ilc newsline

26 JANUARY 2012

IMAGE OF THE WEEK

We're ready for our close-up

Image: Yasuhiro Sugimoto

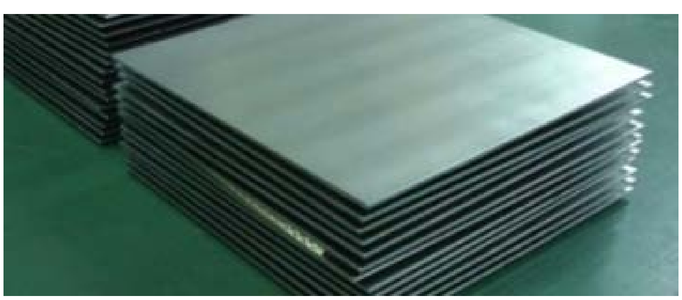
An NHK television news crew followed around ILC scientists for two days last week as they visited proposed sites for building the ILC in Japan. NHK's five-minute segment appeared on the 7 a.m. news, reaching an estimated 30 million homes.

Scientists were excited to be part of the Japanese news media. Here, Global Design Effort Director Barry Barish addresses the camera as he explains the purpose of the ILC.

AROUND THE WORLD

The capability for producing niobium sheets

by Rika Takahashi

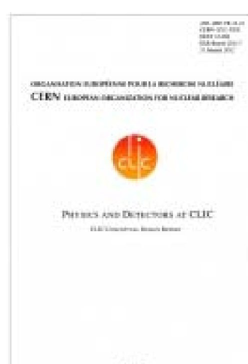


Japanese company Tokyo Denkai is boosting high-purity niobium production and processing with some new equipment and a better-outfitted shop. Should the ILC be built, the company will be able to handle the large order of niobium needed for accelerator cavities.

DIRECTOR'S CORNER

December events and challenges ahead

by Steinar Stapnes



There's a lot to be optimistic and excited about in 2012. CERN's Large Hadron Collider results should provide guidance towards a linear collider implementation and the linear collider community is technically well prepared. The ILC technology is well developed and the *Technical Design Report* is under way. The CLIC technology is also moving rapidly forward: the physics and detectors volume of the *Conceptual Design Report* was completed just last December.

IN THE NEWS

from ***The Hindu***
25 January 2012
Chasing the one trillion trillionth of a second
One would not be too off the mark when describing High Energy physicist Rohini M. Godbole as being extremely energetic. And while explaining the intricacies of gluons and the importance of the elusive Higgs-Boson particle, one is compelled to believe her when she says, "Physics is fun."

from ***Deccan Herald***
25 January 2012
In Higgs they trust
If and when the Higgs boson is nailed, the discovery will rank among the most important scientific findings of the past 100 years.

from ***CERN Bulletin***
23 January 2012
Data goes faster than ever
Using store-bought computers and commercially available optical fibre lines, researchers from the California Institute of Technology (Caltech), the University of Victoria, the University of Michigan, CERN and Florida International University broke the world speed record for LHC data transfer. They caught the attention of HEP experiments worldwide – including the LHC – which rely on ever-improving technology to share their results.

from ***PhysOrg.com***
20 January 2012
The importance of statistics in high-energy physics
Terms like "statistical significance" play a key role in categorising observed signals as hints, evidence or discovery. "Upon performing a search for a new particle or process," Dorigo continues, "you rarely observe such a huge new signal that you do not need to quantify its size or whether it may be due to a fluctuation. You have to have a procedure with which you can give a mathematical interpretation of your data in terms of how significant your result is."

from ***Aspera this month***
January 2012
What to expect in 2012?
Some announced the end of the world for 2012… For astroparticle physics, it is rather a key year for new beginnings. And it will certainly be a «hot year» on many fronts and – why not? – discoveries?

CALENDAR

UPCOMING EVENTS

3rd LC FORUM meeting
DESY, Hamburg
07- 09 February 2012

CALICE collaboration meeting
Shinshu University, Matsumoto, Japan
05- 07 March 2012

UPCOMING SCHOOLS

Physics and Technology of Particle Accelerators (JUAS 2012)
Geneva, Switzerland
09 January- 16 March 2012

USPAS sponsored by the University of Texas at Austin
Austin, Texas
16- 27 January 2012

BLOGLINE

20 January 2012
Byron Jennings
The Interpretation of Quantum Mechanics

20 January 2012
Richard Ruiz
That's Right, Count Them: 4 Quarks

PREPRINTS

ARXIV PREPRINTS

1201.4816
Light Higgsino from Axion Dark Radiation

1201.4657

Excellence in Detectors and Instrumentation Technologies (EDIT 2012)
Fermilab, Batavia, IL, USA
13- 24 February 2012

Infrastructure for Detector Research and Development towards the International Collider

View complete calendar

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26 January 2012

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JAPAN

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AROUND THE WORLD

The capability for producing niobium sheets

Rika Takahashi | 26 January 2012

One of the seven electron beam melting furnaces at Tokyo Denkai. Image: Tokyo Denkai Co., Ltd.

The International Linear Collider will need about 16,000 superconducting radiofrequency cavities, devices that accelerate electrons and their antiparticles, positrons, along microwaves to near speed of light. These cavities are made out of pure niobium, which means the ILC community needs 500 tonnes of high-purity niobium processed into nice, smooth sheets.

In the industrial session held prior to the Global Design Effort baseline technical review meeting at KEK, Japanese company Tokyo Denkai made a presentation to ILC scientists on their capability and method for producing niobium sheets for superconducting cavities.

To process the nine-cell cavities, the niobium first needs to be melted, heated to very high temperatures to remove impurities. The refined niobium is then processed into square sheets about 30 centimetres on a side. The sheets are shaped into half-cells at the cavity fabrication facilities. The half-cells are eventually welded together to form nine-cell structures.

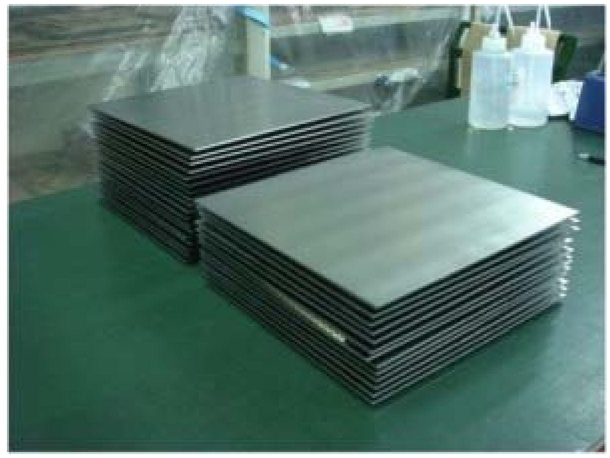
Tokyo Denkai is primarily in the business of refining and producing the mill products of tantalum and niobium. About 80 percent of their business is tantalum processing. The remainder comes from processing niobium, niobium alloys and other metal materials.

Founded in 1932 as Takeuchi Shoten (which means store or shop), Tokyo Denkai began as a metal extractor, extracting tin metal from recycled food cans. In 1959, current president Koichi Takeuchi started the tantalum business, and nine years later, entered into the niobium business. Tokyo Denkai installed two high-power electron beam melting furnaces during this period, an essential facility for producing high-purity niobium.

Their close relationship with accelerator laboratories began in 1985, when Tokyo Denkai won a bid for processing niobium sheets for superconducting cavities for KEK's TRISTAN accelerator. In 1993, they took themselves out of the recycling business, concentrating all their resources on tantalum and niobium.

In 1996, Tokyo Denkai started to supply high-purity niobium sheets to DESY laboratory in Germany for their TESLA test facility. They also supplied one-third of the material needed to produce superconducting cavities for the Spallation Neutron Source at Oak Ridge National Laboratory, US. They continued investing in melting furnaces, and by 2010, were nicely equipped with seven furnaces. (They retired one in 2010, replacing it with a new furnace one month later.)

With this great capacity for pure-niobium sheet production, Tokyo Denkai won the bid for the European XFEL, providing it with half of its superconducting half-cell material. “For that contract, we are going to supply 5,886 sheets of high-purity niobium. All the shipments are on time so far, and production is ahead of schedule,” said Hiroaki Umezawa from Tokyo Denkai. The company later received an additional order of 1,484 sheets for European XFEL GmbH.



Pure niobium sheet produced at Tokyo Denkai. Image: Tokyo Denkai Co., Ltd.

To deal with the large orders from Europe, Tokyo Denkai installed two new types of machine to reduce the production time: the automatic buffing machine and automatic etching machine. Before acquiring the machines, all the etching work had been done manually by the workers. Since this type of work uses chemical solutions and requires handling metal dust, the work came with substantial risks. “It was risky, and workers needed to work under tough environmental conditions,” said Umezawa. Because the shops were not equipped with air conditioners, windows and doors were left open all the time to keep the room ventilated. In winter, room temperatures plummeted to zero and in the summer, rose to 40 degrees Celsius. Thanks to the new machines, these tough jobs are now being done automatically. “I would like to thank DESY for the large order,” Umezawa said. “It was good motivation for obtaining those new machines.”

Tokyo Denkai estimates their capacity to produce niobium sheets for the ILC based on the capacity of its newly outfitted shop and experience from supplying a large batch to XFEL: “We can produce 4,000 sheets per year,” said Umezawa. Estimating the production period as seven years, they can supply 28,000 sheets for the ILC, which covers almost 10 percent of the total sheets needed. “However,” he added, “we can increase the capacity if necessary.”

Tokyo Denkai now has seven working furnaces, though only two of them are currently used for niobium processing. “If we use six of the furnaces to melt the niobium, the production capacity will be tripled, in principle,” said Koichi Takeuchi, company president. He also said that they are upgrading the furnaces to increase productivity.

Tokyo Denkai concluded that increased production can take place only under two conditions. One is of course a stable electric supply. The other essential element, said Takeuchi, is “the continuous supply of sufficient raw niobium material. We do need to consider reserving a large amount of raw material for the project as big as the ILC,” Takeuchi said. “Otherwise, it becomes impossible to supply stably if the price rises drastically.” This might be an issue for the ILC project to consider. Scientists will continue to communicate closely in advance with industries about similar issues to bring the realisation of the ILC one step further.

ACCELERATOR R&D | JAPAN | NIOBIUM | SRF TECHNOLOGY | SUPERCONDUCTING CAVITY | XFEL

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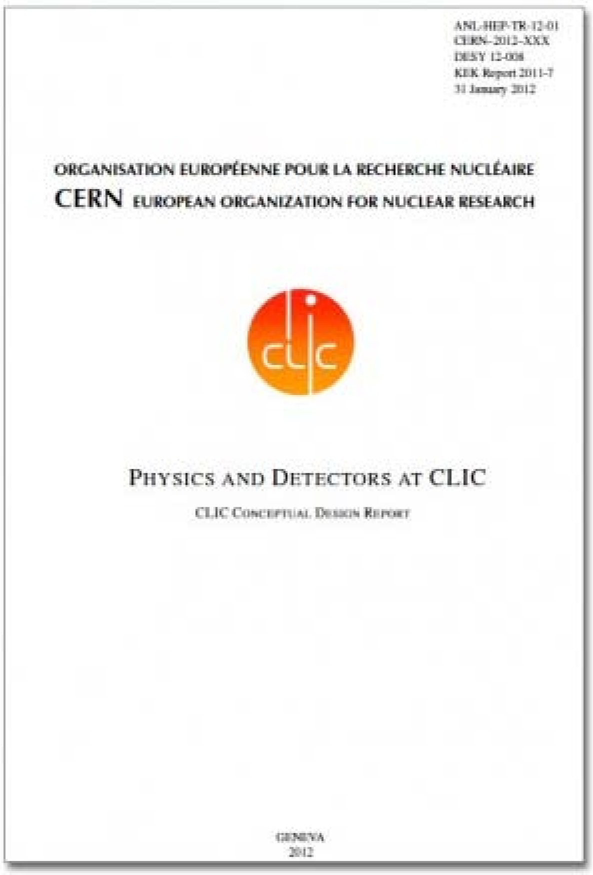
ANL-HEP-TR-12-01
CERN-2012-XXX
DESY 12-008
KEK Report 2011-7
31 January 2012

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

PHYSICS AND DETECTORS AT CLIC
CLIC CONCEPTUAL DESIGN REPORT

GENEVA
2012

CLIC Physics and Detector Conceptual Design Report (CDR) was completed in December 2011. Image: CLIC

Finally – finally we start to see results from CERN's Large Hadron Collider (LHC) that can provide guidance towards a linear collider implementation. It is too early to be conclusive, and more data is definitely needed, but we can be optimistic and excited about 2012. The LHC experiments are zooming in on a low energy Standard Model-like Higgs and by the end of 2012 much more precise results can be expected concerning this possibility, provided the machine can deliver the luminosities promised. In December the LHC's ATLAS and CMS experiments reported their Higgs analyses status at CERN. The reactions and interpretations were mixed, but everybody was impressed by how quickly and comprehensively the data had been examined.

At the same time we know that the LHC experiments continue to search for signatures of Beyond Standard Model physics, for example supersymmetric models and other high-energy phenomena. We also know that many of these phenomena can be thoroughly studied at a linear collider (LC) and they provide a significant part of the LC physics case. In this area we presumably still have to be patient, as only after its long shutdown in 2013-14 will the LHC reach its full energy and be able to push the SUSY limits and discovery potential fully. However, maybe we can be lucky already in 2012; sometimes it does not hurt to be optimistic. In any scenario, the LHC is now really starting to guide the way, as we have all hoped for.

Are we prepared? Technically, probably yes. The ILC technology is well developed – the *Technical Design Report* (TDR) is under way. The CLIC technology is also moving rapidly forward – a *Conceptual Design Report* (CDR) is being completed these days, though it is less mature than the ILC technology. The detector studies are, in my view, well developed. If one compares to the extrapolation in performance one had to make and plan for during the LHC detector construction period, the LC detectors are well advanced and many of the functional parameters are being demonstrated. We also know the key technologies continue to make progress and that many of these technologies can be fully exploited in an LC detector where the radiation levels are more modest than at LHC.

Another milestone in December from my perspective was the completion of the CLIC Physics and Detector Conceptual Design Report. The feasibility of making detailed measurements up to 3 TeV, with the demanding beam time structure of CLIC, is well demonstrated. Most other cases are likely easier. The work and document was reviewed by external experts in October and presented to the CERN Scientific Policy Committee in December by Lucie Linssen. This work is an excellent example of a common LC effort where physicists with ILC and/or CLIC main interests have worked together very efficiently. It was well received, with the main comments emphasising the need for a machine implementation that allows operation at a wide range of energies and that can be adapted to the physics landscape emerging from LHC running. The accelerator volume of the CDR is also under way and will be presented to the same committee in March 2012, including recent measurements in the CLIC test facility at CERN. One can now also sign up to support the studies presented in the CLIC CDR.

Do we have the processes in place that make a linear collider a reality? Not fully, but we are making progress. If one asks physicists around the globe what the timescale, site, and technical implementation of the optimal machine are, one will get different answers. The answers reflect regional views as well as views and hopes of which physics may be within reach. So indeed, more physics guidance will make these choices much easier. Setting up a global LC organisation, involving the entire community, with clear and unique communication lines between the accelerator studies and detector and physics communities is mandatory. The organisations today for ILC and CLIC, including many common working groups, have served us well for the CDR and TDR phases, but now is the time to think ahead. Again there are different views, as there should be, but I hope and believe a common way forward can be found. Important progress was made during the International Linear Collider Steering Committee (ILCSC) meeting in Mumbai in August 2011, and the forthcoming ILCSC meeting in Oxford will be important to continue this process.

In every region there are roadmap processes planned or under way. In Europe the so-called European Strategy Update process will take place this summer and autumn and conclude in early 2013, and I have recently followed a Physics Department Faculty meeting at CERN where the process was outlined in more detail. A large fraction of the same meeting was used to discuss LC matters, with a particular focus on the CLIC detector and physics studies recently concluded. The need to present the case for a LC that can complement and provide significant improved physics results compared to those that can be expected from a luminosity-upgraded LHC was repeatedly mentioned. This is clearly the challenge we have to rise to, and we should be able to provide such answers. Again, this challenge will be significantly easier if early LHC running can provide more guidance of what models to concentrate on, but in absence of this we can demonstrate the same for a representative set of possible models. It will be another busy year.

CDR | CERN | CLIC | EUROPEAN STRATEGY FOR PARTICLE PHYSICS | LHC | PHYSICS AND DETECTORS