HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

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PLT:Lower Hybrid Current Drive Extended Record Power Levels With ICRF

Current drive by lower hybrid waves was extended to record-long pulses of up to 3.5 seconds on PLT during experiments on May 6. One second had been PLT's previous mark.

The 800-MHz waves were used to drive a current of about 160 kA in low-density ($\bar{n}_e = 3 \times 10^{12}$ cm^{-3}) plasmas. Toroidal field strength averaged about 20 kG. Radio frequency power input was 75 kW.

The ohmic heating transformer initiated the discharge and maintained it for the first 0.2 second. Lower hybrid waves kept the current constant for the remaining 3.5 seconds.

According to physicist Bill Hooke, the limiting factor in the experiments was not the effect of the waves on the plasma, but rather the normal precautions taken to safely extend the pulse lengths of the lower hybrid generating system and the toroidal field coils.

Currents are optimally driven in PLT when the lower hybrid waves are caused to propagate along the axis of the vacuum vessel. With proper phasing of the waves, they selectively accelerate those electrons already moving in the direction of propagation and a current is driven.

Besides the success of the lower hybrid current drive, the PLT group has boosted the ICRF power input to the plasma to over 3 MW using the 42-MHz system for second harmonic hydrogen heating. Mean plasma energies of about 4 keV were obtained for densities of 3.5 to 4x10^{13} cm^{-3}. A relatively low toroidal field of about 14 kG was used.

Installed in May of 1980, the power input from the 42-MHz system has been steadily increased through improvements to the coupling systems. It is rated for a maximum of about 4 MW at 42 MHz and about 5 MW at 55 MHz. In these latest experiments conducted April 23 and 24, heating, confinement, and stability showed no deterioration with the higher power input. "Everything seems to scale up well from previous experiments," said experimenter Pat Colestock.

PDX:Exploring The Limits of Beta

A new "trophy" has been added to the case above the PDX control console, representing the attainment of a new record for beta values achieved by PDX.

In experiments on April 29, average beta values of 3% were obtained at magnetic fields of slightly above 9kG. Densities were about 3-5x10^{13} cm^{-3}. Ion and electron temperatures on axis were about 1.5 and 1.0 keV, respectively. All four neutral beams were used.

Beta is the ratio of the plasma pressure to the strength of the confining magnetic field. The plasma pressure is the product of temperature and density.The higher these values above the minimum needed for fusion to occur, the more fusion power is produced. A higher beta value means that greater plasma pressure, and thus more fusion output, is being achieved in a given magnetic field.

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Since stronger magnetic fields require larger magnetic coils, beta values are directly related to the economics of fusion power production.

Theoretical limits for beta in circular plasmas on PDX are estimated to be 1.3 to 5% depending on a number of factors including the aspect ratio, the plasma current and the shape of the plasma. In the ISX tokamak at Oak Ridge National Laboratory, it was found that the loss of confinement with increasing neutral beam power was such that beta values higher than 2.5% could not be attained.

On PDX, however, the results have been more encouraging. A similar but less severe loss of confinement is seen, but even at 3% beta, it seems to be more an operational factor related to the particular characteristics of the experiment rather than a hard and fast limit.

Experimentation on PDX through the summer will continue to explore the limits of beta values and to determine how beta affects or is affected by plasma/wall interactions, the plasma aspect ratio, and divertor operation.

Cafeteria Conservation

The following is an open letter to fellow employees from the C-Site Cafeteria Committee:

In the last three months the utensil inventory in the C-Site cafeteria has been reduced by over 300 forks, 140 large salad bowls, 60 small salad bowls, and 76 9-inch plates. We don't have a current count on the trays, but those have also been disappearing.

When the cafeteria and laboratory management are doing everything possible to improve facilities and food, it would be distressing to return to plastic and paper eating utensils. However, the budget does not allow for replacement of equipment at this rate.

What happens to the utensils? Multiply that one tray, plate and fork sitting under your desk (or your co-worker's desk) by the number of employees who buy takeouts but neglect to ask for and use takeout utensils. It doesn't take much imagination to understand why there aren't any forks left by 12:30.

Would you remove trays, plates or forks from Good Time Charlie's? How much do you think prices would increase if customers did that? For how long would they allow you in the door if you did that?

Cafeteria prices are already an employee benefit and subsidy. Help this benefit go into the food provided, not into reusable, expensive tableware.

The C-Site Cafeteria Committee

N. Jones, Chairman
O. Bernett
D. Muschal
L. Tindall

(watch for Cafeteria Amnesty Day)

"Run For Fun"

Legpower will be the order of the day Tuesday, May 25 when the second annual PPL "Run for Fun" gets underway at 12:30 p.m.

Entrants will follow a three-mile course, beginning and ending on the main road by Module II. Runners will continue on to B-Site's Guggenheim Building, turn left to the Gas Dynamics Building, and return to the start/finish point. Signs will delineate the route on the day of the race, and maps of the run will be posted throughout the laboratory. Juice will be available for parched participants, and Human Resources Manager Len Thomas of the Personnel Deparment will present trophies to the first place male and female finishers.

Anyone interested in joining the run should register with Barbara Safaty at ext. 2440. Registrations will be taken until 10 a.m. on the day of the race.

RIDE WANTED -- Sylvia Farley of Personnel is interested in ride-sharing with employees from the Kuzer Road-Hamilton Township area. She would like to leave at 7:30 each morning, and arrive home at about 5:30 p.m. Anyone interested should contact Sylvia at ext. 3003.