

NEWSLINE

THE NEWSLETTER OF THE LINEAR COLLIDER COMMUNITY

AROUND THE WORLD

LINACs in all (linear) shapes and sizes

by Barbara Warmbein



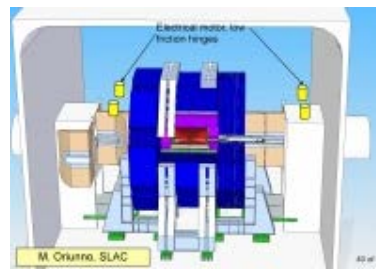
With more 200 linear accelerators around the world in operation for research, and more than 8000 linear accelerators serving industrial and medical application, future linear colliders played a

small but important role at the LINAC14 conference this week in Geneva. It's R&D for future facilities that could make all linacs more efficient and reliable.

DIRECTOR'S CORNER

In preparation for LCWS 14

by Mike Harrison



The next big linear collider meeting, LWS14, will take place in Serbia next month. Mike Harrison, Associate Director for the International Linear Collider, explains how this gathering will be key for the ILC project to discuss

cross-cutting issues between the accelerator and detector communities and the workshop will emphasise on site-specific design. It should provide the forum to allow a final review by all the interested parties before adopting the new design into the ILC baseline.

IMAGE OF THE WEEK

Linear collider scientists gather in Japan

Images: KEK and Rika Takahashi

It's meeting season in North Japan: a series of workshops held in Ichinoseki as well as in Tokyo brings together linear-collider scientists from all sorts of backgrounds: polarisation, particle sources, detector design, physics studies, and, coming up, machine-detector interface and civil engineering.



IN THE NEWS

from *symmetry*

2 September 2014

Detectors in daily life

Not only are particle detectors essential to making discoveries in particle physics, they also play important roles in industry, science and medicine.

from *Kahoku shinpo*

30 August 2014

計画 調査検討費倍増 億円

文部科学省は 日に公表した 年度予算の概算要求で、超大型加速器「国際リニアコライダー」計画の調査検討費として、前年度比倍増となる 億円を計上した。(MEXT included 100 million yen ILC investigation budget for Japan's 2015 budget request. This is twice as much increase from 2014 budget)

from *Motherboard*

30 August 2014

China's Proposed Particle Accelerator Will Be Double the Length of the LHC

Such an accelerator would make for something of a partner to the International Linear Collider, the proposed successor (in spirit) to the LHC, which would initially achieve collision energies near 500 GeV and, later, 1,000 GeV, easily dwarfing not only the proposed Beijing collider but anything yet built or even imagined.

from *Iwate Nippo*

28 August 2014

世界の科学者、続々と 北上山地周辺でILC関連会議

本県の北上山地 北上高地 の周辺で、国際リニアコライダー に関連する三つの国際会議が相次いで開かれる。(Around the Kitakami area, the candidate site for the ILC, three ILC related international meetings will be held consequently)

from *physicsworld.com*

26 August 2014

China pursues 52 km collider project

Particle physicists in China have unveiled plans to build a huge 52 km particle collider that would smash electrons and positrons together to study the Higgs boson in unprecedented detail. The so-called "Higgs factory", if given government approval, would be built by 2028 and put the country at the forefront of international particle physics.

from *Iwate Nippo*

24 August 2014

誘致へ地元の役割再認識 奥州・水沢でILCシンポジウム

国際リニアコライダー の誘致実現に向けたシンポジウム「 の日本実現に向けて」 いわて 加速器科学推進会議 など主催 は 日、奥州市水沢区の市文化会館で、約 人が参加して開かれた。(On 23 August, ILC symposium was held at a civic hall in Osh city, Iwate prefecture, with 800 audiences listening to the talks toward the realisation of the ILC.)

CALENDAR

Upcoming events

27th Linear Accelerator Conference (LINAC14)

Geneva, Switzerland

01- 05 September 2014

MDI-CFS Meeting on ILC Interaction Region Issues

Otemachi, Ichinoseki, Iwate, Japan

04- 06 September 2014

ILD meeting 2014

Oshy City, Iwate, Japan

06- 09 September 2014

3rd International Beam Instrumentation Conference (IBIC 2014)

Monterey, California, USA - hosted by SLAC

PREPRINTS

ARXIV PREPRINTS

1409.0828

A Study of Magnetic Shielding Performance of a Fermilab International Linear Collider Superconducting RF Cavity Cryomodule

1409.0005

Testing Electroweak Baryogenesis with Future Colliders

1408.5944

Neutral 3-3-1 Higgs Boson Through e^+e^- Collisions

1408.5878

Inverse Type II Seesaw Mechanism for Neutrino Masses

1408.5134

The two-loop soft function for heavy quark pair production at

14- 18 September 2014

[International Workshop on Future Linear Colliders 2014 \(LCWS14\)](#)

Vinca Institute of Nuclear Sciences, Belgrade, Serbia
06- 10 October 2014

[25th FCAL Workshop](#)

Vinca Institute of Nuclear Sciences, Belgrade, Serbia
12- 13 October 2014

[View complete calendar](#)

future linear colliders

[1408.4615](#)

Photoproduction of doubly heavy baryon at the ILC

[1408.4553](#)

Composite Higgs searches at the LHC and beyond

[1408.4525](#)

On the Flavor Structure of Natural Composite Higgs Models & Top Flavor Violation

[1408.4456](#)

Higgs Couplings and Phenomenology in a Warped Extra Dimension

AROUND THE WORLD

LINACs in all (linear) shapes and sizes

Barbara Warmbein | [4 September 2014](#)

While the linear collider community is working on the most viable technologies for the two linacs that will one day accelerate electron and positrons efficiently, more than 200 linear accelerators – linacs – are already in use at research institutions around the world. Nearly 500 representatives from both operating and planned linear accelerators are meeting in Geneva these days to catch up on the latest news concerning linacs of all shapes (providing it's linear) and sizes. Electron linacs, proton linacs, ion linacs; superconducting linacs, normal-conducting linacs, low-energy linacs, high-energy linacs... it's all being covered at [LINAC14](#).

The conference is held every two years and started this year with a talk by LCC Director for CLIC Steinar Stapnes on [linear collider studies](#). "The focus of the conference is on new technologies," says the chair of the local organising committee, Maurizio Vretenar from CERN, who is the project leader of CERN's LINAC4 and coordinator of a EU-funded accelerator R&D project. "How can we make power sources more efficient and reach higher gradients in the linacs? What coatings and materials are most promising? These are the questions that we address."



A plenary session during the LINAC14 meeting. Image: W. Grossiord for Linac14

Another challenge currently being tackled by the experts is the breakdown of accelerating cavities. They are trying to find out what leads to the breakdown to be able reaching higher gradients and reduce the size of future accelerating facilities.

Every talk at the conference was related to linear accelerators, but some had a more direct connection to the linear collider – for example Sam Posen's talk on [niobium-3-tin](#) and its "[Present Status and Potential as an Alternative SRF Material](#)", Alexander Romanenko on "[Breakthrough Technology for Very High Quality Factors in SRF Cavities](#)" or Jacek Swierblewski on large-scale [testing of SRF cavities and modules](#) for the European XFEL.

Did you know that there are more than 8000 linacs in operation around the world? The majority are used for industrial and medical applications. Only a small fraction are "scientific linacs" for research and accelerator R&D.

[EUROPEAN XFEL](#) | [LINAC](#) | [NB3SN](#) | [NIOBIUM](#) | [SCRF](#)

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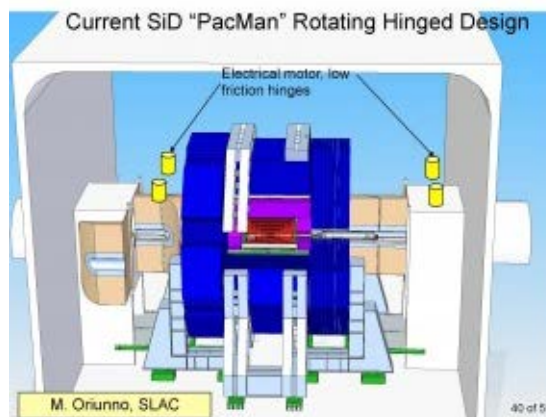
DIRECTOR'S CORNER

In preparation for LCWS 14

Mike Harrison | [4 September 2014](#)

One of the challenges involved in an international project is that of maintaining good communication among the collaboration members. While the detector community has learned over the years to adapt to this situation, typically accelerator design has been centred at a host laboratory that provided the technical leadership. The ILC design team with its global structure has required a different approach. Communications technology has advanced enormously during the past decade and the use of electronic meetings is now routine (even though time differences remain a more fundamental problem as attested to by the many late nights of our Japanese colleagues and early mornings on the west coast of the US). Certain cross-cutting issues however are still best dealt with via face-to-face interactions and this is where the linear collider workshops such as the LCWS series prove their worth. Since the time available at these workshops is finite thorough preparation is the name of the game.

There have been two main themes to the recent ILC work: technology development and a site-specific design. While not ignoring the former issue, our next global meeting, [LCWS 14](#), which will take place from 6 to 10 October in Belgrade, Serbia, will emphasise the latter. A site-specific design is necessary to establish the machine footprint which in turn allows the conventional facilities and siting (CFS) design to proceed. The machine footprint not only involves details of each component of the accelerator chain but also the detector hall layout, tunnel penetrations and tunnel cross-section. I'm sure that we all agree it would be a good idea for the two beams to collide in the centre of the detectors. For most machines this is easily accomplished by adjusting the relative phasing of the opposing bunches. For the ILC it is not quite that straightforward. In order to provide the polarised positron option the high-energy electron bunch is used to provide polarised photons on the positron production target. This design feature results in a fixed time difference between the electron and positron bunches. The collision point position is then given by the path length of each bunch as determined by the fixed machine geometry. Small adjustments are possible in the damping rings but the overall machine footprint must be calculated (and constructed) to within a tolerance of several metres. Since the path length involves interaction among all of the accelerator subsystems, LCWS 14 will be used to address this topic. The length of the main linac is part of this overall path length equation but in addition, together with the average accelerating gradient in the cryomodules, it will also determine the collision energy. Decisions must be made carefully.



A slide from the machine-detector interface talk at this week's SiD meeting. It shows the so-called PACMAN shields in the interaction region between the detector and the beam tunnel.



Just like the Ada bridge in Belgrade, where the next linear collider workshop will be held, links two municipalities, the workshop will address cross-cutting issues between accelerator and detector. Image "[Ada vatromet 1](#)" by [Littjo](#) – Own work. Licensed under [CC BY-SA 3.0](#) via [Wikimedia Commons](#).

A major factor in determining the layout of the tunnel cross-section is the radiation shielding requirements. Plan for too much shielding and the cost increases, plan for too little and operational factors can limit the luminosity. In most parts of the machine, the shielding layout is determined by the so-called worst-case accident scenario. Defining these scenarios will be a topic for discussion during our time in Belgrade for all of the sub-systems.

One topic that has received major attention since the last workshop is that of the Detector Hall layout. Steady progress has been made by the CFS and machine detector interface (MDI) working groups and hopefully a consensus approach will be established next week at Ichinoseki during the [MDI-CFS Meeting on ILC Interaction Region Issues](#). We anticipate that LCWS 14 will provide the forum to allow a final review by all the interested parties before adopting the new design into the baseline.

The formal process to ratify design changes into the ILC *Technical Design Report* baseline has been agreed upon by both the accelerator and physics & detector communities. A change request will be generated by the appropriate group. This change request will cover both the technical and cost impact of the proposed modification. It will then be approved (or not) by the change control board and the appropriate baseline documentation updated. In this way the site-specific design will start to take evolve from the TDR framework. The Belgrade workshop will be the start of this next phase in the design.

[CFS](#) | [CONVENTIONAL FACILITIES AND SITING](#) | [LCWS](#) | [MACHINE DETECTOR INTERFACE](#) | [MDI](#) | [TUNNEL DESIGN](#)

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IMAGE OF THE WEEK

Linear collider scientists gather in Japan

Images: KEK and Rika Takahashi | [4 September 2014](#)

From 27 to 29 August, the [POSIPOL 2014](#) workshop was held at the brand-new library at Ichinoseki-city, Iwate prefecture, Japan. Scientists discussed issues of polarised positron sources, high-intensity positron sources, X-ray/Gamma-ray sources, and their applications. The R&D on positron source technology is crucial for the realisation of the proposed future linear colliders, ILC and CLIC.



Participants of POSIPOL 2014 held at Ichinoseki-city, Iwate, Japan. Image: KEK

On 2 and 3 September, the SiD workshop was held at the University of Tokyo, Tokyo, Japan. This was as special SiD workshop, being the first workshop in Asia. Participants identified the present status of work on SiD, and the many opportunities for the way forward were discussed. Some of the participants will join the ILC site tour hosted by ILD workshop to be held at Oshu city, Iwate.



Group photo of the participants of the Special Sid Workshop held at the University of Tokyo, Tokyo, Japan. Image: Rika Takahashi

[DETECTOR R&D](#) | [IWATE PREFECTURE](#) | [POLARISATION](#) | [POSIPOL](#) | [POSITRON SOURCE](#) | [SID](#)

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