PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
MAY 13, 2013

At PPPL THIS WEEK

MONDAY, MAY 13

PPPL Research Meeting
1:30 p.m. ◆ MBG Auditorium

The meeting can be viewed remotely at http://mediacentral.princeton.edu/id/0_o9krporj.

WEDNESDAY, MAY 15

PPPL Colloquium
3:15 p.m. ◆ MBG Auditorium

Savannah River National Laboratory: Underpinning Critical National Missions

Jeff Griffin, SRNL
Refreshments at 3 p.m. in the LSB Lobby
NOTE SPECIAL TIME

Eldercare Fair
10 a.m. - 2 p.m. ◆ Princeton Univ. Frist Campus Center - Rm. B & C

UPCOMING EVENTS...

May 21
The Trenton EMS Mass Casualty Unit will visit PPPL in honor of National EMS Week
11:30 a.m. - 1:30 p.m. ◆ PPPL

May 28
State of the Laboratory Address
1:30 p.m. ◆ MBG Auditorium

May 31
Princeton University Reunion Tours at PPPL
10:30 a.m. and 1:30 p.m.

June 1
PPPL Open House
9 a.m. - 4 p.m. ◆ Lab wide

Inside...

PPPL & ITER:

Lab teams support the world's largest fusion experiment with leading-edge ideas and design

By John Greenwald

PPPL is a key contributor to ITER, a huge international fusion facility under construction in Cadarache, France. ITER is designed to demonstrate the scientific and technological feasibility of fusion power by the late 2020s.

PPPL provides hardware, fabrication and research and development for ITER under contract to US ITER, a DOE Office of Science project managed by Oak Ridge National Laboratory. The United States participates in ITER together with China, the European Union, India, Japan, South Korea and Russia. "It is very exciting to work on such a challenging global science project with the potential for so great a global payoff," said PPPL physicist Dave Johnson, who heads the development of diagnostic tools for US ITER.

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TEAM ITER AT PPPL Front row from left: Charlie Gentile, Phil Heitzenroeder, Manfred Bitter, Larry Grisham, Ken Hill, Adam Cohen, Wenping Wang. Second row: Irving Zatz, Margaret Carideo, Francesca Poli, Stan Kaye, Novimir Pablant, Dave Johnson, Ankita Jariwala, Charles Kessel, Leo Konkel Jr. Third row: Nevell Greenough, Steve Jardin, Randy Wilson, Joshua Breslau, Roger Raman, Ron Martin, John Dellas, Andrei Khodak, Yuhu Zhai. Fourth row: Rod Templon, Han Zhang, Mark Smith, Jonathan Klabacha, Emil Nassar, Natalia Gnyp, Walter Guttenfelder, Brent Stratton, Russ Feder, Frank Malinowski (behind Feder), Charlie Neumeyer (next to Malinowski). Fifth row: Ali Zolfaghari, Peter Titus, Skip Schoen, Larry Sutton (behind Schoen), Barry Jedic, Masa Ono, Stefan Gerhardt, Mike Gomez, Mike Hause (behind Gomez), Doug Loesser, Mike Duco. Sixth row: Art Brooks, Mike Messineo.

Hall of Machines, art exhibit and more at June 1 Open House

By Jeanne Jackson DeVoe

PPPL's Open House on June 1 from 9 a.m. to 4 p.m. is shaping up to be a fun science festival for every age, with tours of NSTX, LTX and the NCSX coils, as well as NASA moon rocks, a Hall of Machines, an art show of PPPL paintings, science activities for kids and tours of all of the Laboratory's experiments.

Organizers say they need everyone at PPPL to help to make the event a success. "Because of all the wonderful things we're doing, we're going to need a lot of help," said the Open House Committee chair John DeLooper. If each PPPL'er can donate two hours of his or her time, there will be enough people to handle thou-

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PPPL & ITER

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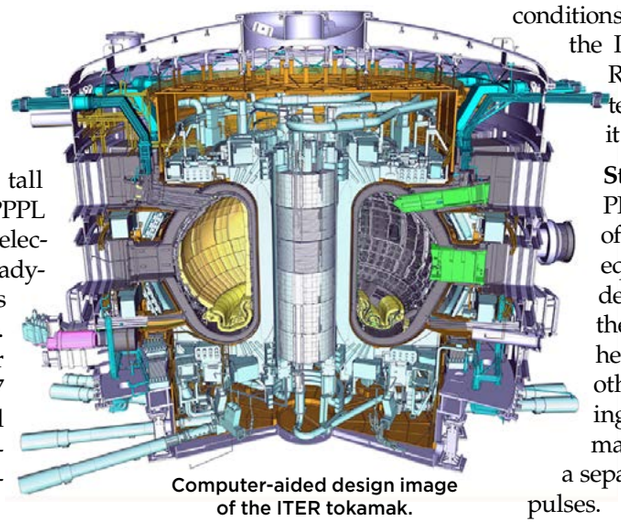
The PPPL tools will provide essential data during experiments on the donut-shaped, 10-story tall ITER fusion facility, or tokamak. PPPL also is procuring the bulk of the electrical network that will deliver steady-state, or constant, power across the sprawling 445-acre ITER site. PPPL contracts for these and other hardware components of the $17 billion-plus machine could total about $180 million, some $90 million of which will flow to subcontractors.



Computer-aided design image of the ITER tokamak.

PPPL is conducting experimental and theoretical research relevant to ITER as well. For example, experiments planned for the National Spherical Torus Experiment (NSTX), PPPL's major fusion facility, could contribute to understanding how plasma will behave and perform in ITER. The NSTX is currently undergoing an upgrade that is doubling the strength of both its electric current and magnetic fields.

"The US ITER project office at Oak Ridge is pleased to have PPPL as a partner laboratory," said US ITER Project Manager Ned Sauthoff. "Not only for the PPPL staff's expertise in fusion engineering, and in design and operation of nuclear fusion facilities, but also for its wealth of experience in plasma science and tokamaks."

Here's a look at PPPL's role in ITER:

Diagnostics. The Laboratory manages the design and production of seven diagnostic systems for ITER. These crucial instruments will help gauge the performance of the superhot, electrically charged plasma gas that will fuel fusion reactions inside the ITER tokamak. The systems include a novel, space-saving design for a device called a reflectometer that will measure the density of the plasma. Developed by scientists at Oak Ridge and the University of California at Los Angeles, the device employs a single antenna system in place of the bulkier dual-antenna system that is the current industry standard. "This should give us far more room to fit everything in," Johnson said.

The diagnostic systems will peer into the plasma through shielded enclosures called port plugs that PPPL is designing under an agreement with the ITER Organization, which coordinates the overall international project. These 45-ton, minivan-sized plugs will be set into the tokamak's interior walls and must withstand the electromagnetic forces inside the facility and exposure to the energetic neutrons, or subatomic particles, that come from fusion reactions.

PPPL's solution is a modular design that fits the tightly packed diagnostic instruments into port plugs that consist of vertical drawers. This arrangement will provide clear views of the plasma while minimizing the penetration of neutrons into the port plugs. "You want high diagnostic access to the plasma together with low exposure to the neutrons," said PPPL engineer Russ Feder, who leads the PPPL port plug design effort. "That's the challenge."

The innovative PPPL design will serve as the model for 18 diagnostic port plugs inside the ITER tokamak. Included in the modular design are stainless steel components called diagnostic first walls that will directly face the plasma. These components, which PPPL engineer Doug Loesser is designing, will dissipate heat and provide openings up to the size of basketball hoops for diagnostic viewing. Loesser also contributes to the port plug design.

PPPL's final task with respect to the diagnostics will be to assemble and test four port plugs fully equipped with instruments. Testing will be done in a large vacuum tank that produces hydraulic pressure and temperature similar to the conditions the port plugs will encounter in the ITER machine. Research teams in Russia are building this port plug test facility and are slated to deliver it to PPPL by early 2017.

Steady-state electrical network. PPPL is now purchasing $30 million of transformers and other electrical equipment for the network that will deliver all steady-state AC power to the ITER site. The current will run heating and cooling systems, among other functions, and light ITER buildings. Experiments on the huge tokamak itself will draw electricity from a separate system that supplies power in pulses.

Leading the procurement effort is PPPL engineer Charles Neumeyer, who also heads an international group of experts that is charged with reviewing the pulsed power systems. Working with Neumeyer is a seven-member team at PPPL whose members are drafting specifications for 16 different groups of electrical items for the steady-state system. With so much to buy, "the team is working really hard to keep up," Neumeyer said.

In-vessel coils. The superhot plasma in tokamaks can send out flares called edge localized modes (ELMs) that can erode the vessel's plasma-facing surfaces. At PPPL, a team headed by engineer Mike Kalish is designing magnetic coils to suppress flares inside the ITER tokamak. The team's tasks also include designing a separate set of coils to enhance the vertical stability of the plasma.

Both types of in-vessel coils must contend with neutron bombardments that could quickly wear out conventional materials. "New technology had to be developed," Kalish said. His team's solution: Magnets fabricated from conductors composed of a stainless steel jacket that wraps around a copper tube. The jacket and copper tube are separated by magnesium oxide insulating material. The project calls for 27 such coils for ELM suppression and two to help stabilize the plasma.

The key to PPPL's solution was the heat- and radiation-resistant magnesium oxide, a mineral that insulates coils in harsh environments such as high-energy physics experiments. The final design phase is being done in collaboration with China's Academy of Science Institute of Plasma Physics (ASIPP), which is building a prototype of the PPPL design.

Research in support of ITER. Experiments on the revamped NSTX will support ITER in many ways. These include studies of the cause of plasma disruptions that can thwart fusion reactions by allowing the plasma to flash apart. Such research could help developers of ITER create tools to mitigate the disruptions. "If you want to design new tools, you have to understand the physics, and our experiments can help with that," said Masayuki Ono, project director of the NSTX.

PPPL also conducts purely theoretical studies on ITER's behalf. PPPL physicist Stephen Jardin is developing a computer model to simulate the impact of large-scale disruptions inside the ITER tokamak. The study, which Jardin is conducting under a three-year contract with the ITER Organization, will be used to show that the tokamak can withstand the force that a worst-case major disruption would produce.

PPPL participates in international forums for ITER as well. PPPL scientists serve on panels of a group called the International Tokamak Physics Activity (ITPA) that brings together researchers from all the ITER partners. The panels plan experiments on topics, such as how to control ELMs, that members can conduct on their own fusion facilities and then compare results. "Research done in that way equals more than the sum of its parts," said PPPL physicist J. R. "Randy" Wilson, who heads international collaborations at the Laboratory and serves on the ITPA coordinating committee. "You get more understanding that way."

Open House

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sands of visitors and still give each staff member time to spend with friends and family members. Please fill out the email form sent to PPPL staff on Thursday to volunteer.

The Open House will offer numerous hands-on activities for people of every age. Children can go on a scavenger hunt of the exhibits and earn a special energy ranger badge if they visit all of them. They'll also get a chance to try out plasma activities like the hair-raising Van De Graaff generator and put out a simulated fire with real fire equipment.

"If you're a plasma scientist or you're somebody who's never heard of plasma before, we have you covered," said Arturo Dominguez, who chairs the committee in charge of exhibits for the Open House. "Our plan is to show all the exciting and ground-breaking things happening here at PPPL."

One of the main features of the Open House is the chance to see fusion experiments that are usually closed to the public, including the National Spherical Torus Experiment (NSTX), which has been undergoing a $ 94 million upgrade, and numerous smaller experiments at the Laboratory.

Dominguez says the planners are especially proud of a new exhibit planned for this year's Open House. "We're very excited about the Hall of Machines, where people can see different machines, their characteristics and how they contribute to the big picture of magnetic confinement fusion," he said. The exhibit will highlight a huge picture of ITER, the international fusion experiment in Cadarache, France, and visitors will see giant drawings of other large fusion experiments scaled to give visitors a sense of how big the nearly 100-foot-tall ITER experiment would be.

With most of the Laboratory open to the public, visitors can see areas like the machine shops where many of the components of the experiments are produced and where there will be a demonstration of how a water jet cutter can slice through metal. Kids will also enjoy seeing the ambulances and fire trucks used by PPPL's Emergency Services Unit.

Another new exhibit unique to this year's Open House is a special art show featuring a painting by artist Josephine Halvorson and works by her Princeton University students.

Adam Cohen, deputy director for operations, far left, and engineer James Chrzanowski, far right, both in black, talk to visitors at the NCSX site at PPPL's 2010 Open House.

The class has spent months painting on site at PPPL and many of those paintings will be on display. The Open House will also feature some posters from the Princeton University Art of Science contest, which is cosponsored by PPPL.

PPPL's Mark Cropper will give the popular cryogenics demonstration in which he'll demonstrate how liquid nitrogen flash-freezes everything from a balloon to flowers. There will also be lectures by top physicists and engineers that will offer a more in-depth look at the magnetic fusion research taking place at PPPL and some of the related projects.

There will be free parking available at PPPL and the nearby Novo Nordisk building with shuttle buses to PPPL and around the PPPL site. There also will be free refreshments and giveaways. More details on the Open House are available at the event's new Web page, you can also download the Open House poster here.

A reminder regarding PPPL's access requirements

The Site Protection Division would like to remind all employees that a Site Access Notification Form is required for all visitors to PPPL, including collaborators, subcontractors, vendors, family members and friends, government officials, media, college students and tour groups.

PPPL Emergency Services Officer John Mazukewicz hands back identification to a visitor at the security booth. A Site Access Notification Form is required for all visitors to PPPL.

The Site Access Notification Form (http://www-local.pppl.gov/SiteAccess.html) should be filled out two days before the visit, if possible. List a host and an alternate host and provide the telephone number and cell phone for both, and give any additional information in the comments section.

For larger tours or meetings, a list of all visitors with their citizenship, date of birth and country of birth can be sent to the Site Protection Division instead of the Site Access Notification Form.

PPPL employees should remind visitors that everyone age 18 and older must show official photo identification, such as a driver's license, at the security booth, and non-citizens must show a valid passport. Foreign Nationals must also submit a Foreign National Registration Form (http://fnvisit.pppl.gov/fnregister.aspx), for formal visits (i.e., visits for non-personal purposes such as business, research or education).

The PPPL Site Protection Division is authorized to inspect vehicles and personal packages, such as briefcases, satchels, book bags, and purses for prohibited materials, devices, equipment, etc.

Please address any questions, comments or suggestions regarding visitor guidelines to the Site Protection Division at extension 3208.

Ahmed Diallo wins DOE Early Career grant

By John Greenwald


Ahmed Diallo

PPPL Physicist Ahmed Diallo has won a highly competitive Early Career Research Program grant sponsored by the DOE's Office of Science. His $500,000 per year award, which can be renewed for up to five years, will fund research into understanding and controlling the volatile edge of the superhot, charged plasma gas that fuels fusion reactions in devices called tokamaks. Controlling the edge of the plasma will be essential to harnessing fusion as a clean and abundant source of energy for generating electricity.

Diallo, who serves as deputy boundary group leader for PPPL's National Spherical Torus Experiment (NSTX), the Laboratory's major fusion facility, was one of 61 Early Career winners chosen from among 770 university- and national laboratory-based applicants. The awards are designed to support exceptional young researchers who are working on projects that fall within the Office of Science's six major areas of interest, which include fusion energy sciences.

Diallo's research focuses on intense bursts of heat that flare from a thin section of the plasma edge called the pedestal, which is just a few centimeters wide. Such bursts can damage a tokamak's plasma-facing components and reduce fusion power. "If we can control the pedestal we can greatly improve fusion performance and reduce large heat loads on the components," Diallo said.

Suppressing the torch-like surges will be vital for all toroidal, or donut-shaped, fusion facilities. These include present devices such as the NSTX, which is being upgraded, and future machines such as ITER, the huge international facility under construction in France. "We're overjoyed by this award," said Michael Zarnstorff, PPPL deputy director for research. "It recognizes not only Ahmed's work and promise, but also the importance of the pedestal for fusion energy."

Diallo plans to use his grant in two main stages. He first plans to enhance a diagnostic system called Thomson scattering that uses laser light to study the formation of the pedestal region over short time scales. He then aims to employ a combination of methods to control the region.

Diallo has gained a wealth of plasma physics and diagnostic experience since coming to the United States from the west African nation of Burkina Faso to earn a bachelor's degree at the University of Montana. He spent the summer of his senior year at PPPL as a participant in the National Undergraduate Fellowship program. He went on to receive a doctorate in experimental plasma physics from the University of Iowa, and then did postdoctoral work at the Ecole Polytechnique Fédérale de Lausanne in Switzerland, and the Australian National University.

Diallo jumped at the chance to join PPPL when a job became available in 2009. "I was very happy that a position opened up," he said. "As an undergraduate, I had a great experience at PPPL and I had always wanted to work here."

Tuesday, May 28, 2013
1:30 P.M.
MBG Auditorium

After Dr. Prager's presentation, the Kaul Prize and the Distinguished Research Fellow Award will be presented.

Refreshments to follow.

All Staff are Invited to Attend.

Post the Open House Poster!

Please help spread the word about our Open House on June 1 from 9 a.m. to 4 p.m. by downloading the poster and sending it to your friends, neighbors and family members and printing it out and posting it at your local stores, libraries and bulletin boards! Paper copies of the larger poster are available in Room B368. The poster can also be downloaded here.

COLLOQUIUM

Savannah River National Laboratory: Underpinning Critical National Missions

JEFF GRIFFIN
Savannah River National Laboratory

Wednesday, May 15

3:15 p.m. (Coffee/Tea at 3 p.m.)
~ NOTE SPECIAL TIME ~
M.B.G Auditorium, Lyman Spitzer Building

Volunteer for PPPL's OPEN HOUSE • JUNE 1

The Open House will have dozens of activities and exhibits and will bring thousands of visitors to the laboratory. We need the help of everyone at PPPL to work for two hours at the event so that each staff member will have most of the day to spend with friends and family members. Please fill out the email form sent to PPPL staff on Thursday to volunteer or contact Andrea Moten, amoten@pppl.gov to volunteer.

PRINCETON PLASMA PHYSICS LABORATORY
OPEN HOUSE
JUNE 1, 2013

The Department of Health and Human Services' Administration on Aging (AOA) celebrates the vitality and aspirations of older adults and their contributions and achievements, during the month of May, for Older Americans Month. With this in mind, there is no better time to bring together vendors who can assist us as we work toward retirement and/or prepare to care for elderly relatives.

Are you approaching retirement age or planning for it? Do you care for a spouse, partner, or other family member? Do you anticipate caring for a parent, locally or long distance? Are you the caregiver of an aging loved one? If you answered, "Yes," to any of these questions, visit Princeton University's first annual healthy aging resource fair:

Planning Ahead

FOR YOU AND THOSE YOU CARE FOR

Wednesday, May 15, 2013
10:00 a.m.—2:00 p.m.
Frist Campus Center
Multipurpose Rooms B and C

Exhibitors will be on hand from organizations and businesses specializing in the health, comfort, and general well-being of the elderly and their caregivers. Professionals will be available to answer questions about resources including assisted living, adult day care, transportation, legal matters, and much more.

In addition to over 30 vendors we will have entertainment and the following informational sessions:

10:00 a.m.—2:00 p.m.
Blood Pressure Screenings
Provided by University Health Services

10:00—11:00 a.m.
and 1:00—2:00 p.m.
Make the Most of Your Retirement Years
Presented by Carebridge

11:30 a.m.—12:00 noon
Asset Protection
Presented by Medina Law Group, LLC

12:15—12:45 p.m.
My Social Security and How to Plan and Calculate Your Social Security Benefits Online
Presented by Social Security Administration

Human Resources PRINCETON UNIVERSITY
Benefits and Worklife

Sponsored by the Office of Human Resources, 2 New South
Questions? Contact Elaine Richards at (609) 258-9109 or erichard@princeton.edu

JUST BREATHE

Mindfulness Series

Mindfulness is the practice of purposely focusing your attention on the present without drifting into concerns about the past or future.

Fridays, May 24 and June 7
12-12:30 p.m. Furth Plasma Physics Library

FOR PPPL STUDENTS, FACULTY, AND STAFF
Drop in as often as you can! No registration is required.

Learn to quiet the mind and ease physical distress. This mindfulness series will provide an opportunity to slow down in this fast-paced setting, and to experience balance and a sense of calm.

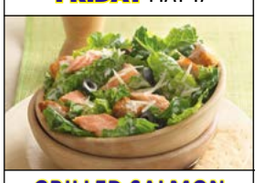
Facilitated by Shefalika Gandhi, LCSW, University Health Services. Sponsored by Princeton Plasma Physics Laboratory (PPPL). Email mgonzalez@pppl.gov for more information.

Brock Café at PPPL Menu

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

Mark Gazo, Chef Manager

COMMAND PERFORMANCE CHEF'S FEATURE

	MONDAY MAY 13	**TUESDAY** MAY 14	**WEDNESDAY** MAY 15	**THURSDAY** MAY 16	**FRIDAY** MAY 17
					
	SWEDISH MEATBALLS OVER EGG NOODLES	**CHICKEN CORDON BLEU**	**VEGETABLE BAKED ZITI** V	**BAKED STUFFED CHICKEN**	**GRILLED SALMON CAESAR SALAD** V
EARLY RISER	Potato Bacon Omelet With Cheddar Cheese	Cream Cheese Scrambled Eggs with Potatoes & Bacon	Chocolate Chip Pancakes (National Chocolate Chip Day)	Sausage, Cheese & Salsa Omelet	Biscuits & Sausage Gravy
COUNTRY KETTLE	Lentil Soup V	Chili con Carne	Chicken Noodle	Split Pea V	Beef Barley
GRILLE SPECIAL	Grilled Turkey, Bacon and Swiss on Sourdough Bead with Fries	Grilled Chicken Caesar Wrap	English Pub Burger with Onions & Cheddar on English Muffin	Monte Cristo with Fries	S. Pacific Grilled Turkey Burger with Ginger Yogurt Sauce
DELI SPECIAL	Mediterranean Tuna Salad Pita V	Turkey, Avacado & Bacon Wrap	Trio Salad Platter	Antipasto Wrap	Shrimp Salad Croissant V
PANINI	Chicken, Portobello, Spinach, Provolone Panini	Cuban Panini	Spicy Chicken & Black Bean Burrito	Ham, Swiss & Roasted Pepper Panini	Crab Cake Melt With Swiss Cheese and Coleslaw

MENU SUBJECT TO CHANGE WITHOUT NOTICE

CLICK HERE FOR A PRINTABLE WEEKLY MENU

WEEKLY

Editor: **Jeanne Jackson DeVoe** ◆ Layout and graphic design: **Gregory J. Czechowicz**
Photography: **Elle Starkman** ◆ Web: **Chris Cane** ◆ Admin. support: **Pamela Hampton**

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Deadline for calendar item submissions is noon on Thursday. Other stories should be submitted no later than noon on Wednesday.
Comments: commteam@pppl.gov ◆ **PPPL WEEKLY** is archived on the web at: http://www.pppl.gov/ppplweekly.cfm