

AROUND THE WORLD



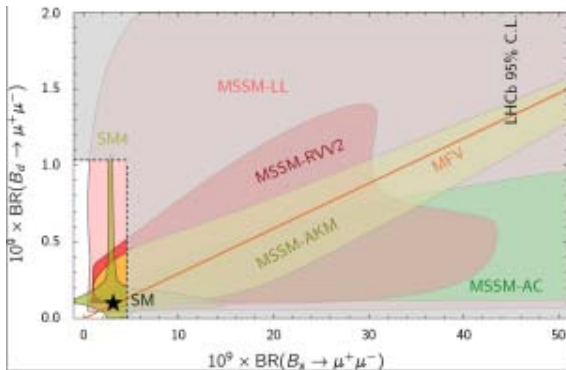
A cavity made in KEK's Cavity Fabrication Facility

by Rika Takahashi

KEK's recently established Cavity Fabrication Facility is a one-stop shopping facility for fabricating superconducting radiofrequency cavities. The fully equipped facility provides a unique and valuable opportunity: a full sequence of R&D for cavity fabrication on one laboratory's premises.

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From CERN Bulletin: Rencontres de Moriond 2012



At the biggest particle physics winter conference, the [Rencontres de Moriond](#) held in La Thuile in Italy from 3-17 March, scientists presented loads of new results, including some on the search for the Higgs boson and on new physics beyond the Standard Model. The *CERN Bulletin* covered some of these results in last week's edition.

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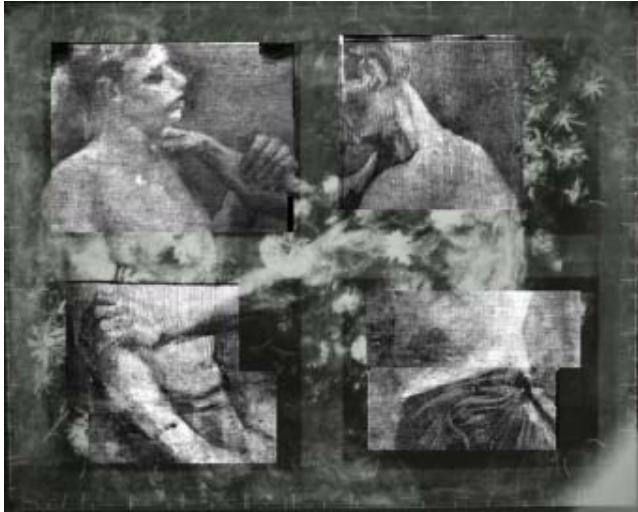
GDE Executive Committee meets face to face

by Barry Barish



The Global Design Effort Executive Committee met face to face in Washington, DC, last month. One of the main goals was to agree on the detailed plan towards completing the *Technical Design Report*, including decisions about the level of detail that will be included in the actual report and how to ensure that the backup documentation will be readily available.

IMAGE OF THE WEEK



Wrestling under an X-ray beam

A beam of particles helps authenticate an early Vincent van Gogh painting

Image: Kröller-Müller Museum

DESY's synchrotron radiation source DORIS has helped settle a decades-old question of whether van Gogh painted the 1886 *Still life with meadow flowers*. Using macro scanning X-ray fluorescence spectroscopy, scientists were able to analyse the canvas's layers of paint with greater detail than had been possible previously.

Earlier X-ray analyses had shown that a painter - suspected to be van Gogh - had painted a scene of two wrestlers on the canvas before painting the flower still life over it several months later. DESY's work revealed even more, in particular, the color palette the painter used for the two wrestlers and their relative state of dress. Both attributes helped authenticate the work as a van Gogh.

A beam of particles (figuratively) painted picture of greater detail.

[Read the DESY press release](#)

IN THE NEWS

from **Discovery News**

19 March 2012

[Success! LHC Sets New Energy Record](#)

Over the weekend, physicists and engineers at the Large Hadron Collider (LHC) nudged proton beam energies to a new record: 4 Tera-electron volts (TeV). This record comes shortly after CERN announced last month they'd be cranking up the juice through 2012.

from **Science**

16 March 2012

[Key Neutrino Measurement Signals China's Rise](#)

Racing to beat competitors around the world to make a key measurement, they worked through the 23 January holiday and surrounding festivities. "Those of us working on the data analysis didn't take time off," says Yifang Wang, co-spokesperson for the Daya Bay collaboration and director of the Institute of High Energy Physics (IHEP) in Beijing. "We were determined to do this."

from **Scientific American**

16 March 2012

[Not So Fast: Independent Measurement Shows Neutrinos Don't Exceed Speed of Light](#)

Albert may still be right. An attempt to repeat an experiment that showed a subatomic particle traveling faster than the speed of light suggests that the earlier result may have erred, and that Einstein's famed special theory of relativity remains intact.

from **symmetry breaking**

14 March 2012

[Scientists send encoded message through rock via neutrino beam](#)

Scientists recently proved possible a new way to converse when radio waves won't do. For the first time, physicists and engineers have successfully transmitted a message using neutrinos.

CALENDAR

UPCOMING EVENTS

[ILC Mechanical & Electrical Review and CFS Baseline Technical Review](#)

CERN

21- 23 March 2012

[AIDA - Academia meets Industry: Solid-State Position Sensitive Detectors](#)

DESY, Hamburg, Germany

26- 27 March 2012

[AIDA 1st Annual Meeting](#)

DESY, Hamburg, Germany

28- 30 March 2012

[Joint ACFA Physics and Detector Workshop and GDE meeting on Linear Collider \(KILC12\)](#)

Daegu, Korea

23- 26 April 2012

UPCOMING SCHOOLS

[USPAS sponsored by Michigan State University](#)

Grand Rapids, Michigan, US

18- 29 March 2012

[AIDA Student Tutorial - Solid State Detectors](#)

DESY, Hamburg, Germany

27 March 2012

[View complete calendar](#)

BLOGLINE

13 March 2011

CERN

[Much food for thought at major physics conference](#)

PREPRINTS

ARXIV PREPRINTS

[1203.3750](#)

Development of CMOS Pixel Sensors fully adapted to the ILD Vertex Detector Requirements

[1203.3365](#)

Linear Collider Test of a Neutrinoless Double Beta Decay Mechanism in left-right Symmetric Theories

[1203.3689](#)

Development of Single- and Double-sided Ladders for the ILD Vertex Detectors

AROUND THE WORLD

A cavity made in KEK's Cavity Fabrication Facility

Rika Takahashi | 22 March 2012

To realise the International Linear Collider, scientists need to address many issues. One of the most important is the primary cost driver for the ILC, the superconducting radiofrequency (SCRF) cavity and cryomodule systems. At KEK, the team responsible for SCRF activity intends to seek cost-effective mass-production scenarios for the SCRF cavity.

The ILC will have 16,000 superconducting RF cavities installed in 2,000 cryomodules. The cavities are made of pure niobium, a precious rare metal. ILC scientists are looking at a target yield of 90 percent for the cavities by working together with industrial manufacturers. As a part of this activity, KEK has set up the Cavity Fabrication Facility, or CFF, where the whole process for fabricating a cavity can be accomplished under one roof. At the end of February, scientists and engineers finished work on cavity "number zero" at CFF.



KEK researchers stand behind cavity zero, most of which was processed in the laboratory's Cavity Fabrication Facility. Image: Nobuko Kobayashi

"We built the CFF based on the world's experiences," said Takayuki Saeki, associate professor at KEK. "We consulted numerous research papers published by scientists at DESY, and visited DESY and RI, a German cavity manufacturer. We also visited Jefferson Lab, Cornell University, and the US manufacturer AES to collect useful information."

DESY has already accumulated experience in manufacturing cavities in collaboration with industry for FLASH (Free-Electron Laser in Hamburg), the world's first X-ray free-electron laser available for photon science research. The US also continues to advance its capability for industrialising cavity production. "Asia lagged behind in this area. CFF is a facility that not only helps us keep up with other countries, but also addresses the issue from a different viewpoint," said Saeki.

CFF is a one-stop shopping facility for fabricating superconducting RF cavities. It is equipped with machines needed to make cavities: a press machine, a vertical turning machine, a niobium surface inspection device, a chemical polishing room, and an electron beam welding (EBW) machine – all in one clean environment. KEK also has an electropolishing facility for cavity inner processing and a vertical test stand for cavity performance assessments. These facilities provide a unique and valuable opportunity: a full sequence of R&D for cavity fabrication on one laboratory's premises. "It is very important to conduct the complete process under very clean conditions, since the impurities on the material can limit its performance," said Saeki. Once the niobium plates or pipes are carried into the CFF, they come out as cavities, without ever leaving the building in between.

Currently, scientists are trying to define the beam parameter set of the EBW machine, including voltage, current, and focus, to weld the niobium-made cavity parts. "Our goal is to establish the beam parameter set and provide it to industry," said Saeki. "It will be effective and cost-saving for both laboratory and industry if KEK provides such parameters." When a company establishes the beam parameters that work well for welding the cavity parts, they will be kept as an industrial secret, which is understandable. If the laboratory provides such information publicly, it can save time and money for R&D.

On 31 January, scientists finished the final welding of cavity number zero, and completed the inner inspection and electropolishing

in February. But why number zero, rather than number one? "We do not call it CFF's first cavity because, for this one, part of the process was done outside of CFF," said Saeki.

"We wanted to start the cavity fabrication earlier than the machine installation for training purposes, so we used a pay-by-the-hour EBW machine to weld the centre parts of the cavity," said Saeki. The EBW machine installed at CFF was imported from Germany last year. Because of the major earthquake that occurred on 11 March 2011, installation of the machine was delayed for a few months from the original plan. The installation was completed in October last year, and the welding of the end-group part of the cavity was done using the CFF's EBW machine.

When researchers welded the centre part and end-group parts, they used the pay-by-the-hour machine again to weld using same beam parameters. Scientists faced a harsh reality at the very last stage of the cavity fabrication. "The cavity got a hole. We were shocked into silence," Saeki said. He speculates that the cause of the hole was impurities adhering to the cavity surface. A piece of dust, even if small, would be turned into gas by the electron beam and could cause the burst. "Our choice was either to give up the whole cavity or fix the hole. So, we made an extensive study to fix the hole using niobium plates and applying them to the cavity." KEK accumulated the experience and know-how for fixing the hole on the cavity, something that was not originally in their plans.

The completion of the performance test on cavity number zero is planned for the end of March. This test will assess the performance of the cavity, of course. But it can also check whether the hole-fixing method works or not. The first CFF cavity is expected to be fabricated during the Japanese fiscal year 2012.

[CAVITY](#) | [CAVITY FABRICATION FACILITY](#) | [CAVITY MANUFACTURING](#) | [CAVITY TESTING](#) | [CFF](#) | [INDUSTRY](#) | [KEK](#) | [SUPERCONDUCTING CAVITY](#)

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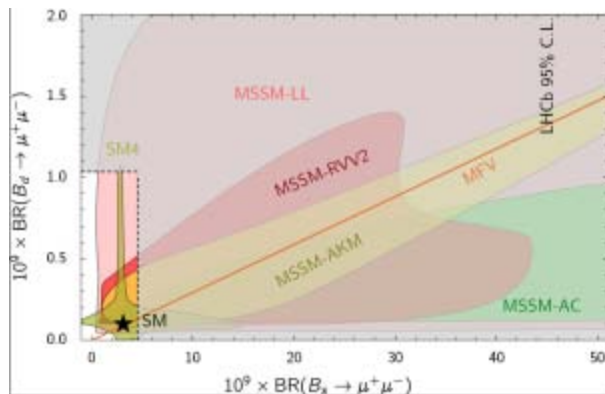
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[HIGGS](#) | [MORIOND](#) | [PARTICLE PHYSICS](#)

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DIRECTOR'S CORNER

GDE Executive Committee meets face to face

Barry Barish | 22 March 2012



The GDE Executive Committee in session. Shown from left to right are Nick Walker, Toshiaki Tauchi, Ewan Paterson and Marc Ross. Image: ILC

The Global Design Effort (GDE) Executive Committee met face to face in Washington, DC, from 8-9 February at the offices of the American Physical Society. The GDE Executive Committee is the senior responsible body for the GDE and advises me on the broad range of science and policy issues involved in directing our efforts. Being distributed around the globe, meeting face to face takes special effort and lots of travel. At the Washington DC meeting, we covered many topics. One topic of special importance was reaching agreement on the detailed plan for producing the *Technical Design Report* (TDR), including its length and level of detail, as well as how to ensure the backup documentation will be readily available.

The TDR will be a self-standing comprehensive document, containing a report on the accomplishments and plans for the ILC R&D programme, a detailed section on the updated accelerator design, a new costing of the ILC project and a Project Implementation Planning section.

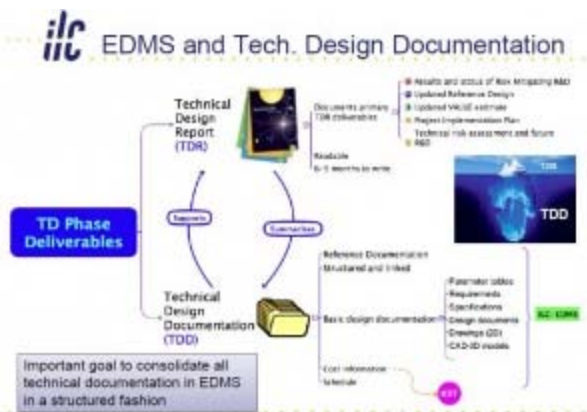
We have made a considerable investment in developing a modern Electronic Data Management System (EDMS) for the GDE, and we plan to organise the backup TDR documentation to be made available through that system. Our goal is to produce consistent and integrated documentation for the TDR baseline, including the large amount of technical detail that accompanies the baseline design. John Carwardine is coordinating the TDR writing effort, while Nick Walker and Benno List are leading the backup documentation effort, using the EDMS system based at DESY.

The TDR will include our first costing of the ILC since the *Reference Design Report* in 2007. Much has changed since that time, including exchange



Gerry Dugan (Cornell) is leading the TDR costing effort. Image: ILC

rates, the baseline design, technical developments and changes, and more information on construction of the superconducting radiofrequency system. At the Washington, DC, Executive Committee meeting, Gerry Dugan presented a TDR costing plan, beginning with cost guidelines established at the 2011 Linear Collider Workshop and refined during the recent Baseline Technical Reviews. Cost reviews will be held for the various subsystems during the coming [Korean workshop in April](#). By late spring, we should have results of industrial studies we have commissioned for the cavities and cryomodules, and we expect to have independent estimates for conventional facilities in the three regions by summer. Our first full TDR costing should then be produced by this summer, giving us time to “scrub” these costs by looking carefully at possible



Nick Walker presented a plan to produce a concise TDR, having accessible backup through a well-organised EDMS system

areas of cost reduction.

Overall, we remain on course to produce the ILC TDR by the end of the year. Face to face Executive Committee meetings, like the one in Washington, are especially valuable in a distributed collaboration, where the leadership primarily meets via WebEx. We had full attendance of the EC members in Washington and this enabled us to grapple interactively on a wide range of issues.

[COST REVIEW](#) | [EDMS](#) | [EXECUTIVE COMMITTEE](#) | [GDE](#) | [TDR](#)

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