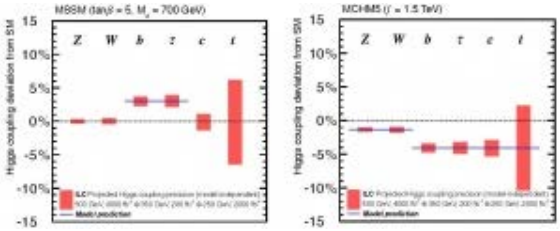
NEWSLINE
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

DIRECTOR'S CORNER

ILC starts at 500 GeV and goes down in energy

by Hitoshi Murayama

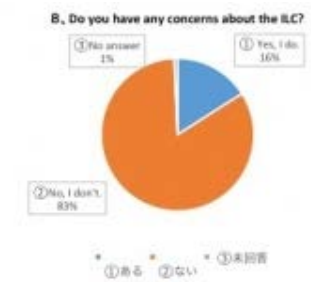


The default collision of the energy of the ILC has always been 500 GeV with promises of an upgrade to 1000 GeV. A while ago, alternative scenarios of a staged ILC that would start at 250 GeV and ramp to 500 GeV later were discussed. All scenarios were evaluated in the community and Hitoshi Murayama reports on the result: the ILC would start at 500 GeV, then go down to lower energies before possibly receiving an upgrade to even higher ones.

AROUND THE WORLD

Survey reveals ILC-related hopes and fears of high school kids

by Barbara Warmbein



In spring, 1408 high school students answered a survey done by the Oshu International Relations Association. The survey asked whether they had heard about the ILC, what it meant to them and whether they had any worries or expectations. The results are fascinating and will have some influence on how the project will be communicated to locals if it gets approved.

AROUND THE WORLD

From symmetry: Q&A: New director-general of KEK

Masanori Yamauchi started his three-year term as head of Japan's major center of particle physics research this spring.

At a recent symposium about the proposed International Linear Collider, Symmetry chatted with Masanori Yamauchi, the new director-general of KEK, Japan's high-energy accelerator research organization. Yamauchi, who received his PhD in physics at the University of Tokyo, has been at the laboratory for more than 30 years.

IN THE NEWS

from *Fermilab Today*
19 June 2015
Fermilab's cutting-edge accelerator R&D area renamed FAST Facility
This accelerator R&D lab, Fermilab's most advanced and modern, has just gotten a new and fitting name: the FAST Facility.

from *Casa Brutus*
18 June 2015
宇宙誕生を解明する国際的な実験施設が、東北にできる!?

4月下旬、ドイツ、オーストラリア、カナダ、中国、イギリスなど海外の研究施設に所属するコミュニケーターが建設予定地を訪れた。(In late April, communication specialists around the world visited preferred ILC construction site in Japan)

from *Iwate nichi nichi*
16 June 2015
街中に音の輪 水沢で祭典
「街なか音の祭典」は14日、水沢商人まつりと同時開催され、会場一帯はにぎわいを見せた。国際リニアコライダー　　の誘致　と市国際交流協会の活動を紹介するブースも設けられ、市民が関係者に気軽に話し掛けていた。(The music and merchants festival was held in Oshu city on 14 June. The ILC booth was set by the city's International Relations Association, promoting the project to general public)

from *Fermilab*
10 June 2015
Fermilab named a Historic Site by the American Physical Society
from *symmetry*
5 June 2015
Steady to a fault
How do accelerators survive in some of the most earthquake-prone regions on Earth?

CALENDAR

Upcoming events

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

XXVII International Symposium on Lepton Photon 2015 (LP 2015)
Ljubljana Exhibition and Convention Centre, Slovania
17- 22 August 2015

10th International Positron Source Workshop (POSIPOL 2015)

Cockcroft Institute, UK
02- 04 September 2015

Upcoming schools

15th Hellenic School and Workshops on Elementary Particle Physics and Gravity (Corfu2015)
Corfu, Greece
01- 26 September 2015

The 2015 European School of High-Energy Physics
Bansko, Bulgaria
02- 15 September 2015

View complete calendar

PREPRINTS

ARXIV PREPRINTS

1506.06675
Exploring extended Higgs sectors by radiative corrections with future precision coupling measurements

1506.06542
Strong IR Cancellation in Heavy Quarkonium and Precise Top Mass Determination

1506.06453
Probing CP-violating ht¯t coupling in e+e−→hγ

1506.05992
Physics Case for the International Linear Collider

1506.05465
Probing the fermionic Higgs portal at lepton colliders

1506.05348
The Pandora Software Development Kit for Pattern Recognition

1506.05316
Construction and commissioning of a technological prototype of a high-granularity semi-digital hadronic calorimeter

1506.04149
Integrating in the Higgs Portal to Fermion Dark Matter

1506.03255
Electron spectra and coherence of radiation in undulators

1506.01963
Testing general relativity on accelerators

1506.01708
α-Attractors: Planck, LHC and Dark Energy

1506.00918
The FCC-ee study: Progress and challenges

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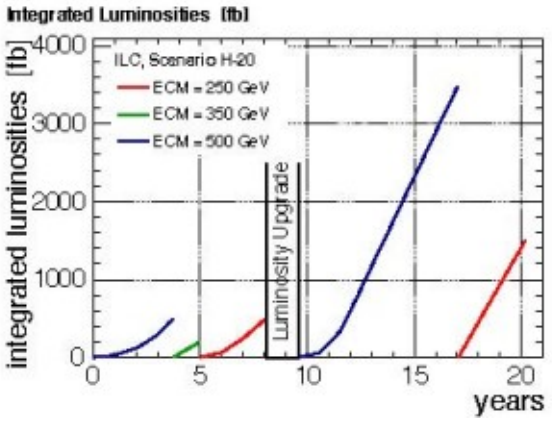
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

DIRECTOR'S CORNER

ILC starts at 500 GeV and goes down in energy

Hitoshi Murayama | 25 June 2015



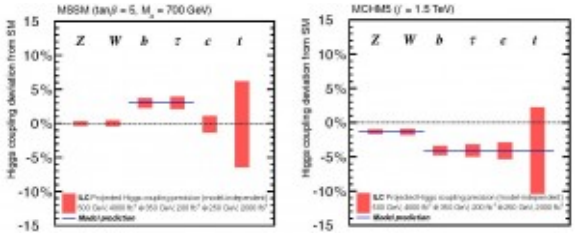
Predicted integrated luminosities for various centre-of-mass energies in the "H-20" running scenario for the ILC, which was recently adopted. In H-20, the ILC starts at a centre-of-mass energy of 500 GeV, followed by runs at lower energies.

ILC operation is still some years away, but physicists are already gearing up to find the optimal way to operate the ILC to harvest as much physics as we can. One of the great advantages of the ILC over circular machines is that the energy of the machine is tunable, and can also be upgraded to higher energies by extending the accelerator later. The *Technical Design Report* (TDR) is based on the collision energy of 500 GeV, but can be brought down to lower energies. Even though it might sound strange to lower the collision energies, it is actually better for some physics goals.

There has been an intense discussion about the so-called "running scenario" in the community. A specific scenario is also needed for studies of detector and machine performances based on a common assumption among the scientists. It may well change as the time comes close, or if LHC discovers new particles, but it is meant to be the "best educated guess" on the optimal strategy of the ILC at this moment.

At the Asian Linear Collider Workshop at KEK, Jim Brau from University of Oregon presented three scenarios called H-20, G-20, I-20, together with the one used in the Snowmass study in 2013, on behalf of the ILC Parameters Joint Working Group. The new three scenarios are meant to be very realistic. The machine often takes time to be brought up to speed and deliver intense beams needed for physics. It does not run for the full 12 months of the year because of maintenance, beam studies, and for saving power. They assume the TDR-based configuration for the first ten years or so, followed by a major 18-month shutdown to upgrade the intensity of the beam. The total envisaged running time is twenty years.

After many months of discussions, the scientists converged on the scenario H-20. It starts with the currently anticipated highest energy of 500 GeV, accumulating 500 fb^{-1} of data. And for the optimal studies of top quark and Higgs boson, the ILC will go down to 350 GeV (200 fb^{-1}) and 250 GeV (500 fb^{-1}), respectively. After the luminosity upgrade, it will run again at 500 GeV (3500 fb^{-1}) and 250 GeV (1500 fb^{-1}). This scenario is shown above.



The proposed running scenario bodes well for precision Higgs studies and more.

This running scenario guarantees that any new physics that may be within the reach of the 500-GeV ILC can be discovered as quickly as possible, while precision studies of the top quark and the Higgs boson maintain competitive edge to the High-Luminosity LHC that is supposed to be operating at the same time as the ILC. The proposed running scenario was approved by the Linear Collider Board.

Now that we have the running scenario, scientists studied the performances of ILC physics with realistic and concrete assumptions. The simulated performance is very very exciting. In a recent paper (K. Fujii *et al*, arXiv:1506.05992), you can see that ILC can reveal the nature of the Higgs boson. One of the major puzzles about the discovered Higgs boson is that it is the *only* point-like particle we know that does not spin. It is out of context, a new breed. We would like to know

whether it has siblings and relatives like in supersymmetric theories, or is it made of smaller constituents that do spin but their spins cancel against each other. Fig. 2 shows that the proposed running scenario for ILC can answer this question given its precision and powerful beams. In addition, this running scenario makes ILC possible to discover “invisible particles” LHC likely misses, or understand whether the heaviest particle we know, the top quark, is composite or elementary.

What will happen after twenty years? It will depend on what we will find at the LHC Run 2, HL-LHC, ILC up to 500 GeV. The currently proposed site of the ILC can accommodate an accelerator providing 1 TeV energy by making the ILC longer. By that time, other more ambitious accelerator technologies such as CLIC or plasma acceleration may become viable. ILC is expected to be a long-term facility, even beyond the anticipated twenty years of the current running scenario.

CENTRE-OF-MASS ENERGY | HIGGS | LHC | LUMINOSITY | RUNNING SCENARIO | SUPERSYMMETRY | UPGRADE

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AROUND THE WORLD

Survey reveals ILC-related hopes and fears of high school kids

Barbara Warmbein | 25 June 2015

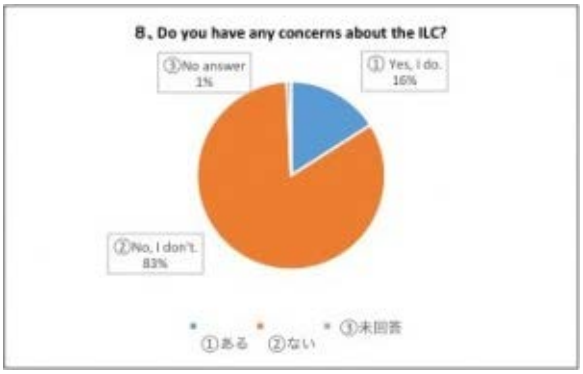
These drawings were made by children who live in the area where the ILC might be built. They show what the children think about the project. A survey has backed these drawing up with real data. Image: LCC

If the ILC comes to Iwate prefecture, one of the major challenges will be to inform the local community about their big new science neighbour. The prefectural government and the councils of the host town have already set up up ILC task forces, and an expat grassroots support committee actively promotes the project in the area. One of the host towns, Oshu, has now conducted a survey with children in high school to find out what they do and don't know about the ILC, what they hope and what they fear it will bring.

Tsuyoshi Sato, chairperson of the Oshu International Relations Association, is one of the motors of the survey. "We have to know the younger generation's opinions and attitudes toward the ILC," he explains. "They will play the leading role of this region when the ILC is installed."

The Association questioned a total of 1408 children between the ages of 15 and 17 from the first and seconds grades of seven different local high schools. Out of these, 30 percent said they knew a thing or two about the ILC, 68 percent didn't, and 2 percent provided no answer. Thirty-four percent of students have already attended a lecture, symposium or event about the ILC, some are veterans with several attended events, but 68 percent had never come in contact with ILC-related information.

In terms of interest for the project there are two camps: those who find newspaper articles about the ILC highly interesting (5 percent), interesting (20 percent) or moderately interesting (31 percent) and those that are not really interested (19 percent) or not interested at all (24 percent). (1 percent aren't sure.)



Sixteen percent of survey participants are concerned about issues like pollution, radiation or cultural differences. Image: Oshu International Relations Association

The survey also asked about their expectations and their fears. The large majority seems neutral towards the project: 71 percent say they do not have any expectations for the ILC, while 28 percent do (1 percent aren't sure). Similarly, 83 percent say they have no concerns about the ILC, 16 percent do (and 1 percent aren't sure).

The survey gets really interesting where kids express their hopes and fears. Especially the fears will sound familiar to any researcher who has ever done outreach work, and they need to be taken seriously and addressed well. Many of the children worry about radiation, accidents, pollution, terrorism, black holes and explosions. "Will the same problem happen like in the Fukushima nuclear plant?", asks one student, another wants to know whether the ground foundations are okay and fears that "mountains will disappear and there will be effect on nature and wildlife." The students also worry about their local culture: "I am worried about incidents because foreigners will be coming and going," says one, "the countryside

will disappear," says another, and "too much international culture will cause Japanese culture to disappear," says another. They wonder how long construction will take, whether wages and land will be enough, and even what will happen after the ILC.

The expectations sound more upbeat: the ILC could lead to "internationalisation of the region", "new infrastructure", "employment", "increased population in Iwate", "improved English abilities" and Iwate being "a prefecture to show off to the world. Some look forward to meeting people from different countries, others welcome the development through the construction projects and the introduction of foreign cultures. Some look beyond their own backyard and expect "further scientific developments", "big discoveries for Japan", "the start of changes in future lifestyles" and "solving the mysteries of the Universe." One student sums it all up by saying "I hope it will do something good for the world."

In order to improve knowledge about the ILC, the children suggest "explanation meetings", more information in the news and in newspapers, talks in school and generally more detailed information. "More people should know about it," says one student, another states "I don't know what the ILC can do so I want more detailed information." "If I can know more about the ILC, then I can become interested in it," says a third. Some kids even used the survey's comments section to wish the project good luck: "I am cheering for you and looking forward to it," they say.

"The most interesting outcome for the association is that about a half of students are not interested in the ILC and so many students don't know about the ILC project," says Sato. They are making the results of the survey available to related organisations so that they can plan actions to provide information about the ILC project to local people. "We hope this survey contributes to making a multicultural society," he stresses.

Getting the trust and support of the local community is key to the successful integration of a large science facility into its surroundings. When the ILC gets built, it will continue the tradition started by other major laboratories like Fermilab, CERN, KEK or DESY to invite the neighbours to the lab, explain the goals of the project and show them the construction sites and the hardware. Researchers will also reach out to the local community by taking the lab to the people to alleviate fears and build trust. The ILC sets itself off from the other projects by already having the active support of local governments and communities through the various Science and ILC Promotion Divisions (Iwate), ILC Promotion Division (Ichinoseki), International Relations Association and ILC Division (Oshu) and the ILC Support Committee. "I am sure we can convince those people who don't know or aren't sure about the ILC to support the project if the future lab and the communities work together," says LCC Director Lyn Evans.

COMMUNITY WORK | IWATE | JAPAN | OUTREACH | SITING | SUPER B

Q&A: New director-general of KEK

Masanori Yamauchi started his three-year term as head of Japan's major center of particle physics research this spring.

Kathryn Jepsen

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Signal to background: Meet the next director of TRIUMF

Courtesy of: KEK

At a recent symposium about the proposed International Linear Collider, Symmetry chatted with Masanori Yamauchi, the new director-general of KEK, Japan's high-energy accelerator research organization. Yamauchi, who received his PhD in physi at the University of Tokyo, has been at the laboratory for more than 30 years.

S: When did you first become interested in physics?

MY: A long time ago, as a high school student. I read a book on symmetry and asymmet which impressed me a lot. At university, I chose to enter the physics department.

S: What was particle physics like when you were a student?

MY: When I was a grad student, I was staying at Lawrence Berkeley laboratory and doing experiments at SLA laboratory. At the time, things were centralized in the US and Europe. Experiments in Japan were small. The nature of collaboration at the time was different.

S: How has it changed?

MY: It's more international. KEK's Belle experiment, which started in 1999, is truly an international collaboratic Almost half of its members are from abroad.

These days more than 20,000 scientists visit KEK every year from abroad to carry out an extensive research program at the accelerator facilities. This provides an extraordinary opportunity, especially to young scientists.

Now we're hoping to construct the ILC in Japan. Everyone is getting together to design the ILC from scratch. Japan is not taking a strong lead; it's an international collaboration.

S: What have been some of the highlights of your career?

MY: I was a spokesperson for the Belle experiment. We confirmed theory of CP violation proposed by [theoris Makoto Kobayashi and Toshihide Maskawa [who won the Nobel Prize in Physics in 2008].

In the course of measurements, we observed many interesting things, including CP violation [a violatic in the symmetry between matter and antimatter] in B meson decays. This is still puzzling. We still don't know how it happens. We need at least 10 times more data to find out. That's why we started the upgrad of KEKB [KEK's particle accelerator]. It's called Super KEKB factory, including the upgrade of detector to

S: What do you do in your free time?

MY: I used to swim a lot, two times a week. Since I became the director-general of KEK, I have no time to swi That's my pity.

S: What did you do to prepare to become director-general?

MY: I had many chances to talk to the former director-general.

I know what I should do. For a big lab like KEK, it's extremely important to keep a good relationship wi the Japanese people, including people in government and at funding agencies. We deeply recognize that their understanding and support are essential to our scientific research. I often talk to them.

Conversation as the representative of KEK is a lot different from dialog with physicists. I'm not used to I have to find appropriate words. Physicists are more likely to talk very frankly and fight.

S: What makes KEK unique?

MY: One thing is our diversity. We cover many fields of research.

In physics, besides confirming the Kobayashi-Maskawa theory, we discovered many exotic compound particles and confirmed the discovery of neutrino oscillation. In material and life science, we determined the structure of novel superconductors and protein-drug complexes. We also studied novel properties induced by hydrogen atoms, spins and electrons in condensed matter.

We have two physics facilities, KEK and J-PARC. Between them we cover flavor physics, B and D meson decays, tau lepton decays, kaons, muons and neutrinos. We have a commitment to the ATLAS experiment [at the Large Hadron Collider].

S: What are your priorities for KEK?

MY: KEK's mission in the near future is to derive the best scientific outcomes from ongoing research programs and to open a firm route to future programs.

The most important thing is the construction of the Super KEKB factory [an upgrade of the KEKB accelerator]. We expect to have the first beam early next year. It is extremely important for us to finish the beam. We are going to carry out a neutrino, muon and kaon program.

As I said, KEK does more than particle physics research. It also has nuclear physics and materials science and life science programs. We will promote them as well.