FERMI NEWS

FERMILAB A U.S. DEPARTMENT OF ENERGY LABORATORY

A New Layer of Sensitivity 11

Photo by Reidar Hahn

Volume 27
February 2004
Number 2

INSIDE:

DZero

BREAKS NEW GROUND in global computing efforts

First steps toward Grid application with 'real data'

ON THE WEB:

Reprocessing of DZero Run II data:
www-d0.fnal.gov/computing/reprocessing/

by Kurt Riesselmann

Searching for subatomic particles very much resembles the often-cited search for the needle in the haystack. Since the beginning of Collider Run II in March 2001, DZero scientists have collected more than 550 million particle collisions. The data fill five stacks of CDs as high as the Eiffel tower—storage cases not included. And the (hay)stacks are growing every day.

"The Fermilab farms can process four million events per day," said Mike Diesburg, who manages a cluster of 600 PCs for the DZero experiment at Fermilab. "That's enough to handle the daily flow of incoming events."

Yet when the DZero collaboration decided to re-examine the entire set of collision data, encompassing more than 500 terabytes, scientists had to look for computing power beyond Fermilab. For the first time ever, DZero scientists had to send actual collision data—the crown jewels of their experiment—off site.

"In the past, DZero and other particle physics collaborations have used remote computing sites to carry out Monte Carlo simulations of their experiments," said DZero scientist Daniel Wicke, University of Wuppertal, Germany. "We are now one of the first experiments to process real collision data at remote sites. The effort has opened up many new computing resources for our collaboration. The evaluation of our experience will provide valuable input to the worldwide development of computer grids."

The reprocessing of the DZero collision data, coordinated by Diesburg and Wicke, so far involves computing resources in six countries: Canada, France, Germany, the Netherlands, the United Kingdom and the United States. (Many other countries contribute to the computing of simulated DZero data and the analysis of processed data.) From November to January, DZero groups in each of the six countries had access to local PC clusters and Grid networks, ranging from one hundred to more than one thousand PCs.

"In the UK, the software installation, submission and monitoring of jobs was done centrally for all participating UK sites in a grid-like manner," said Gavin Davies at Imperial College London. "The machines at Imperial College, for example, are shared across the whole College, so it takes grid software to keep it all running smoothly."

The largest amount of off-site computing took place at the Centre de Calcul in Lyon, France, which reprocessed 36 million collisions.

"Reprocessing involves large volumes of data to be transferred in both directions on a scale that was simply unthinkable a few years ago," said Patrice Lebrun, IPN Lyon. "It will open new possibilities that we are only beginning to explore."

To provide participating computer systems with collision data, the DZero collaboration relied on the SAM software developed at Fermilab. The Sequential Access Manager is essentially a catalog of all the DZero data, and it transfers data on demand. Wyatt Merritt, who is a co-leader of the SAMGrid project at Fermilab, explained the process.

"If a DZero scientist submits a job to the computer system in Karlsruhe, Germany, it may need a particular set of data files," she said. "If those files are not in the local system, the SAM software will automatically determine where they are and retrieve them. With the SAM software, a user doesn't need to know whether the data is stored on tape or on disk, whether it is located at Fermilab or at Karlsruhe."

Western Canada Research Grid (WestGrid):

- 3,000 processors* in beta test shared by DZero, a chemistry group and a second subatomic physics group.
- Processors* used by DZero: 1,000
- DZero events reprocessed: 12 million
- URL: www.westgrid.ca
- Funding: Canada Foundation for Innovation; Natural Sciences and Engineering Research Council

Grid for UK Particle Physics (GridPP):

- Imperial College London, Manchester University and Rutherford Appleton Laboratory provide more than 550 processors*
- Processors* used by DZero: 270
- Events reprocessed: 23 million
- URL: www.gridpp.ac.uk/dzero/
- Funding: Particle Physics and Astronomy Research Council, and other organizations

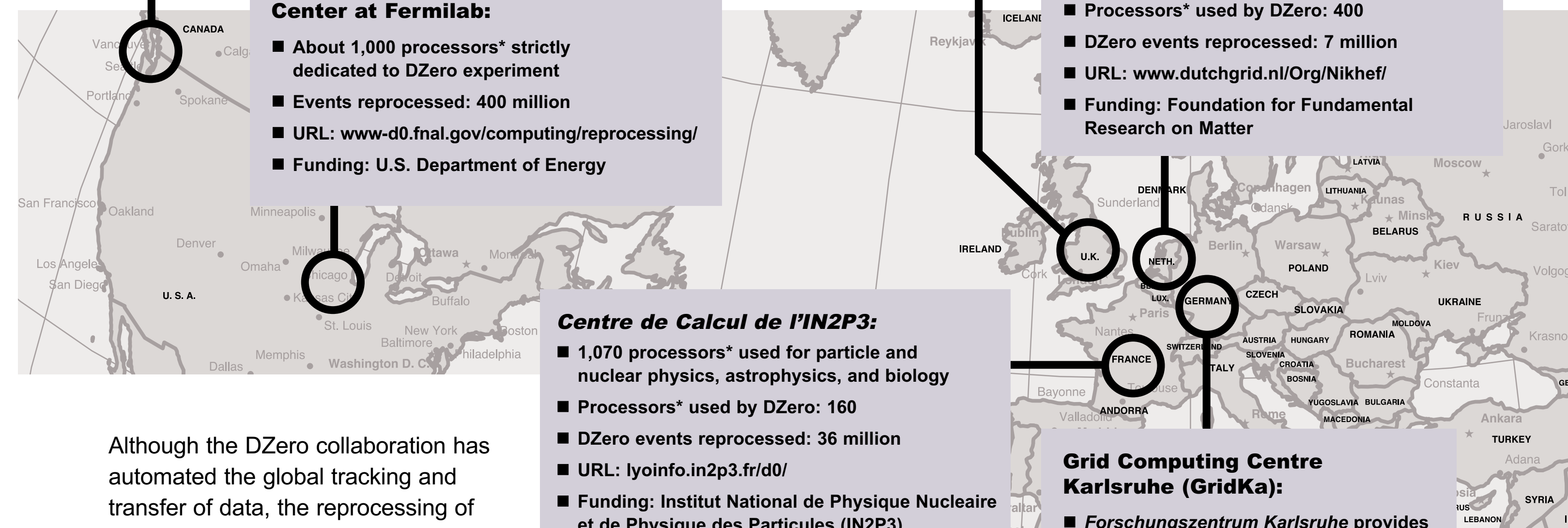
*computing power equivalent to 1 GHz Pentium III processors

NIKHEF DataGrid:

- Local installation of the LHC Computing Grid with 500 processors*, of which 100 are always reserved for DZero
- Processors* used by DZero: 400
- DZero events reprocessed: 7 million
- URL: www.dutchgrid.nl/Org/Nikhef/
- Funding: Foundation for Fundamental Research on Matter

Feynman Computing Center at Fermilab:

- About 1,000 processors* strictly dedicated to DZero experiment
- Events reprocessed: 400 million
- URL: www-d0.fnal.gov/computing/reprocessing/
- Funding: U.S. Department of Energy



Centre de Calcul de l'IN2P3:

- 1,070 processors* used for particle and nuclear physics, astrophysics, and biology
- Processors* used by DZero: 160
- DZero events reprocessed: 36 million
- URL: lyoinfo.in2p3.fr/d0/
- Funding: Institut National de Physique Nucleaire et de Physique des Particules (IN2P3)

Grid Computing Centre Karlsruhe (GridKa):

- *Forschungszentrum Karlsruhe* provides 900 processors* for several particle physics experiments
- Processors* used by DZero: 200
- Events reprocessed: 21 million
- URL: www.gridka.de/D0/
- Funding: German Federal Ministry of Education and Research

Although the DZero collaboration has automated the global tracking and transfer of data, the reprocessing of data does not yet represent a full, global Grid. So far, DZero scientists manually assign computing jobs to specific clusters and local grids. However, scientists at the NIKHEF laboratory in Amsterdam made great progress.

"We have been able to show that we can really use the LHC [Large Hadron Collider] Computing Grid for DZero processing," said Kors Bos, who leads the Dutch computing efforts. "We saw jobs submitted from Wuppertal being executed on our CPUs, and we executed jobs in Karlsruhe, at Rutherford Appleton Laboratory and a few more places."

Wuppertal's Wicke praised these efforts.

"The group at NIKHEF has pushed the Grid concept the most," he said. "They have devoted themselves to running DZero computing jobs on generic computers that have no prior knowledge of DZero programs and data bases. When their efforts pay off, then we can run our DZero jobs on any computer cluster in the world."

The DZero collaboration conducted the reprocessing of all Run II data to improve, among other things, the identification of particle tracks. Raw data contain track information in the form of a vast collection of disconnected points. To connect the right dots, scientists use sophisticated track reconstruction programs. Until recently these programs relied on the theoretical design of the DZero detector rather than its real-world performance.

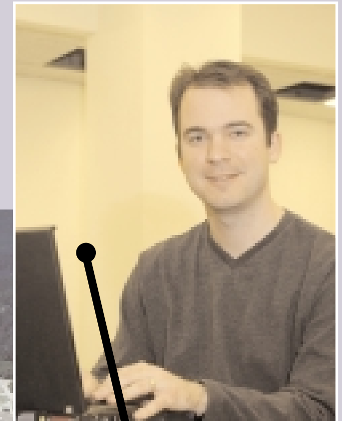
"The new algorithm is based on our knowledge of how well we put the detector together," said Dugan O'Neil, one of the DZero scientists working with the WestGrid in Vancouver, Canada. "This has dramatically improved our efficiency of finding particle tracks."

The collaboration also has adopted the new algorithm to process all new experimental data. Yet the collaboration expects to carry out another reprocessing of all Run II data, old and new, in less than a year, applying further refined analysis tools to the raw data. The new round of reprocessing will require even more off-site computing power, providing ample of opportunity to further develop the Grid system.

"You can't make the Grid work without motivation," said O'Neil. "It's one thing to have a vision, and it is another thing to stay up to three in the morning to make things work because they need to get done. DZero is a real application. We need to get the physics results out."

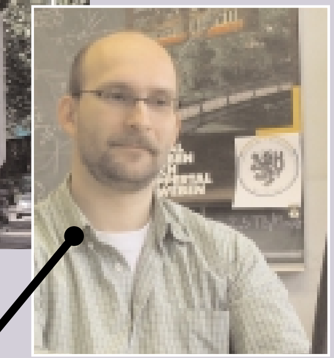
DZero

SFU campus on Burnaby Mountain, Vancouver



"You can't make the Grid work without motivation. It's one thing to have a vision, and it is another thing to stay up to three in the morning to make things work because they need to get done. DZero is a real application. We need to get the physics results out."
– Dugan O'Neil, Simon Fraser University, Canada

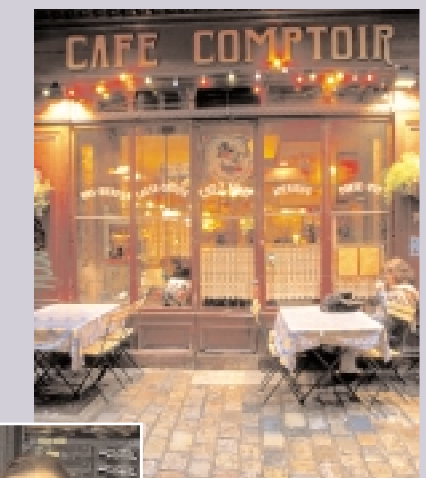
Wuppertal's landmark, the suspension railway



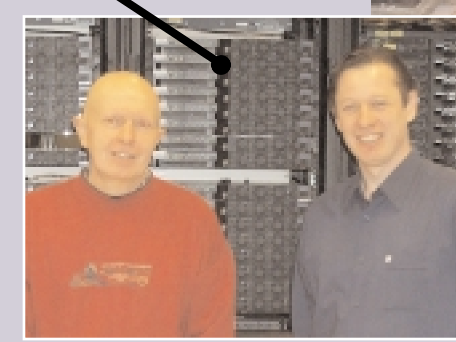
"In the past, particle physics collaborations have used remote computing sites to carry out Monte Carlo simulations. We are now one of the first experiments to process real data at remote sites. The effort has opened up many new computing resources. The evaluation of our experience will provide valuable input to the Grid development."
– Daniel Wicke, University of Wuppertal, Germany

Tower Bridge, London

"The machines at Imperial College, for example, are shared across the whole college, so it takes grid software to keep it all running smoothly." – Gavin Davies, Imperial College London, UK



Street scene in Lyon



"We've participated in large-scale Monte Carlo production in the past, but data reprocessing involves large volumes of data to be transferred in both directions on a scale that was simply unthinkable a few years ago. It will open new possibilities that we are only beginning to explore."
– Patrice Lebrun (right), with Tibor Kurca, CCIN2P3, Lyon, France

"With the SAM software developed by the Fermilab Computing Division and DZero, a user doesn't know whether the data is stored on tape or on disk, whether it is located at Fermilab or at Karlsruhe."
– Wyatt Merritt (left), with Mike Diesburg and Amber Boehnlein, Fermilab, U.S.A.

Chicago skyline

Amsterdam, famous for its canals

"The re-processing was a major milestone for DZero. For us it is also important that we have been able to show that we can really use the LHC Computing Grid for DZero processing. We saw jobs submitted from Wuppertal being executed on our CPUs, and we executed jobs in Karlsruhe, at Rutherford Appleton Laboratory and a few more places."
– Kors Bos (front row, second from left) and the Scientific Computing team at NIKHEF, Amsterdam, Netherlands

Do you feel WELCOME in the United States?

by John Womersley
DZero co-spokesperson

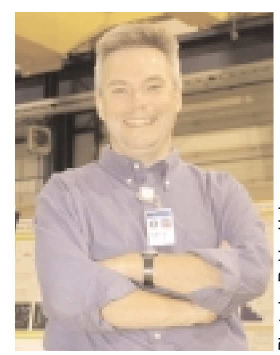


Photo by Reidar Hahn

John Womersley

I was asked this question—a rather personal and an unexpected one to a British citizen—last summer. The DZero experiment held a workshop at Beaune in France and we had invited a number of European physicists to participate, in order to help build some common sense of community. Many of my friends working at CERN seem to believe that while Fermilab may be a great place to do physics, surely, since 9/11, the atmosphere for foreigners has become very unwelcoming. As soon as Run II is finished, wouldn't you rather move back to Europe and work on the LHC?

I hope the answer isn't so obvious. When I came to Fermilab, it was never as part of a plan to spend the rest of my life here. But I like the place. I like the people, and I am proud to be associated with a lab that has made such a clear and strong statement about its openness to foreign scientists and its commitment to international collaboration in science. I have done all that I can in DZero to extend this openness to new collaborating groups from Europe, Asia and North America.

More than 50 years ago, Enrico Fermi said: "Scientific thinking and invention flourish best where people are allowed to communicate as much as possible unhampered." Even at the height, or depth, of the Cold War, scientists from the Soviet Union were full members of Fermilab experimental collaborations.

Recently, my pride in Fermilab's past has become tinged with some embarrassment. I am sorry that recent events have spoiled Fermi's vision of openness. As a U.S. resident (with "green card"), I have been—so far—subject only to minor inconveniences, but I know that our foreign collaborators have faced increasingly tough, unreasonable and often arbitrary barriers when they try to come to the United States to do physics.


Fermilab photo

In 1973, at the height of the Cold War, Universities Research Association president Norman Ramsey (left), National Accelerator Lab scientist William Fowler (light jacket) and Director Robert Wilson (second from right) hosted members of the Soviet Union's atomic energy commission.

I know most of them, and I know they are not terrorists. They have a hard time understanding why making a scientist from Russia or India wait six months for a visa has anything to do with fighting terrorism. Frankly, so do I. I would like to apologize to each and every one of our colleagues for the fact that they have had to go through such an effort to get here; and I would like to thank each of them for the fact that they have chosen, despite the problems, to continue to work here. I really appreciate the commitment.

I grew up in the UK in the 1970's. At that time, the Northern Ireland conflict was spilling over on to mainland Britain. There were bombings and shootings; thousands of people died in a brutal and senseless war. One thing that became clear in that context, and which remains truer today than ever, is the nature of the deepest challenge with which terrorism confronts a liberal democracy. It is not how to defeat terrorism itself: imposition of a police state can go a long way to achieving that goal. The true challenge is how to defeat terrorism without surrendering those very freedoms that make a liberal democracy worth fighting for.

That is the challenge that the United States faces now. I believe that one of the freedoms that defines a liberal democracy is the ability for people to travel as they wish, among them scientists engaged in peaceful cooperative research. This is something which the recent visa restrictions have called into question, and which is continuing to be undermined. It should not be treated as a privilege or a luxury, one of the first things to be surrendered as soon as things get rough. It goes to the very essence to what makes the U.S. special, one of the things that a country built by immigrants and refugees should be proud to stand up for.

To our foreign colleagues, I can only say: keep the faith. We in the U.S. scientific community share your feelings. This is not just idealism; we understand that the situation is hurting our international standing and our ability to attract future projects. We cannot promise to quickly change any of the visa and immigration rules that are so irksome to you. We can only promise that we will not quietly accept them. Your fight is our fight; we understand that we are all in this together, and we are doing what we can.

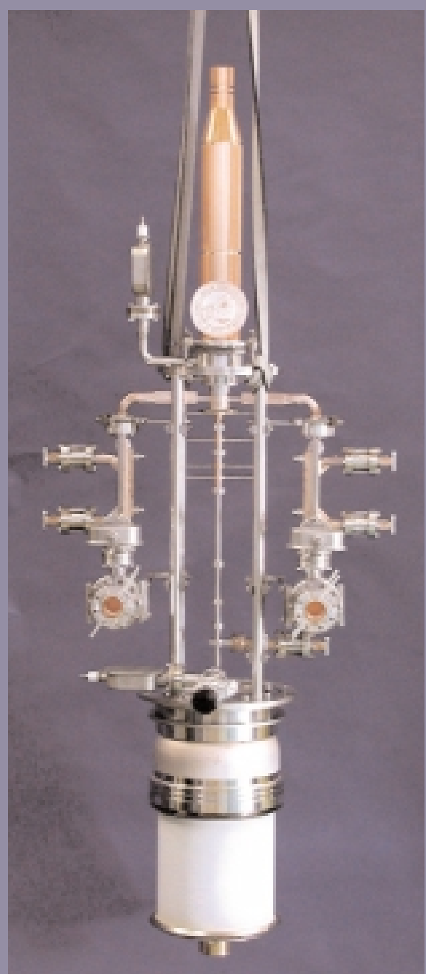


Photo courtesy SLAC

A new 75 MW klystron built at SLAC, which could be used in a “2-pack” to replace the current 4 klystron system later this year.

ON THE WEB:

Stanford Linear Accelerator Center
www.slac.stanford.edu

NLC Collaboration Reaches Critical High-Power X-band Goal

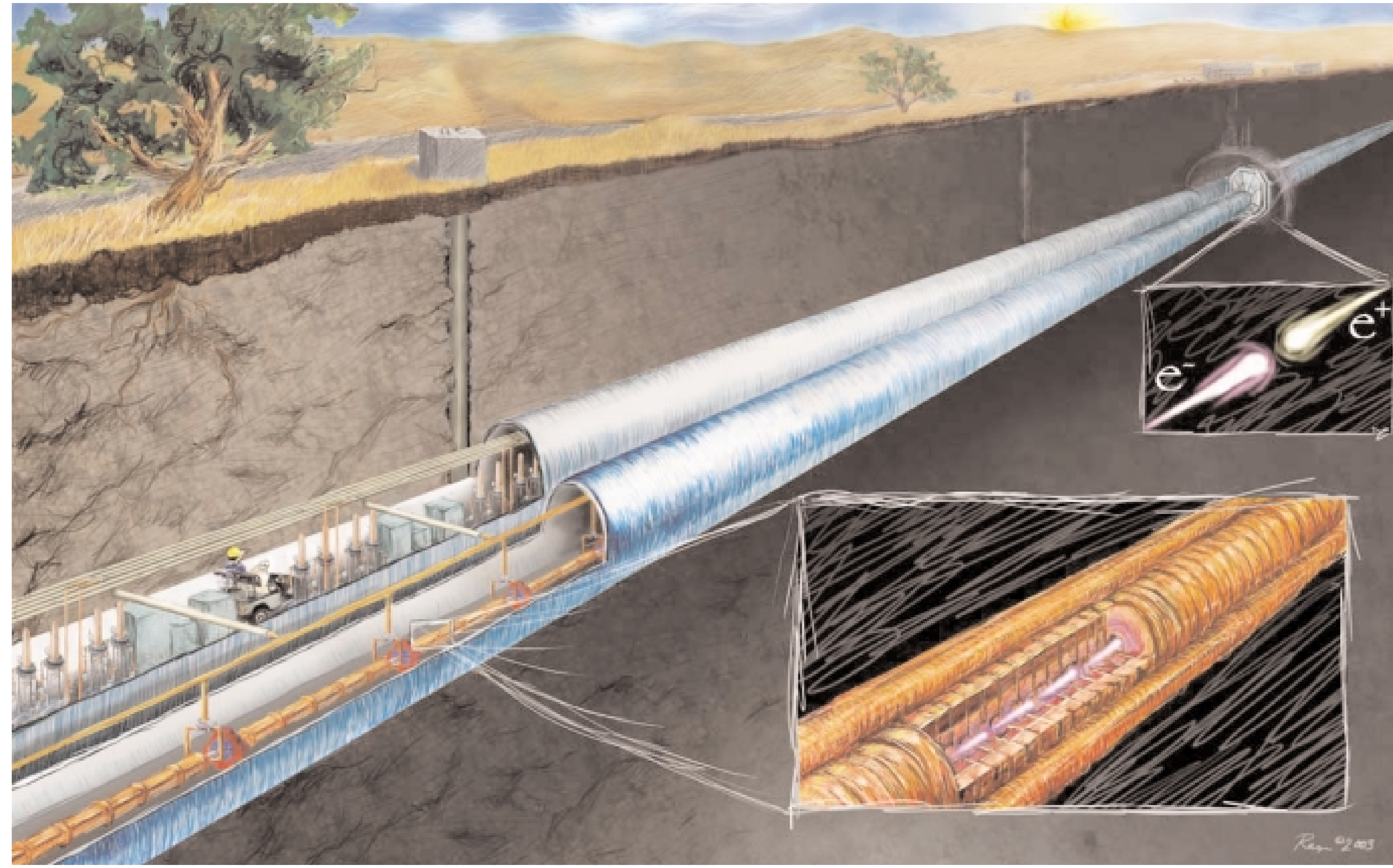


Illustration by Nicolle Rager

Artist’s conception of the Linear Collider.

by Heather Rock Woods
SLAC Office of Public Affairs

MENLO PARK, California—A team at the Stanford Linear Accelerator cleared an important hurdle in December 2003 on the path to a next-generation global linear collider.

The team, part of the U.S.-Japanese Next Linear Collider-Global Linear Collider collaboration, is working on X-band accelerator technology (for the so-called “warm” linear collider). The international particle physics community is also considering another technology option for the linear collider: superconducting radiofrequency technology, being pursued by the TESLA collaboration led by DESY in Germany.

The 8-Pack Project squeezed 475 megawatts of energy into a 400-nanosecond (ns) pulse of radio frequency (RF) power. This short-lived peak power, delivered in 400 billionths of a second, is more than that produced by some nuclear power plants, and demonstrates the capability to supply the power that will be needed to accelerate the electrons and positrons to the desired energy levels.

“This was a real challenge. No one had pushed power this long, this hard and this high,” said SLAC physicist David Schultz, who heads the 8-Pack Project.

The International Linear Collider Technical Review Committee has rated the RF supply system as one of the two most critical goals to reach in order to consider building an X-band linear collider. The second critical goal involves the accelerating gradient of the RF structures. The physics community expects to select either an X-band collider or a superconducting collider by the end of this year.

“This is a great step towards the full TeV-energy mission of the linear collider,” said SLAC Professor David Burke, head of the NLC collaboration.

On Dec. 4, SLAC Professor Sami Tantawi announced that the innovative RF supply station delivered the desired 475 MW / 400 ns pulse at a frequency of 11.424 gigahertz. Soon, the new system began routinely producing 570 MW. This is more than three times the peak RF power, and four times the frequency, that SLAC currently generates to run the world’s longest and most powerful linear accelerator.

Reaching this high-power goal was the culmination of an effort begun more than a decade ago as a collaboration between SLAC and KEK, Japan’s High-Energy Accelerator Research Organization.

“There were cheers all around, back-slapping and hand-shaking. This accomplishment was two years in the making,” Schultz said.

An X-band collider would need over 2,000 such RF supply stations to add 65 mega-electron volts (MeV) of energy to an electron bunch for every meter the bunch travels.

The second critical goal is to demonstrate the high-accelerating gradient performance (65 MeV per meter) of the accelerating RF cavities, the

Dual-mode RF power 'a beautiful work of art'

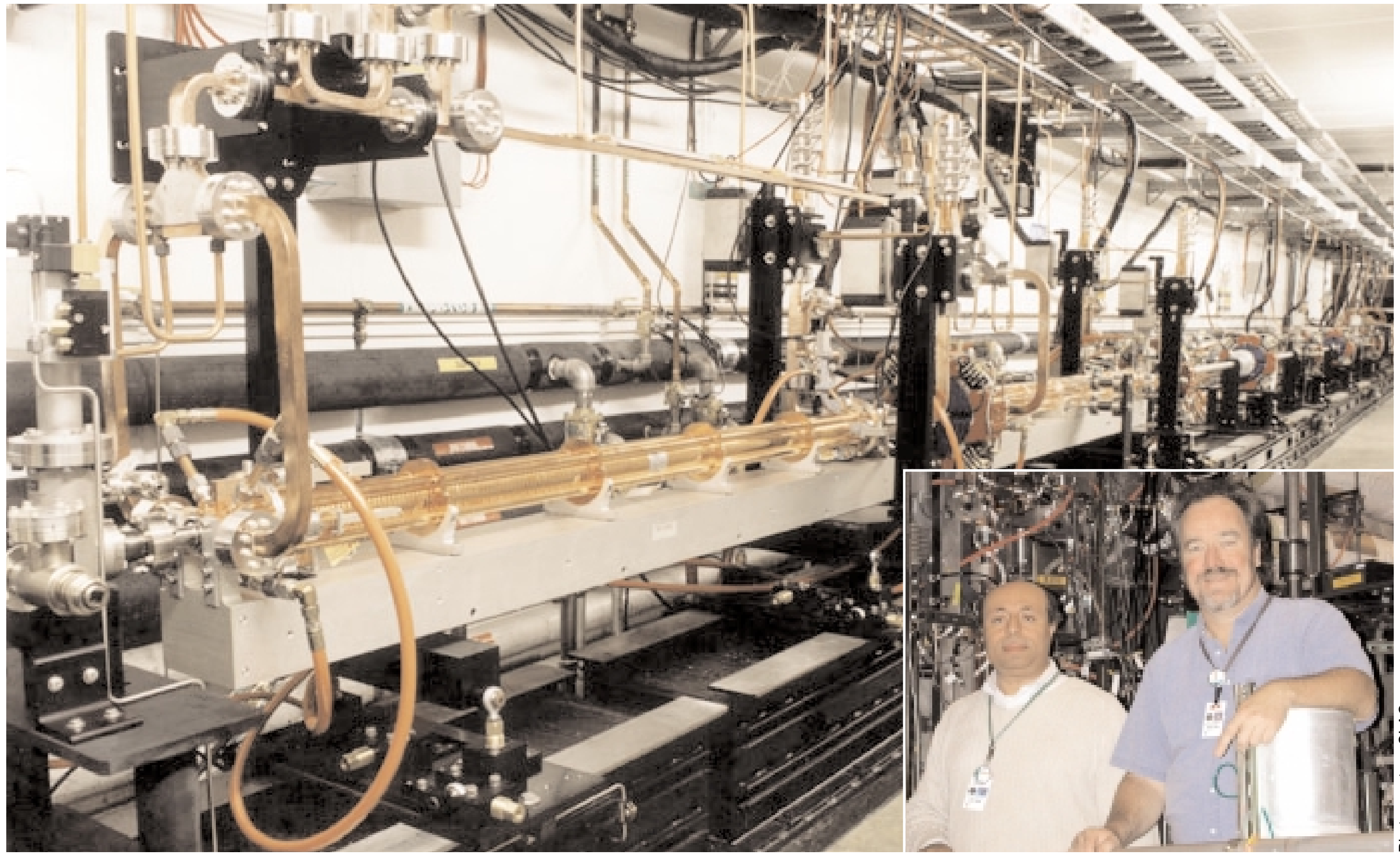


Photo courtesy SLAC

At SLAC's Linear Collider test facility, David Schultz (right) is the 8-Pack Project Manager, and SLAC professor Sami Tantawi designed the new SLED II system.

sophisticated, high-precision copper cells through which the electrons travel in a vacuum. A further test combining the high power with the accelerating structures will be carried out this spring at the NLC Test Accelerator.

"We're enthusiastic about this next step—using the RF supply station to power the accelerating structures being built at Fermilab, SLAC and KEK," Burke said.

In mid-January, the first of six RF accelerating structures to be supplied by Fermilab for the 8-Pack test was delivered to SLAC. Fermilab has also delivered several accelerating structures in the past for high-power RF testing in NLCTA.

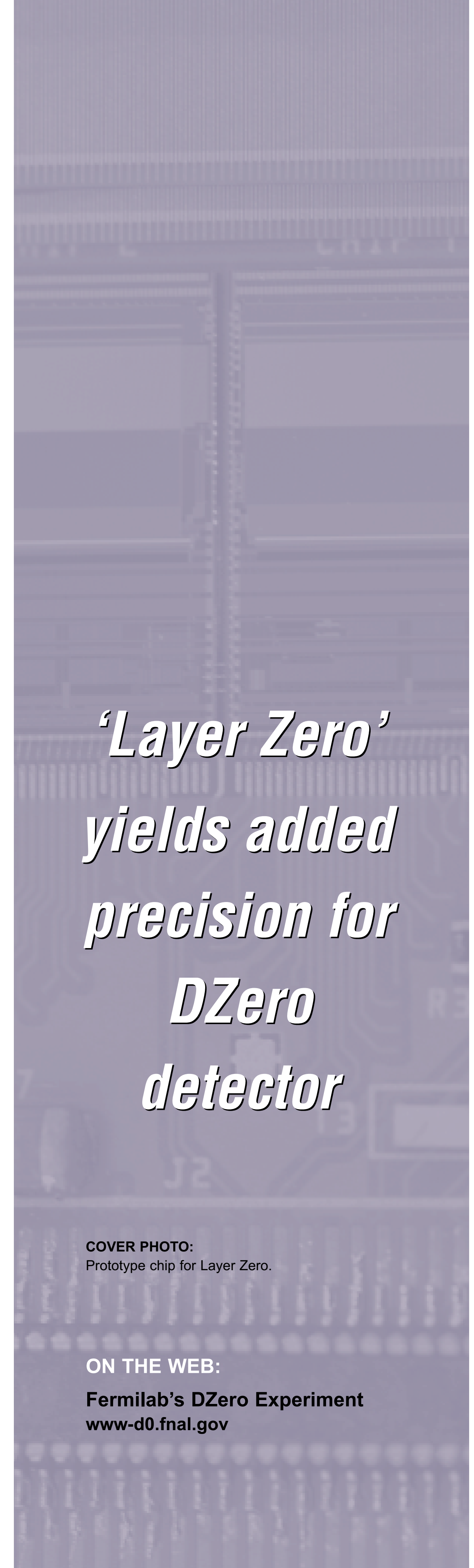
The eight-pack team designed and assembled a new, scaled-back RF system as an alternative to the original design, which required a pack of eight klystrons (the tubes that generate rf power). The current "8-Pack" station needs only four klystrons, which may be replaced this year with just two klystrons of a new design. One of these new 75 MW klystrons recently performed to full specifications for a warm linear collider.

The 8-Pack klystrons are powered by short, high-voltage pulses from a new modulator with pioneering solid-state switches. The RF power from the klystrons is funneled to a new SLED II (Stanford Linac Energy Doubler) system, which triples the power and shortens the pulse by a factor of four. Tantawi and his group designed revolutionary new components for the existing SLED system, enabling it to operate in "dual mode," where the RF power is transmitted in two modes to pack more power into a pulse in a shorter space.

"We were rewarded when all these parts got integrated and operated together in perfect harmony," Tantawi said. "This machine is a beautiful work of art that gave its designers and creators a deep sense of satisfaction."

Tantawi and Schultz are now running a series of performance tests to investigate whether the RF systems are sustainable and reliable under the operating conditions of a linear collider that runs around the clock.

"We want to understand stability and other factors that are important if you need to build 2,000 of these," said Tantawi.



'Layer Zero' yields added precision for DZero detector

COVER PHOTO:
Prototype chip for Layer Zero.

ON THE WEB:

Fermilab's DZero Experiment
www-d0.fnal.gov

A New Layer of Sensitivity

by Matthew Hutson

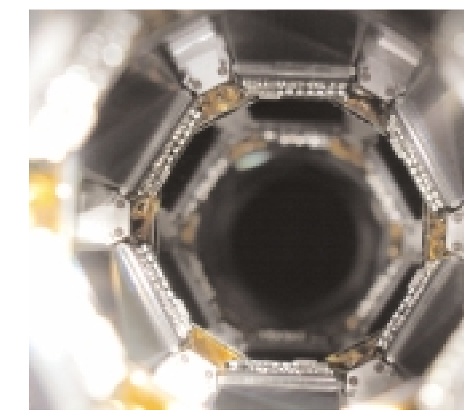


Photo courtesy DZero

The inside of DZero's Layer 1. Layer 0 and a new beam pipe will slide through this 2-inch-diameter hole.

A particle collision is like a messy car wreck at a busy intersection with no immediate witnesses.

The particles produced in a high-energy particle collision usually decay into other particles, which sometimes decay into still other particles. By the time these leftovers have traversed the radius of the beam pipe and strike the surrounding silicon sensors, they're pretty much done with the show. From measuring the types and trajectories of these secondary (and tertiary) particles, physicists must reconstruct what happened inside the beam pipe.

Fermilab scientists are adding a new front line to the battery of sensors inside the giant DZero detector. They've just completed the design of a new set of sensors, to be installed in a very confined space, which will give new life to the experiment. Slyly sitting outside the beam pipe but inside the existing sensors, the long carbon fiber tube covered in chips and wires will have two major impacts. First, it improve the detector's impact parameter resolution—how well the detector resolves the interaction point—by a factor of two; second, it will improve "b-tagging"—the identification of bottom quarks ejected from collisions—by 20%. Tagging b quark decays is important because the interesting heavy objects, such as Higgs and the top quark, decay into b quarks. This is one of the important features to distinguish the interesting Higgs or top decays from the very large rate of background events. The new detector could also help resolve the rapid flavor oscillations of the B_s meson that has so far eluded other detectors.

Photo by Reidar Hahn

Andrei Nomerotski, Kazu Hanagaki, and Jim Fast examine a Layer 0 prototype in Fermilab's Silicon Detector facility.

DZero's original plans for a major upgrade to its silicon detector ended in September due to reallocation of funds, but DZero scientists quickly shifted gears and began preparing for a more modest improvement. The silicon sensors act as a first line of defense in the particle detector, and they take the most punishment from radiation. For about three feet in either direction along the beam pipe from the collision point, several layers of silicon sensors wrap around the beam pipe to a radius of about 16cm. The Central Fiber Tracker (CFT) sits outside the silicon detector, extending in radius from 20cm out to 52cm. Both trackers sit inside a solenoid magnet that bends the particle tracks, allowing physicists to determine their charge and momentum. Massive central and end cap calorimeters, which measure particle energies, surround the trackers.

Over the years, radiation damage will deteriorate the performance of the silicon sensors, and the full "Run IIb" plan called for replacing them all. The new Layer Zero plan calls for sliding one new layer of sensors inside layers 1-4.

Sound simple? It's not. The scientists must install Layer Zero without disturbing any of the sensors already in place; indeed, without touching them. The inside of layer 1 is delicate silicon, so the group's backup plans cannot include greasing up Layer Zero with WD-40 and cramming the thing in. To say that the task resembles threading the eye of a needle would be inaccurate. The piece to be installed is 96 inches long and the hole is less than two inches wide. It's more like threading a row of 100 needles.

A cross section of Layer Zero looks like a ring or donut, with an inner radius of 16mm and an outer radius of 22mm. The 6mm band in between (see drawing, Pg. 13) needs to hold a hexagonal support structure made of carbon fiber, one row of silicon sensors on each of the six sides, a cooling tube in each corner, and analog cables running from the silicon sensors to the ends of the tube.

Lengthwise, 48 pieces of silicon will cover the middle three feet of the carbon fiber support structure, and for another foot in each direction, the structure will hold circuits called hybrids with readout chips mounted on them. These chips will translate the data from the sensors and analog cables into digital values that will run along special cables out to the ends of the detector, where they'll be combined with data from all the other silicon sensors.

In most cases, the readout chips—in this case SVX4 chips, designed by Fermilab, Berkeley, and Padua —sit right on the silicon sensors, but here they won't for three reasons. Most important, there's no room. Second, the extra heat would warm the silicon sensors, making them more sensitive to radiation damage. And third, putting extra material in that area would increase unnecessary scattering of the particles.

There is, however, a downside to this strategy. Namely, the analog cable connecting a sensor to a readout chip will act like an antenna and create noise in the low level analog signals. As Ron Lipton, co-project manager, joked, the cable will have "more sensitivity to picking up the local radio station." Still, scientists over at CDF first used this technique with their Layer Double-Zero (L 00) and have shown that it works, though they encountered considerable difficulties in interpretation of the data because of the pick-up noise

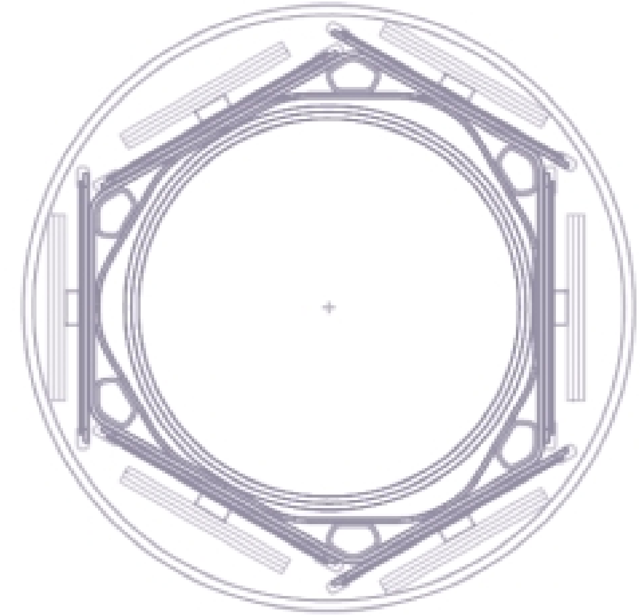


Photo courtesy University of Washington

The DZero mechanical team from the University of Washington will build the carbon fiber support structure. From right to left: Joshua Wang, Research Engineer; Henry Lubatti (PI), Professor of Physics; Colin Daly, Professor of Mechanical Engineering; Bill Kuykendall, Research Engineer. Not Shown: Tianchi Zhao, Research Professor, Physics; Mark Tuttle, Professor of Mechanical Engineering. At left: a CAD cross-section of Layer Zero, not to scale. The inner circle, about an inch across, is the beam pipe.

"When we started to build prototypes three years ago we realized that the low inductance ground connections have paramount importance in the design" said Kazu Hanagaki, Fermilab Wilson fellow at DZero, who performed most of the studies. The Layer Zero support structure will be covered with a mesh of ground lines to provide a good reference for weak signals traveling in the analog cable and prevent the pick-up noise.

Marvin Johnson, Run IIb technical coordinator at DZero, emphasized that the electrical and mechanical designs are "tightly coupled." He explained: "I like to think of the Layer Zero system as an integrated approach. There are no separate electrical or mechanical design meetings but rather joint design meetings. This is a somewhat unusual approach to detector design."

With the amount of real estate available, geometry takes precedence. Andrei Nomerotski, a DZero scientist in charge of Layer Zero's electronics, said: "Everything depends on everything. I cannot change anything on the hybrid without negotiating it with mechanical group." Jim Fast of the Particle Physics Division backed him up: "When someone says, 'let's change the glue joint two thousandths of an inch,' it matters." Fast, in charge of production, acts as the superego keeping the package size within the 6 mm radial specification. "I'm the one who has to make sure it can get through the little hole," he said.

"What really keeps me up at night," said Lipton, "is the question: will it really fit?" They have space contingency of a few hundred microns. "Installation," Lipton continued, "it's going to be an interesting time."

"You have your good-hands people do it," added project co-manager Alice Bean of the University of Kansas. "Keep the physicists away."

Installation, planned for the summer of 2005, will take 5-6 weeks. Two big calorimeters block the ends of DZero like bookshelves. Engineers first must slide one of them out as far as it will go—about 39 inches—and then erect scaffolding and unwire several existing detectors. A 96-inch section of beam pipe will slide out into the Tevatron tunnel through a hole in the center of one of the calorimeters. Then a new section of beam pipe and Layer Zero will slide in through that hole, and everything will be rewired.

Fermilab has begun ordering the parts from manufacturers. About a dozen universities are collaborating on the project. Some will purchase parts and test them. Kansas State University will build a lot of the electronics. The University of Washington will construct the carbon fiber support structure that holds all the elements together. Fermilab will then assemble the whole thing in the Silicon Detector facility.

How did design work go so quickly? A lot of the plans carry over directly from the Run IIb design, and Fermilab has gained experience from DZero and CDF.

"Fermilab has developed a lot of expertise in silicon in the past 10 years," said Bill Cooper, head of the DZero Silicon Mechanical Group. "It's a pleasure to see people who were novices 10 years ago gradually evolve into experts."

(Matthew Hutson is an intern in Fermilab's Office of Public Affairs)

Volunteers foster Fermilab–SciTech PARTNERSHIP

by Katie Yurkewicz

SciTech Hands On Museum is located at 18 W. Benton, Aurora, IL and is open to the public Mon, Tue, Wed, Fri, Sat 10-5, Thursday 10-8 and Sunday 12-5. Admission is $7/adult, $6/child. Members enter free. The museum's latest exhibit is "Bible Times Tech," which compares 60 archeological artifacts from life in ancient Israel to today's counterparts. For more information call 630-859-3434.

ON THE WEB:

scitech.mus.il.us.

AURORA, Illinois — Where can you measure the speed of your fastball, put your hand in the center of a tornado and take a virtual stroll through 1920's Harlem?

At SciTech, the hands-on science and technology museum located in downtown Aurora. At the newly renovated museum, you and your kids can also learn about particle physics by playing the "Particle Smasher" video game or propel yourself on the human yo-yo in the Outdoor Science Park. If you're lucky, in addition to finding a paramecium in the Microscopic Movement exhibit you might spot one of the Fermilab employees who volunteer at the museum.

Fermilab has been closely involved with SciTech since it was founded in 1988. Ernest Malamud, a former Fermilab scientist, was SciTech's founding director. Current Fermilab Director Michael Witherell and former Director Leon Lederman are members of SciTech's advisory board, and former Director John Peoples serves on its board of directors. The current Executive Director of SciTech, Ronen Mir, is a trained particle physicist and a Fermilab guest scientist.

"Fermilab encourages its employees to help SciTech as much as possible," said Mir.

Bruce Chrisman, Fermilab's associate director for administration, agreed.

"Fermilab supports SciTech any way it can," Chrisman said. "SciTech is an important part of our outreach efforts."

Chrisman and Mir meet once a month to discuss the status of the museum, its upcoming projects, and ways in which the laboratory can help. Developing exhibits, teaching classes and advising the museum on safety issues are only some of the ways that laboratory employees have contributed to the museum. The tornado that you can put your hand in? It was designed and built by Todd Johnson, a Tevatron operations specialist, who has been involved with the museum since 1989.

"I heard that Ernie Malamud was working on a museum," Johnson recalled, "and went to ask him a few questions. I was practically yanked right out of my shoes when Ernie found out that I wanted to help."

The 10-foot-tall tornado was one of his first designs.

"My patient wife put up with the six-foot-tall model, completely made of cardboard, that I built in the living room," Johnson said.

Since then he's designed many exhibits, including one that lets visitors experience dolphin sonar navigation and a thermo-acoustic sundial, also known as a "solar horn." Smaller versions of the tornado model were built for exhibits traveling around the nation.

John Konc from the Technical Division's Computing and Information Systems Group also volunteers at SciTech, but in a different capacity. Originally asked five years ago to set up a Web server for the museum, he ended up overhauling the museum's computer systems and infrastructure. For the past two years Konc has also taught classes in computing fundamentals at the museum.

"The classes are a lot of fun," Konc said. "The goal is to expose people to the fundamentals of computing, which we hope will stimulate a greater interest in computers."

Students in the two-week summer classes, which are geared toward those ages 14 and up, build a working computer from individual components and complete a project that teaches them software basics.

Konc also helped to train one of the current SciTech employees. In 1999, Konc met Samuel Landers, a docent at SciTech and a computer networking student at Robert Morris College. On Konc's recommendation, Landers applied for the Summer Internship in Science and Technology program at Fermilab and spent the summer of 2000 working in Konc's group. Landers now works full-time at SciTech, where Konc has taught him the ins and outs of the museum's computer systems.

Landers has set up the Virtual Reality exhibit at SciTech, which includes a virtual walk through the Roaring '20s Harlem. In addition, he can walk visitors through a VR recreation of the human heart and lungs, and he flies them through the universe using a program based on the Sloan Digital Sky Survey.

Photo Matt Hutson

Chris Dunklau of SciTech, John Konc of Fermilab, Samuel Landers of SciTech and SciTech director Ronen Mir have contributed to the progress at SciTech. As has the goat, which is part of SciTech's new exhibit on life in ancient Israel.

"My brother was amazed that I get to come to work and play with a giant videogame all day long," Landers joked.

Johnson and Konc hope that more Fermilab employees will donate their time to SciTech.

"The people at SciTech have great ideas and always need help," Johnson said. "I think many Fermilab people could have fun volunteering at SciTech. The museum is really good for science outreach, and a great way for people to have pride in their community."

F E R M I N E W S

Fermi National Accelerator Laboratory / Kirk Road and Pine Street / P.O. Box 500 / Batavia, IL 60510
Office of Science / U.S. Department of Energy / Managed by Universities Research Association, Inc.

FERMINEWS is published by Fermilab's Office of Public Affairs.
Phone: 630-840-3351

Design and Illustration:
Performance Graphics

Photography:
Fermilab's Visual Media Services

FERMINEWS Archive at:
http://www.fnal.gov/pub/ferminews/

The deadline for the March issue of *FERMINEWS* is Tuesday, February 17, 2004.
Please send story ideas to:
Public Affairs Office, MS 206, Fermilab,
P.O. Box 500, Batavia, IL 60510,
or e-mail to ferminews@fnal.gov.
Letters from readers are welcome. Please include name and daytime phone number.

Fermilab is a national laboratory funded by the Office of Science of the U.S. Department of Energy, operated by Universities Research Association, Inc.

www.fnal.gov
www.doe.gov
www.ura-hq.org

FERMILAB ARTS SERIES

To purchase tickets for Arts and Lecture Series events, or for further information or telephone reservations, **call 630-840-ARTS (1-800-840-2787)** weekdays between 9 a.m. and 4 p.m. Phone reservations are held for five working days, but will be released for sale if not paid for within that time. Will-Call tickets may be picked up, or available tickets purchased, at the lobby box office on the night of the performance beginning at 7 p.m. When coming to this event, only the Pine Street entrance to Fermilab will be open. *For more information, check out our web page at* **www.fnal.gov/culture.**

CHOREOGRAPHER'S SHOWCASE

featuring Gus Giordano Jazz Dance, Tommye Giacchino and Gregory Day, Ballroom Dancing

Saturday, March 13, 2004
Tickets - $18 ($9 ages 18 and under)

Founded in 1962 as Dance Incorporated Chicago, the company was the first jazz dance troupe to tour the Soviet Union in 1974. This focus on jazz dance led to a new name – Gus Giordano Jazz Dance Chicago – and its current mission to develop and preserve the indigenous American art form of jazz dance.

MANYA: A LIVING HISTORY OF MARIE CURIE

Written and performed by Susan Frontzcak

Saturday, April 17, 2004
Tickets- $15 ($8 for ages 18 and under)

Madame Marie Curie (née Maria Sklodowska) - changed our world through her discovery of radium and radioactivity. Through her own passion and perseverance, Marie Curie opened the doors of science to women world-wide. Manya not only celebrates the scientist, but also the human side of Marie Curie, who felt more daunted by the chemistry of the kitchen than the laboratory.

SAM BUSH

Saturday, May 15, 2004, 2004
Tickets- $25 ($13 for ages 18 and under)

Sam Bush has become synonymous with the Telluride Bluegrass Festival. Founder and driving force behind the legendary New Grass Revival, Bush's ability to make music that exceeds all expectations is evident from two projects just in the past year. *Bluegrass Mandolin Extravaganza* and *Short Trip Home* were nominated for Grammy Awards as Best Bluegrass Album and Best Classical Crossover Album, respectively.

2004 IEEE NUCLEAR SCIENCE SYMPOSIUM AND MEDICAL IMAGING CONFERENCE

The Nuclear Science Symposium (NSS), Medical Imaging Conference (MIC), Symposium on Nuclear Power Systems (SNPS) and 14th International Workshop on Room Temperature Semiconductor X- and Gamma- Ray Detectors (RTSD) will be held in Rome, Italy, on October 16-22, 2004 at the Ergife Palace Hotel, one of the largest exhibition and conference centers in Europe. Scientists and engineers from all over the world may present their original work in a variety of subjects related to nuclear science and medical imaging. The deadline for abstract submission is May 17, 2004. For more information, go to the Conference web site: http://www.nss-mic.org/2004 or contact Alberto Del Guerra, General Chairman (IEEE-Rome2004 @df.unipi.it), at the University of Pisa.

MILESTONE

RETIRING

■ Kazuo Seino (ID 2014, AD-Accelerator Controls Dept.), effective March 31; last day of work, February 6.

Chez Léon MENU

LUNCH SERVED FROM
11:30 A.M. TO 1 P.M.
$10/PERSON

DINNER SERVED AT 7 P.M.
$23/PERSON

FOR RESERVATIONS, CALL X4512
CAKES FOR SPECIAL OCCASIONS
DIETARY RESTRICTIONS
CONTACT TITA, X3524
HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML

LUNCH
WEDNESDAY, FEBRUARY 4
Pasta De Mare
Marzipan Cake with Chocolate Sauce

DINNER
THURSDAY, FEBRUARY 5
Booked

LUNCH
WEDNESDAY, FEBRUARY 11
Fish Cakes with Spicy Red Pepper Sauce
Vegetable Medley
Sour Cream Layered Cake

DINNER
THURSDAY, FEBRUARY 12
Booked

LUNCH
WEDNESDAY, FEBRUARY 18
Flank Steak with Guajillo Chili Sauce
Homing and Bell Pepper Saute
Bread Pudding w/Rum Sauce

DINNER
THURSDAY, FEBRUARY 19
Parsnip Pancakes with Smoked Salmon
Saute Pork Tenderloin with Madeira Sauce
Cauliflower Gratin, Steamed Asparagus
Crepes Stuffed with Fruit

LUNCH
WEDNESDAY, FEBRUARY 25
Calzone of Sausage and Three Cheeses
Caesar Salad
Coffee Ice Cream with Hazelnut, Hot Fudge Sauce

DINNER
THURSDAY, FEBRUARY 26
CARNIVAL
Sancocho
Roast Suckling Pig
Chayote Quisado
Rice & Pigeon Peas
Tropical Fruit & Flan De Pina

http://www.fnal.gov/pub/ferminews/

Fermilab

Fermi National Accelerator Laboratory / Office of Public Affairs / P.O. Box 500 / Batavia, IL 60510
Office of Science / U.S. Department of Energy / Managed by Universities Research Association, Inc.