INTERACTION POINT

December 12, 2003

PEP-II on Track to Nearly Double BABAR Data Sample

By Kate Metropolis

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See whole story...

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By Heather Rock Woods

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Accelerator operators (l to r) John Amann, Stephen Weathersby and Tom Sommer are three of the hundreds of people intent on delivering one of the greatest data samples in the history of particle physics. Physicists, engineers, technicians and machinists—some on-call around the clock—all contribute to the effort. (Photo by Diana Rogers)

"It's no exaggeration to say that this is one of the most complicated machines on Earth," says Roger Erickson (AD). The accelerator's basic mission is to deliver to the BaBar detector as many collisions as possible between a positron and an electron, whose energies are set to produce a particular pair of particles: a B-zero and an anti B-zero meson. Particle physicists call this pair 'B, B-bar'—hence the origin of the name BaBar. The B mesons quickly decay into other particles, which fuel the research of some 150 different analysis projects in the BaBar collaboration.

The BaBar detector recorded some 125 million B, B-bar pairs from October 1999 to July 2003, but physicists are eager for more. "PEP-II is providing us with one of the great data samples in the history of particle physics," says BaBar physics analysis coordinator Jeff Richman.

"With our current data, we've already found new ways to explore the difference in behavior between matter and antimatter, discovered an intriguing particle that casts new light on the strong force between quarks, and found many new decay processes."

"But," he added, "we can't rest on our laurels. If we stopped getting more data now, it would be like sealing off the entrance to a mine that we knew still had a lot more diamonds. And there could be even more surprises."

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New equipment is part of the approach. An eighth radio frequency (RF) cavity was added to the accelerator, allowing more particles to be stored in the ring. This device boosts a bunch of electrons along on electromagnetic waves the way an ocean wave boosts surfers. Another improvement was to solve the problem of unwanted electrons in the positron ring. These electrons, kicked loose from the beam pipe by synchrotron light radiated by the orbiting positrons, diffuse the tightly packed positron beam, which lowers the chances of collisions with the electron beam in the detector. Technicians spent grueling weeks in a hot tunnel, winding narrow wire tape around every accessible part of the beam pipe in the positron ring. The windings created a solenoid magnet that traps the slower electrons and keeps them out of the positrons' way.

Maintenance is another important ingredient. Over the summer, a vacuum leak in the interaction region was quickly repaired by the Mechanical Fabrication Department, and the Accelerator Maintenance RF group overhauled the entire RF system. Accelerator physicist Mike Sullivan (AD) gives kudos to both groups for ensuring that starting the accelerator back up was smooth and straightforward.

New ways of operating the accelerator have also started to pay off . Just as people have to sit in a seat to be whirled around an amusement park ride, particle bunches must sit in just the right spot, called a 'bucket,' on an electromagnetic wave to be accelerated around the rings. Last year, PEP-II operated with two empty buckets following each filled bucket. This fall, the pattern was changed: strings of buckets in which every other one is filled alternate with shorter strings of empty buckets.

Each change to the spacing between bunches affects the beams' behavior. "Now," says Erickson, "we're learning the physics of PEP-II when filled buckets sit closer to each other, and this new pattern has opened up empty slots to which we can eventually add more particles."

A new approach to keeping the rings full was adopted at the beginning of December. As the beams collide, their intensity gradually declines. Previously, it was necessary to 'top off' the beams by injecting new particles every 50 minutes or so. During the five or ten minutes injection takes, the detector had to be shut off to avoid the risk of radiation damage. A new trickle injection scheme in the positron ring adds tiny pulses of particles as soon as the buckets begin to be depleted, maintaining the beam at full brightness around the clock. This approach has a double data payoff: the collision rate does not fall off and, since the detector is desensitized for much less time, it can record up to 20 percent more events.

The ambitious plan for run 4 doesn't make department head John Seeman (AD) flinch. He simply says, "That's why we're here."

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(Photo by Nicolle Rager)

On left, Chris Adolphsen (NLC), for original contributions to the beam physics and microwave properties of high frequency high-gradient linear accelerators.

On right, Paul Emma (ARDA), for his contributions to the physics of high brightness beams in linac and compression systems, and his critical impact on the development of linear colliders and x-ray free electron lasers.

Please join us in congratulating these newly elected fellows of the American Physical Society.

INTERACTION POINT
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SuperComputing 2003 Challenge

Pictured from left: Wu-chun Feng (LANL), Les Cottrell (SLAC), and Sylvain Ravot, Cheng Jin and Suresh Singh (all CalTech). *(Photo by Diana Rogers)*

SLAC, CalTech and LANL joined forces at the SuperComputing 2003 Bandwidth Challenge in Phoenix, Arizona to capture the Sustained Bandwidth Award for the most data transferred. The team demonstrated a peak data transfer rate of 23.2 gigabits per second, nearly 400,000 times faster than a typical 56Kbits per second Internet connection.

Data was transferred from the challenge site in Phoenix to the SLAC/Stanford Point of Presence at the Palo Alto Internet Exchange and to other sites in four countries spanning three continents. The team harnessed a new ability to efficiently use both dedicated and shared Internet backbones.

INTERACTION POINT
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Winter Shutdown

By Lee Lyon

Once again, the University is requiring schools, departments, and administrative units to close down all possible operations during the winter holiday period.

SLAC will be closed December 20th through January 2nd with the exception of staff who are requested to work for a critical reason and those needed to ensure site safety and security. Employees not specifically requested to work are asked not to come to the site.

This year Christmas falls on a Thursday. The Laboratory, except for a few areas, will be closed from the end of the day Friday, December 19, 2003, at midnight (0:00) through the end of the day Friday, January 2, 2004, at midnight (0:00). Thursday the 25th, Friday the 26th, and Thursday, January the 1st are University holidays; the 22nd, 23rd, 29th, 30th and 31st are non-paid days when staff will have to use personal time or vacation time to receive full pay (there may be a few staff with unusual schedules for whom the exact dates will be somewhat different). The University has declared December 24th and January 2nd as paid days off. Staff who are required to work on those days will have the sixteen hours added to their vacation accrual. SSRL may have a slightly different schedule due to its operational requirements; SSRL management will inform staff of the schedule.

We recognize this mandatory time off may create some hardship since all staff have been asked to use their vacation accrued this year. We will allow staff to borrow their three Personal Time Off days, their Floating Holiday (formerly Birthday Holiday), and their January vacation accrual from calendar year 2004 to assist with maintenance of pay during this shutdown.

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Gateway Program Trains Hispanic Students to Use Synchrotron

By Heather Rock Woods

Myriam Perez De la Rosa drives across the Mexican-U.S. border every morning to her graduate lab at the University of Texas, El Paso (UTEP). The trip north takes 80 minutes since 9/11, but only 20 minutes south, back to her hometown of Cuidad Juarez.

Gateway students Myriam Perez De la Rosa (left) and Guadalupe de la Rosa presented their scientific results at SSRL's 30th Annual Users Meeting. *(Photo by Diana Rogers)*

During the last three years, Perez crossed a less tangible border, becoming an up-and-coming, award-winning Latina scientist with expert training at a world-class synchrotron light lab—namely SSRL.

Perez is an outstanding student in a DOE-funded program called Gateway. UTEP students receive training at SSRL in advanced synchrotron radiation techniques—powerful tools increasingly used in many scientific fields. The program opens a gateway to expanded careers in science for the predominately Mexican-American and Mexican students at UTEP who otherwise wouldn't gain access to big science.

"The experience at SSRL opened my view about science by learning about the different on-going research studies at different beam lines," said Perez. "The program gave me the tools to break new ground on the catalyst I study, a subject that is over 30 years old. On the border, what pays well for a chemist is quality control. Now I know I can do real science."

The program started from conversations between Iran Thomas, the late Deputy Director of the DOE's Office of Basic Energy Sciences, SSRL Director Keith Hodgson, former SSRL Director Artie Bienenstock and Russ Chianelli, UTEP chemistry professor and chair of SSRL's proposal review panel.

The idea came in part from several government reports pointing to the rapid growth of the Hispanic population in the U.S. and to an inadequate future workforce in science, engineering and technology.

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"A lot of federal agencies want to know where the next generation of scientists and engineers will come from," said Chianelli, Gateway's UTEP faculty director. "Many of the Gateway students have never been out of the El Paso area, and certainly not seen something like a synchrotron. They are seeing a bigger world. They have done extremely well."

Masters, graduate and even undergraduate students are in UTEP's interdisciplinary programs: Materials Science and Engineering, and Environmental Science and Engineering.

Gateway graduate students have to write a proposal to gain access to time on one of the SSRL beam lines. UTEP Professor Nicholas Pingitore teaches a proposal writing course. Gateway pays the students' way to SSRL, where they learn to carry out experiments at a synchrotron source. The scientific results from analyzing these data go into their theses. Some 40 students have been trained during approximately 120 trips here since the program began in 1999.

SSRL's beam line scientists, including Apurva Mehta and John Pople, work directly with the students on their experimental set-up. "I interface with them as with any other graduate students," said Pople. "I'm just on hand a little more to talk them through the processes and give them background on physics and data collection and analysis because they don't necessarily have the same knowledge base." He added, "They're bright, they're extremely eager to learn and very hardworking."

Gateway students and professors return the compliments. "People at SSRL are always so helpful and patient and want to know about your projects and find out what you need," Perez said.

Perez works with chemical catalysts that take sulfur out of oil to produce lower-emission gasoline. Her synchrotron studies of the catalyst overturned the picture of how the catalysts operate, and suggested using synchrotron tools along with more standard techniques to better understand catalyst activity.

She was one of three Gateway students to present SSRL-based research at SSRL's 30th Annual Users Meeting in a special tribute session for Thomas, who died earlier this year.

In addition to building valuable skills, experience and better research, Gateway has encouraged studies of Mexican art and archeology. One student, Lori Pole.e, used synchrotron light to examine the mysterious and beautiful pigment Maya Blue, used by ancient Meso Americans. She found its secret: a stable combination of indigo and clay, and now has a Ph.D. and private funding to start producing the pigment commercially.

The Gateway program reflects Chianelli's philosophy, which Pople describes as, "Do not let a lack of money or a poor country's economy determine who can get a Ph.D. Let's get talent from

wherever we can."

To learn more about Iran Thomas, see: http://www-ssrl.slac.stanford.edu/newsletters/headlines/headlines_10-03.html (item 5).

For more information on Gateway see: http://www.mrti.utep.edu/Full%20Pages/gateway.html

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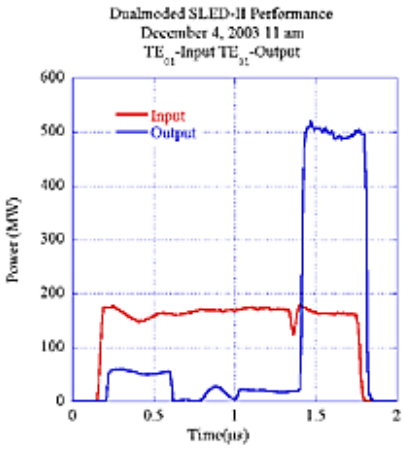

(Image Provided by Tor Raubenheimer)

This is a full demonstration of the system required for NLC operation, and includes all critical components of the rf distribution system. It achieves one of the two critical R1 goals needed to demonstrate X-band technology which were established by the ILC-TRC review committee earlier this year. This is an important milestone which is crucial for the ultimate down select of the technology to be used for the next-generation 500 GeV (ultimately 1 TeV or above) center-of-mass energy linear collider. The system continues to be pushed to higher power and has already operated at 490 MW and 400 ns, in excess of the R1 goal.

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Brandon Hartfiel (EB) won a special ribbon award for juggling.
(Photo by Diana Rogers)

Winners were: 1st overall—Ashley Deacon (SSRL), at 21.38.1; 2nd overall—Toshyuki Okugi (NLC) at 21.41.9, and 3rd overall—Steffen Doebert (NLC) with a time of 21.51.6.

The top three females were: Jennifer Peck (SSRL), at 25.09.0; Ashley Carroll, at 26.11.3, and Eva Dusek (EPR), at 29.17.9. A special ribbon award went to Brandon Hartfiel (EB) for juggling while running with an unofficial time of 26:53.

For complete results, see: https://www-internal.slac.stanford.edu/slacrace/results/20(

The photo archive is located at http://www-project.slac.stanford.edu/slacpix/Special%20Events/2003/112003_walkrun/112003.html

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Traffic Safety at the Main Gate

The traffic regulations in place at the Main Gate are intended to allow for the smooth flow of traffic into and out of the SLAC site.

Main Entry

The main entry is a 'T' intersection with a two-way stop. Vehicles coming on-site turning either le. or right onto the Loop Road have the right of way and do not need to stop.

Westbound Traffic

Vehicles traveling westbound on the Loop Road and exiting the site do not have to stop; however, westbound vehicles continuing on around the Loop Road must stop and yield to vehicles approaching from the north (right), entering the site.

Eastbound Traffic

Vehicles traveling eastbound must stop and yield to vehicles approaching from the north (le.) or exiting the site from the west.

In the interest of traffic safety and good citizenship, all individuals driving a vehicle on the SLAC site should observe all traffic regulations. For more information, see: https://www-internal.slac.stanford.edu/ssec/Security/Traffic.html

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INTERACTION POINT
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The Interaction Point is published bi-monthly every first and third Friday. Submissions are due the second and fourth Tuesdays each month. Send submissions to tip@slac.stanford.edu, or mail to TIP Editor, MS 58, Stanford Linear Accelerator Center, 2575 Sand Hill Road, Menlo Park, CA 94025.