

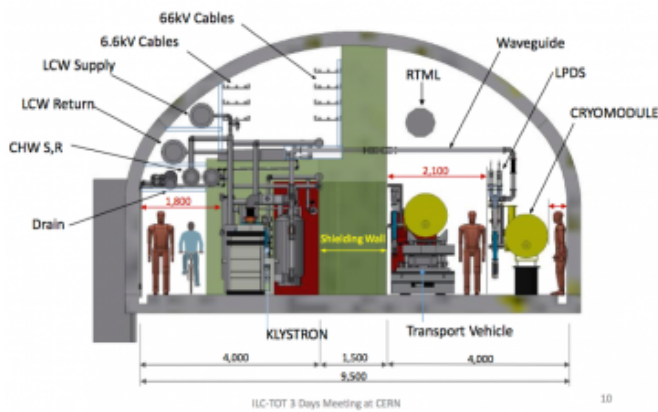
NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

FEATURE

How great does the ‘Great Wall’ have to be?

by Ricarda Laasch



A long-standing issue that had kept civil engineers and accelerator developers busy has now been resolved: the design option of the loaf-shaped Kamaboko tunnel will have a separating wall of 1.5 metres.

DIRECTOR'S CORNER

Rethinking the linear collider in view of the bump

by Lyn Evans



The bump at 750 GeV in the LHC data holds the particle physics community in its grip. Reporting from last week's ECFA Linear Collider Workshop in Spain, LCC director Lyn Evans says that participants discussed what this could mean for the ILC and its configuration. He also summarises the status discussions and keeps fingers crossed for new developments in superconducting RF technology.

IMAGE OF THE WEEK



Impressions from Santander

Images: IFCA (CSIC, Universidad de Cantabria), Foto Zubieta (Santander, Spain)

You cannot miss that there was a big linear collider meeting last week: the Director's Corner gives a summary of results and the Feature highlights a key decision taken during the workshop. Here are some visual impressions of the week, including from the Japanese-Spanish industrial forum on accelerator technologies and advanced detector instrumentation, the opening and some of the sessions.

IN THE NEWS

from CERN Courier

June 2016

[Particle flow in CMS](#)

This approach was first introduced at LEP with great success, before being adopted as the baseline for the design of future detectors for the ILC, CLIC and the FCC-ee. The same ambitious approach has been adopted by the CMS experiment, for the first time at a hadron collider.

from University of Cantabria

7 June 2016

[Eckhard Elsen at the ECFA Lineal Colliders Workshop 2016, Santander](#)

Video interview

from Noticias de la Universidad de Cantabria

3 June 2016

[Elsen, director científico del CERN: “Los aceleradores nos darán muchas respuestas sobre nuestro Universo”](#)

El Congreso sobre Colisionadores Lineales del Comité Europeo de Futuros Aceleradores (ECFALC2016) se ha inaugurado ayer en una sesión presidida por el rector de la Universidad de Cantabria, Ángel Pazos; Marina Villegas, directora general de Investigación Científica y Técnica del Ministerio de Economía y Competitividad (MINECO) del Gobierno de España; Noelia Espinosa Poyo, concejala de Empleo y Desarrollo Empresarial del Ayuntamiento de Santander; Mario Martínez Pérez, gestor del Programa Nacional de Física de Partículas y Aceleradores, del MINECO; Teresa Rodrigo Anoro, directora del Instituto de Física de Cantabria (IFCA, centro mixto CSIC – UC) y Alberto Ruiz, presidente del congreso, junto con Iván Vila (investigador del IFCA).

from eldiario.es

1 June 2016

[Más de 200 expertos debaten en Santander sobre el futuro de los colisionadores lineales](#)

Esta tarde se ha desarrollado el fórum industrial, una de las sesiones clave en el workshop. Cuenta con la participación de empresas tanto españolas como japonesas. “Sesiones de este tipo tienen enorme relevancia: son un punto de encuentro en la colaboración industria-academia a nivel internacional, con importantísimas repercusiones para el fomento de la transferencia de tecnología”, explica Vila.

from RTVE

2 June 2016

[Telecantabria](#)

TV news report from the workshop starting at around minute 13

from RTVE

1 June 2016

[Cronica de Cantabria](#)

Radio interview with Iván Vila

from SER

29 May 2016

[Radio interview with Alberto Ruiz](#)

from Skip Navigation LinksNoticias de la Universidad de Cantabria

27 May 2016

[La UC reunirá en un congreso a los máximos representantes científicos e industriales del ámbito de aceleradores de partículas](#)

La UC reunirá en un congreso a los máximos representantes científicos e industriales del ámbito de aceleradores de partículas

from AIDA-2020

30 May 2016

[On Track – News for the detector community](#)

On Track is the bi-annual newsletter produced as part of the AIDA-2020 project.

CALENDAR

Upcoming events

[38th International Conference on High Energy Physics \(ICHEP2016\)](#)
Chicago, IL, USA
03- 10 August 2016

Upcoming schools

[The 2016 European School of High-Energy Physics](#)
Skeikampen, Norway
15- 28 June 2016

[Linear Collider Physics School](#)
Frauenchiemsee, Germany
20- 27 July 2016

[View complete calendar](#)

PREPRINTS

ARXIV PREPRINTS

[1606.02093](#)
Measuring the trilinear neutral Higgs boson couplings in the minimal supersymmetric standard model at e^+e^- colliders in the light of the discovery of a Higgs boson

[1605.09248](#)
Lepton flavor violating Higgs decay $h \rightarrow \mu\tau$ in the littlest Higgs Model with T-parity

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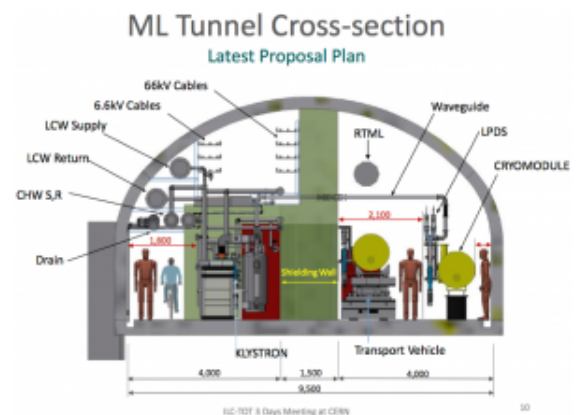
THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

FEATURE

How great does 'Great Wall' have to be?

Ricarda Laasch | [9 June 2016](#)

The question how great the (ILC tunnel's) Great Wall needs to be was answered for the Kamaboko tunnel design at the Kitakami site by the final decision of the Change Management Board to a Change Request (ILC-CR-0012) for the 25-kilometre linear-accelerator (linac) sections of the ILC. The shield wall in the '[Kamaboko' shape tunnel](#), which gets its name from the loaf-shaped Japanese fishcakes, divides the tunnel into three parts: the beam tunnel with the accelerating cavities and the high power beam, the concrete shield wall itself and the service tunnel. In the original plans for the Kitakami site the shield wall had a thickness of 3.5 metres which would have been nearly as wide as the beam tunnel with 3.8 metres and the service tunnel with 3.7 metres. Now the shield wall size was reduced to 1.5 metres, which also reduced the tunnel width from 11 to 9.5 metres. "This decision means we are one step closer to a final design," explains Ewan Paterson, who chaired the study. This gives the civil engineering and related design efforts a better basis for development of a realistic design of the interior of the linac tunnels and their contents.



New tunnel cross-section layout approved at ECFA meeting

Over the past years many different approaches and ideas for the tunnel design have been pursued. In the original Reference Design Report (RDR) a twin tunnel option was proposed because it offered the most flexible solution independent of the site specifics which were unknown at that point in time. Even though this twin tunnel was the baseline in the TDR, further development for a single tunnel design was done. Especially for the radiofrequency distribution system both options were considered. In 2011 the Kamaboko tunnel design was proposed for the mountain site in Kitakami because it offered many promising options for a final design. With a thick 3.5-metre shield wall down the middle of the tunnel a sufficient shielding to emulate twin independent tunnels was possible. Of course further design and development effort was needed on this proposal to adapt it to the needs and requirements of the ILC. But was it really necessary to have such a thick shield wall?

Finally, during the LCWS Workshop 2015 in Whistler, Canada, a full session was dedicated to the 'tunnel question': How thick does this 'great wall' have to be? In various presentations the progress of the R&D process was shown. "We had four different presentations by Nicolay Solyak, Tomoyuki Sanami, Vic Kuchler and myself on different issues related to thinning the wall," explains Paterson "All of them showed different aspects of the impact in changing the size of the wall." These presentations were followed by an open discussion on issues such as radiation safety and emergency egress passages. These discussions included many interesting aspects, like whether it would be cost-effective to have a wall with variable thickness depending on the radiation levels from dark current along the linac – an example being the quadrupoles. "The radiation would be highest around these quadrupoles, but it would also create problems during upgrades for the linac when parts would be exchanged and possibly moved," explains Paterson. Upgrade capabilities are important for a machine like the ILC, therefore such a variable thickness wall would be too limiting in case of exchange of larger parts in the linac.

After the workshop Ewan Paterson and his team summarised the presentations, proposals and discussions into a formal Change Request on the 25-kilometre wall and 'linac only' tunnel cross-section. There was consensus at the workshop that the 5-kilometre central region including the interaction point will be treated independently after further assessment of its options and requirements.

Within the Change Request not only a change of the shielding wall size but also a number of other parameters were adjusted to fit the new conditions. One important factor were the conditions for access to the service tunnel and the equipment. In the original plans of the TDR no access restrictions for the service tunnel were included as the thick shield wall would protect personnel from any high radiation conditions. For the new design, the Kamaboko tunnel with 1.5-metre-thick shielding wall, the access will be limited to times when the particle beam is switched off while other systems can stay switched on. This 'power on' scenario includes for example the radiofrequency for the cavities and the high voltage for the magnets while the thinner wall can shield personnel from the radiation produced by dark current from the powered cavities in the beam tunnel.

Additionally, due to developments in radiofrequency systems, the average failure rate for these stations is expected to be lower than assumed in the TDR. Therefore the regular downtimes of the machine would not be affected as strongly as presumed by the limited access. Hence, as assumed in the TDR, one scheduled 24-hour long maintenance day every two weeks can remain as planned.

In January the Technical Board appointed a three-man review panel consisting of ILC Director Mike Harrison as chair as well as John Osborne from CERN and Chris Adolphsen from SLAC to review the Change Request and its impact on the machine. The review panel not only analysed the submitted materials and changes but also opened the discussion with the requesters concerning possible worst scenarios for high local radiation produced from dark currents. "We discussed many different scenarios and possible sources of radiation from dark currents like magnetic fields of quadrupoles and dipoles," explains Paterson. "We even considered the fact that the linac is not straight but follows the earth's curvature. This is not insignificant over long distances." In a kilometer the linac's centerline has curved by half of the accelerator aperture which means that the particles are not moving in an absolute straight line but along the earth curvature.

"As part of our review process we made a number of simulations for the different scenarios of the tunnel cross-section," explains Mike Harrison. "These studies led us to the special conditions that we also want to implement active radiation safety for the tunnel instead of solely relying on the passive protection of the wall." The impact of the more limited access to equipment in the service tunnel than the free access assumed in the TDR was also considered and discussed between the review panel and Paterson's team.

"After this Change Request we have not only settled some important parameters for a cost of the tunnel construction by approximately 11 billion Japanese Yen ," adds Paterson. "82% of this cost reduction comes from thinning the shield wall." Additionally to this cost reduction the construction time would also be 5 months shorter!

"All factors showed that it was beneficial for the project to reduce the shield wall size and install other measures instead," explains Harrison. "Therefore the panel recommended approval to this request during the ECFA Workshop in Spain." The change was in fact approved and the change request will pass into the design baseline. This was a huge and important step for the ILC design.

[CFS](#) | [TDR](#) | [TECHNICAL DESIGN REPORT](#)

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DIRECTOR'S CORNER

Rethinking the linear collider in view of the bump

Lyn Evans | 9 June 2016



Workshop participants gather under the Spanish sun

The 2016 ECFA Linear Collider Workshop took place in the beautiful Spanish city of Santander from 30 May to 5 June. It brought together more than 200 experimentalists, theorists and machine builders to discuss the latest developments in linear-collider physics.

The Director General of KEK, Masanori Yamauchi, [summarised](#) the present status of discussion in Japan concerning hosting the ILC. The three committees set up by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) are now preparing their final reports, although no final decision will be taken before the conclusion of LHC Run II. Most likely the decision will be taken in 2018.

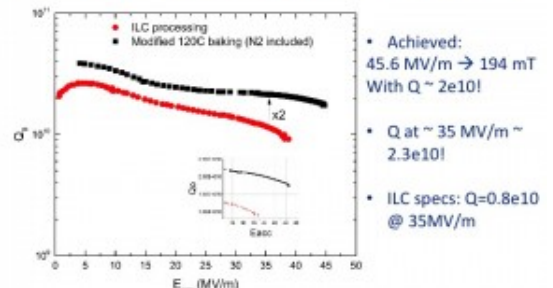
Satoru Yamashita, Project Professor at the University of Tokyo, summarised the actions aimed at gaining international support for the ILC. Bilateral discussions between MEXT and the US Department of Energy have now started with the formation of a discussion group which will meet regularly to discuss important issues such as cost sharing and governance.

The CERN Research Director Eckhard Elsen [outlined](#) the scientific programme of CERN. Top priority is full exploitation of the LHC and its luminosity upgrade. Future long-term options are being prepared for the next European Strategy meeting, probably in 2019. These include a possible staged implementation of CLIC as well as other options like a very high-energy hadron collider (FCC) and an energy upgrade of the LHC.

On the scientific side, there was much discussion of the possible sighting of a new resonance at 750 GeV at the LHC and its implications for the ILC. If this resonance is confirmed in the coming months, it is recommended that the possible option of running the ILC as a gamma-gamma collider at 1 TeV as well as an e^+e^- collider be strongly pursued. This would require a minor modification of the ILC layout.

On the machine side, there was considerable excitement about new results on nitrogen doping of superconducting cavities presented by the Fermilab group. They have previously reported progress in improving the Q value at modest gradients. They have now succeeded in improving this result to achieve simultaneously high Q and gradient on single cell cavities. They are now in the process of testing nine-cell cavities of the ILC geometry. If these tests are successful, they will have an important effect on the ILC design.

Results comparison "standard" 120C bake vs "N infused" 120C bake



Increase in Q factor of two, increase in gradient ~15%

N Solyak | High E, High Q

ECFA ILC, May 30 - Jun 5, 2016, Spain

Fermilab

New results on nitrogen doping presented by Nikolay Solyak, Anna Grassellino and Sebastian Aderhold show an improvement in both Q and gradient in single-cell cavities.

These workshops are important in bringing the community together, particularly during this period of indecision. The next workshop will be held in Morioka from 5 to 9 December 2016. It will include a visit to the proposed ILC site. It is particularly important that strong international support is shown so we hope for a good turnout from the international community

[750 GEV](#) | [ECFA LC2016](#) | [FERMILAB](#) | [GAMMA-GAMMA COLLIDER](#) | [NITROGEN DOPING](#) | [SITE DECISION](#) | [SUPERCONDUCTING RF](#) | [UNIVERSITY OF CANTABRIA](#)

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IMAGE OF THE WEEK

Impressions from Santander

Images: IFCA (CSIC, Universidad de Cantabria), Foto Zubieta (Santander, Spain) | [9 June 2016](#)

[\[Show as slideshow\]](#)



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[ACCELERATOR R&D](#) | [COMMUNITY](#) | [DETECTOR R&D](#) | [ECFA LC2016](#)

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