

NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

FEATURE

Press release: Next-generation particle accelerator is ready for construction

International Linear Collider publishes its Technical Design Report



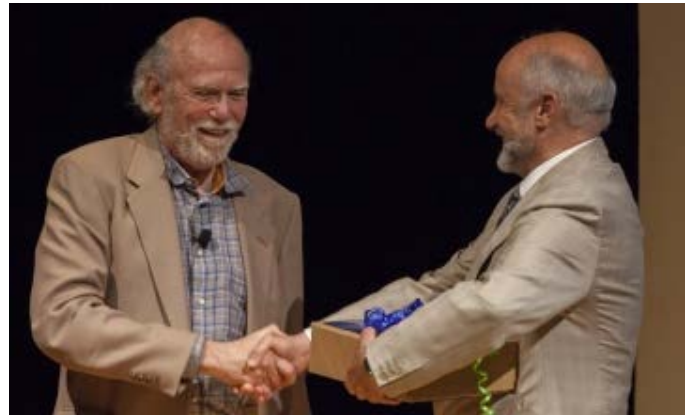
Tokyo, Geneva, Chicago – 12 June 2013. A five-volume report containing the blueprint for a future particle physics project, the International Linear Collider (ILC), was published today. In three consecutive ceremonies in Asia, Europe and the Americas, the authors of the *Technical Design Report* for the

International Linear Collider, a next-generation particle collider to complement and advance beyond the physics of the Large Hadron Collider at CERN, officially handed the report over to the international oversight board for projects in particle physics, the International Committee for Future Accelerators ICFA. The Technical Design Report presents the latest, most technologically advanced and most thoroughly scrutinised design for the ILC.

DIRECTOR'S CORNER

The Global Design Effort completes its mandate in style and substance

by Barry Barish



The Global Design Effort has completed its mandate to produce a technical design for the ILC. Yesterday's official handover of the *Technical Design Report* to ICFA was the culmination of a celebratory three continent event this week. The discovery of the Higgs particle at the LHC at CERN, the production of a viable design for a complementary electron-positron linear collider and the interest of the Japanese in hosting this machine combine to greatly encourage our communities' hopes and dreams of building the ILC.

VIDEO OF THE WEEK

Worldwide video



The nature of a worldwide event happening consecutively in three regions of world is that people can only attend one of the three. So when celebrations ended in Japan and started in Europe, a video of the Asian event showed the participants in Europe what had happened during the day. Likewise, when Europe handed over the Americas, a summary video showed the key moments of both the Asian and the European celebrations. Watch these videos here.

IMAGE OF THE WEEK



Tunnel vision

by Barbara Warmbein

During the ECFA LC2013 workshop that took place at the end of May at DESY in Hamburg, the LC management, civil engineering and machine-detector interface experts visited the tunnel of the future European X-Ray Free-Electron Laser XFEL - a week before construction was officially finished. DESY and the European XFEL celebrated the completion of the construction work with a ceremony, atmospheric lights and music in the new tunnel. Watch the [slideshow](#).

IN THE NEWS

from *The Asahi Shimbun*

13 June 2013

[Japan a candidate to house planned super-collider](#)

Japanese researchers plan to choose a final candidate by the end of July for submission to the government for approval.

from *Le Temps*

13 June 2013

[ILC, l'accélérateur de particules du futur](#)

...l'ILC fait se rencontrer des particules élémentaires, les électrons et les positrons, dont les interactions sont moins complexes et dont on peut bien maîtriser l'énergie. Il devrait donc nous livrer des informations plus précises», indique pour sa part Sandro de Cecco, du Laboratoire de physique nucléaire et des hautes énergies du CNRS, à Paris.

from *ExtremeTech*

13 June 2013

[New 19-mile-long International Linear Collider will investigate the Higgs boson, dark energy, multiple dimensions](#)

All of the world's major particle accelerators, including the LHC and Tevatron, are circular accelerators — which is why the International Linear Collider is so interesting.

from *reuters*

12 June 2013

Japan mulls hosting global collider project – Nikkei

The government has decided to solicit construction in Japan of the International Linear Collider (ILC), a next-generation particle accelerator that will allow physicists to explore rudimentary questions about the universe, the Nikkei said.

from *El País*

12 June 2013

Más de mil físicos e ingenieros, listos para construir el futuro gran acelerador

El Informe Técnico de Diseño, en el que han trabajado expertos de más de un centenar de universidades y laboratorios de 12 países, incluye un plan de trabajo para ponerlo en marcha.

from *CNET*

12 June 2013

Scientists unveil plans for 19-mile-long particle smasher

The blueprints are ready. If it gets funded, the multibillion-dollar International Linear Collider could help solve the mystery of cosmic dark matter.

from *Gizmodo*

12 June 2013

Planet Earth Can't Afford Its New Gigantic Particle Accelerator

A team of scientists unveiled the technical designs for the International Linear Collider (ILC), a proposed particle accelerator that could unravel the deepest mysteries of the universe.

from *The Register*

12 June 2013

You've seen the Large Hadron Collider. Now comes the HUGE Hadron Collider

The ILC will be able to study this elusive particle in greater detail and boasts extra-sensitive instruments to measure the collisions between electrons and positrons, which are crashed into one another at high speeds in the hope of producing a Higgs Boson. All that's left to do now is pitch the design to governments. Oh, and build it.

from *El País*

12 June 2013

Preparando ya otro gran acelerador

Hoy se presenta a escala mundial el que debe ser el futuro gran acelerador de partículas, el ILC (siglas en inglés de Colisionador Lineal Internacional), y sus detectores. Será una máquina lineal, en lugar de circular, medirá 35 kilómetros y Japón quiere alojarla.

from *Ansa.it*

12 June 2013

Luce verde al successore dell'acceleratore Lhc

Si chiama Ilc, presentato in Giappone, Europa e Usa. Il progetto ha coinvolto una squadra internazionale di ricerca che comprende oltre mille fra ricercatori e ingegneri di oltre 100 università e laboratori di oltre 20 Paesi. L'Italia partecipa, nell'ambito del Cern, con l'Istituto Nazionale di Fisica Nucleare (Infn).

from *The Verge*

12 June 2013

Scientists release plans for new largest particle accelerator, designed to find dark matter

But there are still two major obstacles standing in the way of the construction of the ILC at this point, namely, finding a host country for the project and funding it. Japan is the leading likely candidate for where the new collider may be built, with two potential sites located in the mountains, where construction is more challenging.

from *Corriere del Ticino*

12 June 2013

Cern: l'acceleratore ha già un "erede"

È all'apice della "carriera" e della fama, soprattutto dopo la scoperta del bosone di Higgs, ma il più grande acceleratore di particelle del mondo ha già un successore. Ha avuto infatti luce verde la costruzione dell'International Linear Collider (Ilc), un acceleratore lineare che avrà il compito di completare e approfondire le scoperte fatte con l'Lhc e, forse, fare i primi passi nel regno della cosiddetta "nuova fisica".

from *RIA Novosti*

12 June 2013

Представлен технический проект Международного линейного коллайдера

Физики из многих стран мира закончили работу над техническим проектом ускорителя нового поколения — Международного линейного коллайдера (ILC), "наследника" Большого адронного коллайдера (БАК), говорится в сообщении коллаборации линейного коллайдера, которая объединяет множество ученых, в том числе из России.

from *tweakers.net*

12 June 2013

Wetenschappers willen grotere opvolger voor Large Hadron Collider

Een internationale groep van wetenschappers heeft zijn goedkeuring gegeven aan een ontwerp voor een nieuwe deeltjesversneller. Deze International Linear Collider wordt langer dan de Large Hadron Collider en wordt waarschijnlijk in Japan gebouwd.

from *europapress.es*

12 June 2013

Se presenta el diseño del acelerador mundial de partículas de próxima generación

El documento (...) contiene todos los elementos necesarios para proponer la construcción del nuevo colisionador, el ILC, a los gobiernos colaboradores e incluye un diseño técnico y un plan de implementación "realista y optimizado para un rendimiento, coste y riesgo".

from *technopat.net*

12 June 2013

Uluslararası Doğrusal Çarpıştırıcı İnşaat İçin Hazır

Doğrusal Çarpıştırıcı Birliği (Linear Collider Collaboration), Uluslararası Doğrusal Çarpıştırıcı projesi için bir çalışma (PDF) yayınladı. 31 Km uzunluğundaki elektron-pozitron çarpıştırıcısı, CERN'in şu an kullandığı Büyük Hadron Çarpıştırıcısı'ndan fiziksel olarak ve performans bakımından katbekat güçlü.

from *The Hindu (Blog)*

11 June 2013

Ringin in the new age

All these factors combine to position the ILC as a complementary device to the LHC, its purpose. (...) In short, the ILC will make precision measurements where the LHC leaves off. For instance, the linac will measure the mass, spin and strength of the Higgs boson's interaction with other particles. It will also go after the elusive dark matter.

from *Press Trust of India*

9 June 2013

World's biggest' particle accelerator to be 32 km long

"The LHC is a very noisy machine. For every billion collisions we get just one Higgs boson. The ILC is a precision instrument designed as a Higgs factory," Lyn Evans, Cern's project leader for the ILC, said. (...) "The next enormous prizes for these machines is finding dark matter, which makes up most of the mass in the universe but so far has never been seen," he said.

from *The Sunday Times*

9 June 2013

Particle hunter to be a smashing 20 miles long

The LHC's successor, the International Linear Collider (ILC), will smash subatomic particles together with such force that it could reveal evidence for new forms of matter and extra dimensions of space.

from *Japan Times*

6 June 2013

Kyushu in push to host accelerator

Local governments, businesses and academic institutions in Kyushu have launched all-out joint efforts to host a proposed next-generation particle accelerator to study fundamental questions about the universe's makeup.

from *Japan Times*

5 June 2013

Panel to pick site for new accelerator

Japan will choose a site as early as next month for a proposed next-generation particle accelerator to study the fundamental components of the universe, according to the head of the selection panel.

from *Symmetry Magazine*

5 June 2013

The ILC through two lenses

Now that Japan has expressed interest in hosting the International Linear Collider, the next-generation particle collider that will seek to better understand phenomena including the Higgs boson and dark matter, the big question is where in Japan the 31-kilometer-long machine might be built.

from *Science*

31 May 2013

Europe's Updated Particle Physics Plan Weighty With Global Implications

CALENDAR

Upcoming events

[XXVI International Symposium on Lepton Photon Interactions at High Energies \(2013 Lepton Photon Conference\)](#)

UCSF Mission Bay Conference Center, San Francisco, CA, USA

24- 29 June 2013

[IHEP XXIX-th International Workshop on High Energy Physics](#)

Protvino, Russia

26- 28 June 2013

[International Conference on High Energy Physics \(ICHEP 2013\)](#)

Zurich, Switzerland

30- 31 July 2013

[View complete calendar](#)

PREPRINTS

arXiv preprints

[1306.0571](#)

The global electroweak Standard Model fit after the Higgs discovery

[1306.0279](#)

Pair production of a 125 GeV Higgs boson in MSSM and NMSSM at the ILC

[1305.7300](#)

Kalman-filter-based track fitting in non-uniform magnetic field with segment-wise helical track model

[1305.6397](#)

How well do we need to measure the Higgs boson mass and self-coupling?

ANNOUNCEMENTS

The TDR is online

The *Technical Design Report* is out and you can [download it here](#). There is also a dedicated TDR website, "[from design to reality](#)", showing the content of Volume 5 of the TDR (the "outreach volume").

Physics at ILC and its status in Japan

Talk by Hitoshi Murayama (Kavli IPMU, Japan) on Wednesday 19 June from 11:00 to 12:00 (Europe/Paris) at LAL (Auditorium Pierre Lehmann). The talk will be [webcast](#).

FEATURE

Press release: Next-generation particle accelerator is ready for construction

International Linear Collider publishes its Technical Design Report

13 June 2013



Rolf Heuer, member of ICFA, receiving the Technical Design Report from European Regional Director Brian Foster. Image: CERN

Tokyo, Geneva, Chicago – 12 June 2013. A five-volume report containing the blueprint for a future particle physics project, the International Linear Collider (ILC), was published today. In three consecutive ceremonies in Asia, Europe and the Americas, the authors of the *Technical Design Report* for the International Linear Collider, a next-generation particle collider to complement and advance beyond the physics of the Large Hadron Collider at CERN, officially handed the report over to the international oversight board for projects in particle physics, the International Committee for Future Accelerators ICFA. The *Technical Design Report* presents the latest, most technologically advanced and most thoroughly scrutinised design for the ILC.

In a global event starting in Tokyo, Japan, continuing at CERN in Geneva, Switzerland, and ending at Fermilab, Chicago, in the United States, scientists and their guests are celebrating this achievement in symposia, public events, receptions and a series of handover ceremonies. At each regional part of this

global event, one full set of the report is handed over and the three regions give each other a virtual handshake by videoconference when one celebration ends in one time zone and the next starts in another.

“We thank the ILC team for this report and look forward to witnessing the next step of the project,” said ICFA Chair Pier Oddone. *“The report is a testament to the global effort and cooperation that went into successfully designing a machine of this sophistication and scale.”*

“The publication of the Technical Design Report represents a major accomplishment. A huge amount of work has gone into it. The TDR makes a convincing case: thanks to all the hard work, we now have a machine that we know we can build,” said Jonathan Bagger, chair of the International Linear Collider Steering Committee. *“The ILC is good to go.”*

“The Technical Design Report basically says that we are ready to go ahead,” said Barry Barish, Director of the ILC’s Global Design Effort. *“The technology is there, the R&D milestones have been achieved, the physics case is clear, and we could start construction tomorrow. All we need is a clear political statement, and there are strong signs from Japan that it could bid to host the project.”*

“The discovery of a Higgs boson at the LHC has made the case for the ILC even more compelling. The ILC can study its properties in detail and will thus be a great complementary machine to the already very successful LHC,” said Sakue Yamada, Research Director for the ILC.

“The Technical Design Report is an impressive piece of work that shows maturity, scrutiny and boldness. The International Linear Collider should be next on the agenda for global particle physics,” said Lyn Evans, Director of the Linear Collider Collaboration.

The *Technical Design Report* (TDR) marks the completion of many years of globally coordinated R&D and completes the mandate of the Global Design Effort. It contains all the elements needed to propose the ILC to collaborating governments, including a technical design and implementation plan, that are realistic and have been optimised for performance, cost and risk.

Highlights of the achievements include the successful construction and commissioning of superconducting radiofrequency test facilities for accelerators all over the world, great strides in the improvement of accelerating cavities production processes, and plans for mass production, as 16,000 superconducting cavities will be needed to drive the ILC's particle beams. The details of the two state-of-the-art detectors that will record the collisions between electrons and positrons are also part of the report, as well as an extensive outline of the geological and civil engineering studies conducted for siting the ILC.

The design effort continues in the new Linear Collider Collaboration, which combines the two most mature future particle physics projects at the energy frontier, the International Linear Collider and the Compact Linear Collider (CLIC), in an official organisational partnership to coordinate and advance the global development work for the linear collider.

About the ILC

Organised by the Global Design Effort (GDE), a team of scientists from around the world, the ILC is an international endeavour that brings together more than 1,000 scientists and engineers from more than 100 universities and laboratories in over two dozen countries. Consisting of two linear accelerators that face each other, the ILC will accelerate and collide electrons and their anti-particles, positrons. Superconducting accelerator cavities operating at temperatures near absolute zero give the particles more and more energy until they collide in the detectors at the centre of the 31-kilometre machine. At the height of operation, bunches of electrons and positrons will collide roughly 7,000 times per second at a total collision energy of 500 GeV, creating a surge of new particles that are tracked and registered in the ILC's detectors. Each bunch will contain 20 billion electrons or positrons concentrated into an area much smaller than that of a human hair. This means a very high rate of collisions. This high "luminosity", when combined with the very precise interaction of two point-like colliding particles that annihilate each other, will allow the ILC to deliver a wealth of data to scientists that will allow the properties of particles, such as the Higgs boson, recently discovered at the Large Hadron Collider at CERN, to be measured precisely. It could also shed light on new areas of physics such as dark matter.



Schematic overview over the ILC. Image: ILC / form one

About the LCC

The Linear Collider Collaboration is an organisation that brings the two most advanced linear collider designs, the Compact Linear Collider Study (CLIC) and the International Linear Collider (ILC), together under one roof. Headed by former LHC Project Manager Lyn Evans, it strives to coordinate the research and development work that is being done for accelerators and detectors around the world and to take the linear collider project to the next step: a decision that it will be built, and where. Some 2,000 scientists — particle physicists, accelerator physicists, engineers — are involved in the ILC or in CLIC, and often in both projects. They work on state-of-the-art detector technologies, new acceleration techniques, the civil-engineering aspect of building a straight tunnel of at least 30 kilometres in length, a reliable cost estimate and many more aspects that projects of this scale require. The Linear Collider Collaboration ensures that the synergies between both projects are used to the maximum.

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More information:

- TDR handover event page www.linearcollider.org/worldwideevent
- General public website for the *Technical Design Report* www.linearcollider.org/from-design-to-reality
- Download the *Technical Design Report* www.linearcollider.org/ILC/TDR
- Images, videos and background info www.linearcollider.org/images/
- Laboratories, institutes and universities involved in the ILC (interactive map) www.linearcollider.org/ILC/The-

[people/Laboratories-institutes-and-universities](#)

Translations:

- [Japanese version](#)
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DIRECTOR'S CORNER

The Global Design Effort completes its mandate in style and substance

Barry Barish | [13 June 2013](#)



Global Design Effort director Barry Barish handing over the ILC Technical Design Report to Pier Oddone, chair of the International Committee for Future Accelerators on 12 June 2013. Image: Cindy Arnold, Fermilab.

The Global Design Effort has completed its mandate to produce a technical design for the ILC. Yesterday's official handover of the [Technical Design Report](#) to the International Committee for Future Accelerators (ICFA) was the culmination of a celebratory three continent event this week. The discovery of a Higgs particle at the LHC at CERN, the production of a viable design for a complementary electron-positron linear collider and the interest of the Japanese in hosting this machine combine to greatly encourage our communities' hopes and dreams of building the ILC.

Over the past 50 years, three generations of particle accelerators have uncovered many of the secrets of particle physics by colliding protons on protons, as a broad-band discovery device, combined with colliding electrons on positrons as a precision probe of the physics. Through research using these complementary colliders, we have made a plethora of discoveries about the basic constituents of matter and fundamental symmetries in nature. The International Linear Collider represents our plan to build an electron-positron collider complementary to the Large Hadron Collider (LHC) at CERN. The ILC will make possible precision studies of the underlying

physics of the Higgs, as well as provide a different way of discovering the physics of this new energy regime.

Developing such a companion electron-positron machine presents an extraordinary challenge. Electrons and positrons are 2,000 times lighter than a proton and, consequently, at high energies they radiate away much of their energy when bent around a circular orbit in a traditional collider. In fact, the LEP accelerator was limited by such radiation and a new approach is needed to reach the higher energy scale being explored by the LHC. This goal has stimulated the development of linear colliders, consisting of two linear accelerators, one for electrons and the other for positrons, aimed to collide their particle beams with each other. The linear collider scheme solves the radiation problem, but introduces a whole set of new problems that come with a 'single-pass' machine. In contrast to having counter-rotating circular colliders where the particles go around the machine multiple times, the beams in a linear collider pass through each accelerating element only once. Therefore, these accelerating elements must be made to be very efficient at transferring energy to the particles. In addition, at the collision point the beams also cross each other only once so that very dense particle bunches must be produced to achieve the needed collision probability.

Ambitious R&D programmes were carried out towards a linear collider in the 1990s, especially at SLAC and KEK on room temperature technologies and at DESY on superconducting technologies, and they successfully demonstrated the viability of both technologies. ICFA then took on the role of defining the physics goals and choosing the technology (superconducting radiofrequency cavities) to be the basis for the design of the linear collider. ICFA formed the Global Design Effort (GDE) and appointed me as director in 2005 to lead the enabling R&D programme and accelerator design effort.

We then formed a truly global collaboration with the ultimate goal to develop and document a technical design for a future collider project. That step has now been accomplished! The GDE presented the five-volume TDR to ICFA at the worldwide event this week. The ILC TDR design has been thoroughly reviewed for the technologies, the accelerator design and the cost estimates. We now have a design that will be used as the basis of proposals to governments to build the next great particle accelerator.

The Global Design Effort has in itself been a rather unique 'experiment.' The GDE was formed as a global collaboration, having no

central or lead laboratory. To succeed we needed very good support and oversight for a programme distributed among high-energy laboratories around the world. We received consistent scientific and technical guidance from ICFA and its subcommittees, and similarly, management and financial guidance from the FALC. FALC also provided a small common fund that has been used to administer and run the collaboration and to develop a set of joint tools, like a document and data management systems.

But, the real success of the GDE has been due to the pooled talents, dedication and hard work of the teams of accelerator and particle physicists who dedicated themselves to this project. They are the authors of the TDR. I thank them all, but today I particularly want to note and thank the GDE Executive Committee (EC), which served with me from the beginning as the leadership of the GDE. This dedicated group has met via teleconferences once per week for the past eight years with near perfect attendance, and in addition, has met face to face all around the world every couple of months to carry out the distributed business of the GDE. This EC has had great stability and, amazingly, has made numerous important and sometimes controversial decisions on technical issues, collaboration policies and strategic questions, without once taking a formal vote!



The executive committee in 2007 (getting a shot of good Italian coffee).

I believe I speak for all of us in saying we are very proud of what we have accomplished and have documented in the TDR and handed over to ICFA.

But, what really will matter in the end is turning this design into a real accelerator project. We are now passing the baton on to Lyn Evans and his Linear Collider Collaboration (LCC), which has both new leadership and substantial continuity. I wish them well and am confident that this group, working in concert with the Japanese, will be able to take the next big step towards making the linear collider a reality.

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Note from the editors: More about the ILC history and its people in [Global Design Efficiency – the story of a group revolution](#). You can add your own memories here!

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Summary of the [Asian part of the worldwide event](#)



Summary of the [European part of the worldwide event](#)



IMAGE OF THE WEEK

Tunnel vision

Barbara Warmbein | [13 June 2013](#)

During the ECFA LC2013 workshop that took place at the end of May at DESY in Hamburg, the LC management, civil engineering and machine-detector interface experts visited the tunnel of the future European X-Ray Free-Electron Laser XFEL – a week before construction was [officially finished](#). DESY and the European XFEL celebrated the completion of the construction work with a ceremony, atmospheric lights and music in the new tunnel.

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