Lessons Learned: NLCTA Modulator Fire

By Robert Reek

On July 9, a small fire occurred just after midnight in the PFN cabinet of NLCTA Modulator 1. This fire highlighted both the effectiveness of our emergency response systems and the need to analyze and respond to events such as this.

Even a small fire can be destructive. In this case, the fire destroyed the cabinet and its contents, melting nearby water-cooling hoses. Water from the hoses then entered and overfilled the insulated oil tank which, in turn, caused the release of about 100 gallons of oil into the building.

Quick, safe response by the Palo Alto Fire Department (PAFD) and SLAC personnel allowed the fire to be extinguished and the spill to be contained within the building. Hence, there were no injuries or environmental releases.

The staff that responded were very effective in making correct and timely decisions to keep this emergency from being worse than it could have been, and the fire was quickly contained. However, the modulator will be unavailable for at least several weeks and possibly longer.

Analyzing the Incident

Two reviews of this incident were conducted and lessons learned were identified. The lessons included:

1. Exploring the usefulness of enhancing the fire suppression systems in this building.
2. Equipment and possibly streamlineing work with these systems to improve SLAC emergency response plans.
3. DOE’s Integrated Safety Management System (ISMS) ‘circle of improvement’ provides a road map for the SLAC response to any incident such as this. Using ISMS, we analyzed the hazards highlighted by this event, developed further controls and are in the process of implementing them. In the future, we will perform the work with these additional safety elements in place. Subsequent feedback on these fixes will ensure that this improvement process is continuous.

Events like this teach all SLACers to think fire safety and be safe.

SLAC Makes the World’s Shortest Bunches

By Heather Rock Woods

Using all two miles of the linear accelerator (linac), as well as loops and bends in the beam, and a usually troublesome effect called a wakefield, SLAC has made the world’s shortest bunches of electrons: 12 microns (millimeters of a meter) long and 80 femtoseconds (one quadrillionth of a second) fast.

During its first run in May, the Sub-Picosecond Pulse Source (SPSS) made high current, ultra short bunches of electrons and turned them into very bright, ultra short pulses of x-ray light. These first x-rays made by a linear accelerator are 1,000 times shorter than those made by storage rings like SPEAR, enabling direct observations of atomic motion in matter that have never been seen before.

Physicists have always packed billions of electrons into bunches in order to acquire enough meaningful data. Now, manipulating the shape and size of the bunches has become like a science in itself.

SPSS relies on several tricks to compress the bunches, which contain 21 billion electrons, in order to reach a peak current of 30 kiloAmperes. That’s about 1,000 times greater than the current found in a household fuse. “The big increase in energy from the beginning to the end of the SLAC linac allows us to do the gymnastics of rotating and compressing the bunches to reach such small final dimensions,” said (See BUNCHES, page 2)

Busy Schedule for QuarkNet 2003 Workshop

By Tom Glanzman and Molly Uhl

Earlier this summer, 18 high school and junior high school teachers became students once again in order to learn about particle physics. The QuarkNet workshop took place at SLAC and Stanford from 19 to July 3, hosting teachers mostly from the Bay Area, but also from as far away as Washington State.

Four high school physics and chemistry teachers (Gene Csider, Ken Newberry, Earl Roske and Molly Uhl) had spent the summer last year at SLAC and Stanford as part of QuarkNet. The four teachers involved in QuarkNet include Helen Quinn (THI), Julie Hubbard (Liberty HS, Brentwood), Dylan Rich (Palo Alto Prep School, Palo Alto), David Lau (Mission San Jose HS, Fremont), Tom Wousnam (Crystal Springs, Hillsborough), Earl Ranke (Leland HS, San Jose), U Hung (Monta Vista HS, Cupertino), Travis Hambly (Monta Vista HS, Cupertino), Lisa Breton (California HS, San Ramon), Lynda Nicholas (Charger School of Morgan Hill), John Currie (Mt. Tahoma HS, Tacoma, WA), Rafale Nazario (Morse HS, San Diego), Harvey Lynch (BABAR), Willy Langendael (SCS), Thomas Glanzman (EC), Molly Uhl (Notre Dame HS, San Jose), Soffler (BABAR), Brian Martin (Thurgood Marshall Academic HS, San Francisco), Dave Trapp (Sequoia HS, Sequoia, WA), Gene Csider (San Ramon Valley HS, Danville), Jennifer Doekker (SUI students), Manuel Reyes (SUII student).

Similar programs have taken place at physics research centers across the country over the past five years, in an effort to expose teachers and students to cutting edge research and to establish connections between educators and research scientists. The QuarkNet program is based out of Fermilab (http://quarknet.fnal.gov/), and funded by the National Science Foundation and the DOE.

DOE Gives SLAC “Outstanding” Rating for ES&H Performance

By Mike Grissom

Each year, the DOE assesses SLAC’s ability to meet established Environmental Safety and Health (ES&H) standards. Based on both performance and process measures, SLAC received a rating of Outstanding from DOE for fiscal year (FY) 2002. Everyone at the Lab should be proud of his or her contributions toward achieving this rating.

Outstanding is the highest rating possible, and could not have happened without both the hard work of many individuals across the Lab and the results of improvements through SLAC’s Integrated Safety Management System (ISMS). This assessment of SLAC’s ES&H performance illustrates for DOE and Congress how well we accomplish high energy physics and x-ray photon research, and it will ultimately have an influence on future funding.

Measuring Performance

The Lab’s ES&H performance is based on two types of measures, outcome performance and process performance.

Outcome performance measures, also called ‘lagging indicators’, are events that have already occurred, such as the number of Lost Work Days/Total Reportable Cases measured for Accidents and Illnesses. VACs’ lagging indicators are based on both ES&H Division activities and activities from work processes in other Divisions throughout the site.

Outcome measures for FY02 can be viewed at: http://www.slac.stanford.edu/esh/ismas/perfmeas/outpm02.pdf

Process performance measures, called ‘leading indicators’, reflect processes designed ‘up front’ to improve the Lab’s ES&H performance and promote accident/incident prevention, such as the completion of ISMS quarterly reviews, the development of a Behavior-Based Safety Program, or...
Bunches

(continued from page 1)

SPPS accelerator physicist Patrick Krejcik (AD).

The gymnastics occur in three stages, starting as the bunches leave the dumping rings near the beginning of the linac. There, a bunch travels around the curve of the ring-to-linac (RTL) beamline and gets compressed from 6 mm down to 1.2 mm. The bunch looks like a surfer climbing a wave, where they receive less energy vertically (i.e., is closer to the top) than the other. When the bunch goes through the chicane in Sector 10, the lower-energy head of the bunch takes the longer path (shown middle), tail catches up (shown bottom), effectively rotating the bunch to be shorter.

The second step in bunch compression takes place at Sector 10, one third of the way down the linac, where the electrons have been accelerated to nine billion electron volts of energy. Here the bunches are tipped to ride slightly ahead of the wave crest, so the rear gets accelerated more than the front. Entering a chicane with four bends, the higher-energy tail is able to take the shortest path and catch up again, compressing the bunch to 50 microns. Paul Emma (ARDA) calculated the trajectory correction that would be required to achieve this. The bunch has rotated upright again and is now 12 microns long. At this length, the bunch of 21 billion electrons wiggles by a fixed point in 80 femtoseconds. After the compression, the bunches are wiggled by an undulator magnet to generate x-rays. Eric Bong (AD) installed the undulator, on loan from Argonne National Laboratory.

“We need a way to measure the bunch length, so part two of the project is inventing new technologies to measure on the sub-picosecond timescale,” Krejcik said. The group resurrected a specialized accelerator cavity first used here in the 1960’s that kicks the beam vertically (see TIP September 2000, “Rediscovering Deflecting Structures at SLAC”) and inserted it into the beam line. When turned on by a klystron, this transverse deflecting cavity samples a bunch by sweeping it vertically across a screen where the vertical length gives a projection of bunch length when it is 50 microns. The SPPS collaboration is developing electro-optic sampling techniques, borrowed from the world of fast laser technology, to measure the bunches in the future. The group is also developing a specialized cavity that will be used to measure the bunch length at SLAC.

The third step in bunch compression is the chicane bending magnets. There, the low-energy tail of the bunch is stopped, and the upper-energy front is able to take the longer path. After the chicane, the upper-energy end of the bunch is shorter.

To compress electron bunches, SPPS accelerates them below the crest of RF energy (shown top). That way, one end of the bunch has more energy than the other. When the bunch goes through the chicane in Sector 10, the lower-energy head of the bunch takes the longer path (shown middle), tail catches up (shown bottom), effectively rotating the bunch to be shorter.
A Full Schedule

The visiting teachers started with a two-day crash course on the Standard Model on the Stanford campus, presented by Burchat. They also took tours of current particle physics and astrophysics experiments, including Gravity Probe B and the Cryogenic Dark Matter Search.

During the next two weeks, teachers spent five afternoons getting their hands dirty—constructing cosmic ray detectors for classroom use, where they learned the secrets of sanding and polishing scintillator plastic, checking and calibrating photomultiplier tube bases, constructing stands, and assembling and testing entire counters.

There is still a bit of ongoing work to tune these systems. In addition, SULI summer students Jennifer Dodder and Manuel Reyes are working on some Java software to control the equipment and provide useful data to the teachers. The teachers have provided histograms of the results by early October. We expect to have a set of working systems that SLAC can loan out to local schools for in-class demonstrations.

QuarkNet participants construct cosmic ray detectors for classroom use.

The teachers spent five afternoons getting their hands dirty—constructing cosmic ray detectors for classroom use, where they learned the secrets of sanding and polishing scintillator plastic, checking and calibrating photomultiplier tube bases, constructing stands, and assembling and testing entire counters.

There is still a bit of ongoing work to tune these systems. In addition, SULI summer students Jennifer Dodder and Manuel Reyes are working on some Java software to control the equipment and provide useful data to the teachers. The teachers have provided histograms of the results by early October. We expect to have a set of working systems that SLAC can loan out to local schools for in-class demonstrations.

SPEAR2 Magnets Available to DOE Facilities

By Heather Rock Woods

Literally tons of magnets are free for the taking by groups at SLAC, Stanford and other DOE facilities.

The magnets ran SSLR’s storage ring until it was dismantled in April to make way for SPEAR2. This will use more powerful magnets to create brighter x-rays with higher photon flux. About 300 tons of magnets, sitting on seven-ton concrete girders, were either rolled out of the SPEAR tunnel or lifted out by crane in the few places where the roof was removed.

SPEAR uses magnets to bend the path of electrons so they can travel in the circular beam line, and to bend or wiggle the beams so they can create the synchrotron x-rays used to investigate myriad materials. The original SPEAR equipment, which also includes vacuum chambers and ion pumps, is still in good working conditions. The parts are currently stored along the Klystron Gallery.

"This is material that may be useful at other sites," said Riz Prenzachchi (DOE). "SLAC hopes to find a project that can use the materials while they are in good condition, she said.

Currently in suspension storage, these items can’t be recycled or reused outside of SLAC, or other DOE facilities because they’ve been in a radiological area. "While a few items are radioactive, most are not and none are dangerous," said Jim Allan of Operational Health Physics (OHP).

In January 2000, DOE began a suspension on recycling metals from radiological areas (i.e., accelerator housings, radiation areas, high radiation areas, radioactive materials areas—even if they are not radioactive). This suspension will last for at least another year until uniform release standards are approved.

Of the tests items for radioactivity before they’re turned into Salvage. Equipment exposed to beams where the energy is greater than 10 MeV (million electron volts) can potentially become radioactive, Allan explained. The measurable level of radioactive light (radiation levels) with our most sensitive instrument," said Allan.

There are dozens of dipole bend magnets, quadrupole magnets and sextupole magnets, as well as beam scrapers and kicker devices. To see the full list of equipment, or visit the storage site, please contact Alan Conrad. Property and Safety (7259) or Alan. (7259) alinfo@SLAC.Stanford.EDU

Training for the AIDS Honolulu Marathon

By Linda DiStefano White

Lori Sharp (BSD) knows people who have run marathons for many different causes, and she always thought she would like trying one. Then one day last spring, she saw a poster for the AIDS Honolulu Marathon (6 Months Training: You Can Do It) and felt it was perfect, offering excellent training and benefiting a cause she believed in.

This was not, however, a snap decision. "I did the reading, consulted with my husband and thought about the time commitment," said Sharp. "Everyone around you really has to be into it. My husband is a great supporter.

On December 14, Sharp will run in the Honolulu Marathon. She started her 6-month training and fundraising program at the beginning of June, training on her own. She runs two miles a week and meets with a group of runners on Sundays. There are several such groups in the Bay Area, and many more across the country.

The marathon will raise money and awareness for the San Francisco and National AIDS Foundations. Sharp is one of 75 people in her group, which is broken down into pace groups (smaller training and support groups) by ability and experience level. All ability levels are represented, from marathoners and full-time athletes to people who have never run a step in their lives.

Men and women from their teens to senior years, from all walks of life, form the groups. The majority of participants have never done anything like this before, yet ninety-eight percent of them will complete the 26.2 mile marathon.

The training program combines running and walking to increase endurance and strength with low risk of injury. "Every week we go another mile," said Sharp. "You are always succeeding, getting a sense of accomplishment. I feel good."

Sharp is still amazed at how well this huge challenge is working for her. Her pace group is now running 10.25 miles, where just a short time ago five miles seemed an impossible goal. They are training to run in the sun to prepare for warm Honolulu weather. And before the actual marathon, all participants will have run the full 26.2-mile distance.

All money raised is donated directly to the AIDS cause for research, vaccines, food, housing and medical services. Both financial contributions and volunteering are helpful.

"Support of any kind is welcome," says Sharp. "We rely on volunteers to be sure we’re on track and to give us water (water stations are every mile or so)." Volunteers are being sought in all parts of the Bay Area.

For more information see: http://www.aidsmarathon.com/participant.jsp?runner-0-0-003&year-2003

The SLAC Art Committee is proud to present:

Masters of Matter

A new exhibition of photography by world-renowned photographer Peter Ginter

Opens August 19

Panofsky Auditorium Breezeway

Ginter has a unique style of photography, creating theatrical images by painting light and color over the surfaces of his subjects. Gray accelerators become red and green, detectors change color and glow like jewels. The exhibition is a selection from the images Ginter created during visits to DESY in 1997, CERN in 1998 and SLAC in 2002.

Don’t miss this opportunity to see some of the most startling photos of particle physics ever created.
POLICIES AND PROCEDURES

World's Particle Physics Laboratories Join To Create New Communications Resource

By Kathy Bellevin

Interactions.org, a new global Web-based resource, has been launched to provide the particle physics community with news, high quality imagery, video and other tools to support their communications needs. The Web site (http://www.interactions.org) provides a newswire with all the latest developments in particle physics; links to current particle physics news from the world’s press; high-resolution photos and graphics from the particle physics laboratories; links to education and outreach programs; information about science policy and funding; links to universities; a glossary and a conference calendar.

“Audience collaboration is the foundation of success in this era of particle physics research,” said Neil Calder, SLAC Director of Communications. “Interactions.org will help facilitate that teamwork.” For more information, see http://www.interactions.org.

Upcoming Events

Fri., Aug. 15, 12:30 p.m.
SLAC, Green Room
SLAC THEORY SEMINAR
Paul Hoyer, U of Helsinki
“Perturbative QCD on the Hadron Physics”

Tues., Aug. 19, 2:30 p.m.
SLAC, Green Room
SLAC THEORY SEMINAR
Pervez Hoodbhoy, Quaid-e-Azam U
“QCD and the Proton’s Spin”

Wed., Aug. 20, 1:45 p.m.
SLAC, Orange Room
(Refreshments 4:00)
SLAC ASTROPHYSICS SEMINAR
Derek Tournear, Stanford U
“Are Black Hole Candidates Black Holes?”

Fri., Aug. 22, 12:30 p.m.
SLAC, Green Room
SLAC THEORY SEMINAR
Yael Shadmi, Technion, Israel
“Ionic Liquids in Future Energy Applications”

Aug. 25 - 29
Yerba Buena Arts Center, San Francisco
SLAC SYNCHROTRON RADIATION MEETING
H. Tadmor, A. Usaj, S. Byme, SLAC Synchrotron Radiation Instrumentation Conference

The Interaction Point

Editorial Team
Neil Calder
Nina Adelman Stolar
Katherine Bellevin
Vicki Flynn
Contributing Editors
Zaha Mahdavi
Linda DuShane White
Weisers
Heather Woods

Photography/Graphics
Diana Rogers
Michael Hyde

Distribution
Crystal Tlghman
Tessie Crantiad

The Interaction Point is published bimonthly every first and third Friday. Submissions are due the second and fourth Tuesdays of each month.

Send submissions to tipeditor@slac.stanford.edu, or mail to TIP Editor, MS 58, Stanford Linear Accelerator Center, 257 Sand Hill Road, Menlo Park, CA 94025.

TIP is available online at: http://www.fnal.gov/tip