AROUND THE WORLD

Japanese high-energy physics community says go for the linear collider

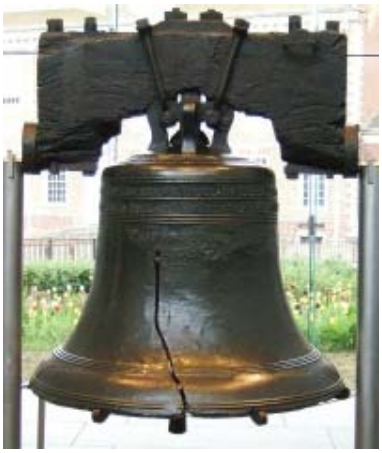
by Rika Takahashi

The Japanese high-energy physics community has now published its recommendations in English. Their report strongly endorses two large-scale projects: an early realisation of a linear collider and a large-scale neutrino detector.

LCPEDIA

Q – cavity quality factor

by Daisy Yuhas



Physicists need to understand each accelerator cavity individually before assembling a collider. One of the cavity characteristics physicists measure is called the cavity quality factor, Q factor for short. The LCpedia series continues.

DIRECTOR'S CORNER

ILCSC plans the future

by Barry Barish

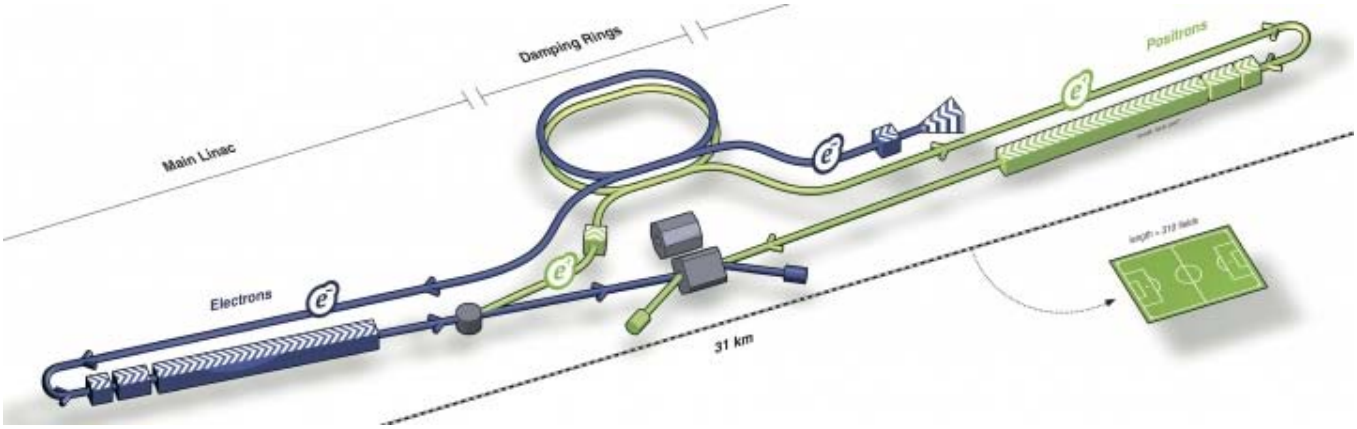
The International Linear Collider Steering Committee (ILCSC) met in Melbourne at ICHEP12 to deal with the completion of its own mission and the initiation of a new organisation to pursue a future linear collider project. The ILC *Technical Design Report* (TDR) and companion *Detailed Baseline Design* (DBD) report will represent the final milestone in the mandate for the ILCSC. The ILCSC balanced its planning for receiving, reviewing and rolling-out of these reports over the coming year, with planning for the new organisational structure that will take the next steps toward a global linear collider project.

IMAGE OF THE WEEK

Here's one we made earlier

Machine graphic updated - can be used in talks and more

Image: ILC / form one



The damping rings have the right shape, transfer lines, sources, detectors and linacs are in their proper places – the ILC overview graphic has been updated in time for the *Technical Design Report*. Use it to explain the ILC and your area of expertise in talks, put it into your papers or simply print it out and hang it up - but please feel free to use it!

IN THE NEWS

from ***New Scientist***
22 August 2012
Higgs boson faces the perils of predictability
Fulfilling expectations is normally a good thing. But the fact that the newly discovered Higgs boson is behaving exactly as expected is cutting its chances of lighting a path to new physics.

from ***Viet Times***
21 August 2012
Những cỗ máy đập vỡ nguyên tử
Tuy nhiên, ngay cả những cỗ máy "siêu hiện đại" nói trên cũng vẫn chưa đáp ứng được yêu cầu của Cộng đồng Vật lý hạt. Một dự án "Máy gia tốc tuyến tính quốc tế" (International Linear Collider, viết tắt ILC) với sự hợp tác của nhiều quốc gia đang được gấp rút soạn thảo (google translation)

from ***Xinhuanet.com***
14 August 2012
Particle collision experiments unveil new insights into primordial Universe
Scientists at the European Organization for Nuclear Research (CERN) on Monday claimed their particle-collision experiments have made new measurements of the kind of matter that probably existed in the first instants of the Universe.

CALENDAR

UPCOMING EVENTS

SiD Workshop
SLAC
21- 23 August 2012

6th International Workshop on Semiconductor Pixel Detectors for Particles and Imaging (PIXEL2012)
Inawashiro, Japan
03- 07 September 2012

POSIPOL 2012
DESY, Zeuthen
04- 06 September 2012

XXVI International Linear Accelerator Conference (LINAC 12)

Tel-Aviv, Israel
09- 14 September 2012

CERN Council Open Symposium on European Strategy for Particle Physics
Crakow, Poland
10- 13 September 2012

12th International Workshop on Accelerator Alignment (IWAA 2012)
Fermilab
10- 14 September 2012

CALICE collaboration meeting
Emmanuel College, Cambridge, UK
16- 19 September 2012

5th International Workshop on Top Quark Physics (TOP 2012)
Winchester, UK
16- 21 September 2012

52nd ICFA Advanced Beam Dynamics Workshop on High-Intensity and High-Brightness Hadron Beams
Beijing, China
17- 21 September 2012

View complete calendar

ANNOUNCEMENTS

Steven Weinberg to speak at LCWS12

Nobel laureate Steven Weinberg will give a public lecture during the LCWS12 meeting in Arlington, Texas. On Wednesday, 24 October at 7:30 pm, he will address conference participants and the general public in Texas Hall at the University of Arlington. Lecture title to be announced.

PREPRINTS

ARXIV PREPRINTS

1208.3626
Status and plans for a SRF accelerator test faciliy at Fermilab

1208.3115
A Search for Leptophilic Vector Boson Z_l at CLIC by Using Neural Networks

1208.3039
Yukawa-unified natural supersymmetry

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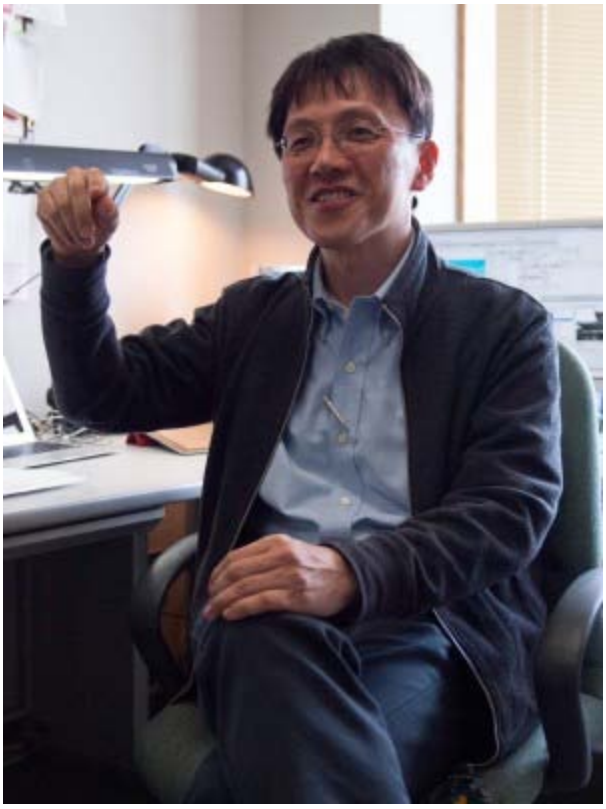
ilc newsline

AROUND THE WORLD

Japanese high-energy physics community says go for the linear collider

Rika Takahashi | 23 August 2012

Research projects in high-energy physics tend to be on larger scales, since they require huge experimental facilities. The realisation of such large-scale projects requires an enormous amount of long-term preparation, and also a big budget. That's why high-energy physicists have decided the priorities for the future experiments by community-wide discussions.



Toshinori Mori, the chair of subcommittee on future projects of high energy physics in Japan

On 8 August, the Japanese high-energy physics community published the English version of their final report of the recommendations for the future of high-energy physics in Japan . This report was prepared by the subcommittee on future projects of high-energy physics chaired by Toshinori Mori, professor at the University of Tokyo. This committee made its recommendations concerning large-scale projects, which comprise the core of future high-energy physics research in Japan.

The recommendation endorsed two large-scale projects:

- ***Should a new particle such as a Higgs boson with a mass below approximately 1 TeV be confirmed at LHC, Japan should take the leadership role in an early realization of an e^+e^- linear collider.*** *In particular, if the particle is light, experiments at low collision energy should be started at the earliest possible time. In parallel, continuous studies on new physics should be pursued for both LHC and the upgraded LHC version. Should the energy scale of new particles/physics be higher, accelerator R&D should be strengthened in order to realize the necessary collision energy.*
- ***Should the neutrino mixing angle θ_{13} be confirmed as large, Japan should aim to realize a large-scale neutrino detector through international cooperation, accompanied by the necessary reinforcement of accelerator intensity, so allowing studies on CP symmetry through neutrino oscillations.*** *This new large-scale neutrino detector should have sufficient sensitivity to allow the search for proton decays, which would be direct evidence of Grand Unified Theories.*

The original report was submitted on 11 February. Reports of this sort have been published twice in the past, at intervals of about ten years.

"We publish the recommendation when a new project is about to start. It is a time to think about the next project," said Mori. He says that the importance of those two projects was widely recognised far before the committee started the editing process of this report. "In this report, we clearly stated the physics conditions to be satisfied towards the realisation of the projects," said Mori.

The condition for the e^+e^- linear collider – "*Should a new particle such as a Higgs boson with a mass below approximately 1 TeV be confirmed at LHC*" – was satisfied on 4 July, by the declaration of the new particle discovery at CERN. Also, the condition set for the neutrino experiment, neutrino mixing angle θ_{13} be confirmed, had been cleared already by the world's neutrino experiments such as DayaBay, RENO, T2K and Double Chooz, just after the submission of the original report.

"The committee envisages that both projects are equally important, and should be driven forward. But this does not mean that Japan should 'host' both projects. We need to discuss further on the priority for what Japan should host," said Mori.

The subcommittee was set up about three years ago. Most of the members are not specialised in ILC studies, and many young scientists were selected as subcommittee members. So, the subcommittee organised numerous study sessions to learn not only about linear colliders, but also high-energy physics research at large.

Some of the subcommittee members were doubtful whether the accelerator technologies are mature enough to realise the ILC. "On this question, the subcommittee asked the specialists at KEK to explain the status of development blow by blow. Now we know that the degree of the maturity of the accelerator design is much higher than any accelerator built in the past at the time of the approval," said Mori.

The original recommendation report was discussed by its umbrella organisation, Japan Association of High Energy Physicists, at their meeting held in March and officially approved. In May, a new body was established to promote the linear collider project as a pan-Japanese community's effort. This new body "ILC Strategy Council" consists of 11 scientists across many different research fields in high energy physics. "So far, accelerator development for the linear collider has been led by KEK, and physics and detector studies were carried out by collaborations among universities. This new body will act as a central part to integrate all the activities toward the linear collider in Japan," said Satoru Yamashita of University of Tokyo who chairs the new body. "We will also communicate with industry and government to make this activity into true country-wide effort," he said.

HIGGS | ILC STRATEGY COUNCIL | JAPAN | KEK | NEUTRINOS

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LCPEDIA

Q – cavity quality factor

Daisy Yuhas | 23 August 2012

Physicists need to understand each accelerator cavity individually before assembling a collider. One of the cavity characteristics physicists measure is called the cavity quality factor, Q factor for short.

One way to understand the Q factor is to pick up a bell. Let the clapper tap the bell edge once. You'll notice that just one tap is enough to leave a long-lived sound. How long that resonating tone lasts is a measure of the bell's quality factor.

Like a bell, an accelerator cavity also resonates. A cavity, explains SLAC physicist Marc Ross, is essentially a hollow metal ball, with a vacuum inside, made of sheet metal. "There are certain frequencies which resonate with that particular size ball in a particular way," Ross says. Just as a shape can resonate mechanically with sound, a metal shape can also resonate with an electromagnetic field.

One way to measure quality factor is to shut off power and observe how long it takes the electromagnetic field to decay within the cavity. The longer the cavity can hold on to that power, the higher its Q factor. Cavities with a high quality factor lose less energy as heat, which means keeping the cavity cool is also easier. Characterising a cavity's Q factor allows physicists to understand how well it can store up energy —and in turn how efficiently it gives that energy to particles.

Rings a bell? This one's Q factor could be better. Image: Tony Fischer Photography

ILC cavities must have a nominal Q greater than 8 billion, meaning that after at least 8 billion cycles of radiofrequency accelerating power, 99.5% of the cavity's stored energy will have decayed.

CAVITY | QUALITY FACTOR | SCRF

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DIRECTOR'S CORNER

ILCSC plans the future

Barry Barish | 23 August 2012

Jon Bagger, chair of the ILCSC presiding over the meeting in Melbourne

In the wake of the discovery of a Higgs-like particle at CERN, the International Linear Collider Steering Committee met at ICHEP12 to orchestrate its own demise (and ours), while taking steps to put into place its (and our) replacements that will have the goal of making the linear collider the next global project in high-energy physics. At the Melbourne meeting, the ILCSC balanced its planning for receiving, reviewing and rolling-out the final ILC TDR and DBD over the coming year with plans for creating a new organisational structure to take the next steps towards a global linear collider project.

The final milestone for the GDE and Physics/Detector group is to submit near-final drafts of the TDR and DBD for review by an augmented PAC in December at KEK. The PAC, augmented by additional technical experts, will carry out an in-depth technical review of both the accelerator and detector reports. Also, a public event will follow this review in Tokyo to publicise the ILC achievement of this milestone. A separate international cost review will be conducted near the end of January 2013. The results of both reviews will be considered by ILCSC at a meeting in Vancouver at the end of February. Final revisions will be incorporated and both reports will be officially delivered to ICFA at the Lepton-Photon 2013 meeting in San Francisco in June 2013.

An unidentified lab director pondering the future...

In parallel with completing this mandate, the new linear collider organisation will become operational. Lyn Evans has already been appointed as Linear Collider Director and he is now organising the leadership for the ILC, detectors and physics and public outreach, and we will keep you informed as that occurs over the coming months. In addition, the Linear Collider Board that will replace the ILCSC is also being formed, and tentatively, the February meeting in Vancouver will be a joint meeting between the outgoing and incoming boards.

Jie Gao, IHEP China, reviewing progress on the R&D programme in Asia.

This is an exciting time of transition for the linear collider efforts. We are busy documenting what are solid and impressive designs for both the detectors and accelerator. We have also accomplished a great deal in our R&D programmes to demonstrate that our chosen technologies are capable of meeting the demanding performance goals needed for an ILC.

We have had a big boost from the Higgs-like particle discovery. The ILC will be a powerful device to follow-up on this discovery. We will present a design in our TDR later this year that is optimised for 500 GeV, but has the flexibility to run and scan near Higgs threshold. We are also considering an alternative of first building a less expensive Higgs factory that will be upgraded in time to full energy.

HIGGS FACTORY | ICFA | ILCSC | LINEAR COLLIDER DIRECTOR | PAC | TIMELINE

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