

DIRECTOR'S CORNER

Interim report on the ILC R&D programme

by Barry Barish



We have reached the midpoint in the ILC R&D efforts towards the *Technical Design Report*. In recognition of that milestone, we release today a new report entitled *International Linear Collider: A Technical Progress Report*. This report gives a comprehensive summary of the major accomplishments to date of the ILC R&D programmes.

RESEARCH DIRECTOR'S REPORT

The gift of research rises from the rubble

This month's Research Director's Report was written by Hitoshi Yamamoto, co-chair of the World Wide Study and regional detector contact for Asia.

by Hitoshi Yamamoto

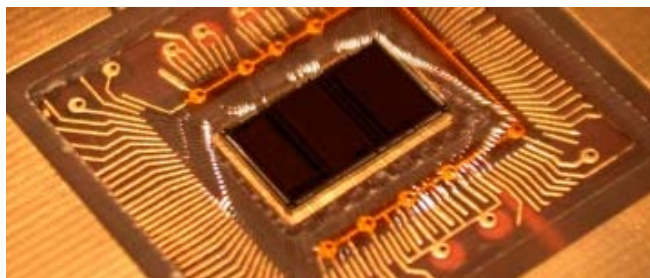


Hitoshi Yamamoto offers a personal account of his navigation through the chaos brought on by shutdowns of transportation systems, electrical grids and running water immediately following the March earthquake. Amid the confusion, he remained mindful of the work of the ILC, resulting in welcome news for detector research.

FEATURE

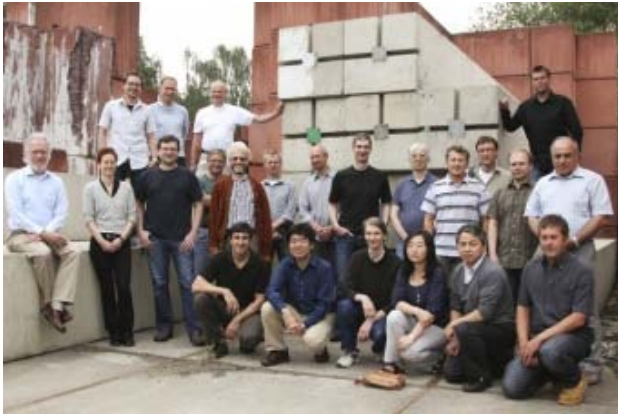
First linear collider power distribution and pulsing workshop

by Marc Weber (KIT), Georges Blanchot (CERN) and Roman Poeschl (CNRS/LAL)



Lowering power consumption is a key issue for particle physicists to solve to design the next generation of collider experiments. Detectors will measure signals recorded in millions of readout channels. Last May, the ILC-CLIC common working group for detectors organised the first workshop on power pulsing and delivery at LAL in Orsay, France.

IMAGE OF THE WEEK



Bunch of experts gathers at DESY

Image: DESY

Attendees at [the second workshop on linac operation with long bunch trains](#) at DESY, Germany from 6-8 June 2011.

Stay tuned to a future issue of *ILC NewsLine* for more on the workshop.

IN THE NEWS

from **NIU Today**

14 June 2011

[NIU's Gerald Blazey accepts two-year post at White House Office of Science and Tech Policy](#)

In 2007, he began a three-year Intergovernmental Personnel Assignment with the U.S. Department of Energy Office of Science, where he served as program manager of the International Linear Collider Program in the Office of High Energy Physics.

from **INFN and University of Rome Tor Vergata**

13 June 2011

[The SuperB Factory will be built at the University of Rome 'Tor Vergata'](#)

300 physicists from all over the world gathered in Elba island (Italy) for the kick-off meeting of SuperB, which marked a crucial milestone on the road towards realization of the accelerator.

from **Wired**

10 June 2011

[New Tevatron Particle May Be a Mirage](#)

The Tevatron's Hail Mary shot at particle physics glory may be fizzling in a puff of protons. New particles recently claimed one of the particle collider's detectors could not be confirmed by its other detector.

from **Fermilab Today**

10 June 2011

[DZero weighs in on unexpected CDF result](#)

Following the analysis procedure employed by CDF as closely as possible, DZero scientists did not find the same excess in the data.

ANNOUNCEMENTS

2011 International Workshop on Future Linear Colliders

The 2011 International Workshop on Future Linear Colliders (LCWS11), hosted by the Universidad de Granada, will be held at the Palacio de Congresos (Congress Hall) in downtown Granada, Spain from 26 to 30 September.

The workshop will be devoted to the study of the physics case for a high-energy linear electron-positron collider, taking into account the recent results from LHC, and to review progress in the detector and accelerator designs for both ILC and CLIC projects.

For information and registration, please visit the [LCWS11 web site](#).

BLOGLINE

14 June 2011

Frank Simon

[Make No Little Plans](#)

14 June 2011

CERN

[Making tracks](#)

CALENDAR

UPCOMING EVENTS

[International Europhysics Conference on High-Energy Physics \(EPS-HEP 2011\)](#)

Grenoble, France

21- 27 July 2011

[15th International Conference on RF Superconductivity \(SRF2011\)](#)

Sheraton Chicago Hotel & Towers, Chicago, IL

25- 29 July 2011

UPCOMING SCHOOLS

[USPAS sponsored by Stony Brook University](#)

Melville, New York

13- 24 June 2011

[View complete calendar](#)

PREPRINTS

ILC REPORT

[2011-030](#)

International Linear Collider: A Technical Progress Report

ILC NOTE

[2011-059](#)

Detector Benchmarking for the 2012 DBD

ARXIV PREPRINTS

[1106.2529](#)

Supersymmetry and Dark Matter in Light of LHC 2010 and Xenon100 Data

[1106.2480](#)

Neutrino Masses from Loop-Induced Dirac Yukawa Couplings

[1106.1932](#)

Discrimination of New Physics Models with the International Linear Collider

DIRECTOR'S CORNER

Interim report on the ILC R&D programme

Barry Barish | 16 June 2011

Today I announce the release of a comprehensive report on the ILC R&D programme and progress. The ILC R&D programme is oriented at establishing the technical viability of the design that will be presented in our *Technical Design Report* (TDR). This report describes our considerable progress to date on R&D and demonstration experiments that will support a robust design for the TDR. The progress report can be downloaded from

linearcollider.org/about/publications/interim-report or a copy can be requested at the same address. I believe those interested in the status of the ILC R&D programme will find this report very informative. An accompanying report on the ILC detector programme will be available in a few months.

The following is my foreword for the report:

The International Linear Collider: A Technical Progress Report marks the halfway point towards the Global Design Effort fulfilling its mandate to follow up the ILC Reference Design Report with a more optimised Technical Design Report (TDR) by the end of 2012. The TDR will be based on much of the work reported here and will contain all the elements needed to propose the ILC to collaborating governments, including a technical design and implementation plan that are realistic and have been better optimised for performance, cost and risk.

We are on track to develop detailed plans for the ILC, such that once results from the Large Hadron Collider (LHC) at CERN establish the main science goals and parameters of the next machine, we will be in good position to make a strong proposal for this new major global project in particle physics. The two overriding issues for the ILC R&D programme are to demonstrate that the technical requirements for the accelerator are achievable with practical technologies, and that the ambitious physics goals can be addressed by realistic ILC detectors.

This GDE interim report documents the impressive progress on the accelerator technologies that can make the ILC a reality. It highlights results of the technological demonstrations that are giving the community increased confidence that we will be ready to proceed with an ILC project following the TDR. The companion detector and physics report document likewise demonstrates how detector designs can meet the ambitious and detailed physics goals set out by the ILC Steering Committee. LHC results will likely affect the requirements for the machine design and the detectors, and we are monitoring that very closely, intending to adapt our design as those results become available.



There are too many people involved in important ways in the ILC programme to thank them individually. Nevertheless, I would like to express our ongoing appreciation of the support of funding agencies around the world, and of the major high-energy laboratories for their continuing support. I also want to note the importance of our oversight committees, the International Committee for Future Accelerators and the ILC Steering Committee, for their steadfast advice and scientific oversight, and of the Funding Agencies for Large Collaborations, both for their support of our common fund, and their ILC R&D resource oversight.

Finally, as director of the GDE, I want to thank the dedicated group of accelerator scientists, engineers and technicians who continue to make such impressive progress in the face of the inevitable ups and downs of the overall project. This document is living proof!

[ICFA](#) | [ILCSC](#) | [INTERIM REPORT](#) | [LHC](#) | [R&D PROGRAMME](#) | [TDP-1](#) | [TDR](#) | [TECHNICAL DESIGN PHASE](#)

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RESEARCH DIRECTOR'S REPORT

The gift of research rises from the rubble

This month's Research Director's Report was written by Hitoshi Yamamoto, co-chair of the World Wide Study and regional detector contact for Asia.

Hitoshi Yamamoto | 16 June 2011



Damage to the walls of Sendai castle after 11 March earthquake.

On 11 March, the three-day symposium on detector R&D for the International Linear Collider at KEK, Japan, came to a close. It was the final annual meeting of the five-year programme sponsored by Japan Society for the Promotion of Science (JSPS), which had been supporting a large part of Japanese ILC detector activities in recent years. We had submitted a new proposal to JSPS. It had passed document review, and a hearing was scheduled on 30 March.

The symposium ended around noon that day. At around 2:30 pm, I was near the train station of Tsukuba Express on my way back to Sendai. I had not eaten lunch yet, and I was very hungry. I went to a Chinese food shop in a food court, paid for chop suey and pot stickers, and was waiting at a table with a vibrating pager that would alarm me when the food was ready.

Then it looked like my plate was ready, and the pager went off – or so I thought. Actually, the pager was not the only item that was bouncing. Soon it became clear that it was an earthquake. The shake was sharp and rapid, and getting stronger and stronger over tens of seconds. Some people started to run out of the building, but I was still determined to get to the food that I had already paid for. Then the cooks came running out of the shops, and I figured I'd better get out of the building also. When I came out to the street, the quake was still getting stronger, and I had to hold on to a mailbox

in order to keep standing. I saw tall buildings swinging like bamboo trees; it seemed they could snap and break down at any moment. It lasted about two minutes. When it subsided, I checked my iPhone and found out that the epicentre was near Sendai – my home town some 400 kilometres away from KEK.

I went to an entrance of a Tsukuba Express station where the train would take me to Tokyo. From there I would take a bullet train to Sendai. There I met two of my students and a few other friends. We then heard an announcement that Tsukuba Express stopped and there was no prospect for restarting. No phone calls to Sendai went through, and the internet connection by cell phone was very slow. Still, the buses were operating more or less as usual – it seems that buses are quite robust against earthquakes. It was quite clear, however, that the bullet train to Sendai would not be operating. So the students and I decided to go back to KEK by bus. There we met several more of my students and friends, and stayed overnight at the dormitory. KEK kindly let us sleep there for free. We gathered together at the lobby of the dormitory and exchanged information. There was neither water nor gas. Electricity was available by an emergency generator, but it could last for only a

day or two. Most information was obtained by Internet through cell phones – which railroad sections were still operating and when and where emergency buses run, and, of course, news on the damage. Information about the disaster came out very slowly. It was many hours after the earthquake when we learned that a huge tsunami had hit the coast of Tohoku region. There was no way to get back to Sendai, and the lifeline at KEK was dwindling. So we had to find places to stay for the time being. Luckily all of my students could find relatives and acquaintances to shelter them, and I myself could stay with my brother, who lived not too far from KEK. My brother's house was in Chiba prefecture, which is next to Ibaraki prefecture where KEK is. Even though many sections of the Japanese railway system in the region were cut off, I was lucky enough to be able to connect the operating sections and emergency buses to get to my brother's. There, the first task was to help them clean up some mess such as broken glass and pottery. The quake there was not as strong as at KEK, but still it was strong enough to cause many inconveniences. Many of the shelves at supermarkets were empty and it was next to impossible to get gasoline for cars. An important issue was to collect information on members of my group.

With the help of a physicist at KEK who volunteered, we were able to confirm that everybody was fine. Then I called JSPS to ask for a postponement of the hearing. At first, they were adamant that the date could not be changed. With my statement 'I have to go back to Sendai now to take care of students who lost their places to stay', they decided to bring it up at the next meeting. Well, my statement was a bit of an exaggeration – only one student had to leave due to damage to her house. Still, many did not have some or all of water, electricity, and gas and they were trying to evacuate from Sendai. A few days later, I got a message on my iPhone that the date had been postponed by three weeks. The hearings of all other proposals had to be delayed also, but this gave us some extra time for preparation.

I returned to Sendai seven days after the earthquake. All major means of transportation to Sendai were still shut down, but I could secure a flight to Yamagata from where it was one-and-a-half hours by bus to Sendai. Fortunately, electricity and water were available at my apartment, and there was no structural damage to the building.

After one day or so of cleaning up, I was able to live there more or less normally. Food was difficult to secure but not impossible, and gasoline in my car happened to be nearly full. Our lab at the university is on the first floor of a three story building buried half underground, and the damage was minimal. There were many tiny cracks on the walls but no structural damage. Electricity was available even though it took about one month for water to come back on. There were three or four people at the lab daily, and we tried to restore the lab so that other group members can come back soon. The computers were up in no time, with a few broken PCs replaced by new ones. Partitions fell down but new legs were purchased and the partitions were propped up securely. This was the end of the fiscal year and we had to close the five-year JSPS program. The ILD workshop at KEK was cancelled and the Japanese Physical Society meeting in Niigata was also cancelled. We had to decide how to deal with the money left unused. I called up our secretary to come help us get through this bureaucratic nightmare. Group members started to come back one by one, and the lab was steadily restoring its normal appearance.

We then had to prepare for the postponed funding review to be held in Tokyo. I moved to Tokyo a few days before the review, and several of us gathered at Tokyo University to prepare for the review. The presentation was 10 minutes long with 15 minutes of questions – this short time would decide on millions of dollars for the next five years. The points to make had to be polished to essences and had to be understood by the reviewers. The strategy was to stress that there was a window of



Fallen partitions at Tohoku lab, just after the 11 March earthquake.

opportunity for the ILC now with LHC's result coming out for the next few years, that our detector was a revolutionary one with [the particle flow algorithms concept](#), and that the detector technologies developed for the ILC would benefit other fields.

The responses of the reviewers were not particularly encouraging and we were not optimistic. It was more of a surprise, then, that I got a notice of acceptance a few weeks later. The official title of the proposal is 'grant-in-aid for specially promoted research: a global research and development program of a state-of-the-art detector system for the ILC'. The total amount is seven million dollars over five years, of which 23 percent is indirect cost and one third is for salary to hire six to eight researchers.

There was a report on TV of a baby born in an evacuation camp. My situation is nothing compared to the ordeals experienced by those who were directly hit by Tsunami, but somehow I cannot help thinking of this grant as a precious baby born in the turmoil of the earthquake.

[EARTHQUAKE](#) | [JAPAN](#) | [JSPS](#) | [KEK](#)

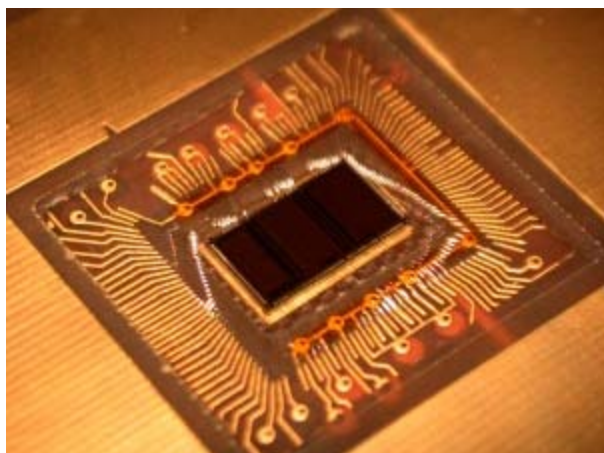
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FEATURE

First linear collider power distribution and pulsing workshop

Marc Weber (KIT), Georges Blanchot (CERN) and Roman Poeschl (CNRS/LAL) | 16 June 2011



SPIROC readout ASIC, as designed for the current CALICE (CALorimeter for LInear Collider Experiment collaboration) calorimeter prototypes. Photo: CNRS/LAL

Lowering power consumption is not only an earth-friendly undertaking. It is also a key issue for particle physicists to solve to design the next generation of collider experiments. Detectors will measure signals recorded in millions of readout channels. At the same time, the pulsed-bunch structure of the future lepton collider beams suggests that detectors should consume lower power between two bunches. How to power the readout circuitry and how to keep the power consumption of the front-end electronics can at a reasonable low level, were the topics of a [first workshop on power pulsing and delivery](#) held at LAL in Orsay, France on 9-10 May 2011. The workshop gathered 40 experts from the field, and was initiated by the International Linear Collider/ CLIC Design – the Compact Linear Collider (CLIC) Study common working group for detectors, and experts from the SLHC (Large Hadron Collider upgrade) community also participated.

Lowering power is key to reduce power budget of course, but also to reduce heat dissipation in the sub-detectors. The lepton collider detectors will have little space for active cooling and neither the electronic circuits nor the sensitive parts like heat. The baseline approach to control the power consumption of ILC and CLIC detectors is called power pulsing, which means that certain functions of the front-end electronics are periodically disabled, for instance between two bunch trains and only configuration registers will remain powered during that time. At the workshop, scientists discussed different solutions to deliver power to the front-end electronics. These solutions included the use of DC/DC (direct current to direct current) converters as it proposed for SLHC detectors, or large storage capacitances. Some speakers pointed out that industrial applications nowadays are targeting ultra-low power-consuming circuits, which may not needed to be power-pulsed. Future detector systems may benefit from this experience too.

Representatives of the different subsystems presented the current status on their realisations in power delivery and power pulsing, indicating that some were more advanced than others. For example, the calorimeter groups have already successfully operated power-pulsed ASICs (application-specific integrated circuit) in a magnetic field in June 2010 at CERN. This achievement can clearly be regarded as a milestone towards the realisation of power-pulsed electronics for future particle detectors.

Beside the front-end electronics, the power management of detectors needs also to take into account peripheral devices like cooling. The workshop provided a forum to discuss these issues. Due to the limited space inside detectors, efficient cooling will be very challenging, in particular for the very inner parts of the detectors. These sub-component groups may work towards a common solution.

The workshop was extremely useful to identify the status of the considerations concerning the power management of detectors for lepton colliders. It was the first time where relevant figures and propositions were assembled in one place, which will be most useful for physicists and engineers working on detector integration.

But the story has just begun, and now our task as workshop conveners is to monitor the progress on this R&D and to make sure all subsystems groups work on a coherent approach, which will require good communication between them. A second workshop should be held in the first half of 2012. The conclusions of this next workshop will most certainly be part of the ILC detector *Detailed Baseline Design Report*.



Experts from ILC, CLIC and SLHC gathered at LAL in Orsay, France in May 2011, to discuss power pulsing and delivery for the next generation of particle detectors. Image: CNRS/LAL/Bruno Mazoyer

[CLIC](#) | [CNRS/LAL](#) | [DETAILED BASELINE DESIGN](#) | [DETECTOR R&D](#) | [ILC-CLIC](#) | [POWER PULSING](#) | [SLHC](#)

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