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DIRECTOR'S CORNER

Global Design Effort optimises industralisation models

This week's issue features a Director's Corner from Akira Yamamoto, Project Manager for the Global Design Effort.

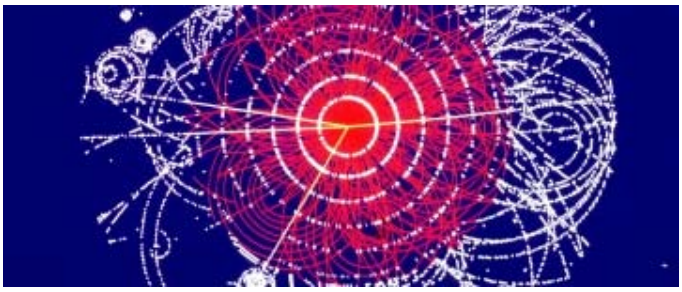
by Akira Yamamoto



As part of Technical Design Phase 2, the Global Design Effort has been working towards more realistic and cost-effective industrialisation models for the production of superconducting radiofrequency cavities and cryomodules, as these are primary cost drivers in the ILC construction estimate. To that end, they have been organising a series of visit to cavity and material manufacturers and workshops. The next one is in July 2011 in Chicago, US.

FEATURE

From *CERN Bulletin*: Experiments at the Large Hadron Collider – How are discoveries made?



With the LHC up and running, some might imagine physicists just waiting for a Higgs boson to pop up in one of the four experiments, before publishing a paper and moving on to solve science's next Big Mystery. However this picture is very far from the reality of experimental particle physics today, where results are based on statistics, statistics and yet more statistics.

FEATURE

Shin-ichi Kurokawa awarded Rolf Widerøe Prize

by Rika Takahashi



Shin-ichi Kurokawa is a mover and shaker in the world of accelerator physics, excelling in science and effectively bringing the community together to form strong, productive relationships. The European Physical Society has recognized Kurokawa's accomplishments, awarding him the Rolf Widerøe Prize.

IMAGE OF THE WEEK



Recovery effort at ATF

Image: Nobu Toge

After repairing some hardware components that were broken in the earthquake of 11 March, the recovery work at ATF is now focusing on fixing the overall hardware alignment using an optical survey technique. This will be followed by recovery of the cooling water, excitation of the magnet and the radiofrequency power, and test beam operation later this month and toward summer 2011.

IN THE NEWS

from ***BBC News***
26 May 2011
New method 'confirms dark energy'
First results from a major astronomical survey using a cutting-edge technique appear to have confirmed the existence of mysterious dark energy.

from ***National Geographic***
24 May 2011
Densest Matter Created in Big-Bang Machine
"Besides black holes, there's nothing denser than what we're creating," said David Evans, a physicist at the University of Birmingham in the U.K. and a team leader for the LHC's ALICE detector, which helped observe the quark-gluon plasma. "If you had a cubic centimeter of this stuff, it would weigh 40 billion tons."

from ***AFP***
23 May 2011
Europe's particle collider smashes another record
A month ago, the LHC set a record of 10 million collisions per second. "This is now 100 million collisions per second," Spiro said at a conference in Paris on the "infinitely small and the infinitely big."

from ***New York Times***
21 May 2011
Atom-Smasher Retires; Lab Makes Career Switch
Fermi's future experiments will focus on creating the greatest number of particles, not necessarily the most energetic ones. Scientists plan to create dense, relatively low-energy beams of neutrinos, little-understood particles that have almost no mass, no electrical charge and other quirky properties.

from ***The Economist***
20 May 2011
Dr Van Winkle and the Large Hadron Collider
Discussions are already under way about future upgrades and complementary devices, like a linear collider which would accelerate electrons and their antiparticles, positrons, in a straight line rather than a circle before smashing them head on.

BLOGLINE

23 May 2011
Frank Simon
Derailed Schedules

PREPRINTS

ARXIV PREPRINTS

1105.3555
Dark matter pair production at the ILC in the Littlest Higgs model with T-parity

CALENDAR

UPCOMING EVENTS

18th FCAL collaboration workshop
Predeal (Romania)
30 May- 01 June 2011

Second Workshop on linac operation with long bunch trains
DESY, Hamburg, Germany
06- 08 June 2011

Technology and Instrumentation in Particle Physics 2011 (TIPP 2011)
Chicago, IL
09- 14 June 2011

UPCOMING SCHOOLS

USPAS sponsored by Stony Brook University
Melville, New York
13- 24 June 2011

View complete calendar

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DIRECTOR'S CORNER

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Akira Yamamoto | 26 May 2011



The second workshop on superconducting radiofrequency technology and industrialisation for the ILC will be a satellite meeting of the SRF2011 conference on 24 July 2011 in Chicago.



The GDE project managers organised visits to superconducting cavity manufacturers in 2009.

As part of Technical Design Phase 2, the Global Design Effort (GDE) has been working towards more realistic and cost-effective industrialisation models for the production of superconducting radiofrequency (SCRF) cavities and cryomodules, as these are primary cost drivers in the ILC construction estimate. The most important issue to be explored is how to distribute and coordinate the globally based SCRF component construction and test.

Developing the optimum industrialisation models has been a multi-year task, starting with our efforts in early 2009 to communicate with potential cavity and cryomodule industrial partners the scope and plan for the ILC, and to receive their advice on possible industrialisation models and production facilities.

This was followed in May 2010 by a workshop called "Superconducting RF Cavity Technology and Industrialization," a satellite meeting of the first International Particle Accelerator Conference held in Kyoto, where further communication and fruitful discussions were realised with worldwide participants from industry and laboratories.

This year a second set of visits is underway with cavity, cryomodule, and material manufacturers. In this series of visits, we are reporting our recent study and consideration of the industrialisation models described in a document titled "Preparation for ILC SCRF cavity and cryomodule industrialization," and are asking for their responses to our request for information.

Based on this progress, we are now organising the 2nd workshop on SCRF cavity technology and industrialisation as a satellite meeting of the SRF 2011 conference. The workshop will be hosted by the GDE project managers and held at the Sheraton Hotel & Towers in Chicago on 24 July 2011. The workshop is open to all, though registration is required for logistical purposes. It will focus on our industrial partners' responses to our request for information, and how these responses affect our planning and implementation in the Technical Design Report. A preliminary agenda outline and contact information for the workshop has been posted.



Global Design Effort plan for SCRF R&D includes communications with industry.

CAVITY | CRYOMODULE | INDUSTRIALISATION | INDUSTRY | SCRF | SRF2011

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Experiments at the Large Hadron Collider - How are discoveries made?

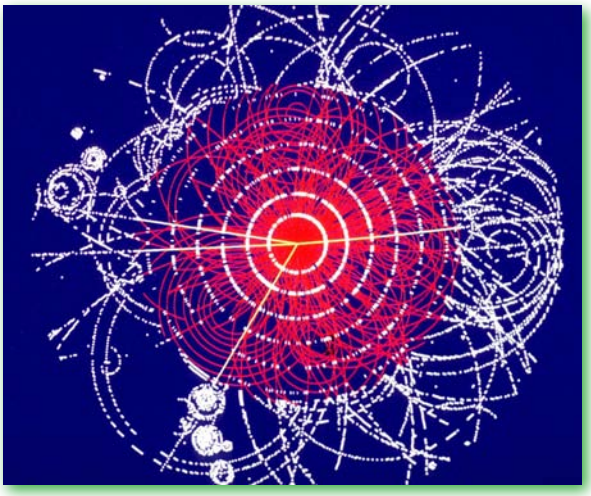
With the LHC up and running, some might imagine physicists just waiting for a Higgs boson to pop up in one of the four experiments, before publishing a paper and moving on to solve science's next Big Mystery. However this picture is very far from the reality of experimental particle physics today, where results are based on statistics, statistics and yet more statistics.

This is because new particles are hardly ever detected directly. Depending on the design of the experiment, there can be several centimetres between the collision point and the first layer of detector electronics. This is a vast distance on the scale of a subatomic particle. Particles created in the collisions interact and indeed decay before ever reaching the detector. If created in an LHC collision, the Higgs boson, for example, is expected to last for a mere trillionth of a trillionth of a second (10^{-24} s), before decaying into other particles – not long enough to move anywhere perceptible, let alone reach the detector. Moreover its decay products may themselves also decay before being detected.

It is only through a complete analysis of the tangle of particles created in collisions that physicists can begin to suppose the existence of something new. Over time, with repeated observations of the same effect, suppositions become more certain. The larger the data set, the more confidence we can have about the results. However, new particles are not created in every collision. Far from it! Finding a Higgs will be like finding a needle in a million haystacks.

Making a discovery often consists of collecting a lot of data and combining them in a plot (one of the most common plots is production rate against mass) before carefully subtracting the contributions expected from known processes. This is because known particles can often produce similar decay products, or signatures in the detector, to new particles. Once all known processes are accounted for, if a signal remains, it might be down to something new.

Often you will hear a sigma value attached to a particular announcement. This gives a measure of how certain physicists are that the result is real and not just a statistical fluke. A two-sigma result has a 2.3% chance that it is not true. A three-sigma result has a 0.15% chance that it is not true. Beyond the three-sigma level, physicists start sitting up and taking notice, but a result can't yet be termed a new discovery. For that to happen, a five-sigma certainty is needed, or a mere one in 3.4 million chance that a sighting is due to chance.



Simulated Higgs decaying into four muons in the ATLAS detector.

And although a three-sigma result may already sound pretty certain to you, don't forget physicists are making huge numbers of different plots. If you plot 1000 different distributions, the chances become about one in a thousand (0.1%) that you'll see something odd in one of them, without it being due to a new particle.

Luminosity is key - the more protons in the LHC and the higher the collision rate, the more data are collected and analysed by the experiments and the lower the error. But this only works up to a point. The sigma value alone does not give the whole story. The contributions from known particles that are subtracted from the plots are not always known exactly. This is a potential source of systematic error that is not reflected in the sigma value.

In addition, the choices made by the physicists running the experiment, such as the criteria for which data to store and analyse, can contribute to errors in the analysis. These choices are based on our current understanding of physics, which gives pointers to what we expect to find, but they are not infallible. There can also be effects due to the way a particular experiment is designed.

Hence the importance of comparisons with results from different teams. CERN's communication protocol ensures that before the lab makes an announcement of a new discovery, the leaders of the other LHC experiments have also had a chance to compare results to their own measurements and give their reactions.

This doesn't mean it's wrong to get excited about the first indications of new physics. It is just important to put them into context. They should be taken with a pinch of salt until they have been both tested over time and subjected to peer review. With the LHC performing so well, there is great excitement all over CERN and huge anticipation of the results that are on their way. Roll on the summer conference season and its abundance of new peer-reviewed papers.

Emma Sanders

FEATURE

Shin-ichi Kurokawa awarded Rolf Widerøe Prize

Rika Takahashi | 26 May 2011



Shin-ichi Kurokawa of the KEK Laboratory at Tsukuba, Japan

The European Physical Society Accelerator Group announced that Shin-ichi Kurokawa, professor emeritus at KEK, Japan, and vice president of Cosylab, was awarded the Rolf Widerøe Prize, which is given to an individual for his or her outstanding work in the particle accelerator field.

Kurokawa has been working in the accelerator field for 37 years. “I was not an accelerator physicist originally,” said Kurokawa. He was an experimental physicist, working on particle physics experiments using low-energy kaon and anti-proton beams. “I started to engage in the construction of KEK’s proton synchrotron beamlines in the early ’70s,” said Kurokawa. He played a central role in the design and construction of beamlines, which caused him to gradually shift his attention to accelerator physics.

He exercised outstanding leadership in many projects at KEK. He was in charge of accelerator control in the TRISTAN project, and he led the successive project, the KEK B-Factory, as a project leader. “We had an electron cloud problem at the beginning of the KEKB commissioning, and could not reach the luminosity we aimed at,” said Kurokawa. To deal with the situation, he employed solenoid coils on the beam pipes. That decision greatly contributed to the later accomplishment of a luminosity world record at the KEK B-factory.

His contribution to accelerator physics extends to international collaboration. He actively participated in international frameworks in Asia such as the Asian Committee for Future Accelerators. He served on the committee since its establishment in 1996, and led the organization as chair from 2004 to 2006.

Kurokawa always says “strengthening the relationship between Asian countries and regions such as China, Korea, India, Taiwan and Japan is crucial for accelerator science to be more actively pursued.” His conviction motivated him to promote numerous collaborative research programs within Asia. He also worked to build collaborative relationships between Asian and Middle Eastern countries in the synchrotron radiation research field, establishing a framework to provide Japan’s accumulated knowledge and expertise in the field to young Middle Eastern and African researchers at SESAME (Synchrotron light for Experimental Science and Applications in the Middle East) in Jordan. He was instrumental in the creation of APAC (Asian Particle Accelerator Conference) in 1998.

In addition, he successfully convened the first IPAC meeting. IPAC, or the International Particle Accelerator Conference, once had three different names, being separately organised in three regions: PAC in the Americas, EPAC in Europe, and APAC in Asia. He made a great effort to merge them into one international conference and chaired the first IPAC successfully in Kyoto in May 2010.

His contribution to the ILC is also significant. Kurokawa chaired the organising committee for the very first International Linear Collider school held in Hayama, Japan, in 2005. He also was the recipient of the *Reference Design Report* for the ILC as Chair of the International Linear Collider Steering Committee in Beijing in 2007.

Looking forward to the completion of the ILC *Technical Design Report* in 2012, Kurokawa said, “The important thing is to evolve

the Global Design Effort into a more structured organisation. The new organisation should stand on more a rigid international framework."

He will receive the medal for the Rolf Widerøe Prize this September at the second IPAC conference, to be held in San Sebastian, Spain.

Read the full statement from the European Physical Society

ACCELERATOR PRIZE | EPS | KEK | ROLF WIDERØE PRIZE

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