

FEATURE

Welcome back, PCMAG!

PCMAG arrives for a fundamental overhaul at KEK

by Rika Takahashi

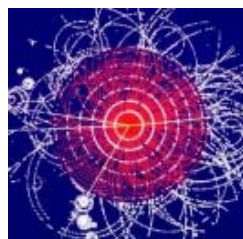


The superconducting magnet PCMAG came back to KEK on 10 August after four years of use in an experiment at the DESY test beam facility.

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FEATURE

from CERN: LHC experiments present latest results at Mumbai conference



Results from the ATLAS and CMS collaborations, presented at the biennial Lepton-Photon conference in Mumbai, India, show that the elusive Higgs particle, if it exists, is running out of places to hide.

DIRECTOR'S CORNER

Thank you, ILC, too!

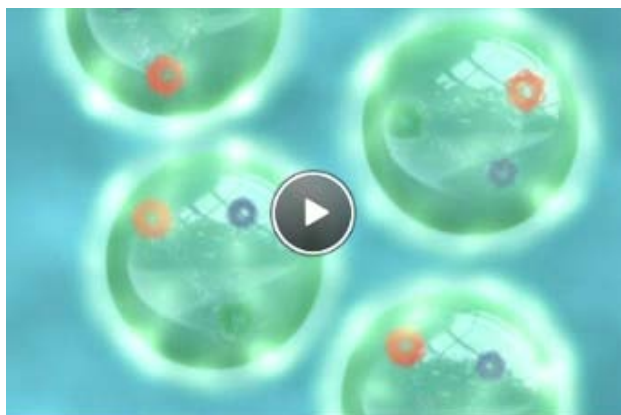
This week's issue features a Director's Corner from Peter H. Garbincius, recent Global Design Effort Cost Manager

by Peter Garbincius



GDE Cost Manager Peter Garbincius bids a fond farewell to the International Linear Collider collaboration.

VIDEO OF THE WEEK



ASACUSA to precisely measure antiproton mass

Video: CERN

CERN scientists and a group at Max Planck Institute in Munich are together working on ASACUSA, a new experiment that uses antiprotonic helium atoms to more precisely measure the mass of the antiproton.

IN THE NEWS

from **Iwate Nippo**

23 August 2011

[ILC誘致を復興策に 科学技術閣議で決定](#)

The government has included the ILC in Japan's outline for basic science and technology, a 5-year national science and technology plan from 2011, as one of the recovery measures from the earthquake.

from **Nature**

22 August 2011

[Higgs signal sinks from view](#)

The Higgs boson, the most sought-after particle in all of physics, is proving tougher to find than physicists had hoped.

from **symmetry breaking**

22 August 2011

[LHC experiments eliminate more Higgs hiding spots](#)

Two experimental collaborations at the Large Hadron Collider, located at CERN laboratory near Geneva, Switzerland, announced today that they have significantly narrowed the mass region in which the Higgs boson could be hiding.

from **BBC News**

22 August 2011

[Higgs boson range narrows at European collider](#)

Scientists at the Large Hadron Collider say a signal that suggested they might have seen "hints" of the long-sought Higgs boson particle has weakened.

from **Reuters**

22 August 2011

[Higgs boson may be a mirage, scientists hint](#)

Scientists chasing a particle they believe may have played a vital role in creation of the universe indicated on Monday they were coming to accept it might not exist after all.

from **Physics Viewpoint**

22 August 2011

[Majorana fermions inch closer to reality](#)

The most interesting Majorana fermions that are predicted to appear in materials are zero-dimensional bound states confined to live on various types of topological defects. In a paper published in *Physical Review Letters*, Pavan Hosur and collaborators from the University of California, Berkeley, predict that these bound states are found in the vortices of the superconductor $\text{Cu}_x\text{Bi}_2\text{Se}_3$.

from **The Daily Californian**

21 August 2011

[New neutrino data may explain origins of matter](#)

Berkeley lab researchers, collaborating with 250 physicists and engineers worldwide to form the China-based Daya Bay

Reactor Neutrino Experiment, are working to decipher specific properties of neutrinos in order to answer questions about how they function through time and space.

from **Fermilab Today**

19 August 2011

[New Fermilab experiment to take muons out for a spin](#)

A new experiment planned at Fermilab will allow researchers to peer into the sub-atomic world of virtual particles and resolve a decade old mystery. The Fermilab muon g-2 experiment will use an intense beam of muons, short-lived particles that are similar to electrons but 200 times heavier.

CALENDAR

UPCOMING EVENTS

[Lepton Photon 2011 XXV International Symposium on Lepton Photon Interactions at High Energies](#)

Tata Institute of Fundamental Research, Mumbai, India

22- 27 August 2011

[ILC positron collaboration meeting](#)

IHEP, Beijing, China

27 August 2011

[POSIPOL 2011](#)

IHEP, Beijing, China

28- 30 August 2011

[2nd International Conference on Micro Pattern Gaseous Detectors \(MPGD2011\)](#)

Kobe, Japan

29 August- 01 September 2011

[Supersymmetry 2011 \(SUSY 2011\)](#)

Fermilab, Batavia, IL

28 August- 02 September 2011

[XXXI Physics in Collision \(PIC 2011\)](#)

Simon Fraser University, Vancouver, Canada

28 August- 01 September 2011

[The 2nd International Particle Accelerator Conference \(IPAC'11\)](#)

San Sebastian, Spain

04- 09 September 2011

[JSPS specially promoted research: "A global R&D program of a state-of-the-art detector system for ILC"](#)

Sendai, Japan

12- 14 September 2011

[LC11: Understanding QCD at Linear Colliders in searching for new and old physics](#)

ECT*, Trento, Italy

12- 16 September 2011

[CALICE Collaboration Meeting](#)

Heidelberg, Germany

14- 16 September 2011

[View complete calendar](#)

BLOGLINE

23 August 2011

Pauline Gagnon

[New results, same uncertainty](#)

PREPRINTS

ARXIV PREPRINTS

[1108.4625](#)

Bending a Beam to Significantly Reduce Wakefields of Short Bunches

FEATURE

Welcome back, PCMAG!

PCMAG arrives for a fundamental overhaul at KEK

Rika Takahashi | 25 August 2011



*PCMAG arrived at KEK's Fuji experimental hall to be upgraded as a coolant-less superconducting magnet.
Image: Toshiaki Tauchi*

The superconducting magnet PCMAG came back to KEK on 10 August after four years of use in an experiment at the DESY test beam facility. PCMAG, which stands for persistent-current superconducting magnet, was originally developed as one of the prototype magnets for the BESS (the balloon-borne experiment with a superconducting spectrometer) experiment, a joint US-Japan balloon collaboration between NASA, the University of Denver, the University of Maryland, JAXA, KEK, Kobe University and the University of Tokyo.

The goal of BESS was the search for antiparticle and antimatter of novel primary origins in cosmic radiation, as well as to provide precise measurement of cosmic ray energy spectra. "Currents needed to be in persistent mode for PCMAG because this magnet was designed to be launched to a place where there is no power supply," said Keisuke Fujii, associate professor at KEK. "Persistent current" means that the magnet, once cooled down to

superconducting temperatures, needs to be charged only once, and continues to run without connection to a power supply for some time afterwards.

PCMAG went up into the sky only once for a technical flight at NASA's Scientific Balloon Flight Facility in New Mexico, US, but never flew into Antarctica's sky. Instead it was used at KEK's proton synchrotron (PS) for many experiments, including the development of time projection chambers for linear colliders (LC-TPC).

Since it was designed to be launched into the sky by balloon, it has a special property of a thin-walled and transparent coil, which allows cosmic rays to smash through. It is also convenient for catching the signals from the accelerated particle beam.

"Many scientists from Germany, France, Canada and other countries came to KEK and worked on the LC-TPC R&D at the PS with us," said Fujii. KEK decided to shut down the PS at the end of the fiscal year 2006. Just at that time a new 21.5-million-euro project had just been approved in Europe. Of the total budget, 7 million euros were contributed by the European Commission. The EUNET project, as it's called, was designed as a five-year project to build and improve the infrastructure for linear collider detector R&D in Europe. "After discussions between the two laboratories and with the LC-TPC collaboration, KEK loaned PCMAG to DESY for the test with their new beamline in the context of EUNET project."

KEK sent PCMAG to DESY in 2006. The magnet was installed at the test beam area, delivering a 1.0-tesla magnetic field for LC-TPC prototype studies. The PCMAG was tested and mapped at DESY in 2006 and 2007 under the cooperation of CERN, DESY and KEK.

PCMAG has another unique aspect. To cool the superconducting magnet in the sky, PCMAG was equipped with a 250-litre tank to provide enough liquid helium for a ten-day-long experiment. "This is not a very convenient feature for an experiment on the ground," says Fujii, since you need to fill the tank every week, a complication you want to avoid if possible.

Fujii explains that PCMAG was returned to KEK "to modify it for operation without liquid helium." Over recent years, new technologies for superconducting magnets have been developed and have become increasingly popular. These technologies require no coolant, which saves researchers the trouble of frequent replenishing. Instead, compressors mounted close to the magnet provide the needed low temperatures, making the operation much easier and cheaper.

Scientists at KEK have developed the coolant-free superconducting magnet systems for the drift chamber beta-ray analyser experiment (DCBA) to study neutrinoless double beta-decay. By adopting the coolant-less magnet, the performance of two-fold magnetic flux density and eight-fold detection volume has been realised. KEK has a long history of R&D on detectors such as ATLAS, Belle, TOPAZ and VENUS, accumulating know-how on the design of superconducting solenoid coils using indirect cooling methods.

Based on this large body of experience, PCMAG will be upgraded to be a coolant-free magnet. A new system will allow scientists to cool the magnet just by switching it on, freeing them from the difficult, dangerous and expensive operation of preparing and refilling the liquid helium. In addition, the design of the cryostat can be simplified because no dewars or pipes will be needed.

This project is implemented under the agreement on academic exchange signed between DESY and KEK in December last year. It is funded in part by DESY and KEK, and in part by the new European detector development initiative AIDA, which followed the very successful EUDET programme this year.

KEK plans to finish the modification work by next spring and to send the magnet back to DESY. The main customer of the magnet will again be the community of TPC developers, but it will be available to others within the AIDA project as well. PCMAG will stay at DESY for another five years, to be tested at the beamline, dedicated mostly to ILC detector R&D.

"We will publish the detailed baseline document for the ILC detectors by the end of 2012. We would like to start the experiment with the new PCMAG in the next year, we hope in early summer, so that we can include the result into the detailed baseline design," Fujii said.

PCMAG won't be a persistent-current magnet anymore. Is it going to have a new name? "PCMAG will stay PCMAG, this time as a unique noun," said Fujii.

[KEK](#) | [PCMAG](#)

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LHC experiments present latest results at Mumbai conference

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22.08.2011

Geneva, 22 August 2011. Results from the ATLAS and CMS collaborations, presented at the biennial Lepton-Photon conference in Mumbai, India today, show that the elusive Higgs particle, if it exists, is running out of places to hide. Proving or disproving the existence the Higgs boson, which was postulated in the 1960s as part of a mechanism that would confer mass on fundamental particles, is among the main goals of the LHC scientific programme. ATLAS and CMS have excluded the existence of a Higgs over most of the mass region 145 to 466 GeV with 95 percent certainty.

As well as the Higgs search results, the LHC experiments will be presenting new results across a wide range of physics. Thanks to the outstanding performance of the LHC, the experiments and the Worldwide LHC Computing Grid, some of the current analyses are based on roughly twice the data sample presented at the last major particle physics conference in July.

"These are exciting times for particle physics," said CERN¹'s research director, Sergio Bertolucci. "Discoveries are almost assured within the next twelve months. If the Higgs exists, the LHC experiments will soon find it. If it does not, its absence will point the way to new physics."

The Standard Model Higgs mechanism is one of a range of ways that fundamental particles could acquire their masses. According to the Higgs mechanism, space is filled with a so-called Higgs field with which particles interact. Those that interact strongly with the field have more mass than those that interact weakly, rather like a streamlined racing car cuts through air more easily than a bus.

At the first major particle physics conference of 2011, the European Physical Society's High Energy Physics conference held in Grenoble, France, in July, both ATLAS and CMS were careful to stress that possible hints of a Higgs signal in their data could be explained by statistical fluctuations. Now, with additional data analysed, the significance of those fluctuations has slightly decreased.

"Thanks to the superb performance of the LHC, we have recorded a huge amount of new data over the last month," said ATLAS spokesperson Fabiola Gianotti. "This has allowed us to make great strides in our understanding of the Standard Model and in the search for the Higgs boson and new physics."

CMS Spokesperson Guido Tonelli concurred, saying: *"It's great that the LHC's fantastic performance this year has brought us this close to a region of possible discovery. Whatever the final verdict on Higgs, we're now living in very exciting times for all involved in the quest for new physics."*

The Lepton-Photon conference runs until 27 August. There will be a press conference on 25 August at which CERN Director General, Rolf Heuer, will be one of the speakers. CERN's LHCb experiment will present its latest measurements on the Standard Model on Saturday 27 August. Following the Lepton-Photon conference, the results from the LHC experiments will be available through the CERN website.

The LHC is on track to at least double the amount of data delivered so far to the experiments by the end of the year.

Further information about the Lepton-Photon conference:

<http://www.tifr.res.in/~lp11/>

To follow the Lepton-Photon conference via webcast:

<http://webcast.cern.ch/live.py>

Latest news from the experiments will be posted on their website:

ATLAS: <http://atlas.ch/>

CMS: <http://cms.web.cern.ch/cms/index.html>

LHCb: <http://lhcb-public.web.cern.ch/lhcb-public/>

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- www.cern.ch
- <http://twitter.com/cern/>
- <http://www.youtube.com/user/CERNTV>
- <http://www.quantumdiaries.org/>

1. CERN, the European Organization for Nuclear Research, is the world's leading laboratory for particle physics. It has its headquarters in Geneva. At present, its Member States are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom. Romania is a candidate for accession. India, Israel, Japan, the Russian Federation, the United States of America, Turkey, the European Commission and UNESCO have Observer status.

DIRECTOR'S CORNER

Thank you, ILC, too!

This week's issue features a Director's Corner from Peter H. Garbincius, recent Global Design Effort Cost Manager

Peter Garbincius | 25 August 2011



Peter Garbincius and friend

International...Linear...Collider

International is the key word. At least in the area of elementary particle physics, the ILC has been the first accelerator mega-project intended to have global participation directly from its conception. Its scope requires international participation, which also demands global understanding and cooperation. What a great concept...if only countries and different peoples could learn to work together on a common goal! Maybe the ILC is just a first step along this path.

During my six years associated with the ILC (and parts of the previous four years with TESLA and the US Linear Collider Technology Options Study), I was very fortunate to work with people from all over the world, visiting their laboratories and universities, many of which I would likely not have visited if not for the ILC. Travel really does broaden one's outlook and teaches one about different cultures and ways of

approaching a problem. I am sincerely thankful for this experience.

The most uplifting thing, however, is working with imaginative, talented and dedicated people. During my time with the ILC, I've met and worked with many such people, and even again with some old friends. These people are always a source of inspiration for me.

As Barry announced in his Director's Corner of 4 August, I am leaving the ILC Global Design Effort to assume more responsibilities within Fermilab. My colleague of many years, Gerry Dugan (we were both Division Heads at Fermilab over twenty years ago), will be taking over as GDE Cost Manager, Cost Engineer, and keeper of ICET (ILC Cost Estimating Tool). I wish him well in bringing this all together for the *Technical Design Report*.

Of course, my thanks and best wishes go out to all of you with whom I worked on the ILC. But special thanks must go to those with whom I worked and interacted the most:

the leaders and representatives of all of the institutions who hosted our meetings, reviews, and workshops, and who extended such great hospitality to us;

the other two Cost Engineers, Wilhelm Bialowons and Tetsuo Shidara;

the Design & Cost Board;

the Conventional Facilities and Siting team, led by Vic Kuchler;

the ILC communicators;

the ICET development team, including Maura Barone, DESY-EDMS, and Triad;
the GDE Executive Committee;
the GDE Project Managers, Marc Ross, Nick Walker, and Akira Yamamoto;
Maxine Hronek, the glue that holds the GDE together;
and, of course, our leader, Barry Barish.

Turnabout is fair play, Barry, so I'll include a picture that my wife Jean shot in Montmartre, Paris last July. When we unexpectedly met Barry and his wife Samoan, he said, "This guidebook says I'll never meet anyone I know on this street." I guess we must have had the same guidebook!

So again, thank you everyone, for making my time with ILC a wonderful experience. I wish you great success in finishing the TDR, further developing SCRF technology, and if the science gods put interesting physics within its reach, a speedy approval, construction, and utilisation of the ILC.

I'll end with my usual toast, "ILC soon!"



INTERNATIONAL COLLABORATION

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GDE Director Barry Barish holding one of only two known copies of a special Paris guidebook