



# HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

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## NEW ION SOURCES INSTALLED ON TFTR BEAMS

TFTR operations have been suspended until January 5th for the installation of three new ion sources on each of the four neutral-beam lines. These sources will help TFTR reach its ultimate goal of providing the first direct experimental data on a new plasma regime in which substantial plasma heating is provided by the helium nuclei (alpha particles) produced in fusion reactions.

To achieve this self-heating regime, a number of improvements in TFTR performance are necessary. A more strongly peaked plasma-density profile--that is, a much higher density in the center of the plasma than at its edge--is needed, along with the means to heat the critical central area for longer periods.

The new ion sources, will provide greater total power--25 MW--for longer duration--up to 2 seconds. But more importantly, they will provide

the beams in a form that will penetrate and heat the plasma's high-density central area.

Developed at the Lawrence Berkeley Laboratory as part of a national research effort, the new ion sources were manufactured by the RCA Tube Operations Division in Lancaster, Pennsylvania. Similar sources will be installed on the "BIG D" tokamak at GA Technologies Inc. in San Diego.

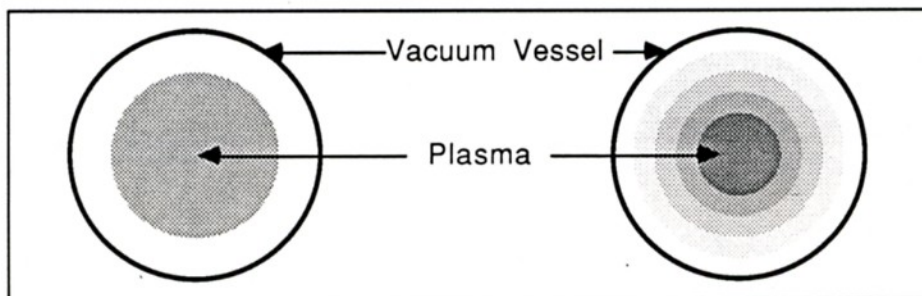
The ion source consists of a plasma generator and an accelerator. To form a beam, an arc discharge is run through deuterium gas, creating a plasma. The ions then enter the accelerator portion of the source where they are "pushed" across a voltage gradient from 120 kV to 100 kV to -3 kV to ground. As they are pushed from high voltage to ground the particles gain energy. The voltages of the grids and the spacing between

them act as a lens to focus the beam.

The accelerated ions leave the source and enter the gas cell neutralizer of the neutral-beam line where about half of the high-energy ions are neutralized via charge-exchange. The remaining ions are deflected from the beam path, leaving only the neutral fraction aimed at the tokamak plasma. As neutral atoms, they can penetrate the confining magnetic fields, enter the plasma, and by colliding with the plasma particles, transfer their energy to the bulk plasma thereby heating it.

The new ion sources called magnetic cusp bucket sources, achieve their penetrating power by improving the mix of atomic-to-molecular deuterium that forms the neutral beam. When deuterium gas is ionized, some of the deuterium forms clusters of two or three atoms, rather like lumps in gravy. When accelerated, a uniform amount of energy--up to 120 keV--is imparted to each particle. Clustered atoms must share this 120 keV, so that when they break up after acceleration, each atom retains only 60 keV or 40 keV, depending on whether there were two or three atoms in the cluster. Unclustered atoms receive the entire 120 keV, and at this

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The above schematic shows a cross section of a plasma of uniform density (left) and one with a highly peaked density profile (right).

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greater energy penetrate more readily to the plasma center.

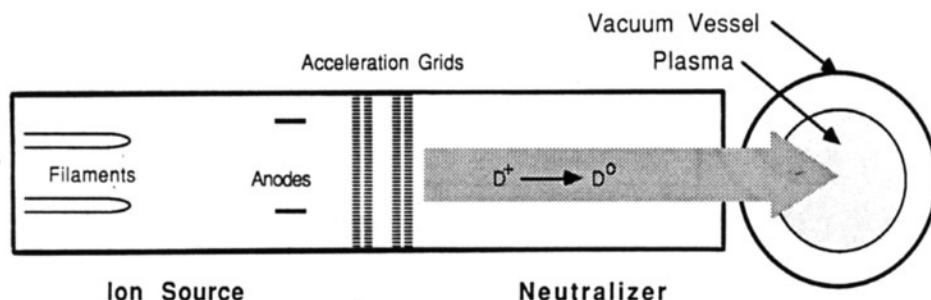
The former ion sources provided up to 20 MW of power with about 50% at full energy, 30% at half energy, and 20% at one-third energy. The sources were developed for 0.5-second pulses and at the end of October were pushed to 1.0 second.

The new sources will provide a total of 25 MW with about 75% of the power in the full-energy component (up to 120 keV), 15% at half energy, and 10% at one-third energy. This will allow a great improvement in TFTR central heating performance. Although the new sources were originally

developed for a 30-second pulse length, the beams on TFTR will be limited to a maximum pulse length of two seconds to allow operation with the existing power supplies and beam line components.

Physicists, engineers, and technicians from the TFTR Project and the Engineering Department are working to install the new ion sources. Presently, they are assembling and installing the sources in magnetically shielded enclosures and modifying power supplies and beam lines to accept them. The sources will then be mounted and tested for the next round of TFTR experiments early in January.

by Diane Carroll



*A schematic diagram of a TFTR neutral-beam line.*

## BATTERY CHARGING

As temperatures regularly dip below freezing this winter, many car batteries will "die" from the strain of cold weather starting. You can avoid sharing your battery's fate by observing the following rules for jump starting a car:

- Use only a 12-volt jumper system. You can damage a 12-volt starting motor, ignition system, and other electrical parts beyond repair by connecting them to a 24-volt power supply.

- To avoid damage to the vehicle's electrical system, DO NOT disconnect the battery of the vehicle to be started.
- Make sure neither vehicle involved in the jump start touches the other and that both parking brakes are fully set.
- Turn on the heater fan motor of the vehicle to be started. In cars with automatic climate control, set the function control to "de-

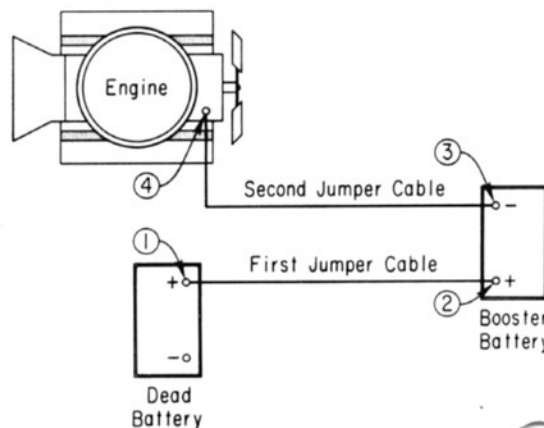
frost." All other switches and lights on both vehicles should be turned off.

- Follow the correct sequence when hooking up jumper cables (see diagram). Be sure to attach the end of the second jumper cable to an engine bolt-head or other metallic contact point. If you connect the negative terminals on both batteries, a spark could occur and explode the gases normally present around the batteries.
- Make sure the jumper cables are not obstructing moving engine parts before starting either vehicle.

If you have any doubt about jump starting your car on campus, call Transportation Services at ext. 3109 during normal working hours. For questions when you're at home or on a trip, contact a good road service.

The best way of avoiding battery failure is to check your battery's condition frequently during winter driving months. Make sure battery cables are

Make Connections in Numerical Order  
(Disconnect in Reverse Order 4, 3, 2, 1.)



*Correct sequence for hooking up jumper cables.*

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tightly fastened to the terminals. If corrosion has occurred, remove the cables and clean both the cables and terminals with a wire brush.

Another indicator of battery health is the electrolyte level. Each cell should be filled to the level indicator, but not overfilled. If the level has dropped, refill the cell with distilled water. Tap water can be used if it has a low mineral or alkali content (if it isn't hard water). If your battery needs water often, have the charging system checked.

And while you're keeping an eye on your battery, remember to protect your eyes and skin. Batteries contain sulfuric acid, and splashing of the acid can cause burns. In case of acid contact, flush the affected area with water for a minimum of 15 minutes.

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## ATTENTION WALKERS AND JOGGERS

Do you like to jog or walk to the Laboratory? Do you walk or run on your lunch hour? Are you interested in developing new walking and jogging trails around the Laboratory?

If any of the above applies to you, you will be happy to learn that possibilities to provide access from the Laboratory to the recently built paths that serve the College Road and Moran Woods areas have become available. But, before any decisions are made, your ideas and suggestions are wanted. Please send them to Bob Smart, Rm B332, C-Site.

Depending on the input, a meeting may be called to discuss the suggestions. If you would like to be invited, let Bob know.

## BRIDGE TO BECOME REALITY

A bridge over the Delaware and Raritan (D&R) Canal at the Millstone Aqueduct may finally become a reality after nearly eight years. "Maybe this winter" is the word Bob Smart received when he checked last month with the Canal Commission on the status of the bridge.

Despite the availability of funding, it has taken this long to gain the necessary approvals from the many public agencies involved in such a project.

The PPPL staff was instrumental in gaining support and approval for this crossing. It is hoped that in the near future many will be able to use the bridge while bicycling, jogging, or walking to the Laboratory from the Princeton area.

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## MIZUTOWICZ TO HEAD ACCOUNTING AND FINANCIAL CONTROL DIVISION



*Wanda Mizutowicz*

Wanda Mizutowicz has been promoted to head the Laboratory's Accounting and Financial Control Division. She succeeds John Murphy, who retired November 5.

Ms. Mizutowicz came to the PPPL Accounting Office in 1977 as a subcontract accountant. She was promoted to Assistant Budget Officer for Program Management in 1981. In 1984, she was transferred back to the Accounting Division as Manager of the Quality and Cost Control Branch. Prior to this promotion, she also served as Manager of Accounting Operations.

As Division Head, Ms. Mizutowicz will provide leadership, planning, and organizational direction for the general management of the Accounting and Financial Controls Division. She will monitor and support the various projects of the Division and will be responsible for both the strategic and day-to-day management.

Ms. Mizutowicz is a Certified Public Accountant, and holds a bachelor's degree in accounting from Trenton State College.

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## NEW INVESTIGATOR HIRED

The Department of Public Safety, Forrester Division, recently welcomed a new staff member when James S. Lanzi was appointed to the Investigator Section. Lanzi will work with investigator Lori Trani-Gettelfinger in crime prevention, campus investigations, and other security and emergency matters.

A 1986 graduate of the Burlington County's 49th Municipal Police Training Course, Jim has attended both Bucks and Mercer County Community Colleges where he took courses on criminal justice,

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crime prevention, and fire science.



*James S. Lanzi*

In addition, Jim has specialized training in firefighting from the Pennsylvania and New Jersey State Fire Schools and the University of Maryland's fire school. He is trained in light and heavy rescue techniques, is a certified Emergency Medical Technician, and is the former fire chief for the Falls Township Fire Company.

Lanzi, who has been a member of Princeton University's Public Safety Department's Main Campus Division since 1980, has held positions as Security Officer, Emergency Services Officer, and Proctor. He replaces Douglas Watson who accepted a supervisory position on main campus.

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## ANS MEMBERSHIP

The North Jersey Section of the American Nuclear Society is presently accepting applications for membership. Interested individuals should contact Charles Gentile, ext. 2139, for further information and application material.

## RETIREES HONORED

Twenty PPPL employees, representing over 250 years of service to the Laboratory, were recently honored with a retirement dinner at the Forsgate Country Club.

The retirees include:

Robert Bergman  
Robert Connolly  
Ernst deHaas  
Mary Alice Eubank  
William Hooke  
Constance Hopkins  
Nan Jones  
Chester Kucemba  
James Lee  
Helen Livernoche  
Robert Middlebrook  
John Murphy  
Aron Nudelman  
Ralph Pope  
Ramon Pressburger  
William Rutkowski  
Sylvia Schiff  
Peter Smith  
Al Swain  
Howard Zuvers

The Laboratory and their friends congratulate them upon their retirement.

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## THANK YOU

The HOTLINE received the following thank-you note from former Laboratory employee William Rutkowski:

"My sincere appreciation and gratitude to everyone who made my retirement luncheon and past ten years at PPPL so successful.

Also, thank you for all the lovely messages and best wishes sent by those who could not attend."

## FOR SALE

FOR SALE: 1983 Buick Skylark; V6, air conditioning, tinted glass, sun roof, am/fm radio. High mileage. Great shape, garage kept, one owner. Must see. \$2995. Call Donald Greene, ext. 3717.

FOR SALE: "Holiday Fun" Lowery Magic-Genie Organ with bench, headset, and books. Excellent condition. Paid \$2,000; sell for \$700. Call 799-8743.

FOR SALE: Dark maple, colonial-style magnavox stereo. AM/FM radio, phonograph, and 8-track tape. Excellent condition. \$50.00. Call 799-8743.

FOR SALE: Blonde TV stand on pedestal. 23" opening. \$10.00. Call 799-8743.

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## CRAFT AND HOBBY SHOW AND SALE

A hobby and craft show/sale, sponsored by the Princeton University League, will take place March 28, 1987 at the League's headquarters, 171 Broadmead, Princeton, NJ.

This event is being offered as a service to the University Community. There is no charge for table space and the League does not take a commission.

Any League members interested in participating can obtain a registration form and additional information by contacting the League office at 452-3650 or Margaret Bol at 466-0809.

If you are not a League member and would like to participate, a membership application can be obtained by calling the League office.

## EMERGENCY CLOSINGS

On those occasions when the Laboratory will be closed for the day or normal starting schedules will be delayed (late opening), special announcements will be made over the following radio stations:

Princeton	WHWH	1350 kHz
Trenton	WTTM	920 kHz
Trenton	WPST (fm)	97.5 MHz
Levittown	WBCB	1490 kHz
New Brunswick	WCTC	1450 kHz

**Please remember:** When Princeton University is mentioned, the announcement also includes the Plasma Physics Laboratory.

The University begins monitoring weather conditions as early as 4 a.m., and arrives at the decision to open, close, or have a delayed opening as early as practical. PPPL does not independently arrive at its own decision to open or close.

The Laboratory has arranged with the Princeton Answering Service to provide an emergency telephone number to call to determine whether PPPL will be closed. When calling the answering service at 609-924-1760, individuals should identify themselves as Princeton Plasma Physics Laboratory employees. Please call this number only if you are unable to receive radio broadcast announcements and only to learn if the Laboratory will be opened or closed. No other information will be given by the answering service.

In the event that PPPL remains open, employees who find it impossible to report to work because of hazardous conditions should notify their supervisors as soon as possible that they are unable to report to work.

## LABORATORY TO CLOSE FOR HOLIDAY SEASON

The Princeton Plasma Physics Laboratory will again be closed for the Christmas/New Year's holiday season -- 24 December 1986 thru 2 January 1987. The dates for the Laboratory closing are:

<u>Day</u>	<u>Date</u>	<u>Type of Leave</u>
Wednesday	December 24	University Holiday
Thursday	December 25	University Holiday
Friday	December 26	University Holiday
Monday	December 29	Laboratory Closing
Tuesday	December 30	Laboratory Closing
Wednesday	December 31	Laboratory Closing
Thursday	January 1	University Holiday
Friday	January 2	University Holiday

Three Christmas holidays instead of the customary two have been authorized by Princeton University. Therefore, only one optional holiday will remain for FY87. Laboratory staff members have the option of charging three days (December 29, 30, and 31) as vacation or two days as vacation and one day as an optional holiday. Employees are encouraged to use the optional holiday during the Laboratory closing.

Staff members who anticipate problems are urged to talk with their supervisors or to contact the Personnel Office as soon as possible.

Paychecks for the Exempt Staff will be available on Friday, December 19; the Bi-Weekly Staff paychecks will be available on Tuesday, December 23.

## — SAFETY TRAINING COURSES —

The Occupational Medicine and Safety Office has scheduled the following training courses for December:

<u>Course</u>	<u>Date and Time</u>
Back Injury Preventions	December 10 8:30 a.m. - 12:00 noon
Lockout/Tagout Procedures	December 11 1:30 - 3:00 p.m.
Proper Use of Fire Extinguishers	December 17 1:30 - 3:00 p.m.

Employees must obtain permission from their immediate supervisor to attend these classes. Supervisors must call Mary Ann McBride at extension 3468 to enroll their employees. Attendees will be notified where their class will meet one week before the scheduled session.



### Tour Guides



July, August, and September certainly did not constitute a "vacation" season for the PPPL tour program. Over 750 visitors toured PPPL. July led the period with 19 tours and 538 sightseers. We'd like to thank the tour guides who led our visitors through the Laboratory.

#### JULY

Halsey Allen, III  
Dale Ashcroft  
Lee Benson  
William Blanchard  
Fred Dylla  
Hsi Feng  
Daniel Huttar  
Robert Fleming  
George Gammel  
Henry Greenside  
Don Grove  
Aleksandar Ilic  
Ralph Izzo  
James Kamperschroer  
Paul LaMarche, Jr.  
George Martin

Milton Machalek  
Ernst Nieschmidt  
David O'Neill  
Robert Philbin  
Joseph Stencil  
Marilee Thompson  
David Ward  
Irving Zatz

#### AUGUST

James Faunce  
Hsi Feng  
Paul Funk  
Charles Gentile  
Robert Kaita  
George Levitsky

Ernst Nieschmidt  
Ned Sauthoff  
Shoichi Yoshikawa  
Michael Zarnstorff

#### SEPTEMBER

William Blanchard  
Alfred Cavallo  
James Faunce  
Hsi Feng  
Paul Funk  
Ed Lawson  
Thomas Murphy  
Alan Ramsey  
Ned Sauthoff  
Stanley Schweitzer

The PPL HOTLINE is issued by the Princeton University Plasma Physics Laboratory, a research facility supported by the United States Department of Energy. Correspondence should be directed to PPL Information Services, Module 2, C-Site, James Forrestal Campus, ext. 2754.