DOE Princeton Plasma Physics Laboratory

Vol. 29, No. 9 • June • 2008

HOTLINE

The Princeton Plasma Physics Laboratory is a United States Department of Energy Facility

# In the Name of Safety

## PPPL Implements Safety Training Observation Program (STOP™)

In May, the Laboratory rolled out a new safety plan of action — the Safety Training Observation Program (STOP™) for Supervision. Designed by DuPont, the program trains line managers to observe people as they work, recognize and reinforce safe work practices, and talk with people to correct unsafe acts and prevent injuries.

It also allows the Laboratory to collect, track and trend data on leading safety indicators and feed the information back into the line organization. The STOP™ training of PPPL line managers, which consists of five modules spread over several weeks, began May 8.

"We're trying to teach supervisors how to see things in situations where people are actually working and to talk to employees about their observations," said ES&H Head Jerry Levine. "The supervisors should note the good things they observe about safety practices, like wearing safety glasses when needed, as well as how to improve."

The goal, he added, is for supervisors to give their staffs positive reinforcement about doing their jobs safely and correctly, as well as to help them change the ways that are incorrect.

Levine noted that safety walk-throughs of areas have been emphasized in the past. "These will still be employed, but STOP™ adds a component that focuses on workers' behaviors, not just the environment," Levine explained, adding that managers now will be soliciting feedback from workers. "We want to foster dialogue between staff and managers."

As part of the STOP™ program, supervisors are conducting regular observations and structured safety audits, which are scheduled 30-minute observations. STOP™ audit check-

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## PPPL Honors Inventors

At the June 17 Patent Recognition Dinner, the Laboratory honored 29 inventors for their creativity at PPPL during Fiscal Year 2007. The dinner was at Princeton University's Prospect House. PPPL Deputy Director Rich Hawryluk and Tech Transfer Head Lewis Meixler hosted the Patent Awareness Program event.

The inventors at the dinner are, from left, Masaaki Yamada, Charles Gentile, Harry Mynick, Stefan Gerhardt, Hantao Ji, Dick Majeski, Chris Brunkhorst, Doug Labrie, Charles Skinner, David Cylinder, Craig Priniski, Elena Belova, John DeSandro, and Manfred Bitter.

The listing of inventors and their inventions is on page 4-5.

## STOP

Continued from page 1

list cards, which are being made available throughout the Laboratory, are sent to Levine and entered into a database. His staff is mapping the trends seen.

"This allows us to gather a database and trends, and look at work and how it is performed before an accident occurs," he said. "Hopefully this process will allow us to correct unsafe behaviors before anyone gets hurt."

STOP™ gives managers the tools to do that. "The whole idea is to prevent as many injuries as possible," Levine said.

PPPL adopted STOP™ and began its implementation when a Lab group addressing how best to enhance safety here recommended it. The group included Levine, Charlie Gentile, Michael Gonzalez, Bill Slavin, and Mike Williams. Members of the team visited other DOE national labs with favorable safety records, including Argonne, Oak Ridge, and Pacific Northwest, as well as the ExxonMobil Research Facility in Clinton, N.J., and DuPont to look at behavior-based safety programs. The Lab ended up adapting DuPont's program.

On May 8, Lab management held an "all hands" meeting in the Auditorium to explain the program to staff.

"Overall, I think STOP™ is going to make the Lab a better place to work," Levine said. ●


***PPPL supervisor Steve Langish compliments technician Manny Fernandez on safely grinding on an NCSX Modular Coil in the RESA Building. Langish reviewed the ongoing coil work and offered feedback to Fernandez as part of the STOP™ program recently implemented at the Lab.***

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**HOTLINE**

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The HOTLINE is issued by the Princeton Plasma Physics Laboratory, a research facility supported by the United States Department of Energy. It is primarily an internal publication. Correspondence and requests to reprint material should be directed to the Editor, PPPL HOTLINE, P.O. Box 451, Princeton, NJ 08543; Interoffice correspondence should be addressed to MS-38, LSB Bldg., C-Site; fax 609-243-2751; telephone 609-243-2757; e-mail pwieser@pppl.gov.

# PPPL Welcomes Summer Undergraduate Students

*Forty-two undergraduate students from across the U.S. came to PPPL in June for one week of intensive courses in plasma physics and fusion engineering to prepare for summer internships at various research institutions, including the Laboratory. The students, at left, are participating in the National Undergraduate Fellowship Research Program in Plasma Physics and Fusion Energy Sciences and the Science Undergraduate Laboratory Internship programs funded by the U.S. Department of Energy and administered by PPPL.*

# Batter Up! The PPPL Tokabats Begin Summer Season


*The 2008 PPPL TOKABATS — a Lab softball team made up mostly of grad students — vie with other teams from Princeton University in intramural summer games. All but one game are at the West Windsor Fields off Washington Road and begin at 5:45 p.m. The remaining regular season games are July 1, 9, 14, 15, 24 (24th at Broadmeade Field — off Western Way in Princeton between Harrison and Broadmeade), and 29. Playoffs run July 30 – August 7.*

*The Tokabats, from left, are: (kneeling) Luc "Stellar Raider" Peterson and Nate "Super Shot" Ferraro; (middle row) Dan "High Harmonic Fast Ball" Lundberg, Martin "Sausage Instability" Griswold, Clayton "Oscar" Myers, Filippo "Flipper" Scotti, and Craig "Sawtooth" Jacobson; (top row) Laura "B-Dot" Berzak, Hua "H-Mode" Wang, Jess "Bollywood" Baumgaertel, and Josh "Super Banana" Kallman. Not Pictured are Andrew "K-12" Zwicker, Patrick "Ringer" Ross, Katy "KSTAR" Ghantous, John "Bachelor" Rhodes, Jong-Kyu "Rock" Park, Woochang "Solid" Lee, Jongsoo "Goosebuster" Yoo, and Sterling "Go, Daddy, Go!" Smith. For more information contact Tokabats Captain Luc Peterson at jpeterso@pppl.gov or check out http://www.facebook.com/group.php?gid=35924955568. Everyone is welcome in the cheering section!*

# 2007 PPPL Inventors and Inventions

*At the Patent Dinner, PPPL honored the inventors below, who represent the Lab's Research, Engineering and Technical staffs, as well as other institutions that work in collaboration with PPPL.*

**JUN GYO BAK**
**ELENA BELOVA**
**MANFRED BITTER**
**A. H. BOOZER**
**ANDREW CARPE**
**DAVID CYLINDER**
**RONALD C. DAVIDSON**
**JOHN DESANDRO**
**CHARLES A. GENTILE**
**STEFAN GERHARDT**
**SCOTT GIFFORD**
**KENNETH W. HILL**
**HANTAO JI**
**IGOR D. KAGANOVICH**
**JAMES C. KELLOGG**
**STEPHEN W. LANGISH**
**DOUGLAS LABRIE**
**SANG GON LEE**
**FRED M. LEVINTON**
**RICHARD MAJESKI**
**H. E. MYNICK**
**NEIL POMPHREY**
**CRAIG PRINISKI**
**WAYNE T. REIERSEN**
**ALLAN HAROLD REIMAN**
**ADAM B. SEFKOW**
**CHARLES SKINNER**
**EDWARD A. STARTSEV**
**MASAAKI YAMADA**

## Patents Issued in Fiscal Year 2007

U.S. PATENT NO. 7,209,542 B2

### Simultaneous Measurement of the Reflectivity of X-ray with Different Orders of Reflections and Apparatus for Measurement Thereof

***Manfred L. Bitter, Sang Gon Lee, and Jun Gyo Bak***

This invention relates to a new method and an apparatus for simultaneously measuring the integrated X-ray reflectivity of a crystal in different orders of reflections. A spherically-bent crystal serves as a diffraction grating. When "white" X-ray light, such as the bremsstrahlung continuum from an X-ray tube, strikes the surface of the crystal it is broken into its constituent frequencies. Different frequencies are reflected at different angles of incidence. The new method allows a very fast measurement of the X-ray crystal reflectivity due to the fact that "white" instead of "monochromatic" X-ray light is used, so that the measuring time for a full characterization of the X-ray crystal reflectivity is substantially reduced, requiring only a few minutes instead of several hours (or days) needed with previous techniques.

U.S. PATENT NO. 7,244,948 B1

### Miniature Multinuclide Detection System and Method

***Charles Gentile, Andrew Carpe, and Stephen Langish***

This invention relates to the Miniature Integrated Nuclear Detection System (MINDS) — a real-time ambient temperature radionuclide identifier capable of resolving X-ray and gamma ray spectroscopy at levels slightly above normal background in a matter of seconds. The system has demonstrated the ability to detect and resolve embedded spectra resident in more dominant signals. MINDS detects acute changes (suppression) in background radiation indicating the presence of high-Z materials possibly used for shielding. MINDS also monitors for acute increases in background radiation indicating the detection of radionuclides that may not be in its identification library. MINDS can be configured to scan moving vehicles, workplace entrances, post offices, tollbooths, airports, commercial shipping ports, and in police cruisers to detect the transportation of unauthorized nuclear materials. Current MINDS deployments include Newark-Penn Station, NJ, the Port of Oakland, CA, and various U.S. military and Department of Homeland Security venues.

## Inventions Disclosed in FY 2007

### Convertible Aerial Vehicle with Contra-rotating Wing/Rotors and Twin Tilting Wing and Propeller Units

***David Cylinder and James C. Kellogg***

An improved version of an unmanned micro-aerial vehicle of the stop rotor converting type, this vehicle is capable of vertical take-off and landing, hover and slow speed flight with agile maneuvering while operating as a rotary wing aircraft, and efficient high speed flight when operating as a fixed wing aircraft. Missions for this aircraft include military reconnaissance, law enforcement surveillance, intelligence gathering, hazard area inspections, video and photojournalism, and environmental monitoring. It will also be of interest to the hobby and toy industry as a flying model aircraft.

### Microelectronic Dust Transporter System

***Charles H. Skinner***

This invention eliminates dust in tokamak fusion reactors or other devices where it could potentially accumulate and cause a safety hazard. A large-area semiconductor device contains an array of pixels that can be selectively charged. The dust is repelled by the charged pixels, and by generating waves of moving charge, the dust can be moved across the substrate to a collection point. A second embodiment is to convert the electrostatic charge into miniature mechanical motion so that the dust can be mechanically moved to a collection area. A third option is to detect the particles electrostatically and use this information to trigger the mechanical motion.

### Magnetic Field Coils for Stabilizing the Vertical Mode in Tokamak Plasmas and in other Magnetic Confinement Devices

***Allan H. Reiman***

This invention consists of a set of parallelogram-shaped magnetic field coils that can be placed near the top and bottom of tokamaks or other toroidal magnetic confinement plasma devices to provide control of vertical instabilities. The parallelogram shape can be modified

somewhat, by allowing two of the straight sections to follow the toroidal curvature, by allowing the coil winding surface to be curved to conform to the local shape of the plasma, or more generally by introducing some curvature to optimize relative to other considerations.

### Controlling Charge and Current Neutralization of an Ion Beam Pulse in a Background Plasma by Application of a Small Solenoid Magnetic Field

***Igor D. Kaganovich, Edward Startsev, Adam B. Sefkow, and Ronald C. Davidson***

Propagation of an intense charged particle beam pulse through a background plasma is a common problem in many plasma applications. The plasma can effectively neutralize the charge and current of the beam pulse, and thus provides a convenient medium for beam transport. The application of a small solenoid magnetic field can drastically change the self-magnetic and self-electric fields of the beam pulse, thus allowing effective control of the beam transport through the background plasma. Under certain values of applied solenoid magnetic field, the radial force acting on the beam ions is considerably reduced. This effect can be used to minimize beam pinching. The results of analytical theory have been verified by comparison with simulation results obtained from two particle-in-cell codes, which show good agreement, validating the proposed effect.

### Inductive Field-Reversed Configuration Formation Utilizing a Spheromak and an Ohmic Solenoid

***Stefan Gerhardt, Masaaki Yamada, Hantao Ji, and Elena Belova***

This invention involves a scheme for the formation of a field-reversed configuration (FRC) plasma. A spheromak plasma is formed utilizing a well-tested flux-core technique. An ohmic solenoid is used to sustain and increase the poloidal flux of the plasma, while the toroidal flux decays due to electrical resistivity. An FRC plasma results, which can be translated in a simply-connected volume for whatever uses are envisioned. The scheme does not require the high-voltage fast capacitor banks typical of FRC formation by a theta pinch, nor does it require the additional hardware associated with FRC formation by the merging of two spheromaks. The scheme has been conceptually verified by experiments performed in the Magnetic Reconnection Experiment.

### Fusion Reactor First Wall with Pumping Cooling, and MHD Stabilization using a Lithium "Thick Film" First Wall and Closed-channel Lithium Flow

***Richard Majeski***

A two-layer first wall is proposed for use in tokamak fusion reactors. In the first, plasma-facing layer, a thin film of slowly flowing lithium is entrained in a surface layer of porous metal. This first layer is to be backed by a fully enclosed hollow wall, through which a fast-flowing (10 – 50 m/s) 1-2 cm thick layer of liquid lithium is pumped. For the first layer, flow may be driven by the Marangoni effect. For the fast flow, pumping may be provided externally (if the flow is along magnetic field lines), or driven by J × B effects. The thin, entrained plasma-facing layer provides strong particle pumping and controlled removal of the tritium inventory. The fast flow within the hollow wall provides cooling of the plasma-facing layer, and additional plasma MHD stability.

### An Electro-optical Tunable Birefringent Filter

***Fred M. Levinton***

This invention relates to electro-optically tunable wide field-of-view optical filters. The filter is a birefingent interference filter comprised of a polarizer on either side of a birefrigent crystal. Another embodiment of the filter is a split element design that has the crystal in two parts, rotated by 90 degrees, with a half wave retarder between them. This arrangement provides a wider field-of-view. In either configuration, the bandpass wavelength can be tuned using an electro-optically active birefringent crystal and applying a voltage to the crystal along the optical axis.

### Target Positioning Arm

***John DeSandro, Scott Gifford, Doug LaBrie, and Craig Priniski***

This invention is an adjustable fixture that can repeatedly set the position of any diagnostic placed at the endmost position of the fixture. The fixture contains five moveable arm segments that are locked into position using a quick release pin. Each segment contains a joint that can rotate 360 degrees and extend swing in a 270-degree movement. The fifth segment also contains a sliding section to extend or retract. The end of the fixture is a three-axis gimbals. The endmost position contains a mounting block with a series of tapped holes for mounting components to the arm. All the moveable joints have a label affixed next to the removable pin, making the fixture repeatable each time it is used.

### Programmable Coil Array with Optimized Currents for Transcranial Magnetic Stimulation

***H.E. Mynick, N. Pomphrey, and A.H. Boozer***

This invention is a device for inducing magnetic and electric fields in the brain for transcranial magnetic stimulation (TMS). The device has a range and precision in space and time enhanced over present-day TMS probes. The invention could be used for neuroscience studies and for possible therapeutic applications. It permits the induction of a much wider range of TMS fields, better tailored to stimulate desired regions of the brain than current TMS probes, and with far more control over the location and time-development of the applied fields. The probe consists of an array of coils capable of generating magnetic fields in the range of 1 tesla, fixed on a helmet-like frame, independently energized, with coil currents electronically controlled and programmable.

### Direct Drive Electric Generator Pump

***W.T. Reiersen***

This invention is a device that can be used to directly generate electric power from internal combustion or to drive a pump from an electric power source without any mechanical linkages. The device has the potential to greatly simplify the production of electricity from internal combustion engines by eliminating connecting rods, crankshafts and generators. It could be used in transportation to power electric motors. It may result in lighter, more reliable power sources with less maintenance. By not being tied to mechanical linkages, the compression ratio and timing of the engine is infinitely variable, allowing great flexibility in optimizing combustion dynamics with possible benefits in efficiency and emission. As a pump, the virtues are similar. ●

## Spotlight

**Name:** Bill Slavin

**Position:** Slavin is a Senior Industrial Hygienist and Safety Professional in the Lab's ES&H group. He joined PPPL's staff in 1989 as an intern in the Occupational Safety Branch while working on a master's degree and became a permanent full-time employee a few months later. Slavin received a master's in industrial hygiene and safety, and a B.A. in biology, both from Temple University.

Slavin's job entails a variety of safety-related tasks, from participating in safety walk-throughs to doing routine paperwork such as updating policies and procedures, and completing compliance forms. He issues confined space permits, consults with staff and management about safety questions, reviews work orders and projects, analyzes job hazards, performs pre-job briefings, and provides field support for PPPL staff and contractors. He is a safety trainer and is the prime person behind the Lab's STOP™ program.

**Quote:** "PPPL has a relaxed atmosphere and the management has really supported safety, making it easy to do my job," says Slavin. "Some workplaces view safety as a speed bump rather than an integral part of the company. For instance, at a factory the goal is to produce. Here we are encouraged to do our jobs safely and to do them right. It has grown into this attitude and is still growing. That's nice to see."

**Other Interests:** Slavin is an avid woodworker, sci-fi fanatic, volleyball enthusiast, and BMW sports car fan.

"I have a woodworking shop in my house. I mostly make smaller items like jewelry boxes, clocks, and toys for my nieces and nephews. Some of my best pieces are a pair of rocking horses for my aunt's grandchildren. For her third grandkid, I made a toy wood lawn mower," he says. While most of his creations are for family and friends, he has sold his work at a crafts fair. "It was nice to hear from strangers that they liked it," Slavin says. (Slavin's web site is at: http://mysite.verizon.net/unclebillys/)

Slavin uses local hardwoods like oak, maple, cherry, and walnut, as well as some exotics such as mahogany, teak, and purpleheart for his creations. He uses power tools and hand tools — table saw, hand saw, router table, drill press, hand saws and planes — and uses plans and patterns. "I often look at others' work and photos, and do the reverse engineering, using 3-D software to sketch it out."

He began woodworking because he was always a "do-it-yourself" guy. He watched Norm Abram on the PBS program, The New Yankee Workshop, and began acquiring power tools while setting up a shop in his den. "The internet makes it easy to find great tools, information, and tips from other woodworkers."

Sometimes he woodworks several hours each night and all weekend. Other times he puts it aside to dig into a science-fiction fantasy book. His favorite authors include David Eddings and J.R.R. Tolkien and he's seen all the Lord of the Rings films based on the Tolkien novels. "They are well done, but not as good as the books," he says. He started reading sci-fi novels as a kid and enjoyed watching the original Star Trek TV series as reruns. He also liked many of the Star Wars books and the original movie trilogy.

At PPPL, he is a regular on the volleyball court at lunchtime outside the Theory wing. And when his workday is done, he often can be seen heading off-site in his dark blue 1996 BMW Z3. "I fell in love with the car. It is fun to drive, but it is incredibly impractical. It's a two-seater and has no cargo space," Slavin says. It's also no good on slick roads. Slavin recalls heading home one day when the roads became icy. As he arrived at his Yardley development he was unable to get up the small hill to his home. Now he has a Subaru Baja for regular trips. "But I'm planning on driving to the Outer Banks in North Carolina this year in my BMW. It's a fun car for nice weekends."

***As long as you drive safely, safely, safely, Bill!*** ●

# PPPL Grads Collaborate to Produce Unique Results

The Program in Plasma Physics at Princeton University has produced wonderful scientists, solid research, and interesting findings.

In February, one of the program's collaborations led to a spectacular, first-time result — Wallace Joseph Snow.

"Wally is the first offspring of two graduates of the Princeton Plasma Physics Program," says proud mom Jill Foley, who joined husband Tom Kornack in the production. Foley received a Ph.D. in 2004 and Kornack received one the following year.

"We met in Sam Cohen's lab in the fall of 2000, when I was working with Fred Levinton on my thesis project, and Tom was finishing up his first-year project with Sam. We started dating that winter, and got married in 2005."

Jill still works at PPPL, now as a collaborator in her position as a physicist at Nova Photonics, and Tom is Chief Scientist at Twinleaf, a small company that he and Jill founded to develop and commercialize the sensitive magnetic field detection techniques that he worked on as a graduate student.

They welcomed the 8-pound, 11-ounce Wally on February 16. He was born at home with the help of three midwives. "Two hours after birth our midwives noticed that Wally had developed labored breathing. Tom rushed him to the hospital, where he was diagnosed with the modern equivalent of 'wet lung' and admitted for four days," says Foley. "A few hours after Wally's birth I sprang out of bed to join him. While Wally was there we slept on couches to nurse him day and night."

Wally shortly rejoined the family, which also includes cats Lyman and Simon. "The cats were born here at PPPL on D-site in the summer of 1999. My first-year project advisor Hyeon Park brought them to my attention. I trapped them with the advice of PPPL's Marilyn Hondorp and help from former grad student Adam Rosenberg, and brought them home as kittens," Foley says.

Foley praised the family-supportive atmosphere of PPPL. "Barbara Sarfaty, the graduate program administrator, looks after the graduate students like a second mother, and Tom and I were delighted when she greeted Wally's arrival with the enthusiasm of a surrogate grandparent," she says. Congratulations, Jill and Tom! ●

*Wallace Joseph Snow, son of Jill Foley and Tom Kornack. The blanket is a gift of PPPL's Barbara Sarfaty.*

## PPPL Grad Students Win Prizes

Jessica Baumgaertel has been chosen to represent PPPL at the Lindau Nobel Laureates Meeting in Germany this summer.

Jayson "Luc" Peterson has won the 2008 Thomas H. Stix '54 Plasma Physics Prize. He will use it in September to attend the Joint EU-US Transport Task Force Workshop in Copenhagen, Denmark, and to visit the Max Planck Institut fur Plasmaphysik at Garching, Germany.

Stay tuned for future Hotline articles about Jessica's and Luc's experiences. ●

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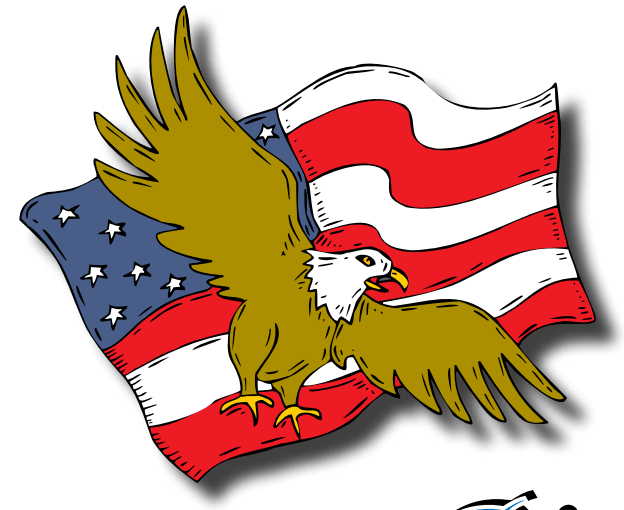


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