



HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

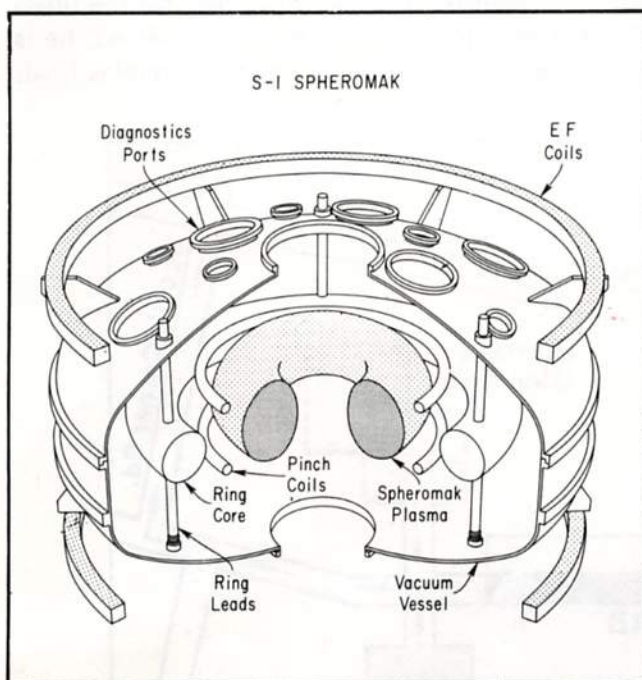
Vol. No 1, No. 12

July 25, 1980

Initial Spheromak Results

One of the alternate magnetic fusion concepts being studied at PPL is spheromak, a sort of combination tokamak and mirror machine. In spheromak, the toroidal field is generated by a plasma current, and the poloidal field by current flowing in ring shaped coils. Together they keep the plasma in a roughly spherical (actually low aspect toroidal) shape, one of the best for confinement.

About one year ago Harold Furth, Tom Stix and Masaaki Yamada proposed a way of forming spheromak plasmas. To test the scheme, a small device called Proto S-1 was built. Its largest coil is about one foot in diameter, and the entire assembly fits on a table top. The results have been excellent.



A diagram of the S-1 Spheromak device. The outer diameter of the ring core is about seven feet.

At an average magnetic field strength of two kilogauss, an ion temperature of 300,000 degrees C, and a peak density of 10^{15} , the plasma lifetime (the time the plasma was in the spheromak configuration) was as high as 30 microseconds. Because of Proto S-1's small size and low temperature, the theoretical limit on confinement time (set by magnetic diffusion processes) is only 50 microseconds. Since Proto S-1 was able to approach this upper limit, it appears there are no large scale instabilities in the device that would negatively affect the performance of larger machines.

In addition, the formation of the plasma has proceeded as predicted, indicating a good theoretical understanding of the machine's behavior. Beta (β), the ratio of the outward plasma pressure to the confining magnetic field pressure, was in the range of 10%-50%. A working reactor will need a β greater than 5%, so this is also positive news.

Presently Jim Sinnis is directing the fabrication of the bigger S-1 machine, due to come on line in late 1982. S-1 will be located at C-Site in the RF bay. It will be six times larger than Proto S-1, will have a 6-9 kilogauss field and a plasma temperature of one million degrees C. Dr. Yamada believes that eventually it may be possible to build spheromak reactors that are smaller, simpler and less expensive than those using other magnetic confinement schemes.

Symposium Slated

Dr. Klaus H. Berkner of Lawrence Berkeley Laboratory will be the speaker at the TFM Project Symposium, to be held August 11 at 4 p.m. in the LOB auditorium.

Dr. Berkner will speak on neutral beam development for TFTR and other fusion devices.

Fire Fund

The Employee Relations Section is taking up a laboratory-wide collection for the John Woolsey family, whose Hamilton Township home was gutted by fire in June.

John, a Coil Shop employee, his wife and two children escaped injury in the blaze, which destroyed the interior of their house.

Donations of furniture, clothing or cash should be sent to Len Thomas, B-Site Personnel, ext. 2052.

Road Closing

The Plainsboro Township Police Department has announced that Plainsboro Road between Fox Run Drive and Hunters Glen Drive will be closed for approximately one month for resurfacing and reconstruction, beginning August 1st.

Motorists traveling eastbound on Plainsboro Road should turn left onto Dey Road, then right onto Scotts Corner Road to Plainsboro Road to avoid the construction area.

Motorists traveling west bound on Plainsboro Road should turn right onto Scotts Corner Road, left onto Dey Road to Plainsboro Road. All detours will be properly marked.

Listen to radio station WHWH 1350 AM, Princeton, for daily updates.

"Run for Fun"

Several laboratory employees with a passion for dashin' are planning a PPL "Run for Fun". Entrants would traverse a predetermined course during a designated lunchtime, and audience participation will be encouraged.

Anyone interested in entering the "Run for Fun" is asked to contact Ann O'Day at ext. 3377 during the day, or Bruce Brilliantine at ext. 3595 after 4 p.m.

The date, time and place of the "Run for Fun" will be announced in a future issue of the Hotline.

Handball Champ

Howard Eisenberg of the laboratory's professional technical staff successfully defended his doubles title at the National U.S. Handball Association One Wall Championship tournament, held recently in New York.

Eisenberg, partnered with Joel Wisotsky of Long Island, captured the championship from a field of 200 players. In his 23 years of handball competition, the Plainsboro resident has reached the finals of a national tournament 26 times. At 41, he is the oldest player to win a national doubles final.

