Fermilab Today

Thursday, May 8, 2014

Calendar

[Have a safe day!](#)

Thursday, May 8

11 a.m.
Academic Lecture Series - One West
Speaker: Sheldon Stone, Syracuse University
Title: Quark Flavor Physics II

2:30 p.m.
Theoretical Physics Seminar - Curia II
Alejandro de la Puente, TRIUMF
Probing Radiative Neutrino Mass Generation through Monotop Production

3:30 p.m.
DIRECTOR'S COFFEE BREAK - 2nd Flr X-Over

4 p.m.
Joint Experimental-Theoretical Physics Seminar (NOTE DATE, LOCATION) - WH3NE
Speaker: Steve Olsen, Seoul National University
Title: A New Hadron Spectroscopy

4 p.m.
Accelerator Physics and Technology Seminar (NOTE DATE, LOCATION) - Curia II
Speaker: Kazuhiro Terao, Columbia University
Title: The MicroBooNE Detector, Beam Requirements and Status

Friday, May 9

3:30 p.m.

Milestone

Fermilab launches new home page on website

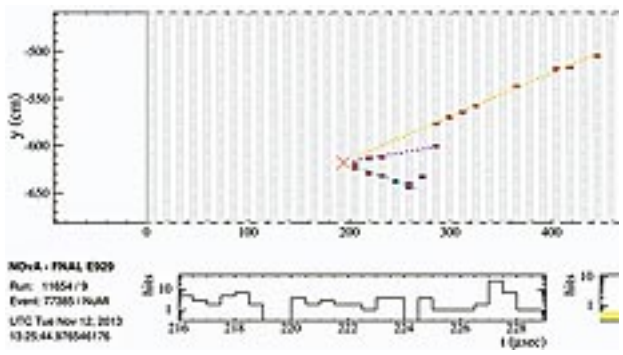
The new Fermilab home page features a rotating series of images of the laboratory.

On Wednesday, Fermilab launched a new home page at fnal.gov. In addition to updating the look of these pages, we have revisited the top-level navigation. The home page has been greatly simplified and is geared toward external Web visitors.

Fermilab employees and users are invited to check out the new Fermilab at Work page. We encourage you to bookmark this page and consider using it as the start page in your browser.

From *symmetry*

NOvA's first neutrino

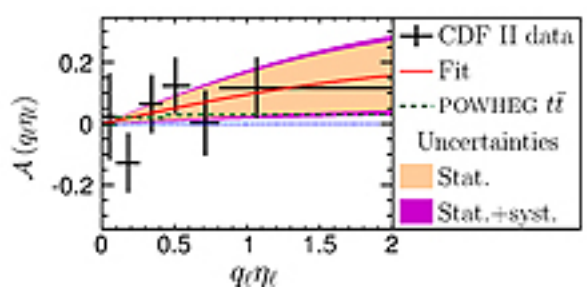


The first picture of a neutrino that traveled from Illinois to Minnesota shows the NOvA experiment's advantage in studying neutrino properties. *Image courtesy of NOvA collaboration*

Neutrinos are notoriously hard to see. But detecting these tiny particles is only part of the challenge of studying them;

Frontier Science Result: CDF

Top quark continues to pique physicists' interest



The asymmetry of the leptons from top decays as a function of the lepton rapidity from the CDF data. The fit (red curve) is in good agreement with the data and provides for a measurement of the inclusive asymmetry.

Since the discovery of the top quark in 1995, physicists at the Tevatron have been probing the properties of this mysterious elementary particle to see whether it behaves the way we expect it to. One of these properties is called forward-backward asymmetry.

The Tevatron collided protons with antiprotons to produce other particles, including top quark pairs. Forward-backward asymmetry refers to the preference of top quarks to follow the proton direction, forward, and antitops to follow the opposite direction, backward. The asymmetry is the difference between the fraction of top quarks going forward and the fraction of them going backward: the larger its value is, the larger the positive asymmetry.

Simple theoretical estimates of this asymmetry turned out to be small, but experiment shows otherwise. Larger-than-expected forward-backward asymmetry measurements made at the Tevatron have triggered substantially better theoretical Standard Model predictions and new physics models. These results have pushed scientists for better measurements and a better understanding of top quark physics.

A powerful independent piece of evidence to help determine whether the observations are in tension with the Standard Model predictions comes from

DIRECTOR'S COFFEE BREAK - 2nd Flr X-Over

4 p.m.
Joint Experimental-Theoretical Physics Seminar - One West
Speaker: Tammy Walton, Hampton University and Fermilab
Title: Exclusive Muon and Proton Quaselastic-like Scattering at MINERvA

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

Ongoing and upcoming conferences at Fermilab

Campaigns

Take Five

Weather

Breezy
83°/68°

Extended forecast Weather at Fermilab

Current Security Status

Secon Level 3

Current Flag Status

Flags at full staff

Wilson Hall Cafe

Thursday, May 8

- Breakfast: Canadian bacon, egg and cheese Texas toast
- Breakfast: oatmeal raisin pancakes
- Steak soft tacos
- Smart cuisine: braised beef with vegetables
- Southern fried chicken
- Baked ham and Swiss ciabatta
- Mandarin orange pecan

scientists also need to figure out their identities.

Neutrinos come in not just one but three types, called flavors: electron, muon and tau. When a neutrino shows up in a particle detector, it usually leaves a calling card in the form of an electron, a muon or a tau particle. This lets a scientist know which flavor of neutrino dropped by.

But sometimes, the neutrino opts to play ding-dong-ditch instead, depositing a fraction of its energy in the detector before speeding away. This is called a neutral current event, and, in many cases, it is the bane of the modern neutrino physicist's existence.

"Every experiment has to deal with this in one way or another," says physicist Mark Messier of Indiana University, co-leader of the NOvA experiment.

The neutrino's game of ring-and-run can lead to confusion, as the signal it leaves behind in a particle detector can look awfully similar to the mark of an electron neutrino, even when the particle speeding away is of another type. This can artificially inflate the number of electron neutrinos a physicist counts.

To combat this problem, researchers on the NOvA experiment made their detector out of light plastic. Particles can move relatively freely through this low-density material, making it easier for scientists to see what kind of message they leave behind.

On November 12, 2013, the NOvA detector in Minnesota saw its first neutrino sent in a beam from Fermilab in Illinois. From the looks of the display, that neutrino bumped into a nucleus in the detector, transferring some of its energy but leaving no electron, muon or tau: a neutral current event. The energy left behind produced a particle that decayed immediately into two photons (shown in yellow and magenta) and a proton (shown in cyan).

Read more

—Kathryn Jepsen

Photos of the Day

Horses by DZero

measurements of just the leptons arising from top quark decays. Physicists expect the leptons (electrons or muons) from the top quark decay to follow the directions of their parents. Thus these leptons should inherit the forward-backward asymmetry properties of their respective quarks or antiquarks.

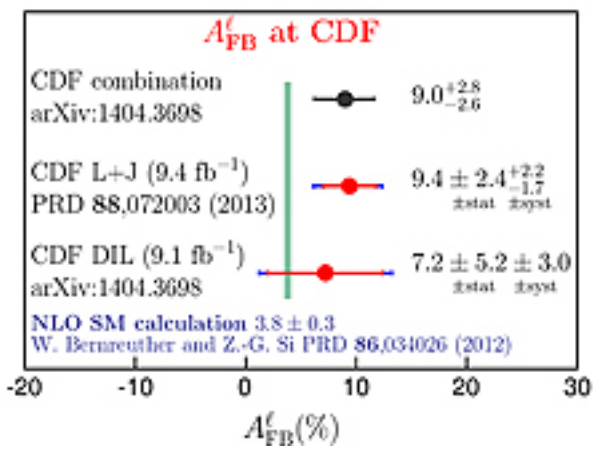
CDF has just completed a new measurement of the lepton asymmetry using the sample of the full Tevatron Run II data with two charged leptons from top pair decays. The above figure uses a hyperbolic tangent function to recover the total lepton asymmetry both in the detector and in the undetected region. The resultant asymmetry in the two-lepton mode is 7.2 ± 6.0 percent.

After combining this with the previous measurement, which used data with only one charged lepton from top pair decays, the final CDF measurement of this asymmetry comes to 9.0 +2.8/-2.6 percent (see lower figure). While there are several competing theoretical predictions, most currently predict an asymmetry of about 4 percent, so this result is in moderate disagreement with predictions.

This new result continues to pique the scientific community's interest in top quark production. The effort at CDF continues, working on the asymmetry of the top quark pairs in the two-lepton mode. Measurements of the asymmetry of the bottom quark pairs that probe the same physics question are also on the way. It may take a long time before we know if the observed asymmetry is consistent with the Standard Model.

Learn more

—edited by Andy Beretvas



The figure shows a comparison of forward-backward asymmetry measured in this experiment (DIL, dilepton mode), in an earlier CDF measurement in one-lepton mode (L+J, lepton +

chicken salad
- Beef barley soup
- Chef's choice soup
- Assorted pizza by the slice

Wilson Hall Cafe menu

Chez Leon

Friday, May 9
Dinner
- Mussels with white wine and thyme
- Herb-crusted lamb chops
- Caramelized onion and horseradish mashed potatoes
- Sauteed baby carrots
- Banana profiteroles

Wednesday, May 14
Lunch
- Danish open-face sandwiches
- Cucumber salad
- Caramel apple cake

Chez Leon menu
Call x3524 to make your reservation.

Archives

Fermilab Today

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Horses by DZero enjoy the sunny day. Fermilab's first director Robert Wilson started the Indian Creek Riding Club in 1970, and lab employees have kept it going ever since. Currently about 17 horses are at the stables at Fermilab. They are owned by Fermilab employees and their spouses. *Photo: Leticia Shaddix, PPD*

The horses graze in the field, with Wilson Hall in the background. Members of the riding club enjoy taking their horses around the lab grounds, especially along the lakes in the Village. Thanks to Jeff Wittenkeller, TD, for the information. *Photo: Leticia Shaddix, PPD*

In the News

Universe evolution recreated in lab

From BBC News, May 7, 2014

An international team of researchers has created the most complete visual simulation of how the Universe evolved.

The computer model shows how the first galaxies formed around clumps of a mysterious, invisible substance called dark matter.

It is the first time that the Universe has been modelled so extensively and to such great resolution.

The research has been published in the journal *Nature*.

The simulation will provide a test bed for emerging theories of what the Universe is made of and what makes it tick.

Read more

jets), and in their combination.

These CDF physicists contributed to this data analysis. From left: Ziqing Hong, Jason Nett and Dave Toback, all from Texas A&M University.

In the News

Tiny dark matter "bullet" may be one among hundreds

From *New Scientist*, May 6, 2014

The smallest galactic smash-up to show evidence of dark matter has been found, and it hints at an army of similarly tiny lookalikes.

Read more

Announcements

Today's New Announcements

FermiPoint and MyPoint (SharePoint 2013) extended outage – May 10

Budker Seminar - May 12

Fermilab scientist gives Higgs talk - May 15

Mac OSX end of life - May 21

Yoga registration due today

Central web service town hall meeting - today

Yoga Open House class - today

Take the train commuting survey by May 9

English country dancing with live music on May 18

Joint Speaker Series: Science and Serendipity - May 21

Change in tax practice may affect some visitors

Be a winner! Take the Take Five Challenge spring 2014

A Smart Cuisine purchase earns you 10 bonus points

Thursday night golf at Arrowhead Golf Course

Submit an announcement