NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

DIRECTOR'S CORNER

ILC candidate site evaluation in Japan

Today's issue features a Director's Corner from Sachio Komamiya, Chair of the Linear Collider Board.

by Sachio Komamiya

The ILC Site Evaluation Committee of Japan has assessed the two candidate sites, the Sefuri mountains in Kyushu (south island of Japan) and the Kitakami mountains in the Tokoku, northeast area, based on technical and socio-environmental criteria. On 23 August, they unanimously concluded that the Kitakami site is the best candidate site for the ILC in Japan.

AROUND THE WORLD

Want a Higgs factory? Damping rings are key

CesrTA collaborators work to improve the ILC's damping ring design

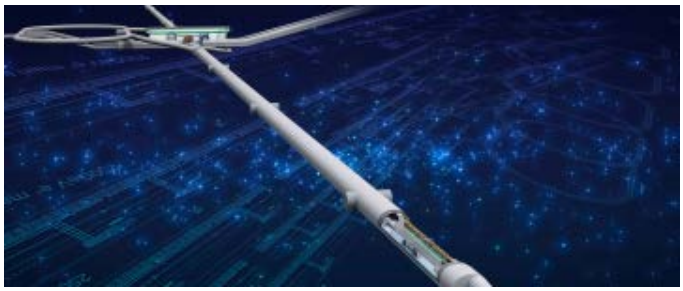
by Julianne Wyrick

The CesrTA collaboration at Cornell University, US, made important contributions to the design of the ILC damping rings for the recently completed *Technical Design Report*, including finding ways to reduce a phenomenon known as the electron cloud effect. Post-TDR, the collaboration is pursuing ways to make the damping rings even more effective by better understanding another phenomenon: intrabeam scattering.

FEATURE

ILC project is entering next phase

by Rika Takahashi



A committee of Japanese scientists has just recommended Kitakami mountains as a candidate construction site for the ILC. The project now has to go through international negotiations, which should take at least a few years. Meanwhile, on 28 August, Japan's Ministry in charge of science policy (MEXT) delivered its first official national budget request for the ILC. The ILC project has now entered into the next stage.

AROUND THE WORLD

Concentrating our energy towards the realisation of the ILC

Jie Gao, chair of the Asian Linear Collider Steering Committee summarises the progress achieved in Asia in the last months towards the realisation of the ILC.

by Jie Gao

On 3 September, the Asia-Pacific High Energy Physics Panel (AsiaHEP) and Asian Committee for Future Accelerators (ACFA) jointly issued a statement that the ILC is the most promising electron positron collider to achieve the objectives of next-generation physics.

IN THE NEWS

from *Tokyo Shimbun*
12 August 2013

誘致に国民の声必要 素粒子物理学の村山斉さん講演

来場者からは、　　に関して「五輪のように国内に誘致するためにはどうすればいいか」との質問が出た。 村山さんは「国民から『　　を使った実験は おもしろそうだからやってみよう』という声が上がらなければ、政治家は 誘致に向けて 動かない。声が上がることが大事なポイントと思う」と答えた。(Responding to the question from the lecture attendee, how can Japan invite the ILC like Olympic game, Murayama said “If there is no back-up from the public, politicians would never take action. Important thing is that many people think that the ILC is very interesting .”)

from *Kahoku Shinpo*
5 September 2013

北上山地誘致実現求め決議 東北北海道商議所連絡会議

東北・北海道商工会議所連絡会議が 日、秋田市のホテルであり、岩手県南部と宮城県北部にまたがる北上山地への誘致を目指す超大型加速器「国際リニアコライダー　　」の建設実現などを国に求める特別決議を採択した。A meeting of Chamber of Commerce in Tohoku and Hokkaido area was held on 4 September, and they adopted a special resolution to appeal the realiaztion of the ILC to the government)

from Physics World
3 September 2013
Asia-Pacific particle physicists back ILC
As well as choosing the ILC over CLIC, the AsiaHEP/ACFA statement also backs plans announced on 23 August by Japanese particle physicists to build the ILC in the Tōhoku region about 400 km north of Tokyo. The 50 km route under the Kitakami mountains was selected over an alternate location at Sefuri on the island of Kyushu.

from *CERN Courier*
September 2013
AIDA boosts detector development
…the International Linear Collider and Compact Linear Collider (…) will demand extremely high-performance calorimetry, which is best achieved using a finely segmented system that reconstructs events using the so-called particle-flow approach to allow the precise reconstruction of jet energies. The technique works best with an optimal combination of tracking and calorimeter information and has already been applied successfully in the CMS experiment.

from *The Japan Times*
30 August 2013
Collider project needs consensus
The ILC is an enormous international project that will require time-consuming negotiations so construction won’t begin for five years. Its construction will involve the participation of some 1,000 engineers and researchers from both Japan and abroad, and take 10 years. If research and improvement are taken into account, 40 years will be needed, and there is also a plan to extend the ILC tunnel to 50 km.

CALENDAR

Upcoming events

LC13 Workshop
Villazzano (Trento), Italy
16- 20 September 2013

16th International Conference on RF Superconductivity (SRF 2013)
Paris, France
22- 27 September 2013

ILD meeting
Cracow, Poland
24- 26 September 2013

CLIC Detector and Physics Collaboration Meeting
CERN, Switzerland
01- 02 October 2013

BLOGLINE

23 August 2013
Richard Ruiz
The International Linear Collider: More than Just a Higgs Factory

PREPRINTS

ARXIV PREPRINTS

1309.2625
Observation of Electron Trapping in a Positron Storage Ring

1309.2248
Characterization of the International Linear Collider damping ring optics

1309.2247
Low-emittance tuning at the Cornell Electron Storage Ring

FCAL workshop
DESY, Zeuthen
07- 08 October 2013

Linear Collider Forum 2013
DESY, Hamburg, Germany
09- 11 October 2013

SiD Workshop
SLAC, USA
14- 16 October 2013

LCWS 2013
The University of Tokyo, Japan
11- 15 November 2013

Upcoming schools

Linear Collider Physics School 2013
DESY, Hamburg
07- 09 October 2013

View complete calendar

1308.4868
Comments on photon colliders for Snowmass 2013

1309.1561
Beam polarization effects in the radiative production of lightest neutralinos in $e^+ e^-$ collisions in supersymmetric grand unified models

1309.1370
GEM Module Design for the ILD TPC

1309.0914
Origin and reduction of wakefields in photonic crystal accelerator cavities

1309.0372
Luminosity Spectrum Reconstruction at Linear Colliders

1309.0021
Exotic Higgs Decay h to 2a at the International Linear Collider: a Snowmass White Paper

1308.6395
The Time Structure of Hadronic Showers in Imaging Calorimeters with Scintillator and RPC Readout

1308.6228
Cherenkov loss factor of short relativistic bunches:general approach

1308.5929
Development of Imaging Calorimetry

1308.5579
The Higgs Particle and Higher-Dimensional Theories

1308.5489
Evaluation of measurement accuracy of $h \to τ^+ τ^-$ branching ratio at the ILC with $\sqrt{s} = 250$ GeV and 500 GeV

LC NEWSLINE
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DIRECTOR'S CORNER

ILC candidate site evaluation in Japan

Today's issue features a Director's Corner from Sachio Komamiya, Chair of the Linear Collider Board.

Sachio Komamiya | 12 September 2013

Sachio Komamiya (left) and Satoru Yamashita (right) at the ILC site evaluation press conference held on 23 Augusut.

The ILC Site Evaluation Committee of Japan co-chaired by Kiyotomo Kawagoe, professor of Kyushu University and Hitoshi Yamamoto, professor of Tohoku University has assessed the two candidate sites, the Sefuri mountains in Kyushu (south island of Japan) and the Kitakami mountains in the Tokoku, northeast area, based on technical and socio-environmental criteria. The committee has met 60 times since January this year and discussed for more than 300 hours. In addition to committee meetings they formed technical and socio-environmental sub-committees, and worked with the eminent experts that sat on these committees. On 23 August, the committee announced that they unanimously concluded that the Kitakami site is the best candidate site for the ILC in Japan.

We, the Linear Collider Board, appreciate their great efforts to come to this decision on a purely scientific basis. The committee has issued a press release which sets out the reasons for this conclusion. We would also like to thank the local governments and residents of the two regions, who were deeply involved in the evaluation processes, for their sizable amount of work.

The federation of Diet members of Japan to promote the construction of an international laboratory for the Linear Collider voted well before the announcement that they would respect the conclusion of the committee based on a scientific evaluation. The Ministry of Education, Culture, Sports, Science and Technology (MEXT), the funding agency in charge of the ILC activity, also pays regard to it. Since it is not easy for the people who were involved in this process from the Kyushu area to accept the conclusion, the committee is continuously explaining the evaluating process used to reach the conclusion.

The ILC accelerator sector of the Linear Collider Collaboration is starting to work on an engineering design towards real construction in the given site conditions. We think this is a major step forward for the project.

ILC SITE | JAPAN

NEWSLINE
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AROUND THE WORLD

Want a Higgs factory? Damping rings are key

CesrTA collaborators work to improve the ILC's damping ring design

Julianne Wyrick | 12 September 2013

CesrTA collaborators studying intrabeam scattering. Image: David Rubin

The CesrTA (Cornell Electron Storage Ring Test Accelerator) collaboration at Cornell University, US, made important contributions to the design of the ILC damping rings for the recently completed *Technical Design Report*, including finding ways to reduce a phenomenon known as the electron cloud effect. Post-TDR, the collaboration is pursuing ways to make the damping rings even more effective by better understanding another phenomenon: intrabeam scattering.

A damping ring is a closed storage ring that decreases the volume of the particle bunches making up a beam, creating bunches that are denser and more compact. The ILC design has two damping rings, one for the electron beam and one for the positron beam. Each beam will pass through a damping ring prior to being sped through the main accelerator to the collision point.

Creating beams with compact particle bunches, or low emittance, is important to the ILC because compact bunches are required for high luminosity. Luminosity is proportional to the electron-positron collision rate in the accelerator.

"One goal of the linear collider is to produce a lot of Higgs particles," said David Rubin, principal investigator of the CesrTA research program. "To produce a lot of Higgs particles, you need to have a lot of collisions, which means you need to have a high luminosity."

The ILC has both a target vertical emittance and a target beam current, which is another factor involved in increasing luminosity. The target vertical emittance is 2 picometre·radians, and the target beam current is approximately 400 milliamps.

When designing the damping rings for the *Technical Design Report*, one major issue the CesrTA collaboration had to deal with is known as the electron cloud effect, which primarily affects the positron beam.

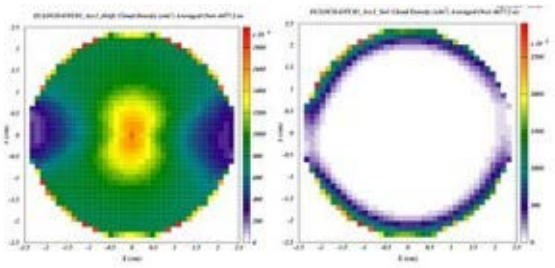
This effect occurs when radiation from the beam particles hits the walls of the ring's vacuum chamber, the tube through which the beam runs, and dislodges electrons. The electrons interfere with the positron beam, which results in increased bunch size, lower particle density and reduced accelerator performance.

CesrTA researchers tested sections of vacuum chamber with different mitigations, or methods for reducing the electron cloud. These mitigation techniques include different vacuum chamber coatings, such as titanium-nitride, and different vacuum chamber geometries, such as grooves. Other mitigations include inserting clearing electrodes, which remove electrons from the chamber, and applying a

longitudinal magnetic field, which keeps the electron cloud near the vacuum chamber wall and away from the beam. Measurements from these tests allowed the researchers to calculate whether they could design a vacuum chamber to meet ILC emittance and beam current specifications.

“At the beginning of the CesrTA program, there was a lot of uncertainty about whether the damping ring that was required could actually be made to work,” Rubin said. “I think now we’ve demonstrated how to do it, and we can say with some confidence that it will work.”

The CesrTA collaboration is currently in Phase II of their damping ring R&D programme, which began in 2011 and will continue through 2014. In the past year, CesrTA researchers have moved their focus from the electron cloud issue to another factor limiting the density of particle bunches: intrabeam scattering.



These graphics show electron cloud density in a vacuum chamber. A vacuum chamber with a significant electron cloud effect (left) is shown compared to one with a reduced electron cloud effect (right). In this graphic, the cloud was reduced using a longitudinal magnetic field, one of the many mitigation techniques tested by CesrTA researchers. Image courtesy of Jim Crittenden

In intrabeam scattering, the particles in a bunch of positrons or electrons scatter off one another, limiting their ability to be squeezed into a dense bunch. This phenomenon is specific to beams that are already compact and high-density.

“It will eventually be the limiting factor (of beam size) once we get rid of the electron cloud,” said Jim Crittenden, a research associate in the CesrTA research programme.

To understand intrabeam scattering, researchers need to make precise measurements of individual particle bunches.

“We need to measure the vertical size, the horizontal size and the length of the bunch,” Rubin said. “At the Cornell storage ring, we have developed instruments that allow us to do this.”

After that, researchers will determine how beam energy affects intrabeam scattering.

“By pursuing these other effects now, we’re exploring the possibility that the damping ring might be specified in a different way, perhaps with an even lower emittance or a higher current,” Rubin said. “But that requires a deeper understanding of all of these effects.”

CESRTA | CORNELL UNIVERSITY | DAMPING RING | ELECTRON CLOUD | INTRABEAM SCATTERING

NEWSLINE
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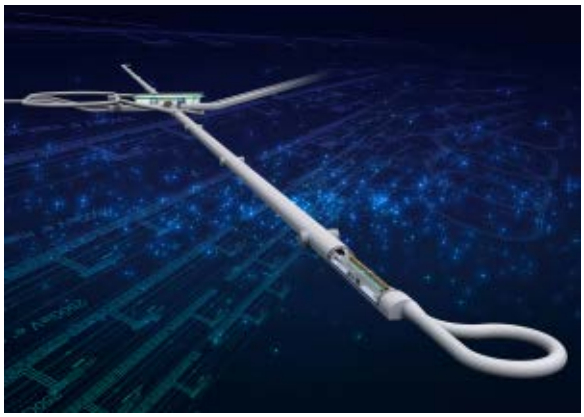
FEATURE

ILC project is entering next phase

Rika Takahashi | 12 September 2013

A committee of Japanese scientists recommended the Kitakami mountains in Tohoku, Japan's northeast region, as a candidate construction site for the International Linear Collider after evaluating it together with the alternate candidate of Sefuri in Kyushu, the southern island of Japan.



Artist's rendering of the ILC accelerator. Image: Rey. Hori

"It really was a tough process," said Kiyotomo Kawagoe, co-chair of the ILC site evaluation committee of Japan and professor at Kyushu University, "especially because I have been working with the many people who are backing the ILC activities in Kyushu". The site evaluation committee was set up in January 2013, and since then, they spent more than 300 hours to investigate both sites. "We are very confident with our evaluation result. It is the fruit of a very careful and fair evaluation process. We would like to express our deepest appreciations to everyone who understood and helped us promoting the ILC project," Kawagoe said.

The evaluation was made on two aspects: the technical aspects necessary to build an accelerator, and the socio-environmental conditions on and around the proposed main campus area.

The evaluation committee was a team of seven physicists plus an expert on conventional facility studies, with adequate advice from accelerator and detector experts. Under the committee, two sub-committees of sixteen technical experts and twelve socio-environmental experts were separately created to provide expertise on issues such as the geological conditions, the environmental impact, the possible problems during construction and the social infrastructure of each candidate site.

The Kitakami site was recognised for its technical advantages in several areas. For example, the foreseeable difficulties in land acquisition or to obtain approvals and licenses were evaluated to be much lower. The Sefuri site is located close to a developed area and the existing infrastructures would cause delay in the approval process, for as long as two years, according to the evaluation. The Kitakami site also has a geological advantage in water drainage, which may lower the risk of a potential extension of the construction period. The estimated total length of the access tunnels, which will have an impact on the tunneling costs, were also evaluated shorter for the north site.

One of the site-specific issues that Kitakami bears is the seismic adequacy. The committee took time to investigate this matter. In general, underground facilities sustain less damage than surface structures, and Kitakami's robust bedrock will help strengthening this effect. In fact, the data collected from Japan's March 2011 earthquake show that the magnitude of the seismic acceleration was reduced by half to one quarter in the underground caverns from the those on the surface ground. The committee concluded that the site would be able to accommodate a seismic-resistant design that can withstand earthquakes larger than magnitude 9.0 level earthquake, the largest earthquake in Japanese history.

The committee also evaluated the socio-environmental context of the main campus areas in both candidate sites. A total of four

potential main campuses, two from each candidate construction sites, were evaluated. Among those, one site in Sefuri was evaluated to be the best with excellent infrastructures, convenient access from downtown, and valuable experience in administrative services for foreigners living in Japan. However, convenient environment and cost of living tend not to go hand in hand. Therefore, the committee found not so much of difference on socio-environmental aspects in the overall assessment.

The committee examined technical and socio-environmental items in a comprehensive way, and came up with their conclusion. “The evaluation was made with a purely scientific and academic point of view. We didn’t make any political considerations whatsoever,” said Satoru Yamashita, a University of Tokyo physicist who chairs Japan’s ILC Strategy Council. “We received support from political and industrial communities that the site should be decided from the scientific view point,” said Yamashita.

The Science Council of Japan, who has been consulted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) to examine the scientific significance of the ILC, stated that it was premature for Japan to bid for being the host nation of the ILC, and that it should take a few years to discuss this within Japan and internationally. “The proposed plan to take a few years for the discussion is consistent with our original plan. We want to build an ‘international’ linear collider,” Yamashita says. “It now has to go through international negotiations and this should take at least a few years. The Japanese government can only officially decide to ‘go’ after establishing international partnerships.”

With the proposed location of the construction site, the project entered into the next stage. On 28 August, MEXT announced that they included ILC research expenses in next year’s budget request. This is the first official national budget explicitly for the ILC, and means a big step forward to realise the project.

ILC SITE | JAPAN

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AROUND THE WORLD

Concentrating our energy towards the realisation of the ILC

Jie Gao, chair of the Asian Linear Collider Steering Committee summarises the progress achieved in Asia in the last months towards the realisation of the ILC.

Jie Gao | 12 September 2013

The official completion of the technical design for the International Linear Collider on 12 June 2013 marked the start of a new boosting engine for the ILC. The ILC was launched in 2005 in Snowmass, Colorado, after it was baptised in August 2004 at the technology decision by the ITRP panel. Now all engines are concentrating to boost the ILC towards its orbit.

Participants of the Conference "Windows on the Universe" held at Quy Nhon, Vietnam.

From 16 to 19, July the third Asia-Europe Physics Summit (ASEPS3) was held, during the 12th Asia Pacific Physics Conference of the Association of Asia Pacific Physical Society (AAPPS) in Chiba, Japan. The emphasis of the physics summit was put to international strategic planning for large research facilities with researchers and policy makers from Asia, Europe and the US. participating into round table discussions.

From 11 to 17 August, a workshop about "Windows on the Universe" was held at the International Center of Interdisciplinary Science Education (ICISE), QuyNhon, Vietnam. More than 180 scientists participated, including five physics Nobel prize winners. The status and the future of high-energy physics was presented and discussed. Barry Barish, former ILC Global Design Effort Director, gave a keynote summary of this impressively high-level scientific workshop.

The July meeting concentrated on strategic scientific policy while the August one concentrated on particle physics itself. The meeting conclusions stated that the ILC was surely one of the key tools for particle physics with its unique feature of being a truly global large research scientific facility with a great physics potential to open the "Window on the Universe".

On 3 September, the Asia-Pacific High Energy Physics Panel (AsiaHEP) and Asian Committee for Future Accelerators (ACFA) jointly issued the statement that the ILC is the most promising electron positron collider to achieve the objectives of next-generation physics. This statement is a milestone and it will guide us to the next converging steps.

The ILC is a e+e- high-energy-frontier collider with clear physics goals and big potential, a genius accelerator with the most technological impact to multi-disciplinary sciences in general. But the ILC is even more than that. It is a new way of doing particle physics: a totally new organisation, a totally new structure, a totally new scientific way of life, and a totally new human culture. ILC will become to science what the Olympic Games are to sport, with the same humanistic and peaceful spirits.

From 11 to 15 November, the next global Linear Collider Workshop (LCWS13) will be held in Tokyo. We hope we will achieve new step forward there, and, as Tokyo is the host city for the 2020 Summer Olympic Games, let's hope the ILC becomes a reality after Tokyo Olympic Games in 2025.

ACFA | ASIA