



NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

Special LC NewsLine issue: The US strategy



Building for Discovery

Strategic Plan for U.S. Particle Physics in the Global Context

This issue of LC NewsLine may come a bit later than usual, but it also comes full of the latest news from the US strategy process along with commentary from the American directors in the Linear Collider Collaboration, Harry Weerts and Mike Harrison, on what the P5 recommendations mean for the linear collider. Download the draft P5 report [here](#).

DIRECTOR'S CORNER

The roadmap for high-energy physics in the US from P5

by Harry Weerts and Mike Harrison

After the release of the European Strategy for Particle Physics last year, the strategy process in the US is also being finalised. The Particle Physics Project Prioritization Panel (P5) was put together and charged by the High Energy Physics Advisory Panel (HEPAP) to create a "10 year strategic plan in context of a 20 year global vision" for the US programme. The complete committee report was presented to HEPAP today and discussions about its content are ongoing. The P5 roadmap outlines a broad particle physics programme for the US, including strong endorsements for the ILC in Japan.

AROUND THE WORLD

From symmetry: Proposed plan for the future of US particle physics

FEATURE

From Fermilab Today: International Linear Collider makes progress in siting, R&D



The Particle Physics Project Prioritization Panel's report, released today, recommends a strategic path forward for US particle physics, reports Kathryn Jepsen in symmetry magazine.



Last week, members of the Linear Collider Collaboration met at Fermilab to discuss the progress and future of the proposed International Linear Collider, as well as of CERN's Compact Linear Collider, during the Americas Workshop on Linear Colliders. At the workshop, scientists and engineers involved in the ILC discussed both their recent successes and the work still to be done to make the 18-mile-long electron-positron collider a reality. [Read more](#)

IN THE NEWS

from *E&T*

19 May 2014

[Finding a successor to the world's largest science experiment](#)

The most technologically mature option is the International Linear Collider (ILC) – an electron-positron collider with an initial collision energy of 500GeV and the potential to upgrade to 1TeV. The technology is well established, with a smaller version running at the DESY research centre in Hamburg. Proponents are impatient to get started. "It's a question of swings and balances, but if we were forever waiting for some new phenomenon to show up then we would never have built the LHC," says Professor Brian Foster, of the University of Oxford and European regional director for the ILC.

from *Iwate Broadcasting Company*

19 May 2014

[マインツ大の齋藤教授が小学校でILCの特別授業](#)

宇宙の成り立ちや 国際リニアコライダーの役割について学ぶ特別授業がきょう盛岡の小学校で行われました。 The special lecture about ILC was held at the elementary school in Morioka city, Iwate prefecture)

from *University of Texas Arlington*

16 May 2014

[UT Arlington particle physics team awarded \\$2.5 million grant, 25 percent funding increase](#)

Physicists from UT Arlington who have traveled the world to support new scientific discoveries, including the widely publicized Higgs boson, have been awarded a \$2.5 million, three-year Department of Energy grant to further their work. – See more at: <http://www.uta.edu/news/releases/2014/05/HEP-funding.php#sthash.vkqTmiPS.dpuf>

from *Il Fatto*

11 May 2014

[Cern, i 60 anni dell'Onu della scienza. Gianotti: "Caccia alla materia oscura"](#)

A seguito della scoperta del bosone di Higgs all'Lhc, il Giappone sta valutando la possibilità di costruire l'Ilc (International linear collider), un acceleratore lineare a elettroni per misurare in dettaglio le proprietà di questa particella. La decisione dovrebbe essere presa nel giro di qualche anno.

from *NHK web news*

8 May 2014

[誘致巡り有識者会議](#)

日本への誘致が検討されている最先端の実験施設、 国際リニアコライダーの建設の是非について話し合う国の有識者会議の初会合が開かれ、来年度をめどに誘致がもたらす効果や課題などについて報告がまとめられる予定です。(The first meeting of the expert panel to discuss the benefits and challenges on inviting the ILC to japan. The panel will deliver the report in the fiscal year 2015)

Iwate Broadcasting Company

8 May 2014

[有識者会議が初会合](#)

宇宙誕生の謎に迫る実験施設で北上山地が建設候補地となっている [国際リニアコライダー](#)について、日本に誘致した場合の課題を検討する国の有識者会議がきょう初めて開かれました。(The expert panel to discuss the challenges on inviting the ILC in Japan had their first meeting today)

from *Nikkan Kogyo Shimbun*

5 May 2014

[国内誘致へ 産業界の期待と挑戦](#) [課題は費用と研究者確保](#)

宇宙誕生の謎に迫る次世代巨大加速器「[国際リニアコライダー](#)」について、文部科学省は有識者による調査・検討部会を立ち上げた。(Japan's Ministry of Education, Culture, Sports, Science and Technology set up an expert panel to discuss about the ILC. Based on the recommendation to be made by the panel, the government will make a decision whether to invite the ILC)

CALENDAR

Upcoming events

[Technology and Instrumentation in Particle Physics 2014 \(TIPP 2014\)](#)

Amsterdam, the Netherlands
02- 06 June 2014

[5th International Particle Accelerator Conference \(IPAC'14\)](#)

Dresden, Germany
15- 20 June 2014

Upcoming schools

[The 2014 European School of High-Energy Physics](#)

Gardenen, the Netherlands
18 June- 01 July 2014

[View complete calendar](#)

PREPRINTS

ARXIV PREPRINTS

[1404.7437](#)

Study of the heavy CP-even Higgs with mass 125 GeV in two-Higgs-doublet models at the LHC and ILC

[1405.5149](#)

Doubly-charged Higgs bosons in the diboson decay scenario at the ILC

[1405.4330](#)

Refraction of e⁻ beams due to plasma lensing at a plasma-vacuum interface — applied to beam deflection in a Copper cell with electrical RF-breakdown plasma

[1405.3841](#)

Prospects for bounds on electroweak and Higgs observables via scaling effects

[1405.3781](#)

Higgs Physics

[1405.2970](#)

Emittance Growth Due to Multiple Coulomb Scattering in a Linear Collider Based on Plasma Wakefield Acceleration

[1405.2689](#)

Polarized positron source with a Compton multiple interaction point line

[1405.2156](#)

Spin Transport and Polarimetry in the Beam Delivery System of the International Linear Collider

[1405.1935](#)

Neutrino Mass and Dark Matter from Gauged U(1)B-L Breaking

[1405.1635](#)

Higgs-portal assisted Higgs inflation in light of BICEP2

[1405.1024](#)

Test in a beam of large-area Micromegas chambers for sampling calorimetry

[1404.7663](#)

Higgs vacua behind barriers

[1404.7510](#)

Physics at a Higgsino Factory

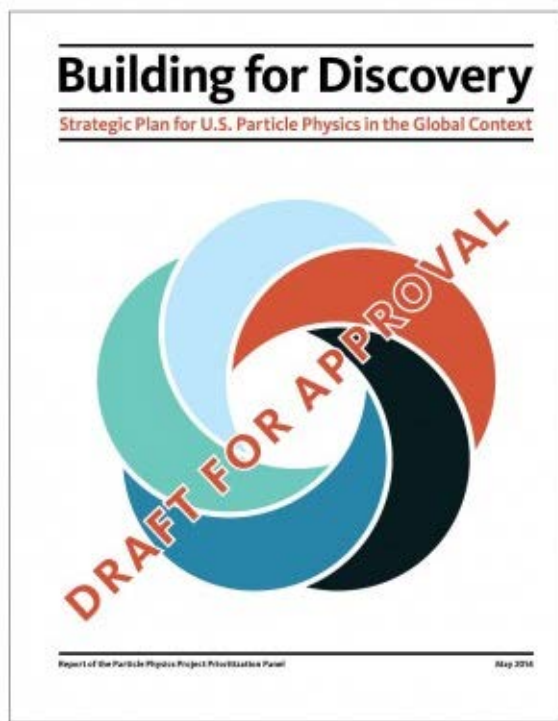
NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

DIRECTOR'S CORNER

The roadmap for high-energy physics in the US from P5

Harry Weerts and Mike Harrison | [22 May 2014](#)



Around October 2012 the US high-energy physics (HEP) community and funding agencies started a strategic exercise to create a roadmap for the future of high-energy physics in the USA. The first step was the initiation of the [Snowmass process](#) to review the complete science status of the field.

This culminated in the Snowmass 2013 meeting at the University of Minnesota in the summer of 2013. In his summary William Barletta, co-convenor of the Frontier Capabilities Group, stated clearly "We welcome the initiative for ILC in Japan" and "We are experienced and ready to do it". Chip Brock, who led the Energy Frontier group, emphasized how crucial it is to carry out a precision study of the Higgs boson. The group concluded: "An international research programme focused on Higgs couplings to fermions and vector bosons to a precision of a few percent or less is required in order to address its physics." Chip also said unequivocally, "To me, it's the ILC. "

After Snowmass, the [Particle Physics Project Prioritization Panel \(P5\)](#) was put together and charged by the [High Energy Physics Advisory Panel](#) HEPAP to create a roadmap for the US programme. It is important to remember that P5 is a subcommittee of HEPAP and reports to HEPAP.

The high-energy physics community was involved in all stages of this process and invited to give input and comments. Colleagues from around the world joined in as well to report on their strategies. At the meeting at

Brookhaven National Lab in December 2013 the American linear collider community provided input to P5 and outlined a possible plan for a US contribution to the ILC in Japan.

At the March 2014 HEPAP meeting, Steve Ritz, the P5 Chairman, gave an update on the P5 process. At [this meeting](#) P5 distilled the Snowmass recommendations into five scientific drivers which are intertwined:

- Use the Higgs as a new tool for discovery
- Explore the physics associated with neutrino mass
- Identify the new physics of Dark Matter
- Test the nature of Dark Energy in detail, and probe the physics of the highest energy scales that governed the very early Universe
- Search for new particles and interactions; new physical principles

An overarching consideration in this talk and in the final report discussed today at HEPAP is that "*Particle Physics is global*". This is

already reflected in the P5 process, which involves significant regional involvement and thus has a very global approach.

The complete committee report was presented to HEPAP today, 22 May 2014, and discussions about its content were ongoing as this article was written. Steve Ritz made the presentation to HEPAP. His talk can be found [here](#) .

The P5 roadmap outlines a broad particle physics programme for the USA which addresses all the science drivers mentioned above. Here we will concentrate on and single out the parts of the roadmap that involve the ILC in Japan.

The report has a total of about 29 recommendations and there are two which are directly relevant to the ILC in Japan.

The global nature of particle physics is reflected in the first recommendations of the report which states that the US should:

“Pursue the most important opportunities wherever they are, and host unique, world class facilities that engage the global scientific community.”

At several places in the talk the ILC physics case is referred to as “*extremely strong*” and this is reflected in the second ILC-related recommendation:

“Motivated by the strong scientific importance of the ILC and the recent initiative in Japan to host it, the U.S. should engage in modest and appropriate levels of ILC accelerator and detector design where the US can contribute critical expertise. Consider higher levels of collaboration if ILC proceeds.”

This is a very strong endorsement of the ILC programme. It is another step towards realising the ILC and a potential US contribution.

In the discussion of the financial scenario, without fiscal constraints, P5 adds three items to the programme. One of them is US participation in the ILC and P5 says that it “*would enable the US to play a world-leading role in the detector program as well as provide critical expertise and accelerator components.*” They also note that “*Decisions by government on whether or not to proceed, and the levels of participation, depend on many factors, beyond the scope of P5.*”

This is a reminder that the financial scale of the ILC in Japan is such that high-level political agreements need to be established between the host country and the US side before “*higher levels of collaboration*” can be considered in the USA.

A link to the complete P5 draft report can be found [here](#).

Officially HEPAP still needs to approve the report and hopefully that will happen after the discussion either today May 22 or tomorrow.

[DOE](#) | [ILC](#) | [P5 REPORT](#) | [US](#)

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AROUND THE WORLD

From symmetry: Proposed plan for the future of US particle physics

22 May 2014



Illustration by Sandbox Studio, Chicago

Particle physics will become even more of an international endeavor in the coming decades, according to a panel charged with developing a strategic plan for the future of US particle physics, whose long-awaited recommendations were released today.

According to the panel, top priorities for US particle physics include continuing to play a major role at the Large Hadron Collider in Europe; building a world-leading neutrino program hosted in the United States; and participating in the development of a proposed future linear collider, if it is built in Japan.

“The United States and major players in other regions can together address the full breadth of the field’s most urgent scientific questions if each hosts a unique world-class facility at home and partners in high-priority facilities hosted elsewhere,” the panel members wrote in their executive summary.

The 25-member Particle Physics Project Prioritization Panel (P5) was charged in September 2013 with developing a draft strategic plan for US particle physics for the next decade and beyond. P5 reports to the federal High Energy Physics Advisory Panel (HEPAP), a 24-member body that formally advises both the US Department of Energy Office of Science and the National Science Foundation on support of particle physics.

HEPAP is expected to consider and vote on the panel’s recommendations during a two-day public meeting being held in Bethesda, Maryland, today and Friday.

The P5 report culminates a more-than-yearlong process that began with meetings of members of the US particle physics community in late July and early August of last year and ended with P5 working by consensus to create a unified strategy.

“The community was deeply engaged, and we’re very grateful for that,” says physicist Steven Ritz of the University of California, Santa Cruz, who led the P5 panel.

The plan recommends a US particle physics program that will pursue research related to the Higgs boson, neutrinos, dark matter, dark energy and inflation, and as-yet undiscovered particles, interactions and physical principles.

To keep the United States at the forefront of particle physics, the plan advocates for investing a larger portion of the DOE high-energy physics budget in the construction of new experimental facilities, raising the level from 16 to 20 to 25 percent.

“This is a discovery-driven field,” Ritz says. “In order to discover, you have to build.”

The P5 panel recommends moving forward with a variety of projects, including a number of complementary large facilities, which the panel says must be ordered in time to fit within budget constraints. The sequence of recommended large projects is: the Mu2e experiment; upgrades to the Large Hadron Collider and its experiments; and a long-baseline neutrino experiment to be based at Fermi National Accelerator Laboratory. P5 also recommends US participation in the development of an International Linear Collider in Japan, if a decision is made in Japan to go forward on the facility.

The P5 panel envisions the United States as host of an international program of neutrino research that will attract the worldwide neutrino community, operating the world's most powerful neutrino beam and, with international partners, building a major long-baseline neutrino facility complemented by multiple small, short-baseline neutrino experiments.

Launching this program will involve a change in direction, however, as the panel recommends reformulating the current Long-Baseline Neutrino Experiment as an internationally designed, coordinated and funded program called the Long-Baseline Neutrino Facility, or LBNF. The facility would use a neutrino beam at Fermilab, upgraded through the proposed project called the Proton Improvement Plan II; a massive liquid-argon neutrino detector placed underground, likely at Sanford Underground Research Facility in South Dakota; and a smaller detector placed nearer to the source of the beam.

The P5 panel recommends directing resources toward a variety of other projects requiring medium or small levels of funding.

The plan emphasizes the need for the United States to begin several planned second-generation dark-matter experiments immediately, with a vision to build at least one large, third-generation experiment in the United States near the beginning of the next decade.

It also recommends increasing funding for the particle physics components of cosmic surveys. The panel recommends completing the Large Synoptic Sky Survey (LSST) and, if funding is available, building the Dark Energy Spectroscopic Instrument (DESI). It recommends working with other agencies to fund additional joint projects such as CMB-S3, CMB-S4 and the Cherenkov Telescope Array.

The recommendations call for a change in direction in the area of accelerator and instrumentation R&D to better align it with P5 priorities. The report says that, as recent physics results have reduced the near-term necessity of muon colliders, the panel recommends consulting with international partners on the early termination of the currently underway MICE muon-cooling project.

The panel's report proposes a roadmap for US particle physics under three budget scenarios: one in which funding is constant for three years and then increases by 3 percent per year; one in which funding is constant for three years and then increases by 2 percent per year; and a third in which funding is unconstrained. The two constrained scenarios differ by about \$500 million summed over a decade.

"While seemingly small, these differences would have very large short- and long-term impacts," the report says. "Thus, the relatively small increment in funding in the higher scenario yields a very large return on investment."

In the lowest budget scenario, DESI would be cut; accelerator and detector R&D would be reduced substantially; personnel would be reduced; LBNF would be delayed; capabilities for building a third-generation dark matter experiment would be reduced or delayed; and the funding profile for Mu2e would be changed.

"The panel made tough choices in face of the reality of budgets for particle physics that have declined since the previous P5 plan," says physicist Andrew Lankford of the University of California, Irvine, the chair of HEPAP, who served on the previous P5 panel in 2008.

In an unconstrained budget, the P5 panel recommends working on a greatly expanded accelerator R&D program with an emphasis on developing transformational technology for discovery machines beyond the capabilities of the LHC and ILC; playing a leading role in the ILC detector program and providing critical ILC accelerator components; and hosting a second large, underground water Cherenkov neutrino detector to complement the proposed LBNF detector.

This article first appeared in [symmetry magazine](#).

[DOE](#) | [HEPAP](#) | [HIGH ENERGY PHYSICS](#) | [P5 REPORT](#) | [US STRATEGY](#)

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International Linear Collider makes progress in siting, R&D



Scientists and engineers met at Fermilab this week for the Americas Workshop on Linear Colliders. *Photo: Reidar Hahn*

This week, members of the Linear Collider Collaboration met at Fermilab to discuss the progress and future of the proposed International Linear Collider, as well as of CERN's Compact Linear Collider, during the [Americas Workshop on Linear Colliders](#).

At the workshop, scientists and engineers involved in the ILC discussed both their recent successes and the work still to be done to make the 18-mile-long electron-positron collider a reality.

One recent breakthrough took place at KEK. At the Japanese laboratory's Accelerator Test Facility, scientists achieved an electron beam height of 55 nanometers at the final focus, or the point where the collision would occur. This is the smallest electron beam ever produced. It was a demonstration that the techniques scientists used to shrink the beam would be transferable to the ILC, whose aim is an electron beam height of 5 nanometers.

"The ATF at KEK is an essential element in the R&D activity toward a linear collider," said Linear Collider Collaboration Director Lyn Evans. "The latest results give great confidence that the design parameters of a linear collider can be reached."

That electron beam would travel through accelerator cavities — long, hollow niobium structures that look like strings of pearls. Scientists at Fermilab have made significant advancements on this front, achieving world-record quality factors. The so-called quality factor is a measure of how effectively the cavities store energy. The more efficient they are, the lower the cost of refrigeration, which is needed to keep the superconducting cavities cold.

"This workshop at Fermilab gives us the perfect opportunity to interact with the SRF community here at the lab," said ILC Director Mike Harrison. "We take advantage of the workshop to catch up on the latest results at the lab."

For the first time, ILC researchers actively discussed the International Linear Collider in the context of a precise, geographical home — the Kitakami mountains in the Japan's Iwate prefecture. Site pictures and films at the workshop included actual accelerator and detector locations among hills and trees.

"This really gives a sense of reality to the project," said Fermilab Director Nigel Lockyer. "Now the site-specific design work needed to put the ILC in that location can begin in earnest. This has been a long time coming, and we are very pleased with this step forward."