Brian Dotson

Page 2

Research Highlights . . .

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Fermilab's Tevatron sets luminosity record

Scientists of the CDF and DZero experiment collaborations have achieved their first findings in data from Collider Run II of the Tevatron at DOE's Fermilab. The scientists have identified their first top quark candidates, along with their first Run II results involving measurements of the W and Z particles, carriers of the weak force. Precision measurements of these particles will help scientists track down the Higgs boson, theorized as the source of mass among fundamental particles. The Tevatron also set its all-time luminosity record of 30.2 E 30, a measure of the machine's "brightness," or number of collisions taking place. The higher the luminosity, the greater the chance of physics discoveries.

[Mike Perricone, 630/840-5678, mikep@fnal.gov]

Gold nanoparticles yield better catalysts

In the search for new catalysts, scientists at Brookhaven Lab may have discovered the mystery behind a new "gold standard"— gold nanoparticles layered on titanium dioxide. At the National Synchrotron Light Source, the Brookhaven team has shown that adding gold, a notoriously unreactive element, to titanium dioxide, a widely used industrial catalyst, changes the electronic properties of both materials to yield a catalyst that is five to ten times more efficient at destroying sulfur dioxide (SO2), a common cause of acid rain. The scientists are now investigating whether this catalyst might also be effective at neutralizing the deadly components of chemical weapons.

[Karen McNulty Walsh, 631/344-8350, kmcnulty@bnl.gov]

Simple solutions lurk in extreme places

Yellowstone's hot spring bacteria could boost the efficiency of many industrial processes, from the bleaching of fabric to the sterilization of fruits and vegetables, say scientists at DOE's Idaho National Engineering and Environmental Laboratory. The bugs, called thermophiles for their high temperature affinity, manage with enzymes that top the stability charts. Already, the team has isolated the hydrogen peroxide-busting catalase—a catalyst industry uses to split the leftover chemical into water and oxygen. The heat-loving bacteria's version of the molecule still works after days spent at 75º C, they find, far surpassing commercially available beef liver-derived catalase that fails after just two minutes in that heat.

[Kendall Morgan, 208/526-3176, morgkk@inel.gov]

Tiny technology leads to big research advance

New gene therapy procedures, DNA-based sensors, and other medical application may be possible using a new method to initiate and control chemical reactions on DNA strands, developed by a team of chemists at DOE's Argonne National Laboratory. The new technology uses specially designed nanometer-sized semiconductors—less than a billionth of an inch in size. The technology is based on the group's discovery of "conductive linkers"—small organic molecules that connect the electronic properties of semiconductors to biological or organic molecules. The researchers found that by using different conductive linkers they can selectively control oxidation.

[Katie Williams, 630/252-7997, kwilliams@anl.gov]

DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Handheld spectrometer boon for rad detection

Scientists from DOE's Lawrence Livermore National Laboratory in collaboration with engineers at Lawrence Berkeley National Laboratory have developed a mobile, handheld mechanically cooled germanium radiation spectrometer that detects signature gamma-rays from radioactive materials.

Known as the Cryo3, the spectrometer has clear applications for homeland security. Researchers say the device would be able to determine the types of radioactive materials no matter where they might be located - at a border crossing, in an airport, or even on a person.

With precision energy resolution, the Cryo3 not only detects the presence of hard X- and gamma- radiation, but also provides information on the quantities as well. The detector is coupled to a low-power electronics package for control and signal processing.

In the past, in order to attain the high energy resolution of germanium detectors, the germanium had to be cooled to 90 K in a laboratory setting using liquid nitrogen. However, this new germanium radiation spectrometer is cooled mechanically by a low-power, compact micro cryocooler, eliminating the need for liquid nitrogen, yet attaining the same high-level energy resolution.

Cryo3 Spectrometer

The spectrometer, which consists of hermetically encapsulated germanium detector, utility vacuum housing, micro cooler, and controller, weighs 10 pounds. The low power requirements mean that Cyro3 can operate up to eight hours on two rechargeable lithium ion batteries.

Cryo3 properties—recision energy resolution, good sensitivity, lightweight, low-power requirements, and mechanical cooling—mean that gamma-ray radiation spectrometers usually restricted to laboratory use can now be used in the field. Cyro3 can operate continuously unattended for at least six months without ever being turned off.

Submitted by DOE's Lawrence Livermore National Laboratory

Brian Dotson—digital dynamo

Brian Dotson

Brian Dotson, an engineer at DOE's National Energy Technology Laboratory, envisions things that others don't see. No, Brian isn't a character out of the hit sci-fi flick the *Sixth Sense*. He is hard at work on NETL's new four-surface, virtual environment center, a technology that allows researchers to visualize and experience data in three dimensions. Brian says, "Scientists and technology designers typically work in a flat world, a 2-dimensional world of data. A VE center lets them explore beyond the flatland."

For Brian the challenge to develop the center is a formidable one.

After earning a Bachelor's Degree in Mechanical Engineering and Master's Degree in Electrical Engineering from West Virginia University, Brian worked for the Department of Defense building flight simulators and gaining valuable experience in simulations and graphics programming. Nine years later Dotson left the DOD for a new position at the National Institute for Occupational Safety and Health, and the opportunity to develop the NIOSH virtual reality laboratory.

Brian said, "While I found doing research at NIOSH fun, I was also looking for new challenges."

When Brian learned that NETL was in the early stages of planning a virtual reality lab, he jumped at the opportunity.

Brian joined NETL in March of 2001. His task: to get the multi-wall virtual reality system up and running. His goal: to not only get the system up and running, but to become a liaison between the researchers and the visualization technology that could bring their designs and concepts to life.

Brian's work involves writing 3-D graphics software, system integration of the virtual reality center, communication between computers, tracking systems, and virtual reality peripherals.

Brian is excited. He said, "Once researchers realize the capabilities of this technology, they'll be knocking the door down to take advantage of all that the VE center has to offer."

Submitted by DOE's National Energy Technology Laboratory