HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

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TFTR VALVE PASSES TEST

The fast shutter valve for the first of TFTR's neutral beams has successfully completed its acceptance tests.

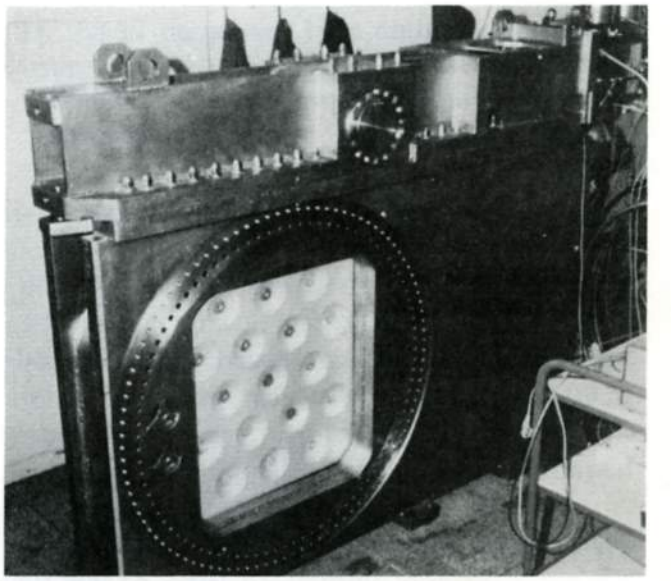
The fast shutter valve will be installed between the neutral beam line and the beam entry port on TFTR. It reduces the number of particles that drift back into the neutral beam after the source is fired into the tokamak. It functions in conjunction with the source, and must cycle within 150 milliseconds.

The unit was delivered to PPL from Leybold-Heraeus in October. It was fitted with hydraulic lines and electrical power as part of its acceptance testing procedure. Monitors were set up on both sides of the valve, and a known amount of gas was injected into the unit. Measurements determined the amount of leakage through the valve, which has a specified leakage rate of 50 liters per second. At the conclusion of the recent acceptance tests, valve leakage was found to be between 25 and 30 liters/sec after 1200 test cycles. The valve is expected to complete approximately 25,000 cycles in high vacuum before maintenance will be required.

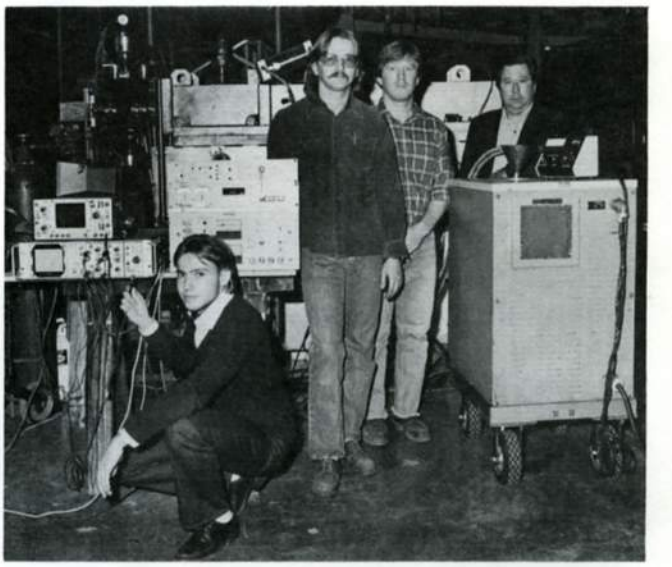
The fast valve shutter is constructed of aluminum, to be as stiff and as light as possible. The shutter moves so quickly heavier metals would have created an unacceptable load on the connecting shaft and axles

The unit utilizes a hydraulic drive system. The valve is operated from a control panel incorporating solenoid valves. The solenoids open and close various ports along the hydraulic piping system. Oil is driven through the ports to hydraulic pistons on top of the valve.

The valve will now be sent back to the warehouse to await the final placement of the neutral beam system.



The fast shutter valve, with the shutter gate closed.



The team that conducted the acceptance test on the fast shutter valve included (left to right) Rainer Klose, technical engineer for Leybold-Heraeus; TFTR neutral beam technicians Harmut Gentzik and Carl Bunting; and cognizant engineer Ken E. Wright. Not pictured are technical associate Vic Garzotto and Bob Walls of the Vacuum Shop.

RF Heating Experiments On TFTR

To bridge the gap between radio-frequency (rf) heating experiments currently being done on PLT and the development of rf systems for use on future devices, PPL experimenters hope to do substantial investigation of rf heating on TFTR. Rf heating involves the introduction of high-frequency radio waves into the plasma and using the energy of these waves to heat ions and/or electrons.

Although planning is now in the early stages, work is expected to center on the ion cyclotron range of frequencies (ICRF). Sometime late in 1983, the 3-MW, 42-MHz ICRF system now on PLT will be transferred to TFTR; the frequency will be raised to 60 MHz. The system will be used primarily for first harmonic heating of hydrogen, and for second harmonic deuterium and helium-3 heating.

The main part of the TFTR ICRH program would not begin, however, until about 1986. At that time two enhancements are planned. Physicists hope to be able to add 20 MW of ICRF heating at 80 MHz. Not only would this allow experimentation within a wide range of conditions, but it would also provide enough heating power to supplement the neutral beams, allowing TFTR to operate with extended parameters.

The other major component of the TFTR ICRF heating program is the addition of a 3-MW, 180-MHz system in about 1985. This system would be used to answer several questions related to the use of waveguides for ICRH. The TFTR set-up would use a dielectric-loaded waveguide. The dielectric would enable the waveguide to be considerably smaller than a conventional air-filled waveguide, similar to those presently in use.

Several major questions related to the use of rf heating on future machines, most notably the Fusion Engineering Device (FED), will be explored on TFTR. Studies will be done to better understand the mechanisms by which rf waves couple to the plasma, and the effects of this coupling on plasma behavior in a large tokamak. The effects of radiation and severe thermal stress on rf equipment, especially antennas and waveguides, will also be evaluated.

Thanksgiving Savings

Thanks to the Utility Equipment Shutdown program, developed as part of PPL's energy conservation measures, the laboratory was able to save approximately $10,000 in energy costs during the Thanksgiving holiday.

Under the plan, initiated and directed by Energy Systems associate Richard Terhune, boilers, chillers and HVAC systems on A and C-Sites were turned off during the holiday period. According to Frank Fumia, chairman of the Energy Management Administration Committee, approximately $5,000 in fuel oil costs were saved by the shutdown. An equivalent savings in electrical energy was also realized, Fumia added.

John Pacuta, supervisor of power plant operations, handled the shutdown of the power plants. The shutdown of the electrical and HVAC systems was handled by Robert Longmuir, supervisor for mechanical trades.

Shuttle Rerouted

Transportation Services is anticipating extending the current shuttle route at C-Site in the near future. Under the new routing plan, when the shuttle arrives at the LOB from A-Site it will turn right and continue around the C-Site complex in a clockwise direction. It will pass the Tech Shop, TFTR, MG and ESAT buildings, Plant Maintenance and Operations, the Ebasco trailers, Receiving 3 & 4, the fire house, and the C-Site Security entrance. The shuttle will stop again at the LOB outbound to A-Site.

These changes, which are expected to begin after January 1, will be contingent on the completion of the inground construction in the area of the Tech Shop—RF courtyard.

United Way

PPL employees can be good neighbors by contributing to the United Way during its "Neighbors Helping Neighbors" fund drive.

A tax-deductible donation to the United Way will help 24 voluntary agencies in the Princeton area provide service for young and old alike. Day care, family counseling, care for the aged, assistance to the handicapped, and aid from the Red Cross are just some of the programs offered by United Way organizations.

There has been a 300 percent increase in the use of United Way services since 1977; approximately 60,000 people were helped by the Princeton area United Way last year. This year's total is expected to go even higher, despite governmental budget cuts and service reductions that threaten to curtail a majority of these vital services.

PPL United Way volunteers are distributing donation forms and brochures about United Way services throughout the laboratory. Anyone who has not received the form or brochure should contact Len Thomas of Personnel at ext. 2036.

Fire Safety

The U.S. Consumer Product Safety Commission (CPSC) has issued guidelines that can make fireplaces and wood-burning stoves energy savers rather than safety hazards.

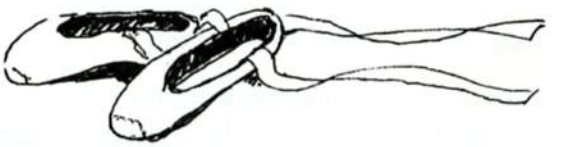
The CPSC recommends that fireplaces, wood stoves and chimneys be inspected once a year to assure proper operating condition. The correct fuel for each fireplace or stove should be used, and consumers should guard against overfiring their stoves. Such overheating could cause a fire in structures adjacent to the stove.

Combustible materials, such as paper, kindling, draperies and the like, should be kept away from stoves and fireplaces. Children should not be allowed to touch fireplace screens or stove exteriors; either can cause bad burns.

Glass doors or fireplace "inserts" both reduce the amount of heated air escaping up the chimney. The Commission suggests that householders add only the accessories designed and approved for their fireplace or stove. Use of other accessories may block air vents, creating excessively high temperatures in the fireplace or stove.

For additional information on installing wood-burning stoves and fireplaces, contact the Commission's toll-free Hotline at 800-638-8326.

N.Y. Ballet Tickets



The Princeton University League is offering tickets to the Saturday matinee performances of the New York State Ballet to league members. Tickets are available for "A Mid-Summer Night's Dream" January 16; "Divertimento No. 15," "Agon," and "Union Jack" February 6; and "La Source," "Andatino," "Meditation," and "Vienna Waltzes" February 20. All performances are at Lincoln Center in New York City.

The Princeton University League is open to all University staff members. Information on membership is available from the league offices, 171 Broadmead, or by calling 452-3650.

Exhibit

The Princeton University League is sponsoring an exhibit of photography by T. Wayne Roberts at the league offices, 171 Broadmead, through January 22.

Roberts has photographed nature in Maine, Utah, Wyoming, Greece, Cape May and Princeton. His work has been shown at the New Jersey State Museum, the Audubon Society in Cape May, and in other New Jersey locations.

League offices are open from 9 a.m. to 1 p.m. daily.

SPOTLIGHT ON

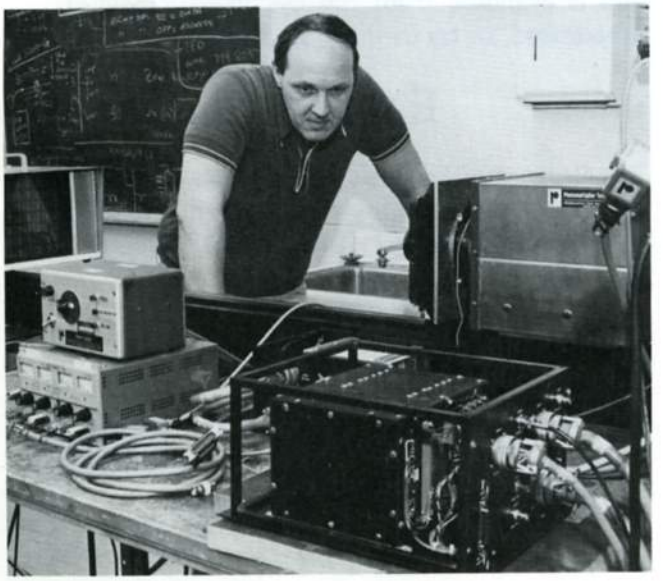
Electro-Optics Group

Although most laboratory employees think of PPL as A, B and C-Sites, there's another group of PPL people working at a fourth "site". Visit Peyton Hall on main campus, and you'll find the Electro-Optics Section, headed by John Lowrance—a section that joined the laboratory en masse.

John is section head of the group, part of the Diagnostic Branch of the Engineering Division. Section employees include Stephen Hayes, Donald Long, George Renda, Paul Zucchino, William Harter, Robert Hoch, Vincent Mastrocola, John Opperman, David Ciotti and Andrew Siroki.

The section was begun when John came to the Astrophysics Department of the University from RCA Astroelectronics 15 years ago. "Our project was to develop instrumentation for space astronomy," John explained. "Twelve years ago, we began doing some work for PPL, using our special skills in non-standard television for their nuclear fusion work."

The Electro-Optics section started working on TV Thomson Scattering with Dirck Dimock's Laser Group, and slowly began doing more and more work for PPL. Approximately three years ago, the group "administratively became a part of PPL," according to John. The section now devotes approximately 75 percent of its time to PPL activities, with the remainder going to the Astrophysics Department.

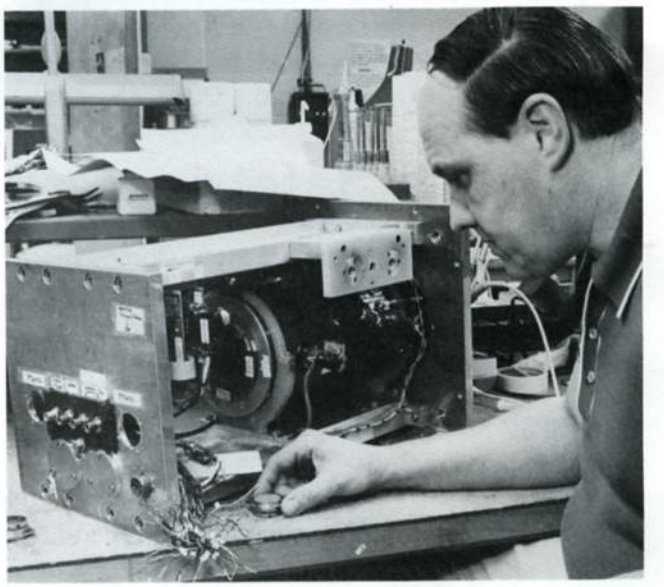


That astrophysics work entails grants and contracts, including studies for a space telescope and its accompanying detectors. The group is developing television imaging systems to replace film in space. Since the wave length range and sensitivity of TV-type detectors is greater than photographic film, electro-optic sensors allow for spectrographic measurements and imaging impossible to obtain in any other way.

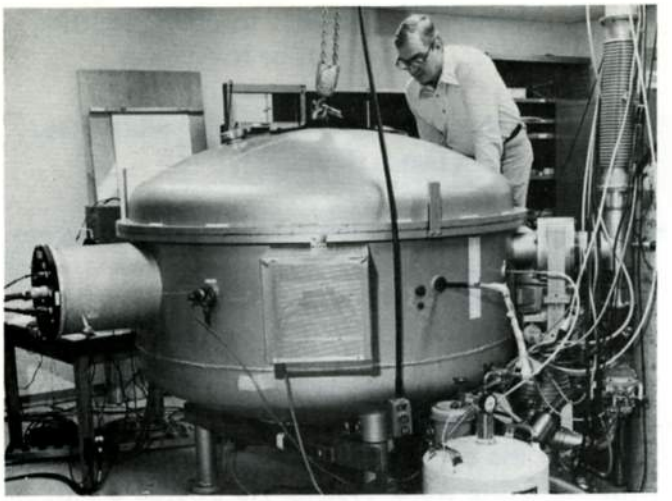
"Our work for PPL and for the Astrophysics Department was synergistic, " John said, "since many detectors for nuclear fusion diagnostics also have applications to astronomical measurements, especially in the ultraviolet and infrared."

Among the section's numerous projects is a plasma television system for TFTR. The system consists of a 20-foot periscope, which will transmit images of the interior of TFTR through the six foot test cell floor which shields the diagnostic intruments below.

The plasma TV employs a high frame-rate TV camera to record the visible plasma. A second measurement in the near-infrared spectrum (also



Bill Harter examines a charge coupled device (ccd) test camera being developed for TFTR (at left). Above, Bill works on a ccd observation camera (Obscan) which will be mounted on the Kitt Peak Observatory telescope.



Bill Opperman monitors a vacuum chamber containing a focus coil assembly. The assembly will be part of a windowless ccd being developed for a sounding rocket payload.

George Renda (left) and Vincent Mastrocola run a calibration check on a bolometer chassis.

employing a CCD TV camera) will tell scientists the temperature of the vacuum vessel inner wall; such data allow calculations of the neutral beam energy striking the wall. The system will also enable inspection of the vessel interior by television and film imaging, documenting the condition of the vacuum vessel walls.

The periscope, constructed by Instrument Technology Inc. of Westfield, MA, recently completed its acceptance tests. It is expected to be delivered to PPL this month.

John pointed out that the difference between the diagnostic instruments for TFTR and those for PDX and PLT is that " there will be a lot more neutron and gamma radiation produced as we approach the breakeven point. Detectors and electronic components that are acceptable on PLT and PDX because of the lower radiation can't be used on TFTR."

For example, in TFTR the bolometer (which measures all the energy radiated by the hot plasma) employs platinum thin-film resistors as the detector. These platinum resistors must be used instead of the thermistors previously used on PLT and PDX, due to the susceptibility of such metal oxides to neutron damage. The platinum bolometers developed for TFTR will be installed on PDX for testing in the next few months.

The group is also active in the TFTR Thomson Scattering experiments, "which were our entree into PPL," according to John. This instrument utilizes an intensified charge coupled device (ICCD), which in this case is a solid state image sensor composed of an array of 160,000 photo-diodes. The image intensifier allows the optical image to be reduced electro-optically, rather than optically—simplifying the optics and increasing the sensitivity of the sensor.

In the space astronomy field, the Electro-Optics section is developing a windowless intensified CCD, to be used as a sounding rocket payload. The CCD, combined with an eschelle spectrograph, will make measurements in the 900 to 1200 angstrom region, gathering data on the interstellar medium.

The CCD has been developed primarily for broadcast television (and more recently for still photography), but the section is continually pushing the state-of-the-art applications of CCD's for infrared, ultraviolet and soft X-ray measurements.

T.O.U.R.S.

As we mentioned in our last issue, tourism at PPL is booming. We'd like to acknowledge our guides and speakers for the month of December. Our 230 guests were escorted through PPL by Stu Foote, Bob Fleming, Diane Carroll, Charlie Bushnell, Sal Cavalluzo, Harold Johnson, Ernst de Haas, John Coonrod, Al von Halle, Stan Schweitzer, Felix Ullrich, Myron Norris, Henry Chandler and Al Swain. Thanks for a job well done!

Chemical Cautions

While many chemicals have the ability to become hazards, proper handling methods will prevent any threat of toxicity. Listed below are several guidelines for handling chemicals:

- Food and drink should never be stored, prepared or consumed in areas where chemicals are stored or used. Chemical residue on tables or other surfaces can easily contaminate food.

- Before using any chemical, read the label or the Material Safety Data Sheet, available from the stockroom for stockroom-supplied items. Material data sheets may also be requested from the manufacturer when items are ordered through Purchasing.

- Use adequate ventilation. This may include use of fume hoods and dust collecting systems. Never use a chemical in a confined area without proper ventilation. If the chemical is flammable, insure that the vent system motor is explosion proof.

- Wear impermeable rubber gloves. Many chemicals can enter the body through the skin; never wear cloth gloves when handling chemicals.

- If there is a potential for a chemical splash or spill, chemical splash goggles, boots and apron should be worn.

- Never wear contact lenses when working with chemicals. If a chemical is splashed into the eyes with contacts in, the lenses must be removed before treatment begins. (See HOTLINE, April 9—Eye Wash Fountains)

- All chemicals should be stored in approved containers, clearly labeled for chemical content and hazard.

- Never mix chemicals together when you are unsure of their properties. Many chemicals can react together, emitting heat, toxic vapors or toxic gases.

- When leaving the chemical work area, wash hands thoroughly.

ERC Notes

The ERC met on Wednesday,November 25. During committee reports, Ken Semel of Health & Safety addressed the committee on the recent problem with the C-Site water system. He offered a time sequence of the events in the incident and explained his department's role in rectifying the problem. It was noted that many people in the lab do not know the proper department to notify when they suspect a problem; this often results in problems not being solved as quickly as they could be.

Under new business, it was voted to change the ERC meeting schedule from twice to once a month. Beginning in January '82 the committee will meet on the first Wednesday of each month.

Several issues were raised, along with questions as to the ERC's justification for involvement in them. Chairman Larry Michaels volunteered to look into them personally and report back to the committee.

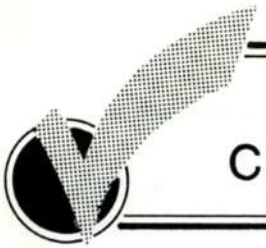
The long-awaited reclassification of monthly employees was discussed. It was decided that Steve Iverson would be questioned regarding its current status.

Singles Social

The Princeton University League's first singles wine and cheese social of the new year will be held January 14 in the Fine Tower faculty room. Monthly socials will also be held on February 11, March 11, April 15 and May 13.

The League has been sponsoring the singles socials program for the past year.

All single members of the University faculty and staff are invited to attend.



Security Checkpoints

The University is responsible for maintaining a safe atmosphere for its employees. Traffic regulations are a very important part of maintaining that atmosphere.

Traffic signs have been posted at specific points to identify problem areas. For example, stop signs have been posted in potential collision zones. Yield signs are present to allow for smooth traffic flow. Handicapped parking is provided for individuals with mobility problems. Speed limits ensure the safety of pedestrians and motorists alike.

It is the responsibiltiy of the Security Department to enforce the traffic regulations. It is the responsibility of the employees to adhere to the traffic regulations.

Stop signs should be obeyed by coming to a complete stop. Speed limits should be obeyed to ensure the safety of all. Handicapped zones should be used only by those who have special handicapped parking permits. New Jersey state statutes regulate handicapped parking; *it is not a University policy.*

At the time of employment, each employee signs a waiver guaranteeing his adherence to the traffic regulations, as explained in the motor vehicle manual. It is the responsibility of the employee to read and understand the parking and traffic regulations.

Questions should be directed to the Security Department at 683-2893.

Combatting The Cold

People who are outside in low temperatures and strong winds tire easily, becoming susceptible to frostbite as exposed skin surfaces cool rapidly. Strong winds, combined with a temperature slightly below freezing, can have the same effect as a still-air temperature about 35 degrees lower.

To determine how much protection you really need, refer to the wind-chill table below. At wind-chill equivalent temperatures below -25^{o}F, exposed skin can freeze within one minute.

WIND-CHILL EQUIVALENT TEMPERATURES (^{o}F)

Calm Air	At 15 MPH	At 30 MPH	At 40 MPH & Over
30	9	-2	-6
20	-5	-18	-22
10	-18	-33	-38
0	-31	-49	-54

If you must go outside in cold weather, observe the following safety measures:

- Avoid Overexertion: Cold weather itself puts an extra strain on the heart without any physical exertion. If you add the strain of heavy physical activity (such as shoveling snow, or simply walking too far or too fast), you risk damaging your body.

- Dress Warmly: Wear loose-fitting, layered, lightweight clothing. Outer garments should be tightly woven and water repellent. Wear a hat, since most body heat is lost from the head. Protect your face and cover your mouth to protect your lungs from very cold air. Wear mittens instead of gloves; they allow your fingers to move in contact with one another, keeping your hands much warmer.

- Watch for Frostbite: Frostbite causes a loss of feeling and a white or pale appearance in the extremities. If such symptoms occur, get medical attention immediately. DO NOT RUB WITH SNOW OR ICE; this does not help the condition, and in fact will aggravate it. The best treatment for frostbite is the slow rewarming of the affected tissue.

When the body begins to lose heat faster than it can produce it, a condition called hypothermia results. The symptoms include uncontrollable shivering; vague, slow or slurred speech; memory lapses, or incoherence; immobile or fumbling hands; frequent stumbling, or a lurching gait; and apparent exhaustion.

Many people who have suffered overexposure to cold or wet and windy weather don't realize the seriousness of their danger. Take the following measures for overexposure, even if the victim claims to be in no difficulty:

- Get the victim into dry clothing, then into a warm bed or sleeping bag with a "hot" water bottle (which should actually be warm to the touch). Keep the victim quiet, applying warm towels, a heating pad or some other heat source. Concentrate heat on the trunk of the body, lowering the head and raising the feet to get warm blood circulating to the head.

- Give the victim warm drinks, but NEVER give alcohol, sedatives, tranquilizers or pain killers; they only slow down the body processes even more.

- Do not jostle, massage or rub the skin, which is very susceptible to tissue damage when extremely chilled.

- If symptoms are extreme, call for professional medical assistance immediately.

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

INFORMATION SERVICES WISHES YOU ALL A HAPPY HOLIDAY SEASON!