

## Calendar

**Thursday, October 20**

**8:30 a.m. - 6:00 p.m.** [TeV4LHC 2005](#)

[Workshop](#) - 1 West

**3:30 p.m.** Director's Coffee Break - 2nd Flr X-Over

**4:00 p.m.** Accelerator Physics and Technology Seminar - Curia II (note location)

Speaker: P.N. Ostroumov, Argonne National Laboratory

Title: Beam Physics in the RIA Accelerators

**Note:** There will be no Theoretical Physics Seminar Today

**Friday, October 21**

**8:30 a.m. - 6:00 p.m.** [TeV4LHC 2005](#)

[Workshop](#) - 1 West

**1:00 p.m. - 5:00 p.m.** [Top Turns Ten Symposium](#) - Ramsey Auditorium

**8:00 p.m.** [The Rocky Horror Picture Show](#) - Ramsey Auditorium

**Note:** There will be no Joint Experimental Theoretical Physics Seminar or Director's Coffee Break today

## Weather



Chance of Rain **55%/40%**

[Extended Forecast](#)

[Weather at Fermilab](#)

## Current Security Status

[Secou Level 3](#)

[Wilson Hall Cafe](#)

## 4th Round of TeV4LHC Workshops Begins Today

Starting today, Fermilab will host the fourth round of the [TeV4LHC](#) workshops, meant to benefit the experiments at CERN's Large Hadron Collider through the experience gained from the world's highest energy accelerator. "The idea is to use the knowledge we are collecting at the Tevatron to be better prepared for physics of the LHC," said Marcela Carena, a Fermilab theoretical physicist who is organizing the workshop with Stephen Mrenna, of the Computer Division.

About 150 people are expected to attend the three-day workshop to improve analysis techniques at the LHC by studying Tevatron data. Topics will include electroweak interactions, the Higgs boson, QCD and searches for new physics. The opening workshop was held at Fermilab last September with follow-up sessions at Brookhaven National Laboratory in February and at CERN in April.

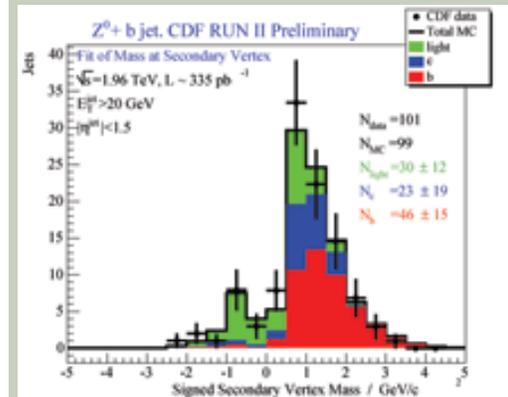
—Kendra Snyder

## CDF's Maruyama: Top Quark Excitement Still Ahead

For more reflections on the top quark's discovery, attend the [Top Turns Ten celebration](#) from 1-5 p.m. Friday in Ramsey Auditorium.

## Fermilab Result of the Week

### What do Z's and b's Tell us About the Higgs Boson?



The "invariant mass" of particles originating from the secondary vertex of a jet in association with a Z-boson, signed by the lifetime. The positive high mass values are more sensitive to b-quarks, and the negative lifetime is mainly due to light quark jets that are falsely reconstructed. A fit to this distribution yields  $46 \pm 15$  Z-events with a b-quark. (Click on image for larger version.)

The Higgs boson is the only Standard Model particle not yet observed. At the Tevatron the Higgs can be produced simultaneously with a Z-boson. This is one of the best ways to find the Higgs since it involves the detection of an easily identifiable Z-boson plus two b-quarks from the Higgs decay. Measurements of b-quark production also provide one of the best testing grounds for the theory of the strong interaction, quantum chromodynamics (QCD). Here we show the first CDF measurement of the simultaneous production of a Z-boson and a b-quark at CDF.

Z-bosons can be produced along with an up, down, charm, strange or bottom quark which appears in the calorimeter detector as a collimated stream of particles called a "jet." Using tracks from these particles inside the jet one can reconstruct an

## Thursday, October 20

- Minnesota Wild Rice w/Chicken
- Tuna Melt on Nine Grain
- BBQ Ribs
- Chicken Casserole -Buffalo Chicken Wrap
- Mexican Pizza
- Chicken Pecan Salad

The Wilson Hall Cafe accepts Visa, MasterCard, Discover and American Express at Cash Register #1.

[Wilson Hall Cafe Menu](#)

## Chez Leon

### Thursday, October 20

#### Dinner

- Tortilla Soup
- Grilled Spiced Lamb with Red Pepper Sauce
- Saffron Vegetables
- Profiteroles

### Wednesday, October 26

#### Lunch

- Enchiladas
- Rice and Beans
- Pico De Gallo
- Pecan Rum Cake

[Chez Leon Menu](#)

Call x4512 to make your reservation.

## Search

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## Info



Taka Maruyama is one of CDF's conveners for top quark physics. (Click image for larger version.)

To Taka Maruyama, the most exciting moment in top quark research wasn't its discovery ten years ago. It's right now. With years of strong Fermilab top quark data under CDF's belt, Maruyama is most enthralled by what discoveries the famous particle can help uncover today and in the future.

Maruyama, one of CDF's conveners for top quark physics, was a student at Japan's Tohoku University when Fermilab made headlines about the top quark discovery. "It had a very big impact," he said. "Even in Japan it was on the front page of the newspapers." Maruyama joined the CDF collaboration in 2002 as a postdoc from the University of Chicago.

"The properties of the top quark are still an interesting part of our field," Maruyama said. "Indeed, the last two or three years have been most exciting for the top quark." Tevatron luminosity, the measurement of particle collisions, has greatly increased since Run II began.

Maruyama said that with more data available for top quark analysis, scientists can conduct more precise measurements of top mass, decay and production cross section.

With improved top quark measurements,

"invariant mass" of the tracks, which is related to the mass of the quark that produced the jet. B quarks are the heaviest of these quarks, and so jets with a large mass are most likely originating from b-quarks. A characteristic signature of a b quark is a second vertex in the jet at a distance of about 0.5 cm from the primary interaction point. This decay vertex is reconstructed using the high precision CDF silicon detector. The invariant mass of the tracks at this secondary vertex is shown in the figure for the 101 events where a secondary vertex is observed. By fitting this distribution the fractional contribution of b-quarks is extracted.

As a result we find that only about 2 percent of jets in Z-boson events are b-jets, in good agreement with the QCD prediction. This result is the first measurement of this rate without any assumptions about the contribution from the other quarks. Since this measurement increases our understanding of events which mimic Higgs production, it will help refine the search to discover the Higgs boson at the Tevatron.



Beate Heinemann and Andy Mehta (U. Liverpool) are the physicists who did the Z+b cross-section measurement. (Click image for larger version.)

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scientists also are able to indirectly measure the Higgs mass, Maruyama said. Those measurements could aid the search for the actual Higgs boson at the Large Hadron Collider. "With what we have learned about the top, the LHC experiments can imagine what mass the Higgs boson has and they can pin down what mass range they should search."

—Kendra Snyder

## Help Save Energy at Fermilab

*October is "Energy Awareness Month" throughout DOE. In the coming weeks, Fermilab Today will run a series of tips and reminders so we can all do our part.*

In the wake of Hurricanes Katrina and Rita, the president has [directed](#) all Federal Agencies to do their part to save as much energy as possible. Here at Fermilab, even [small changes](#) will make a difference. During the winter months, consider opening blinds to let in sunlight and switching of extra lights when they are not needed. Make new friends at the lab by arranging carpools, and only print and photocopy what you really need on paper.

"As part of the national response to Hurricanes Katrina and Rita," Stephen Webster of the DOE Fermi Site Office reminds us, "We all need to do our part." It's always been a good idea to save energy, but this plea comes at an especially crucial time for the energy infrastructure in the Gulf of Mexico, which was forced to take offshore oil production and three-quarters of natural gas production offline after the hurricanes ripped through the region.

Fermilab is poised to make a real



From left to right: Bill Noe, Stefano Moccia, and Dervin Allen are leaders of Fermilab technical crews that maintain the infrastructure for the CDF detector, including the cooling and interlock systems used by the silicon detection systems which are part of this Z+b analysis. (Click image for larger version.)

[Result of the Week Archive](#)

## Science Grid This Week

### e-VLBI Measures Earth and Sky



Diagram of e-VLBI demonstration network for iGrid 2005. Image Courtesy MIT Haystack Observatory. (Click image for larger version.)

The technique of Very Long Baseline Interferometry has been used since the late 1960s by astronomers to make detailed images of distant radio-emitting objects in the universe, and by geoscientists to precisely measure the dynamics of the Earth. This well-established technique uses an array of independent antennas, scattered over the surface of the earth and synchronized with atomic clocks, to make simultaneous observations. With the use of global multi-gigabit optical networks, VLBI may be poised for a major upgrade.

[Read More](#)

difference during the coming winter. In an October 13 [message](#), the United States Secretary of Energy, Samuel Bodman, emphasized the important role that agencies like Fermilab, which are located in the colder regions of the country, will play in this effort. Steve Krstulovich, Fermilab's energy conservation expert explained, "This is one of those rare opportunities where we can actually do something to improve our lot, both individually and nationally."

—Siri Steiner

### In the News

#### From *news.telegraph*, October 16, 2005:

##### How Katie put the science back into songwriting

For millions of listeners across the world, the enchanting lyrics proved an instant hit. But for one physicist, some of the lyrics of Katie Melua's single *Nine Million Bicycles* was light years away from fact - and something had to be done.

Katie Melua: no right to 'guess' at the age of the universe  
Simon Singh took issue with the second verse of the song which stated that, at a "guess", the edge of the universe was "12 billion light years away". Now, after publicly correcting her statistical error, the 21-year-old musician agreed to re-record the track, changing the lyric to the more factual 13.7 billion light years.

Mr Singh, 41, who has recently written a book on the history of cosmology called *Big Bang*, described the flaw as "deeply annoying".

He said yesterday: "It's the word 'guess' that I rail against. I can guess the lottery

### Accelerator Update

#### October 17 - 19

- During the 48 hour period, two stores provided 20 hours and 22 minutes of luminosity.
- Vacuum bursts plague TeV, Recycler, and MI
- Pbar pulse magnet ground faulted
- ComEd power glitch aborts store and stash
- TeV vacuum leak hunted

[Read the Current Accelerator Update](#)

[Read the Early Bird Report](#)

[View the Tevatron Luminosity Charts](#)

### Announcements

#### Yoga Classes start October 25

Classes are held on Tuesdays from 12:00 p.m. to 1:00 p.m. in the Auditorium at Wilson Hall. The eight-week session will begin October 25 and run through December 13. The cost for this session is \$80.00. Registration can be done by mail, fax x5207, in person in the Recreation Office or if you are using a credit card for payment, by phone. These classes DO NOT require a recreation membership.

[More Information](#)

#### Volunteer for Girl Scout Projects

On November 12, from 9 a.m. to 3 p.m., there will be a Fermilab Girl Scout Badge workshop on site. Volunteers are needed to help with cemetery and village history projects, the prairie harvest, Ask A Scientist/Engineer-type activities and various other things during this event. Anyone and everyone is welcome to help out! If you have any questions or wish to volunteer contact Anne at

[Lucietto@fnal.gov](mailto:Lucietto@fnal.gov).

numbers for next week but the edge of the universe is better than that.

[Read More](#)

[Upcoming Activities](#)