Fermilab Today

Thursday, Aug. 5, 2010

Calendar

Have a safe day!

Thursday, Aug. 5
2:30 p.m.
Theoretical Physics Seminar - Curia II
Speaker: Ulrich Nierste, Universität Karlsruhe
Title: B_s Mixing: Gate to New Physics?
3:30 p.m.
DIRECTOR'S COFFEE BREAK - 2nd Flr X-Over
THERE WILL BE NO ACCELERATOR PHYSICS AND TECHNOLOGY SEMINAR THIS WEEK

Friday, Aug. 6
3:30 p.m.
DIRECTOR'S COFFEE BREAK - 2nd Flr X-Over
4 p.m.
Joint Experimental-Theoretical Physics Seminar - One West
Speaker: Arafat Gabareen Mokhtar, SLAC National Accelerator Laboratory Title: Charmonium-Like States, Real or Fake

Click here for NALCAL, a weekly calendar with links to additional information.

Upcoming conferences

Campaigns

Take Five

Tune IT Up

H1N1 Flu

For information about H1N1, visit Fermilab's flu information site.

Feature

Fermilab-designed beam position monitors go to KEK

Members of the beam position monitoring collaboration for KEK's Accelerator Test Facility. First row from left: Brian Fellenz, Andrea Saewert, Manfred Wendt and Eliana Gianfelice. Second row from left: Duane Voy, Dehong Zhang, Charlie Briegel, John Van Bogaert, Alexey Semenov and Nathan Eddy. Not pictured: Peter Prieto.

Last May, in only two weeks' time, a team of Accelerator Division Instrumentation Department employees installed, powered, debugged and started up a brand new, home-made beam position monitoring system at KEK's Accelerator Test Facility. It worked flawlessly.

"I'm very happy with the BPM's operational performance just after installation," said KEK physicist Nobuhiro Terunuma. "It was a result of the professional work by our Fermilab colleagues."

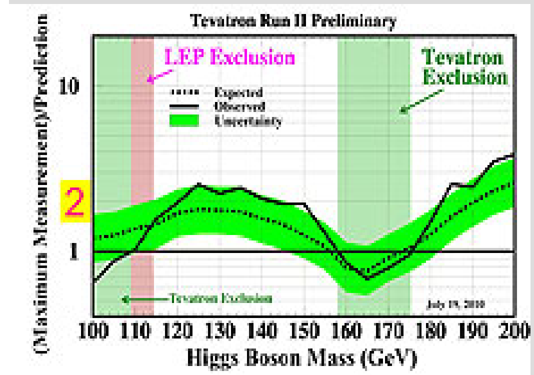
The development of ATF's new beam position monitoring system began in 2007, when Fermilab scientists helped upgrade 20 of 96 damping ring BPMs with Echotek digitizer boards, which process the beam signals. It later became clear that if KEK continued to purchase commercially available products, upgrading all 96 BPMs would be cost-prohibitive. So members of Fermilab's Instrumentation Department, led by Manfred Wendt, set out to design from scratch a new board – and a whole new system to go with it.

Commissioning a Fermilab original gave KEK the advantages of a customizable BPM system without breaking the bank.

"A commercial system may or may not be adaptable to your specific needs," said AD

Result of the Week

Higgs hunting: What's next?



This figure shows a combination of data from DZero and CDF. The area where the squiggly solid line crosses the horizontal line shows that we can rule out possible values for the Higgs boson mass. As we get more data, the squiggly lines will move downward.

Last week, Fermilab announced an improved measurement in the search for the Higgs boson, and in last week's Result of the Week, CDF described its contribution to the measurement.

Rather than simply describing the DZero portion of the measurement, I thought that I'd give *Fermilab Today* readers a sense of the big picture. Just how close are we to finding the Higgs boson if it exists?

First and foremost, to find the Higgs at the Tevatron would require combining DZero and CDF data into a single measurement. This effectively doubles the amount of data involved. To further understand the situation, we need to examine the figure above. Ordinarily I like to avoid such a technical plot, but it tells an important story. The solid, horizontal line shows the prediction for the Higgs boson according to the Standard Model. Our measurement is determined by how our data relates to this solid line.

The figure has two squiggly lines: one dotted and one solid. The dotted one is our prediction of what we expected to measure and it is surrounded by a bright green band. The band shows how certain we were in our prediction. The best way to interpret this is that the bright green region shows the area where we predicted our measurement should be somewhere in the bright green region.

Weather

Sunny
83°/60°

Extended Forecast
Weather at Fermilab

Current Security Status

Secon Level 3

Wilson Hall Cafe

Thursday, Aug. 5
- Breakfast: apple sticks
- Tomato Florentine
- BBQ-pork sandwich
- Kielbasa & sauerkraut
- Chicken Marsala
- Smoked turkey melt
- Assorted sliced pizza
- SW chicken salad w/roasted corn salsa

Wilson Hall Cafe Menu

Chez Leon

Thursday, Aug. 5
Dinner
- Caesar salad
- Lobster tail w/lemon butter
- Grilled asparagus
- New potatoes
- Strawberry shortcake

Wednesday, Aug. 11
Lunch
- Stuffed summer vegetables
- Tomato & mozzarella salad
- Vanilla bean cheesecake w/ fresh strawberries

Chez Leon Menu
Call x3524 to make your reservation.

Archives

electrical engineer Peter Prieto, who oversaw the system's implementation. "We have experience in engineering the solution, so we can really tailor-make it to a specific machine."

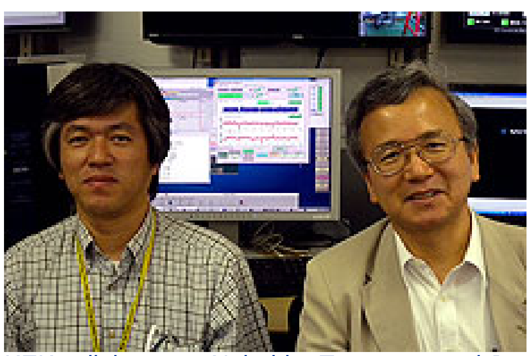
Beam position monitors give accelerator scientists the data they need to characterize the beam's orbit and related information. An optimal beam trajectory should be perfectly centered inside the quadrupoles, the magnets that focus beam particles. That "golden" beam orbit will provide the ultimate low emittance, an indicator of good beam quality.

The Fermilab-built system, using completely rewritten software and re-engineered firmware and hardware, provides KEK with ultra-high-resolution BPMs needed to optimize and confirm low-emittance beams. It also self-calibrates the BPMs on the fly. The digitizers are flexible enough to work in different system configurations, so they can be used in almost any accelerator.

"We can make the system do just about anything they can dream up," said Fermilab physicist Nathan Eddy.

"The success of this collaboration is due to the good team spirit of our instrumentation experts, their enthusiasm and their willingness to work far beyond what is typically required," Wendt said.

-- Leah Hesla



KEK collaborators Nobuhiro Terunuma and Junji Urukawa sit next to a display of the first ATF beam orbit measured by the Fermilab-designed BPM system.

In the News

However, a prediction isn't a measurement. For the measurement, we turn our attention to the solid, squiggly line. This solid line tells us the maximum amount of Higgs boson production allowed by the data. For instance, if we look at a Higgs boson mass of 120 GeV, we see it crosses the line on the graph labeled by the big red number 2. This means that our data tells us we rule out producing Higgs bosons twice as often as predicted.

Where the squiggly solid line dips below the horizontal one is where we start to rule out the Standard Model Higgs boson. If our measurement indicates that the maximum-allowed Higgs boson production is below the prediction, then we can rule out this prediction. We see the light-green Tevatron exclusion regions where the solid line dips below the horizontal one.

Additional data will make the squiggly lines move downward. This will make wider the green regions currently between 100-109 GeV and 158-175 GeV. It is in these regions that we will most quickly discover or rule out the Higgs boson. Because the squiggly line is nearly flat from 120-150 GeV (and farthest from the horizontal line), it will still be quite some time before Tevatron data can rule out Higgs bosons in this mass range. Still, even in this difficult-to-exclude region, the data is very near the prediction. If the Higgs exists, the Tevatron is close to discovering or excluding it. The next year or two will be very interesting.

-- Don Lincoln

The DZero annual summer retreat convened in Marseille, France this year. The most important topic of conversation was how to maximize our chances of success in the hunt for the Higgs boson.

Announcements

Fermilab Today

Result of the Week

Safety Tip of the Week

CMS Result of the Month

User University Profiles

ILC NewsLine

Citizen science: People power

From ***Nature News***, Aug. 3, 2010

Networks of human minds are taking citizen science to a new level, reports Eric Hand.

The whole thing began by accident, says David Baker, a biochemist at the University of Washington in Seattle. It was 2005, and he and his colleagues had just unveiled Rosetta@home — one of those distributed-computing projects in which volunteers download a small piece of software and let their home computers do some extracurricular work when the machines would otherwise be idle. The downloaded program was devoted to the notoriously difficult problem of protein folding: determining how a linear chain of amino acids curls up into a three-dimensional shape that minimizes the internal stresses and strains — presumably the protein's natural shape. If the users wanted, they could watch on a screen saver as their computer methodically tugged and twisted the protein in search of a more favourable configuration.

Thousands of people were signing up for Rosetta@home, says Baker, which was gratifying, but not entirely surprising; this kind of digital citizen science had become almost routine by then. It was first popularized in 1999 by the SETI@home project at the University of California, Berkeley (UCB), which harnessed volunteers' computers to sift through radio telescope data in search of alien signals. And in 2002, UCB engineers had released a generalized version of the software known as the Berkeley Open Infrastructure for Network Computing (BOINC). By 2005, there were dozens of active BOINC projects — Rosetta@home among them — and hundreds of thousands of users worldwide.

Read more

Lunch & Learn about the power of preventative health care

Martial arts classes begin Aug. 9

Argentine Tango, Wednesdays through Aug. 25

Aug. 20 deadline for The University of Chicago Tuition Remission Program

Applications for URA Visiting Scholars Awards due Aug. 20

Regal movie theater discount tickets available

NIM and Physics Reports now completely online at Fermilab

Toastmasters - Aug. 5

Grounding and Shielding of Electronic Systems course - Aug. 12 and 13

Free piano concert featuring Sandor Feher, Ramsey Auditorium at noon on Aug. 12

What's New with NI and the latest version of LabVIEW (NI Week highlights)? - Aug. 19

Gizmo Guys - Fermilab Arts Series - Sept. 25

Submit an announcement