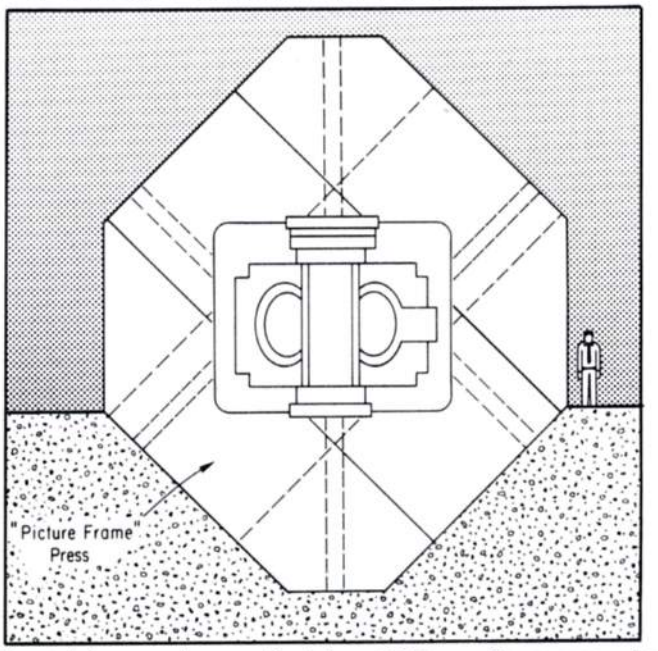
HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 7, No. 7 April 14, 1986

PPL LEADS CIT PROPOSAL EFFORT

PPL has been asked by the US DOE Office of Fusion Energy (OFE) to lead a National Design Team in the development of a proposal for the construction of a Compact Ignition Tokamak (CIT), the next machine beyond TFTR. A Conceptual Design Report and an R&D plan will be formally submitted to DOE on May 23.



Elevation view of the CIT reference design showing the "picture-frame" press

A consensus has emerged within the national fusion community regarding the physics goals and general design characteristics for the CIT. While TFTR's primary mission is the attainment of scientific breakeven, where the fusion power produced in the plasma equals the auxiliary heating power required to maintain the plasma temperature at 100 million °C, CIT will go a step further. It will be capable of producing a "burning" or ignited plasma, where enough fusion power is produced to sustain the plasma temperature at 100 million °C, without the aid of auxiliary heating. While scientific breakeven occurs at Q = 1 (where Q is the ratio of fusion power output to auxiliary heating power input), ignition occurs when $Q = \infty$, i.e., net fusion power is produced with no auxiliary power input.

In D-T reactions, 20% of the fusion energy produced is in the form of alpha particle kinetic energy. Since they are charged, the alphas remain trapped in the magnetic field and through collisions transfer their energy to the plasma, heating it. At ignition, alpha particle heating is sufficient to sustain the 100 million °C plasma temperature without auxiliary heating. CIT will provide physicists with an opportunity to study alpha particle heating in a burning plasma, and enable them to study plasma confinement properties in the range required for fusion power plants.

An ignited plasma is analogous to a conventional fire. Initially, some energy must be input to the fuel to start the fire. However, once ignition occurs, the fire is self-sustaining as long as fuel is available. The initial energy input to a CIT plasma "fire" will come from ohmic heating, indigenous to a tokamak, and to a much larger extent from auxiliary heating in the form of radio frequency waves.

If funded according to the proposed schedule, CIT would begin operation in late 1992. It will be capable of a 3-4 second plasma burn, a sufficient duration for essential plasma physics experiments, while keeping construction costs to an upper limit of $300 million. CIT will serve as a cost-effective intermediate step between TFTR and

(continued)

(continued)

the operation of an Engineering Test Reactor (ETR), about 10 years later. ETR would take advantage of physics knowledge gained on CIT coupled with advanced engineering and materials development, allowing sustained ignition and a demonstration of the actual conversion of fusion energy to heat and then to electricity.

Design and Construction

The CIT proposal will call for design and construction in the 1988-92 time frame. A site for CIT will be selected before detailed design begins. Location at PPL would minimize cost due to savings from the use of existing TFTR support facilities. Parsons, Brinckershoff, Quade, and Douglas have been retained by US DOE as architect-engineer to perform a facilities study in support of the CIT conceptual design. Currently, a cylindrical test cell configuration is preferred with a rotatable shield ceiling, above which a polar crane would operate through a radial access slot.

At a January meeting of the Ignition Technical Oversight Committee (ITOC), chaired by PPL Director Harold Furth, agreement was reached as to basic design guidelines intended to channel the near-term activities of the CIT National Design Team toward the preparation of an effective proposal.

The compactness of CIT, with a major radius of about R = 1.22 meters compared to 2.45 meters for TFTR, results in the need for a high magnetic field to achieve the plasma confinement quality required for ignition. The magnetic field strength in CIT will be of the order of 10 tesla, twice that of TFTR. Since magnetic pressure increases as the square of the field strength, the CIT coil and machine structure must be designed to withstand pressures up to a factor of four greater than those experienced on TFTR. One of the most interesting CIT design characteristics is the proposed use of an innovative "picture-frame" press to counteract toroidal field (TF) coil vertical separating forces. When energized, each of CIT's D-shaped TF coils will experience a vertical force which tends to push it apart at the top and bottom of the "D". To counteract these forces, the entire CIT machine will be fitted within the large central cut-out of a "picture frame" press, comprised of two giant, parallel, welded steel plates (see sketch). Arrays of hydraulic cylinders above the tokamak will press CIT inside the frame. As the TF coils are energized, the hydraulic cylinders are programmed to react and apply forces of up to 50 million pounds (equivalent to the displacement of a large battle ship) to counteract the vertical separating forces within the TF coils. Although it appears to be rather large, the frame press actually allows better machine access compared to other design approaches.

Engineering studies have led to the conclusion that CIT's PF coils should be placed outside the bore of the TF coils, as in TFTR. Toroidal field (TF) conductors are to be made of bonded copper-Inconel sandwiches, cooled by liquid nitrogen. TF centering forces will be taken up entirely by wedging action between adjacent TF coils. CIT will not have a center column to serve as a secondary support against centering forces. Thus, the CIT conceptual design will proceed with self-supporting TF and OH coil systems having the simplest structural features of all the options considered.

CIT Physics

CIT will be designed to produce both limiter and divertor plasmas with OH currents up to 10 MA. The machine will accommodate 20 MW of auxiliary heating, most likely ion cyclotron radio frequency heating (ICRF). Several key physics questions need to be addressed before machine operation, such as how well ICRF works in high pressure, diverted plasmas. CIT program participants have called for an expansion of the US RF heating program in the near-term to provide an enlarged data base in preparation for the new machine. U.S. participation in RF heating work on foreign tokamaks such as JET and JT-60 has also been recommended.

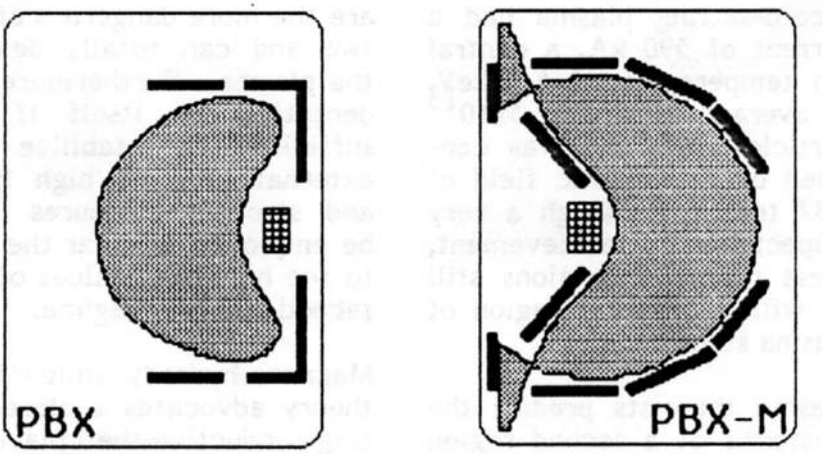
The Lawson factor, or confinement quality $n\tau$, required for ignition is 2×10^{20} m^{-3} sec, a factor of five greater than that needed for scientific breakeven. CIT will be designed to attain in densities, $n \geq 6 \times 10^{20}$ m^{-3} in combination with global energy confinement times, $\tau \geq 0.4$ second at temperatures exceeding 100 million °C, thereby reaching ignition.

(continued)

(continued)

CIT Project Team

In addition to PPL participants, members of the CIT National Design Team are being drawn from MIT, the Fusion Engineering Design Center, Oak Ridge National Laboratory, GA Technologies, Inc., Idaho National Engineering Laboratory, and Lawrence Livermore National Laboratory. PPL's John Schmidt is Project Manager and Bruce Montgomery of MIT is Deputy Project Manager.



"Old" and "new" PBX plasma configurations

MODIFICATION OF PBX APPROVED

The $10 million improvement of PBX has been formally approved by the USDOE Office of Fusion Energy. The modified device, which will be called PBX-M (for "Princeton Beta Experiment-Modification"), will be completed in April 1987, and is expected to reach beta values well beyond those attained in PBX, already a record high for a large tokamak.

Although PBX will not be completely torn apart as envisioned in the most ambitious of the plans developed a year ago, the hardware inside the vacuum vessel will barely be recognizable when the modifications are complete. Not only will the existing magnetic field coils inside the vacuum vessel be shifted to new locations, but five new coils will be wound in place. That includes a replacement for the present "pusher" coil, which gives the PBX plasma its indented shape. Furthermore, the system of electrically conducting "passive stabilizer" plates that are essential to the operation of PBX will be greatly extended in PBX-M.

Some four tons of inch-thick, stainless-steel-clad aluminum will hug the plasma with a clearance of only a few inches over most of its surface. A gap of about 16-inches on the outboard side will allow human access to the plasma volume for installation and repair work, and will also provide a way for the neutral beams to fire into the plasma to heat it up.

A less visible but no less important part of the overall project will be six new power supplies to drive the magnetic fields that will accurately maintain the shape and position of the plasma within its enveloping shell. These will be installed in the ESAT building to the east of the C-Site MG area. Finally, the old (and obsolete) IBM 1800 process controller -- which has already served FM-1, ACT, PDX, and PBX -- will be replaced by modern and much more flexible PLC's (Programmable Logic Controllers).

The primary physics goal of the modification is the attainment of beta values in the so-called second region of plasma stability. Beta is the ratio of the plasma pressure to the pressure of the magnetic field that traps the plasma. The plasma pressure is the product of temperature and density, two quantities which directly determine the fusion power output. The higher these values are above the minimum needed for fusion to occur, the more fusion power is produced. A higher beta means that greater plasma pressure, thus more fusion output, is achieved in a given magnetic field; or conversely, that the same output can be achieved in a weaker field.

Since the cost of a reactor is strongly influenced by the strength of the magnetic field that must be provided, beta values are directly related to the economics of fusion power production. Beta is usually expressed as a percentage, with 5% generally believed to be the minimum value required for a economical fusion reactor.

In May of last year, PBX achieved a beta above 5% with a neutral beam heating

(continued)

(continued)

power of 5.5 MW. This record-setting plasma had a current of 590 kA, a central ion temperature of 4.5 keV, an average density of 5×10^{13} particles/cm^3, and was confined by a magnetic field of 0.87 tesla. Although a very respectable achievement, these plasma conditions still lie within the first region of plasma stability.

Plasma theorists predict the existence of a second region of plasma stability provided beta can be made high enough -- typically above 10%. The challenge is to get to this regime experimentally without driving fatal plasma instabilities. Physicists believe that there are two major instabilities to surmount on the way to the second region, historically identified by the type of distortion they produce in the plasma as "kinks" and "ballooning modes." The former generally appear at lower beta than the latter, but since the most dangerous kinks can in principle be stabilized by a conducting wall close by the plasma, attention has focused on bypassing the ballooning modes. As has been noted in earlier HOTLINE editions, the indented plasma of PBX is meant to do just that.

Kink instabilities come in two varieties: "internal" and "external." The internal kink is a helical distortion of the plasma core which may cause a severe loss of energetic particles injected into the plasma from the neutral beams. Theory predicts that indentation is an effective defense against the internal kink, and results of recent PBX experiments support these predictions. External kinks, which give the plasma the appearance of a twisted candy bar, are the more dangerous of the two and can totally destroy the plasma. Furthermore, indentation by itself if not sufficient to stabilize the external kink at high beta, and stronger measures must be employed to clear the way to the high beta values of the second stability regime.

Magneto-hydrodynamic (MHD) theory advocates a close fitting conductive shell placed in the outboard region of the plasma as an effective means of suppressing the external kink mode. Physicists hope to realize this stabilization on PBX-M by encasing the plasma within appropriately placed conducting plates, while still accomodating the logistical limitations posed by the presence of internal field coils, diagnostics, divertor hardware, and neutral beamlines. The plasma-shell separation will be about five centimeters.

While the primary objective of the shell will be to stabilize external kink modes, it should have the further advantage of allowing a more highly indented plasma and thus strengthening the stability against both internal kinks and ballooning modes.

Another important feature of PBX-M is an improved, high recycling divertor configuration. Not only is the new divertor expected to greatly enhance the power and energy handling capacity of PBX, it will also generate a strong H-mode (high confinement mode). During an H-mode, a sharp boundary appears at the plasma edge, indicating that no large scale turbulence takes place and that the improved thermal insulation at the edge can produce higher beta with given heating power.

The combination of the conductive shell and the improved divertor configuration should allow exploration of the second stable region with betas of 10-15%.

First Trilateral Agreement Signed

On January 15, the United States, the European community, and Japan signed a formal agreement calling for an exchange of information and scientists between TFTR, JET, and JT-60 -- the three operating large tokamak devices. The pact, negotiated through the Paris-based International Energy Agency (IEA), established the first joint project involving all three large tokamak facilities.

Through a series of topical workshops, scientists will exchange data and operational experience. Details regarding the exchange of a small number of scientists are to be worked out by an executive committee comprised of representatives of the three devices. The future implementation of a computer data link will also be discussed. The Japan Atomic Energy Research Institute (JAERI), which operates the JT-60, will act as coordinator for information exchanges and program planning.

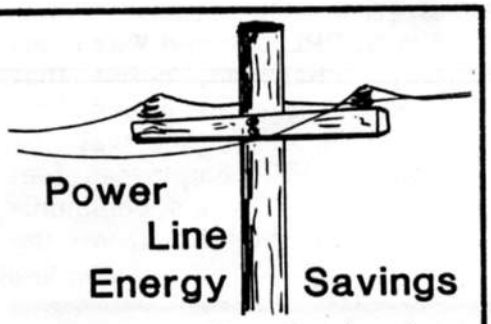
JAERI Executive Director Dr. Shiregu Mori signed the agreement for Japan. Dr. Alvin W. Trivelpiece, Director of the DOE's Office of Energy Research, signed the pact for

(continued)

(continued)

the United States. Professor Paolo Fasella, Director-General for Science, Research, and Development at the European Communities Commission, signed the agreement on behalf of both the European community and the JET joint undertaking. PPL Director Dr. Harold P. Furth represented the TFTR project at the signing ceremony, held at the Max Planck Institute for Plasma Physics in Garching, Germany.

The TFTR was the first of the three tokamak devices to become operational, followed by the European community's JET in June 1983, and Japan's JT-60 in April 1985. During the past five years, the three partners in the agreement have spent about $4 billion in fusion research.



Power Line Energy Savings

The Power Line Carrier System is an energy management system controlling the on/off time of water fountains, water heaters, and hall lights throughout C-Site. Under normal circumstances, the heaters, fountains, and lights are turned on at 7 a.m. and off at 6 p.m. Monday through Friday.

Anyone wishing to alter this schedule, or who temporarily needs to have hall lights turned on longer than scheduled, should call ext. 3092 between 8 a.m. and 4:30 p.m. weekdays or ext. 3101 after hours.

Award Winner

TFTR Project Manager Donald J. Grove has received the United States Department of Energy's Distinguished Associate Award. The honor is given by the Federal agency to recognize outstanding individual efforts or achievements on the part of contractor employees. The recipient receives a citation and a bronze medal upon which his name is inscribed.

Dr. Donald J. Grove

The award was conferred on Dr. Grove for his leadership in the design, development, construction and operation of TFTR, recognizing his contribution to the project's significant scientific results. Dr. Grove previously received a Distinguished Associate Award in 1976 from the US DOE's predecessor agency, the Energy Research and Development Administration, for his work on PLT. He served as PLT Project Manager, responsible for the design, fabrication, installation, and operation of the device.

Dr. Grove, who received his Ph.D in physics from Carnegie-Mellon University, came to PPPL "on loan" from the Westinghouse Electric Corporation in 1954. Working with Dr. Lyman Spitzer, he was one of four scientist-engineers who made the first studies on the practical aspects of power production from magnetic fusion. He also planned, constructed and put into operation the first ultra-high vacuum laboratory for large fusion systems.

As physicist-in-charge of PPL's Model C Stellarator operations in the 1960's, Dr. Grove managed the entire facility and generated more than 50 papers on plasma physics and controlled thermonulcear research. From 1970 to 1972, he managed a crash conversion of the Model C Stellarator to the more advanced Symmetric Tokamak device, managing operations for that project as well.

Dr. Grove received the Westinghouse Electric Corporation Order of Merit in 1976. He joined the Princeton University staff in November 1982, after retiring from Westinghouse.

Lost

LOST -- A small black and white Zenith television with a cream-colored exterior casing. The TV belonged to Carl Pierce. If you have the set, or know where it is, please call Ann McKee at ext. 2198.

TRANSITIONS

The HOTLINE offers its congratulations to the following employees, who have become proud parents:

Joe Bartolick of the Spectroscopy Group and his wife, Michelle, whose son, Joe Jr., was born January 27;

Jules Nemeth of Maintenance and his wife, Sharon, whose daughter, Hope Christine, was born February 9;

Karen Tuttle of DAS Applications Programming and Al Frank, whose son, Bryan, was born February 14;

Tom Goodwin of the AC Power Section and his wife, Donna, whose daughter, Amanda Lynn, was born February 24;

Wayne Riersen of Engineering Analysis and his wife, Jeannine, whose daughter, Dana, was born March 4;

Jerry Williams of Maintenance and his wife, Cheryl, whose daughter, Brandi Renee, was born March 4;

George Walton of TFTR and his wife, Kathleen, whose daughter, Meghann, was born March 13;

Henry Stevens of TFTR and his wife, Dana, whose daughter, Jessica Michelle, was born March 17;

Dr. Alicia Ehrhardt of Engineering Analysis and her husband, William, whose son, Jeremy Michael, was born March 17.

PPL Wins United Way Award

By more than doubling their contribution rate this year, PPL employees helped the United Way complete another successful fund drive. The United Way showed its thanks by giving the laboratory its first United Way Gold Award, which now hangs in the lobby near the information desk.

The citation on the award plaque commends the PPL staff "for outstanding services to people of our community -- the United Way."

The laboratory's giving rate in this year's United Way fund drive was 32%, with a total of $15,202 contributed. This compared with a 12% giving rate last year. A number of units in the laboratory registered impressive increases above the laboratory average. One of the largest units, the Mechanical Engineering Division under Dave Mullaney and Don Knutson, attained 67% participation. Two smaller units in Administrative Operations -- IRM and Personnel -- had 100% "perfect" participation rates.

Deputy Director for Administrative Operations James Clark, PPL's United Way campaign chairman, noted that the increase in giving "reflects in a tangible way the concern PPL employees feel for people in this community. We benefit from the

(continued)

The American Cancer Society has offered to assist PPL in presenting a free course on smoking cessation. If there is sufficient interest, the class will run for four weeks from noon to 1 p.m. in the Sayre Hall auditorium. Class participants would bring a "brown bag" lunch to each class session.

If you are interested in attending such a program, please fill in the attached coupon and return it to the PPL Health and Safety Building, C-Site.

Want to Quit ?

Yes, I want to attend the course and stop smoking.

Name _____

Phone _____

SEND TO:

HEALTH & SAFETY BUILDING, C-Site

(continued)

support of the community, and this is a way we can give something back. We are pleased that the United Way has recognized our improvement, and we hope to do even better next year."

PPL recorded another "first" with the United Way when Jack Joyce was appointed a member of the group's Board of Trustees with a three-year term.

United Way

AT WORK

Although senior citizens have certain needs and interests, many do not know where to go or who to contact to meet them.

The Princeton Area Council of Community Services, a member agency of the United Way-Princeton Area Communities, has made finding out who's who and what's what easier for area senior citizens. The Council has produced a free Senior Directory, which lists services available for older people in the Council's and the United Way's service area. Communities covered by the Directory are Cranbury, East Windsor, Griggstown, Hightstown, Kingston, Montgomery Township, Plainsboro, Princeton, Rocky Hill, West Windsor, and adjacent areas of Hopewell, Lawrence, and South Brunswick Township.

Groups and organizations are listed by name, address, telephone number, and the types of senior citizen services each provides. Adult day care centers, clubs, consumer protection, counseling and guidance, education, employment, financial advice and aid, health services, nursing homes, nutrition, support and self-help groups, and transportation are just some of the topics discussed in the directory.

Copies of the directory are available at the Council's office at 25 Valley Road in Princeton. Directories are also available from any of the libraries in the 13 communities listed above.

The Council can be reached at 609-924-5865 or 609-799-6033.

PPL Wins Second DOE Safety Award

For the second consecutive year, the Department of Energy has presented PPL with the Award of Excellence. The award, which recognizes dramatic improvement in a facility's safety record, was given to only one other DOE Chicago Operations Office facility for its 1985 safety performance

In a memo to Associate Director for Administration Richard Rossi, Milton Johnson of DOE's Princeton Area Office (PAO) said the "PAO is proud of this accomplishment, especially since it is the second year in a row that such recognition has been given to PPL. We trust that with continued management support of safety and continued safety awareness by all employees, PPL will maintain its outstanding safety performance in the future."

Caution: Prolonged Sitting May Be Hazardous to Your Health!

You can harm yourself more by sitting in your comfy chair than by falling out of it. Studies show that people who spend a good part of their lives sitting run a greater risk of developing herniated discs, varicose veins, phlebitis, and colon cancer.

Sitting actually puts a lot of strain on the whole body. When you "take a load off your feet," you simply shift the load elsewhere, usually to your back and your legs. Sitting puts 40% more pressure on your spinal discs than standing does, and sitting cross-legged nearly doubles the stress on your spine.

The best advice for people with back problems and varicose veins is to avoid sitting for more than an hour at a time. Get up and get a drink of water, or stand and pace while on the telephone.

One simple, painless exercise is to put your hands in the small of your back and arch backward. Some other exercises to get your back back in shape include:

- Push away from your desk, curl to the floor to touch your toes, then uncurl one vertebra at a time.

(continued)

(continued)

- Press your belly to your spine. The movement becomes a kind of isometric situp you can do while sitting up.

- Drop a pencil to the floor and bend from the waist sideways to pick it up.

- Circle your ankles, wrists, and head periodically. Flexpoint your feet.

- While seated, rest your hands on a desk or the seat of your chair and lift one leg off the floor. Put it down slowly, and lift the other leg in the same way. This exercise will strengthen the muscles of your stomach and lower back.

Antenna Survey

In 1981, two antennas were installed outside the LOB as part of PPL's satellite data link. The antennae were state-of-the-art technological devices which have not only functioned up to expectations, but have also reduced transmission costs for relaying computer information to the West Coast. However, employees have periodically expressed concerns regarding the safety of these antenna dishes, which transmit data via microwaves.

On May 4, 1981, the HOTLINE published information on the first survey of these devices. A follow-up survey on February 3, 1986 obtained identical results, indicating that the microwave levels emitted from the dishes remain very low -- below detection limits in most cases.

At the plane of the dish (see dashed line on diagram), measured microwave power densities were below the detection levels of the measurement instrument (less than 0.05 mW/cm^2). The maximum predicted power density in this near-field region is 0.02 mW/cm^2, with much lower power levels (0.002 mW/cm^2) predicted near the edge of the dishes. Health physicists in the Project and Operational Safety Office are confident that microwave levels in any area accessible to PPL employees are far below the U.S. standard of 5 mW/cm^2 at the operating frequencies of these antennae.

A noteworthy feature of these devices is that they can transmit data up to a satellite (22,300 miles up) at one watt. By comparison, a standard walkie-talkie used by the Public Safety Department operates at approximately 5 watts.

Employees who would like a further explanation of antennae operation from a safety standpoint should call Joe Stencel or Jack Couch of the Project and Operational Safety Office, ext. 2600.

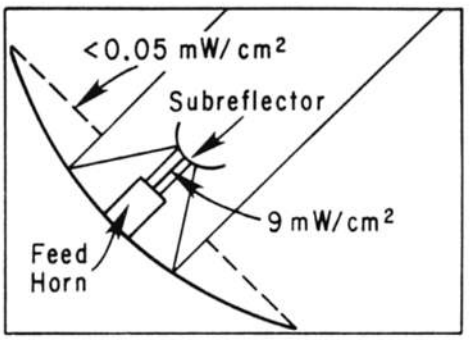


Diagram of microwave power densities measured at the LOB satellite antennas

Bowling League News

The Pony Express team once again proved they can deliver by winning the first half of the 1985/1986 Princeton Mixed League bowling season.

Team members Ken and Nancy Strine, Debra Simmonds, Keith Sapp, and Al Martin won 81 games and lost 45, edging out the Low Rollers (Spence Holcombe, Terry Tempkin, Noreen Cruser, Matt Lawson, and John Luckie) for first place halfway through the 34-week season.

Each of the eight teams in the league is composed of five PPL or University employees. The league competes each Wednesday at Colonial Lanes, Route 1, Lawrenceville. If you're interested in substituting for the league, or in joining a team for next season, contact league secretary Sarah Thomas at ext. 3711.

Great Adventure

You'll find something for everyone in the family when you visit Six Flags Great Adventure this year. And if you use your free Funseeker card, now available in Personnel, you'll also find a little more money in your wallet at the end of your visit.

The Funseeker card will save you four dollars on a combination admission to the theme amusement park and the drive-through safari park now through May 25. After that time, you can save two dollars on a combination admission, or on admission to the theme park or safari only, until the 1986 season ends September 28.

You can get your free Funseeker card from Meg Gilbert in Personnel, Sayre Hall, B-Site.

Science Seminars

Supercomputers, lasers, and recombinant DNA are among the topics enticing over 180 high school students to attend the Science on Saturday seminar program sponsored by PPL. The eight-week program features a lineup of distinguished academic, research, and industrial scientists offering local teenagers, teachers, and parents a look at some of the leading areas of scientific endeavor.

"We have tried to present a wide cross-section of scientific research," said program developer Diane Carroll. "PPL, the University, and area industries provide an enormous pool of scientific talent. The laboratory's goal in this program is to use this resource to stimulate an interest in science among area students, and to provide an opportunity to enrich their science education. Exposure to working scientists is another plus."

"Many of the laboratory staff are eager to offer their talents to enhance science education, and this program provides one such outlet," Deputy Director for Administrative Operations James Clark pointed out. "We feel that programs like this provide an important link between the laboratory and the community."

The seminars meet weekly for two to three hours at PPL. Lecture titles for this session include "An Introduction to Fusion Energy Research;" "Molecular Biology, Gene Cloning, and Playing God;" "Satellites and Space Technology;" "New Drug Development;" "Supercomputers -- Past, Present, and Future;" "Horizons in Laser Technology;" and "Comets and Mass Extinctions." One session covers robotics, light guide engineering, and computer-aided manufacturing, and offers a tour of the AT&T Engineering Research Center in Hopewell.

There are no tests and no fees. The Greater New York Chapter of the American Vacuum Society provides refreshments at each meeting. "The sessions are very informal. I think this helps people to respond to the topic, and ask questions they might not bring up in a more formal setting," Diane said.

"The students have been very enthusiastic about the program," she continued. "You can't get 180 teenagers out on a Saturday morning unless there is a great deal of interest. I know it has been rewarding for laboratory participants, too. We would like very much to do this again next year."

Following a few simple rules can help maintain office security and avoid thefts of personal and laboratory property:

- Lock all doors, windows, desks, or cabinets when you are not in your office. If you don't have keys available, ask your supervisor to obtain them for you. Be sure to keep all keys out of plain sight.
- Record all identifying information (including government property numbers, serial numbers, makes, and model numbers) for all valuable items, and keep the records in a safe place.
- Engrave valuables that have no specific identifying information (such as electric pencil sharpeners, staplers, small desk clocks, etc.). Employees who wish to borrow engravers, or who would like to make an appointment to have their property engraved, should contact the Public Safety Department at the Chemical Sciences Building.
- Keep personal valuables, such as handbags, brief cases, or clothing, secured. Secure all small valuables in locked cabinets or drawers.

Questions concerning theft and crime prevention should be directed to the Public Safety Department at the Chemical Sciences Building, ext. 2894.

Thank You

The HOTLINE received the following thank-you note from former laboratory employee Portia Edwards:

"My utmost respect and sincere thanks go to all who attended my farewell luncheon. Thanks for being there, and thanks for your kind words for future success.

To Pete Haney, for pulling it all together and keeping it a suprise -- thank you, Pete! I also extend my thanks to all who contributed to my gift, as

(continued)

(continued)

well as to those of you who were unable to attend the luncheon, but who encouraged me to move onward and upward. You all will always have a special place in my thoughts.

I have enjoyed my experiences at PPL, and appreciate the opportunity I had to provide support for laboratory projects. Special thanks go to C. Neumeyer, M. Awad, D. Harnsberger, the ECS engineers and technicians, and the members of the TFTR Facilities Operation group. I wish you and the project much success in the future!"

Science Camp

Does your child prefer "Mr. Wizard" to "Miami Vice?" Do you have to make an appointment with her to use your home computer? Is Madame Curie his pin-up of the month?

If you answered yes to any of these questions, then your gifted and talented child is ready for the Science Camp at Trenton State College, to be held July 7 to August 1. Now in its ninth year, the Science Camp is designed to give children the opportunity to explore aspects of science and computer programming which they do not ordinarily get in high school.

The camp is divided into three sections: Division I for current seventh and eighth graders; Division II for current ninth and tenth graders; and Division III for current eleventh graders. Campers in Divisions I and II are challenged by both hands-on experiments and mini-lectures in biology, chemistry, astronomy, technology, and physics. Division III campers are teamed one-on-one with a faculty member to assist with an ongoing research project. All campers participate in a computer lab to help them improve their programming skills. Courses are taught by a highly qualified professional staff, and class size is small.

Dr. Fred Pregger, TSC professor of physics and co-director of the Science Camp, has planned several field trips, including a visit to Longwood Gardens in Pennsylvania. Two overnight, four-day weekends will be held at TSC's Camp Mohican, located near the Delaware Water Gap. The weekends include swimming, canoeing, and geology and ecology hikes.

Children may attend the camp for one two-week session, or for the full four weeks. They have the option of living on the TSC campus in a residence hall under the supervision of an adult counselor, or of commuting daily. Scholarship aid is available.

For more information or for application forms, write to the Division of Continuing Studies, Trenton State College, Hillwood Lakes CN550, Trenton, NJ, 08625-0550. You may also call the college at 609-771-2255.

Tatoo Warning

Many children have been caught up in the sticker craze, collecting and trading multi-colored stickers and paper-backed "tatoos." But unless parents become more cautious, their children might be caught up in something much more serious -- drugs.

According to national police reports, some youngsters have inadvertently been exposed to LSD by handling a form of tatoo called "Blue Star." The tatoos, which are about the size of a pencil eraser, are sold on a white sheet of paper. Each star is impregnated with LSD, which can be absorbed through the skin by handling the tatoos, or by removing a star from the paper backing and placing it in the mouth.

Police have also found stickers that have been treated with LSD. These stickers, which are about the size of a postage stamp, feature Superman, Mickey Mouse, and other Disney characters. They are packed in a red cardboard box, which is wrapped in foil and enclosed in a clear, lock-type plastic bag.

Symptoms of exposure to LSD include hallucinations, mood changes, and severe vomiting. If your children display these symptoms, get them to a hospital immediately. If you or your children find "Blue Star" tatoos or the suspect stickers, DON'T HANDLE THEM; notify your police department instead.

OSHA Violations

The following safety reminders are drawn from a list of common Occupational Safety and Health Administration (OSHA) violations:

- The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the

(continued)

(continued)

ground, or some other equivalent means of protection.

- If employees may be required to enter an excavation, excavated or other material shall be effectively stored and retained at least two feet or more from the edge of the excavation.

- Sides, slopes, and faces of all excavations shall meet accepted engineering requirements by scaling, benching, or other equally effective means. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

Tour Guides

October, November, and December certainly didn't constitute a holiday season for the PPL tour program. Almost 1,000 visitors viewed our facilities, with 545 tourists arriving in October alone. Our appreciation is offered to the following tour guides, who shepherded our sightseers during the recent holiday season:

OCTOBER

William Blanchard
Nelson Bowen
John Bradish
James Chrzanowski
Ernst deHaas
John Doane
Robert Forester
James French
Charles Gentile
Phil Heitzenroeder
Hans Hendel
John Johnson
Robert Kaita
James Kamperschroer
Dan Kungl
Paul LaMarche
Benoit LeBlanc
George Levitsky
George Martin
Ernest Nieschmidt
William Osborne
Stan Schweitzer
Joseph Stencel
Al von Halle
Irving Zatz

NOVEMBER

Nelson Bowen
Graham Brown
Alfred Cavallo
David Ciotti
Robert Forester
George Gammel
Naren Kokatnur
George Martin
Thomas Meighan
Ernest Nieschmidt
Earle Sheaffer
Wolfgang Stodiek
Al von Halle

DECEMBER

Dale Ashcroft
William Blanchard
Diane Carroll
Fred Dahlgren
Robert Ellis
George Gammel
Dan Huttar
James Kamperschroer
Naren Kokatnur
Paul LaMarche
Dale Meade
Dave O'Neill
Greg Rewoldt
Stan Schweitzer
Fred Wood
Masaaki Yamada

Volunteers: People People

The following volunteer opportunities were submitted to the HOTLINE by the Princeton Area Council of Community Services, a member agency of the United Way-Princeton Area Communities. For further information on any volunteer position, contact each agency directly.

- The Mercer County Unit of the New Jersey Association for Retarded Citizens offers a variety of recreational opportunities to mentally retarded individuals and their families. Volunteers can lend a hand at parties held on the first and third Fridays of each month from 7:30 to 9:30 p.m. Or you may prefer to help out at the Association's coffeehouse, held monthly on the second and fourth Wednesday from 7:30 to 9:30 p.m. Scorekeeping and coaching assistance during Saturday morning bowling sessions would also be appreciated. For further information, call the Unit at 609-393-2483.

- Princeton University's International Center provides service to the more than 700 foreign students and visiting scholars on the Princeton campus. Volunteers willing to host first-year foreign undergraduates, graduate students, and visiting fellows are always welcome, as are tutors in conversational English and hosts for the weekly International Center luncheons. For more information, call the Center at 609-452-5600.

(continued)

(continued)

- If you'd like to "make" history, offer your aid to the Princeton History Project, which collects local history and publishes "The Princeton Recollector" 10 times a year. The project needs volunteers to conduct local research, interview senior citizens, transcribe tapes, type oral history interviews, write articles, address envelopes, and do fundraising. If you're interested, call 609-921-8330.

The next listings were provided by the United Way of Somerset Valley. To learn more about any listing, contact each agency directly.

- The New Jersey Commission for the Blind and Visually Impaired needs volunteers who can record printed material onto audio cassettes, or transcribe printed material into braille. Many of the Commission's clients also need help with errands, correspondence, reading, making and keeping appointments, and using transportation. Call 201-648-3330 to lend a hand.

- The Resource Center for Women and Their Families needs a variety of clerical support, as well as volunteers willing to assist with a telephone hotline, provide transportation, or offer evening child care. To find out more, call 201-685-1122.

- SWIM, Inc. needs volunteers to provide transportation, to assist swimmers in the dressing rooms and while entering and leaving the pool, and to supply or serve refreshments. Call 201-766-6436 or 201-439-2356 to offer your aid

The following volunteer posts were supplied by the Voluntary Action Center of Middlesex County. For more details about any position, contact the VAC at 201-249-8910.

- The Voluntary Action Center of Middlesex County is seeking individuals with fundraising and public relations skills to help with a fundraising project. Volunteers would personally follow up on area restaurants previously contacted for recipes, contributions, and coupons.

- The Rahway Forum is a program of the Rahway State Prison offering various types of assistance to inmates. Counselors are needed, as are tutors in basic skills, resume writing, and job hunting. The Forum also conducts a pen pal program. To get involved, call the VAC.

The next volunteer opportunities were supplied by the Voluntary Action Center (VAC) of Morris County. Additional information on any listing is available by calling the VAC at 201-538-7200.

- Develop a guide to services and programs available in Morris County to assist children and families. The guide will become an invaluable tool for those in this state organization for preventing child abuse. Office, desk, phone, and clerical assistance are available.

- The nominating committee for a national girl's organization is seeking a finance whiz to handle the accounts, statements, and reports. The organization holds monthly board meetings, and staff assistance is available.

- Got a nose for news? Prepare news releases, write feature articles, arrange distribution to the media, and assist with a newsletter for a new group dedicated to research on the environment of the Morris County area. Work at their office, or from your own home.

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.