) | [EUROPE](#) | [EUROPEAN STRATEGY FOR PARTICLE PHYSICS](#) | [FCC](#) | [ILC](#) | [J-PARC](#) | [JAPAN](#) | [LHC](#)

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AROUND THE WORLD

## Future large colliders in Asia – a personal perspective

Jie Gao | [28 May 2015](#)



*Qinghuada is the potential site for the Chinese collider.*

With the discovery of the Higgs particle at the Large Hadron Collider at CERN in July 2012, after more than 50 years of searching, particle physics has finally entered the era of the Higgs, and the door for human beings to understand the unknown part of the Universe is wide open!

The Standard Model theory of particle physics is now gloriously complete: all particles that it has predicted have been found through experimental discovery with particle colliders. Now is the time to nail it down with precision and to match to new theories to cover the unknown components of the Universe, such as Dark Matter and Dark Energy, through Higgs with its field stretched out to the whole Universe space. The Higgs couples not only to known fundamental particles in the Standard Model but might also couple to unknown parts of the Universe. To understand the whole Universe, with 5%

of known Standard Model particles, 27% of Dark Matter and 68% Dark Energy, on the basis of the fundamental principles, the key of keys is to understand the 125-GeV Higgs with great precision. In fact, this task has great importance in science in terms of the fundamental understanding the Universe as a whole, including its beginning, its current status and its evolution. It is in this sense that studying the Higgs with great precision becomes one of the top subjects of big science.

Different from a hundreds years ago, big science requires big instruments, a big scientific community, and big collaborations, especially in particle physics, which is becoming one of the precious cultures in human beings' scientific activities. Different from a hundreds years ago, big science requires big investment in terms of both finance and human resources. However, just like a hundred years ago, big science rewards human beings in all aspects of life and activities on this planet and in space, such as electricity, nuclear power, and the World Wide Web as a (big!) byproduct out of big science research activity. And who knows, maybe (in at least philosophical point of view) human beings might one day be able to collide Dark Matter with the Higgs to release energy just like what we have done to hit atomic nucleus with neutrons to release nuclear energy.

Concerning precise Higgs studies and beyond, the International Linear Collider (ILC), baptised by the International Committee of Future Accelerators (ICFA) in 2004, is one of such future big instruments. It is an electron-positron linear collider based on superconducting linear accelerator technology, with a potential of exploring centre-of-mass energies up to 1 TeV. In 2013, the ILC team finished its *Technical Design Report* (TDR), and Japan is considering to become its hosting country.

In September 2012, right after the Higgs was found at the LHC, Chinese scientists proposed a [circular electron-positron collider in China](#) at 240 GeV centre of mass for Higgs studies with two detectors situated in a very long tunnel at least twice the size of the LHC at CERN. It could later be used to host a proton-proton collider well beyond LHC energy potential to reach a new energy frontier.

From 12 to 14 June 2013, the 464<sup>th</sup> Fragrant Hill Meeting was held in Beijing about the strategy of Chinese high energy physics development after Higgs discovery, and the following consensus were reached: 1) support ILC and participate to ILC construction with in-kind contributions, and request R&D fund from Chinese government; 2) as the next collider after BEPCII in China, a circular electron-

positron Higgs factory CEPC) and a Super proton-proton Collider (SppC) afterwards in the same tunnel is an important option and a historical opportunity, and corresponding R&D is needed.

The vision of the 464<sup>th</sup> Fragrant Hill Meeting consensus is that firstly, ILC is the right machine to be built globally in the world with its centre-of-mass energy potential up to 1 TeV, and China will be one of its important participants and contributors, and secondly, China should contribute not only through ILC collaboration and participation, but also make contributions to precise Higgs measurement through CEPC jointly with ILC for a period of time as a combined instrument with three detectors taking data during ILC and CEPC operation to ensure the excellent joint precision, and thirdly, shifts from CEPC operation to SppC construction and operation to explore physics in energy frontier as long term contribution.

In fact, ILC and CEPC are complementary, and the complementarity between ILC and CEPC manifests itself not only through more detectors to increase joint measurement precision, but also through their energy region running scenarios. The ILC and CEPC are planning starting times that are almost the same. The ILC runs only at 500 and 350 GeV in the first five years, while CEPC during this time is running at 240GeV. After 5 to 7 years running, CEPC will start its shift to SppC, while the ILC continues a 20-year programme running at 500GeV, with possible upgrades to 1TeV and beyond.

Finally, the fact that Japan and China, both Asian countries, having strong willingness to contribute to the high-energy physics community and science in general with world participation, one for hosting ILC and another for CEPC, is really excellent, it responds well to the fact that we have entered the era of the Higgs, and ILC and CEPC are a needed united big instrument to have excellent joint precision for Higgs study and beyond.

Prof. Jie Gao, Institute of High Energy Physics, CAS, China

[CEPC](#) | [CHINA](#) | [EUROPEAN STRATEGY FOR PARTICLE PHYSICS](#) | [FRAGRANT HILL MEETING](#) | [IHEP](#) | [P5](#)

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IMAGE OF THE WEEK

## Building trust and big machines

Barbara Warmbein | [28 May 2015](#)



The Japanese town Kesen-Numa has large expertise in the fishing and port industry, but they have never hosted a major international lab. A delegation recently visited CERN to learn how these labs work, what they need and what benefit they bring to their neighbours.

Their visit included a trip to the site of the CMS detector, where a huge cavern was excavated to house the detector some 100 metres underground. The excavated rock was piled up into two hills that are now overgrown with grass, shrubs and trees, and a little water reservoir of water extracted from the cavern air has become the home for insects, toads and some families of ducks. A walking path leads around the CMS site, the hills and the pond and is a favourite running and dog-walking spot for locals. As CMS site manager

Martin Gastal from CERN points out, all this was planned and realised in close cooperation with the neighbouring villages. CMS also cooperates with the local tourist information and reserves visit slots for locals and for tourist in order to build and keep the trust of the neighbours. To Kesen-Numa mayor Shigeru Sugawara this was a major lesson: "Seeing high-tech in such harmony with the environment was most impressive," he said.

Kesen-Numa would be the arrival and assembly place for many crucial parts of the future ILC and a home for many of the researchers and hopes that its industry will play a major role in the science project. "We cannot do it all, but with the collaboration of many it can be done," says Sugawara. "First we need to convince the Japanese government."

Host and visit organiser Akira Yamamoto also reports on the visit in the Director's Corner of this issue. Delegation Kesen-Numa, quote from mayor, community work CMS, etc.

[CERN](#) | [COMMUNITY WORK](#) | [ILC HOSTING](#) | [INDUSTRY](#) | [JAPAN](#) | [OUTREACH](#)

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