ilc newsline

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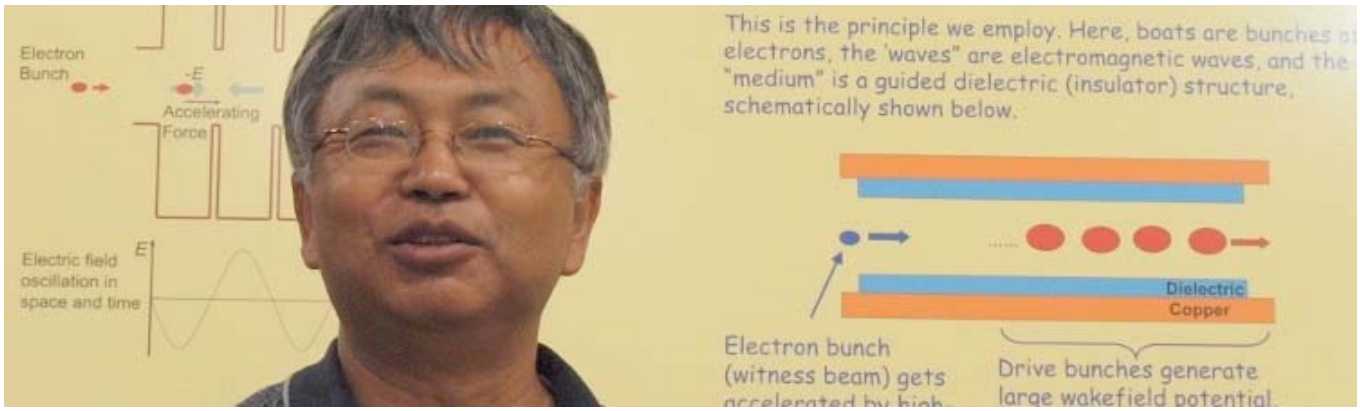
## FEATURE

# Wei Gai leads positron source efforts for ILC

by Leah Hesla




Scientists at the ILC who deal in matters positively charged have a new go-to guy: Wei Gai. This month, Gai assumes the role of the ILC's Positron Technical Area Group Leader (Positron TAGL). He takes over the position from Jim Clarke at the Science & Technology Facilities Council/Daresbury Laboratory in the UK, who has given up the role because of the UK's changing programme priorities.

## AROUND THE WORLD

# New start, new hope

Third IHEP-KEK 1.3-GHz SRF technology collaboration meeting

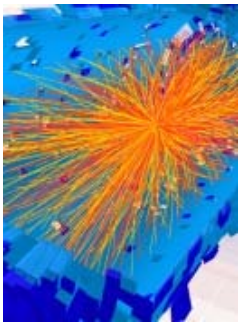
by Min Zhang

From 7 to 8 December 2010, the IHEP-KEK 1.3-gigahertz superconducting radiofrequency (SRF) technology collaboration meeting was held at the Institute of High Energy Physics (IHEP), Chinese Academy of Sciences in Beijing. This was the third in a series of meetings held regularly since 2009. Eight high-energy accelerator experts from KEK and Kyoto University and nearly thirty researchers from IHEP participated.

## DIRECTOR'S CORNER

# As the New Year dawns…

by Mike Harrison



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## IMAGE OF THE WEEK


# IceCube neutrino detector completed

On 19 December, at the height of the antarctic summer, the IceCube neutrino detector was completed after a decade of planning, building, testing and melting holes into ice. The main IceCube detector, a massive ice-bound telescope that fills a cubic kilometre of deep Antarctic ice, now contains 5,160 optical sensors on 86 strings embedded two kilometres below the National Science Foundation's Amundsen-Scott South Pole Station.
Read the press release

## IN THE NEWS

From Nature News
31 December 2010
New year, new science
That damned elusive Higgs. Although it is unlikely that the Higgs boson will be spotted this year by the Large Hadron Collider near Geneva, Switzerland, there's a good chance the collider will turn up something, such as evidence for supersymmetry…

From physorg.com
24 December 2010
Super-B accelerator funded by Italian government
Last week the LHC passed the threshold of 3 pb-1 total integrated luminosity delivered to the experiments, of which about half was delivered in just one week.

From Daily Mail
23 December 2010
Incredible IceCube observatory built 8,000ft BENEATH the Antarctic ice designed to catch mysterious particles from space
Deep beneath the ice of Antarctica, the world's strangest observatory has finally reached completion.

From Physics Today
30 December 2010
No microscopic black holes yet
From among 1013 proton-proton collisions at 7 GeV in its first year of operation, the Large Hadron Collider (LHC) at CERN has as yet yielded no evidence of black hole production.

From Science
17 December 2010
NSF Won't Build Underground Lab; Scientists Hope That DOE Will
Plans to convert an abandoned gold mine in South Dakota into the world's largest underground lab may have to be scaled back and could fall apart entirely after the National Science Foundation's (NSF's) oversight board rejected the current proposal.

## ANNOUNCEMENTS

### Registration for ALCPG11 is open

Registration for ALCPG11, the 2011 Linear Collider Workshop of the Americas, is now open. This workshop, jointly organised by the ALCPG and the GDE, will be held on the

## CALENDAR

### UPCOMING EVENTS

Second Baseline Assessment Workshop (BAW-2)
SLAC
18- 21 January 2011

University of Oregon campus in Eugene from 19-23 March 2011. You will find registration details and options for accommodation on the web site. Register by February 15 for the early registration fee.

### UPCOMING SCHOOLS

US Particle Accelerator School (USPAS)
Old Dominion University, Hampton VA
17- 28 January 2011

Excellence in Detectors and Instrumentation Technologies (EDIT 2011)
CERN, Geneva, Switzerland
31 January- 10 February 2011

View complete calendar

## BLOGLINE

31 December 2010
*Frank Simon*
Looking back: A good Year

Follow all Quantum Diaries

## PREPRINTS

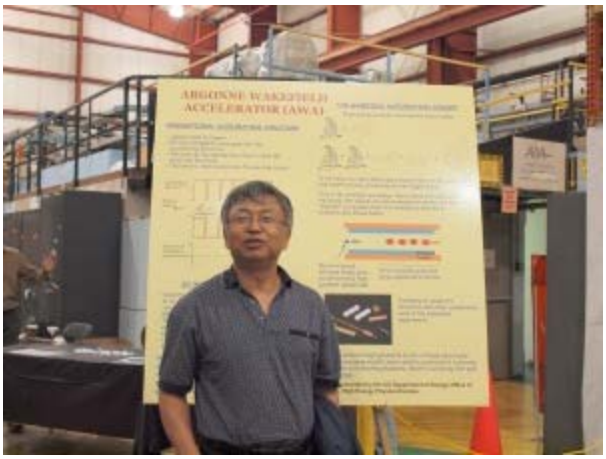
### ARXIV PREPRINTS

1101.0412
Rare Z-decay into light pseudoscalar bosons in the simplest little Higgs model
1101.0359
NLO corrections to WWZ and ZZZ production at the ILC
1012.5773
*W*-pair production in modified perturbation theory
1012.4343
Electromagnetic response of a highly granular hadronic calorimeter
1012.3566
Signals of additional *Z* boson in $e^+e^-$ ? $W^+W^-$ at the ILC with polarized beams

FEATURE

# Wei Gai leads positron source efforts for ILC

Leah Hesla | 6 January 2011



*New GDE Positron Technical Area Group Leader Wei Gai stands in front of a poster on wakefield acceleration, one of his research focuses. Gai also heads the Argonne Wakefield Acceleration Group. Image: Jennifer Seivwright*

Scientists at the ILC who deal in matters positively charged have a new go-to guy: Wei Gai. This month, Gai assumes the role of the ILC's Positron Technical Area Group Leader (Positron TAGL). He takes over the position from Jim Clarke at the Science & Technology Facilities Council/Daresbury Laboratory in the UK, who has given up the role because of the UK's changing programme priorities.

Gai enters the role at a crucial time in ILC development. He will oversee the contribution of positron-related R&D in the months leading up to the 2012 publication of the *Technical Design Report*, a milestone document for the ILC. During that time, he will work with Global Design Effort (GDE) project managers and research scientists from approximately ten laboratories to identify critical issues in positron source development. He will also help decide how best to marshal human and financial resources in the ILC's positron arena.

"One of the main reasons I accepted this position is that I want to help realise all the work we have put into the ILC positron source," said Gai.

Certain aspects of the positron source are at the top of his agenda as the new technical area group leader. He aims to resolve open issues related to the rotating positron target, a metallic spinning wheel that takes on high-intensity photons, converting them to positrons. This involves a collection device, a magnet that captures positron beams with large divergent angles and energy spreads. Scientists at the Cockcroft Institute in the UK and at Lawrence Livermore National Laboratory in the US are developing the target and associated capturing devices.

Gai is also focusing on further development of a shorter-period undulator, which generates the photons. That research is also being conducted at the UK labs and possibly at his home lab, Argonne National Laboratory in the US, in the near future.

"I'm looking forward to a successful, concrete demonstration of these key technologies," Gai said.

As a longtime ILC collaborator, Gai has both big-picture and thumbnail views of the ILC positron system. His own fluency in particle beam physics originates from his work at Argonne, where he researches wakefield acceleration and high-current electron beam physics. That research nicely dovetailed with the work that needed to be completed for ILC's positron source development, and he joined the collaboration in 2005.

"Positron physics is very similar to electron beam physics," Gai said. "You just switch the sign in the simulation code. It's not that complicated."

Of course, it isn't that simple, either, and GDE project managers recognise Gai's skill in optimising positron source components.

"We hope Wei will be able to mobilise Argonne expertise to help with key positron target technical issues," said Project Manager Marc Ross.

Mobilising expertise will be nothing new for Gai, who has served for 15 years as a group leader at Argonne, where he will continue to head the Wakefield Accelerator Group.

Former Positron TAGL Jim Clarke successfully oversaw the construction and testing of a rotating positron target prototype at Daresbury. He also led the effort for constructing and testing an undulator at Rutherford.

“I’m looking forward to learning from John Sheppard of SLAC and Jim Clarke, whose wisdom in these matters can only help me in fulfilling the ILC’s mission,” said Gai.

Stay tuned to *NewsLine* to learn about the rotating positron target, undulators, and Clarke’s contributions to these projects.

ARGONNE | POSITRON SOURCE | UNDULATOR

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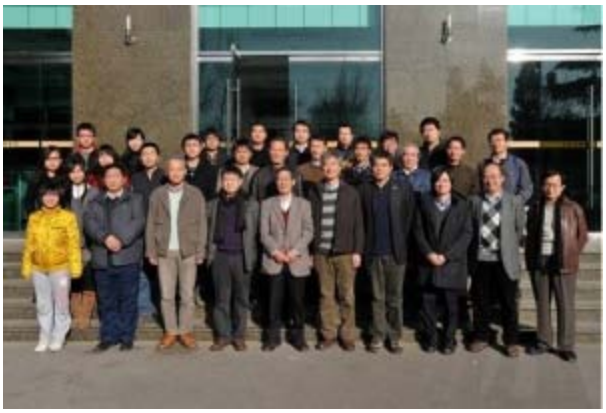
AROUND THE WORLD

# New start, new hope

## Third IHEP-KEK 1.3-GHz SRF technology collaboration meeting

Min Zhang | 6 January 2011

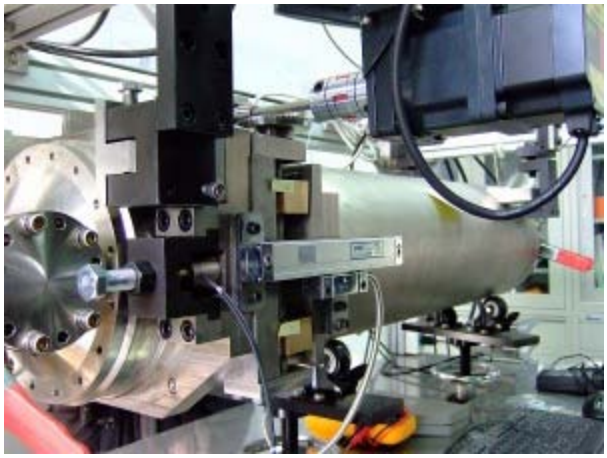


*Several physicists from KEK and University of Kyoto visited IHEP in Beijing for the Japan-China Collaboration on SRF Technologies for the ILC. Photo: Jie Liu*

Each end-of-year people are used to gathering together to look back on a year of progress and to making plans for the coming year. Experts are no exception, whether from China or Japan. From 7 to 8 December 2010, the IHEP-KEK 1.3-gigahertz superconducting radiofrequency (SRF) technology collaboration meeting was held at the Institute of High Energy Physics (IHEP), Chinese Academy of Sciences in Beijing. This was the third in a series of meetings held regularly since 2009. Eight high-energy accelerator experts from KEK and Kyoto University and nearly thirty researchers from IHEP participated.

"The aims of this meeting are to review the progress of the KEK superconducting radiofrequency test facility (STF) and the IHEP 1.3-GHz superconducting accelerator unit project, to discuss detailed technical problems together with some collaboration agreements for the next few years," said Jie Gao, chair of the Asian Linear Collider Steering Committee and chair of this meeting. During the meeting, experts from KEK and IHEP gave 16 talks on diverse topics such as KEK-STF status, STF coupler window tests, high-power input couplers, tuner and low-level RF performance and IHEP 1.3-GHz cryomodule and cavity R&D. These talks triggered lively discussion, and scientists achieved some consensus on future cooperation issues.

In addition to the first 1.3-GHz low-loss type large-grain nine-cell superconducting cavity (IHEP-01) successfully tested this year, IHEP has started the fabrication of the second cavity IHEP-02, which will be a TESLA-type cavity. It was agreed the second test of IHEP-01 or the first test of IHEP-02 would be performed at KEK, depending on the priority and the schedule. It was also agreed that IHEP would fabricate a TESLA-type cavity as their third cavity. "This will make its test at STF phase 2 easier," said Kaoru Yokoya, ILC Global Design Effort Regional Director for Asia.



*est setup for an active tuner, built by the IHEP group, which has been attached to a cavity package in use and on lease from KEK. Photo: Nobu Toge*

"The year of 2010 was full of progress both for KEK and IHEP: a Japanese cavity recently met ILC specifications at KEK's SRF test facility and the IHEP-01 cavity achieved an accelerating gradient of 20 megavolts per metre in its first vertical test," said Yokoya. "The exchange of ideas both from China and Japan creates more opportunities and benefits bilateral cooperation in the future."

The fourth meeting will be organised between IHEP and KEK ILC groups in 2011 in order to strengthen the IHEP-KEK collaboration. "This meeting series is a good example of ILC Asian collaboration on accelerator technologies. I hope we will have participants from other Asian countries, such as Korea and India, in the future," Gao said.

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DIRECTOR'S CORNER

# As the New Year dawns...

Mike Harrison | 6 January 2011

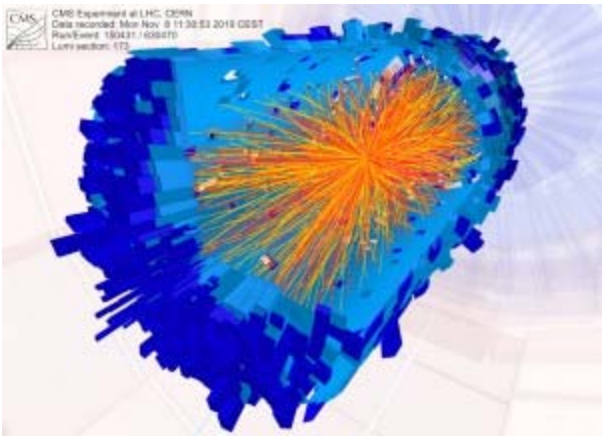
It is traditional at this time of year to take stock and assess not just the preceding year but the prospects for the upcoming one too. It appears that I'm not immune to that sentiment.

Is there ever a good time to be proposing the creation of a large and complex science facility? Probably not, but at face value we seem to have chosen a particularly inopportune moment to be raising this issue. Reading newspapers today it is impossible to avoid noticing the state of public finances around the world. The 2008 credit crisis in the financial markets created a severe economic downturn, which affected many countries and resulted in large governmental budget deficits. Governments responded to this situation in different ways: severe budget cuts in many EU countries, stimulus spending in the US leading to concerns about runaway government budget deficits and more-of-the-same credit creation in Japan. Details aside, suffice it to say that government spending is presently under very close scrutiny in those countries, which are the traditional backers of high-energy physics.

Large international projects haven't been exactly covering themselves in glory recently either. The International Thermonuclear Experimental Reactor (ITER) in Cadarache, France, has experienced cost and schedule problems that not so long ago engendered a change in upper management. The James Webb space telescope isn't looking too happy in this regard either and, in deference to my colleagues in the US, I won't mention the cost history of the ill-fated Superconducting Super Collider (SSC) project. The common feature of these projects is the impact of the technical complexity on its cost and schedule. The ILC is hardly without its own issues in this regard.

Another problem we have to deal with is the lack of any direct evidence for "new physics" beyond the standard model. Indirect evidence abounds of course, but it is generally accepted that exciting new discoveries from the LHC are vital to justify the ILC project as well as to determine its final collision energy. The LHC start-up was delayed significantly by the interconnect incident and to date only a small data set exists. Unfortunately Fermilab's Tevatron, which is running wonderfully well, struggles to reach these mass ranges.

So we have worldwide budget austerity, no supporting physics results, and international science projects that continue to demonstrate just how difficult such enterprises are to manage effectively. Not promising at first sight. In spite of these events, however, it looks as though 2011 is poised to be an interesting year for the ILC programme.



*Luminosity at the Large Hadron Collider has exceeded the 2010 goal, finally reaching 2 x 1032 cm-2 s-1. The LHC's detectors, such as the Compact Muon Solenoid (a CMS event is pictured here), have been taking data with better resolution*

The first cause for optimism is the LHC operation. Although delayed, the initial commissioning and physics operation that took place during the past twelve months has gone very well. The commissioning proceeded smoothly with machine luminosity increasing continuously throughout the period of operations, exceeding the 2010 goal and finally reaching $2 \times 10^{32}$ $cm^{-2}$ $s^{-1}$. The detector operation has also been first-rate with data-taking efficiency, detector resolution and rapid initial analysis capability all better than could have been anticipated. Indeed, the overall situation is so encouraging that it appears that the first running period is likely to be extended into 2012 with integrated luminosity estimates sufficient to produce a physics data set capable of covering the anticipated Higgs particle mass range. This data set will also greatly extend the mass range for discovery of possible supersymmetry physics. A highly significant physics result in the time scale of 2012 would be a tremendous boost for the ILC programme and is now

*and initial analysis capability than anticipated.*

increasingly probable.

Avoiding the pitfalls encountered by the existing international projects is built into the GDE programme. Addressing technical and cost risks is the main priority of the R&D programme and again here the outlook is bright. Under the auspices of the Global Design Effort (GDE), and with the talents of the worldwide lab collaboration, the progress in regard to superconducting radiofrequency technology has been remarkable. It is worth remembering that only a few short years ago the 35-megavolts-per-metre accelerating gradient chosen for the baseline design was viewed as hugely challenging. Recently we were seriously asking ourselves whether we should go higher (a challenge graciously declined by Akira Yamamoto). The new baseline design, recently described by Barry Barish, has better performance, is cheaper, and possesses more upgrade potential than that used in the reference design. Technology improvements do not appear to be slowing down and there is little doubt that by the end of the R&D programme in 2012 we will have compelling support for the *Technical Design Report*. While nobody can completely guarantee the cost and performance of something as big and complex as the ILC, 2011 will be the year when many of the questions are answered.

Probably the most difficult question to assess is whether (multi-) government funding will be available to move forward into ILC construction. If I could answer this question with any certainty I would probably be in a different profession. What I do know is that a project of the scale and scope of the ILC will not “fly under the radar” and will need to proceed on its merits. In this regard a harsher overall government-spending environment with increased oversight could actually help. Any rational analysis of a developed economy must note the role of science and technology in promoting a high-wage environment. Science spending typically holds up quite well in difficult conditions and a project like the ILC can easily become a highly desirable science opportunity for a potential host rather than a mere physicist sandbox. The decision to proceed to construction for the ILC has a major political component and governments move in mysterious ways. We’ll see.

Time alone will tell how events transpire but 2011 promises much for high-energy physics as well as the ILC programme. We hope we can fulfil that promise.

I wish everyone the very best for the New Year.

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