§1. High Density Plasma Experiment HYPER-I

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The High Density Plasma Experiment (HYPER-I) device is a linear plasma device with a magnetic field designed for basic plasma experiments. Plasmas are produced and sustained by an electron cyclotron wave through ECR. The frequency of microwave source is 2.45GHz, and the output is 15 kW (CW). There is no cutoff density for the accessibility of ECW, and thus a density higher than 1×10^{13} cm^{-3} is achieved for an argon plasma. This density is two orders of magnitude higher than the usual density scaling of the ordinary mode with the same frequency. Since HYPER-I device provides large-diameter (30 cm) and high-density plasmas, it is suitable for basic plasma experiments such as wave-plasma interaction near the electron cyclotron range of frequency, pattern and vortex formation in plasmas, and magneto-hydrodynamic wave experiments *etc.*. The ongoing experiments are;

(i) high- density plasma production

High-density plasma production experiments have been carried out to obtain the detailed information of the energy deposition of ECW in the resonance region. For this purpose, we have developed a new antenna with high directivity, and measured the axial profile of the Poynting flux of ECW.

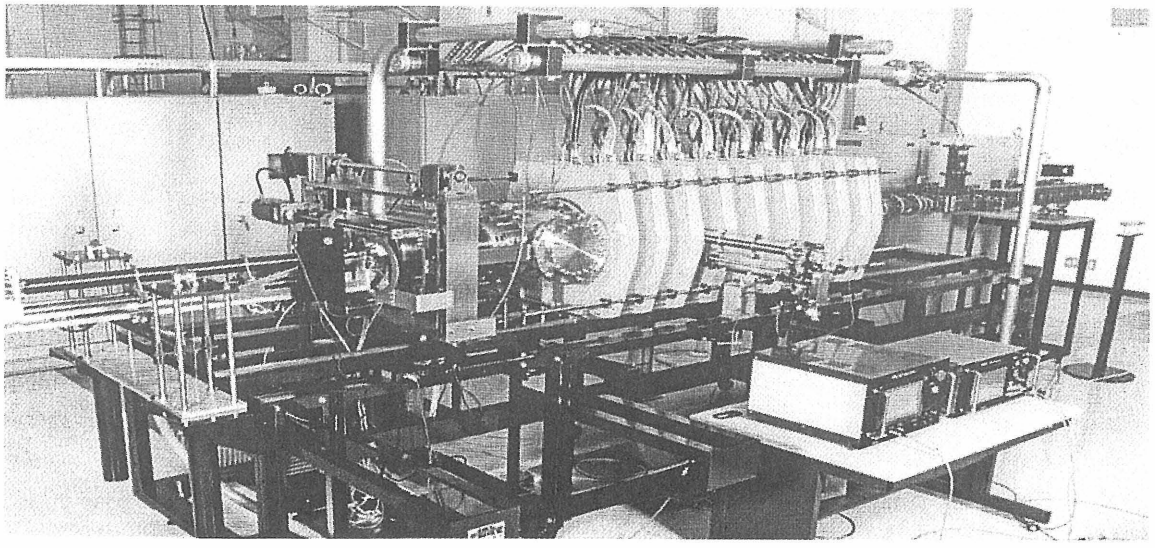
To realize a high-density plasma suitable for magneto-hydrodynamic wave experiment, we introduced a new klystron amplifier. The frequency and output are 2.45 GHz and 80 kW (CW), respectively. The aging test for the new klystron amplifier has been completed. Now, the microwave circuit is under modification for the new microwave source.

(ii) plasma flow measurement

Measuring the velocity field is of key importance for the experimental study on large-scale structure formation in plasmas. We have developed the method for determining the plasma flow velocity at an arbitrary angle with respect to the magnetic field. The effect of magnetic field on a directional probe current has been carefully examined, and it is demonstrated that the magnetic field effect can be exactly cancelled in determining the flow velocity. Now, it is possible to obtain a vector field plot of plasma flow on an arbitrary plane with respect to the magnetic field.

(iii) vortex formation in a plasma

Localized plasma columns have been observed in a certain range of background pressure. These columns are stationary and always appear in a pair. These columns are co-rotating in the direction of electron diamagnetic drift, showing a coupled vortices. The characteristic feature of the coupled vortices is that there present a thin parallel shear layer and they are confined within the shear layer. Experimental study on the mechanism of vortex formation and their interaction is now in progress.



HYPER-I device