

At PPPL
THIS WEEK

MONDAY, APRIL 16

Special Theory Seminar
10:45 a.m. - Noon ♦ T169

WEDNESDAY, APRIL 18

PPPL Colloquium
4:15 p.m. ♦ M.B. Gottlieb Auditorium
Planetary Dynamors: Investigations of Saturn and Ancient Mars
Sabine Stanley (University of Toronto)
[CLICK HERE FOR ABSTRACT](#)

THURSDAY, APRIL 19

The Andlinger Center
4:30 p.m. - 5:30 p.m. ♦ Main Campus
Friend 006
Wind Energy... the Journey
Pratima Rangarajan
(Vestas Technology)

Physics Colloquium
4:30 p.m. - 6 p.m. ♦ Main Campus
Jadwin A10
Dark Energy, Dark Matter and the Emergence of Gravity
Erik Verlinde
(University of Amsterdam)
[CLICK HERE FOR ABSTRACT](#)

FRIDAY, APRIL 20

DIII-D Science Meeting
1 p.m. ♦ B-233

PPPL-led Researchers Seek to Demonstrate a Novel Design for a Key Diagnostic Tool for ITER

By John Greenwald

Scientists working under the leadership of the U.S. Department of Energy's Princeton Plasma Physics Laboratory (PPPL) have developed and are preparing to test a novel design for a key diagnostic instrument for ITER, a \$20 billion experimental fusion facility, or tokamak, that represents the next major step in harnessing fusion power. If proven successful, the design could replace the more conventional, bulkier instrument now planned for ITER.

The new diagnostic design marks a nationwide effort by U.S. researchers in support of U.S. contributions to ITER (whose name is Latin for "the way"), which is under construction in the south of France by the European Union, China, India, Japan, South Korea, Russia and the United States. Scientists at the University of California at Los Angeles (UCLA) and the DOE's Oak Ridge National Laboratory (ORNL) developed the prototype instrument, which is being tested on the DIII-D tokamak operated by General Atomics in San Diego for DOE. "This is a good example of U.S. fusion experts working together to support the conceptual design," said PPPL physicist Dave Johnson, who heads the development of the diagnostic tools that the U.S. will deliver to ITER.

The prototype instrument, called a reflectometer, measures the electron density profile of the hot, electrically charged plasma gas that fuels fusion reactions. The profile shows changes in density from the volatile edge of the plasma to the center of the plasma core, and must be maintained at an optimal level for a stable self-sustaining reaction, or burning plasma, to take place. Plans call for ITER to produce a burning plasma for at least 500 seconds during the 2020s.

Radical Departure

The prototype represents a sharp departure from standard "bistatic" reflectometers, which use dual antenna systems: one to launch radar-like microwaves towards the plasma through waveguides, and a second one to carry back the reflected signal for analysis. The dual system aims to prevent any reflection off mirrors, windows or other parts of the first antenna/waveguide system from interfering with the signal coming back from the plasma.



Dave Johnson

Diagnostic Tool

continued from page 1

By contrast, the new design features a single, or “monostatic,” antenna/waveguide system to both deliver and return the microwave signal from the plasma. The designers seek to solve the interference problem by increasing the distance from the microwave source to the plasma, giving the system time to filter out spurious radar images. “The goal of the DIII-D test is to see whether you can launch and receive the reflected power on the same antenna,” said Tony Peebles, head of the UCLA Plasma Diagnostics Group that designed the monostatic system together with ORNL engineer Greg Hanson, who created the waveguides that carry the microwave signal.

The single antenna/waveguide system will capitalize on the vast size of ITER, which will be three to five times larger than today’s experimental fusion facilities. The vacuum window for the ITER antenna will be many meters from the plasma, for example. This extended propagation distance “will make it significantly easier to filter out spurious radar images,” said Peebles. If the tests on DIII-D are successful, he noted, the prospects for a monostatic system look promising for ITER.

The UCLA design anticipates the layout of the ITER system on a smaller scale. The prototype antenna/waveguide system measures 39 feet long by 3.5 inches in diameter, compared with the 147-foot-long system that is contemplated for ITER. The prototype resembles a pipeline that runs through a series of right-angle bends between the microwave source and the plasma.

Benefits of the monostatic system could range from increased diagnostic capability to potential cost savings. Six monostatic transmission systems could perform the same measurements as the twelve bistatic systems currently planned for ITER. This “monostatic advantage” would allow a potential cost-savings related to construction, installation and maintenance. Alternatively—and perhaps preferably—increased measurement capabilities could be introduced. For example, additional monostatic transmission systems could be installed to perform highly desirable measurements related to the study of waves and instabilities that degrade plasma confinement and stability.

Researchers at DIII-D will be led by UCLA in testing the monostatic prototype on the tokamak starting in May and running throughout the summer. Findings will be compared with those previously obtained from the bistatic antenna system that has long been on the tokamak. “This is a case where the whole U.S. community is working together for ITER,” said Rejean Boivin, director of the DIII-D Computer and Diagnostic Systems division. “It’s good science and very valuable engineering tests.”

Results will help PPPL’s Johnson determine whether the monostatic system warrants further consideration for the final antenna design. A contractor will be picked later this year and ITER is to review plans for the chosen system in 2014. “We hope to learn enough from the DIII-D tests to assess the feasibility of the monostatic design,” said Johnson. “Based on these results we will possibly make a recommendation to modify the reflectometer to be monostatic.” ☐

Reminder of the University’s Copyright Infringement Policy

The Higher Education Opportunity Act requires that colleges and universities take appropriate steps to address infringing uses of copyrighted material on their computing networks. Accordingly, we take this opportunity to remind you of the University’s copyright policy, particularly as it applies to your use of Princeton’s computing and network resources.

Members of the University community who engage in activity that infringes copyrighted materials may be subject to disciplinary action. Under circumstances involving repeated instances of infringement involving the use of the University’s computing network, such disciplinary action may also include the termination or suspension of network privileges. For further information regarding the University’s copyright policy, see Rights, Rules & Responsibilities (<http://www.princeton.edu/pub/rrr/part1/#compPropertyRights>) and the University IT policy (www.princeton.edu/itpolicy).

In addition to University penalties, persons found liable for copyright infringement may be ordered to pay civil damages, and willful acts of infringement may result in crim-

inal penalties, including imprisonment and fines of up to \$250,000 per offense. Of course, fear of litigation is not the primary reason to respect the intellectual property rights of others. It is important to remember, however, that many entertainment and software companies are vigilant and aggressive in protecting their intellectual property and often turn to the courts in their efforts to combat illegal file-sharing.

We provide below some links to additional sources of information regarding copyright law that you may also find useful. Thank you for observing University policy and for your cooperation in helping us to raise awareness among other members of the University community who may appreciate the reminder.

For further information regarding “fair use” and other aspects of copyright law: <http://www.princeton.edu/ogc/resources/copyright/fair-use/> .

For further information regarding legal sources of copyrighted material: www.educause.edu/legalcontent .

2012



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TUESDAY, APRIL 24

EARTH DAY 2012

COLLOQUIUM

Planetary Dynamos: Investigations of Saturn and Ancient Mars

SABINE STANLEY
University of Toronto

Wednesday, April 18

4:15 p.m. (Coffee/Tea at 4 p.m.)
M.B.G. Auditorium, Lyman Spitzer Building

University Medical Center of Princeton at Plainsboro
OPEN HOUSE Saturday, May 12 • Noon to 6 p.m.

1 Plainsboro Road, Plainsboro

*Tours of the New Facility
Info on Services and Programs
Kid's Activities and Games
Free Health Screenings
Refreshments*



Volunteers Needed for PPPL Exhibit

Volunteers are needed to staff the PPPL exhibit at CommUniversity on Saturday, April 28, from noon to 5 p.m. CommUniversity is an annual town-gown community arts festival sponsored by Princeton University students and the Arts Council of Princeton. If you can volunteer for an hour or two at our table, please contact Patti Wieser at pwieser@pppl.gov.

Brook PPPL Café Menu

BREAKFAST 7 a.m. - 10 a.m.
CONTINENTAL BREAKFAST..... 10 a.m. - 11:30 a.m.
LUNCH 11:30 p.m. - 1:30 p.m.
SNACK SERVICE until 2:30 p.m.

MONDAY, APRIL 16

TUESDAY, APRIL 17

WEDNESDAY, APRIL 18

THURSDAY, APRIL 19

FRIDAY, APRIL 20

**COMMAND PERFORMANCE
CHEF'S FEATURE**



Meatball Parmesan Hoagie w/ Fries & Veg.



Chicken Piccata served over Rice



Create Your Own... Cincinnati Chili w/pasta



Fresh Carved Honey Glazed Ham w/Potato



Fettucini Chicken Florentine

EARLY RISER

The XL Ham & Swiss Omelet w/Home Fries

Fresh Baked Banana Bread

Chocolate Chip Pancakes with choice of Meat

Gina's Breakfast Casserole

Crispy Chicken, Egg and Cheese on a Biscuit

COUNTRY KETTLE

Manhattan Clam Chowder

Beef Noodle

Cream of Carrot

Minestrone

Corn and Potato Chowder

GRILLE SPECIAL

Teriyaki Glazed Chicken Sandwich with Fries

Rustic Grilled Pizza

Black Bean and Corn Quesadilla with Salsa

Fresh Stuffed Bacon and Cheddar Burger with Fries

Cheese Steak, Pepper and Onion Burrito, Onion Rings

DELI SPECIAL

Seafood Salad Hoagie with Lettuce and Tomato

Caribbean Ham and Swiss

Turkey Pastrami Reuben

Louisiana Shrimp Salad on a Multi Grain Roll

Chipotle Chicken Salad on a Multi Grain Roll

PANINI

Turkey, Ham, Cheddar Peppers and Honey BBQ

Texas Roadhouse

Mediterranean Chicken

Pepperoni, Red Peppers and Fresh Mozzarella

Grilled Chicken, Roasted Peppers, Swiss and Mayo

MENU SUBJECT TO CHANGE WITHOUT NOTICE

[CLICK HERE FOR A PRINTABLE WEEKLY MENU](#)

WEEKLY

Editor: **Patti Wieser** ♦ Copy Editor /Graphic Design: **Gregory Czechowicz**
Photography: **Elle Starkman** ♦ Web: **Chris Cane** ♦ Writer: **John Greenwald**

PPPL WEEKLY is published by the PPPL Office of Communications on Mondays throughout the year except for holidays.

Deadline for calendar item submissions is noon on Thursday. Other stories should be submitted no later than noon on Wednesday.

Send to: pwieser@pppl.gov ♦ Comments: commteam@pppl.gov ♦ PPPL WEEKLY is archived on the web at: <http://www.pppl.gov/ppplweekly.htm>