§31. Installation of Multi-Purpose Probe in CHS

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Recently, a spontaneous formation of edge transport barrier (ETB) with confinement improvement with 40% degree was observed in CHS. The measurement of plasma properties in edge region is strongly required to understand the physical mechanism of ETB formation. In order to investigate the plasma behavior with transition phenomena in edge region, a multi-purpose probe, which works both as multi-channel Langmuir probe and as calorimeter probe, has been installed by two-dimensional probe drive system in CHS, and is named as "Hybrid probe". The main objectives of this probe are follows;

(1) measurement of plasma parameters in peripheral region in CHS.
(2) measurement of heat flux profile in peripheral plasmas.
(3) measurement of neutral beam profile in CHS vacuum vessel.

The probe is made of oxygen free high conductivity copper (40mm in diameter) with a water cooling system. There are ten probe heads (4mm in diameter) on the probe surface, and each head has a sheathed thermocouple in order to estimate the local heat flux in a peripheral plasma (see fig. 1). The probe is electrically isolated by CHS vacuum chamber, so keeps floating potential in plasmas. The voltage of each probe head is same and is able to be swept by a power supply. The probe current collected by each probe head is translated to voltage by a resistor and isolated by isolation amplifier with time response of 100kHz. The data acquisition of these isolated probe currents is temporary performed by ADC module (WE7251, 10ch, 100kS/s, 1Mwords memory) of WE7000 , and will be done by Cinos system in near future, which is main data acquisition system in CHS experiment.

Another feature of this measurement is to obtain the spatial distribution of some plasma parameters using a two-dimensional probe drive. The probe is inserted by a linear drive (750mm travel), of which insertion angle can be changed from -4 degrees to 20 degrees in the major radius direction (see Fig. 2). Thus a probe is able to scan in R-z space in wide region of horizontally elongated cross-section (see Fig. 3).

The probe installation has finished, so the measurement of peripheral plasma parameters and heat flux will be performed soon. Moreover, it is planed to make directional probe, which can measure plasma flows, and to investigate three-dimensional flow structure in CHS.

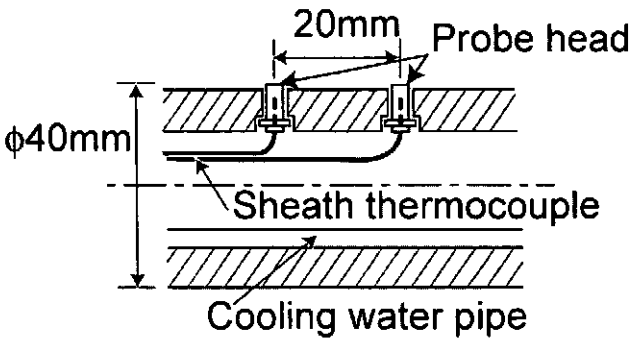

Figure 1. Schematic of hybrid probe.

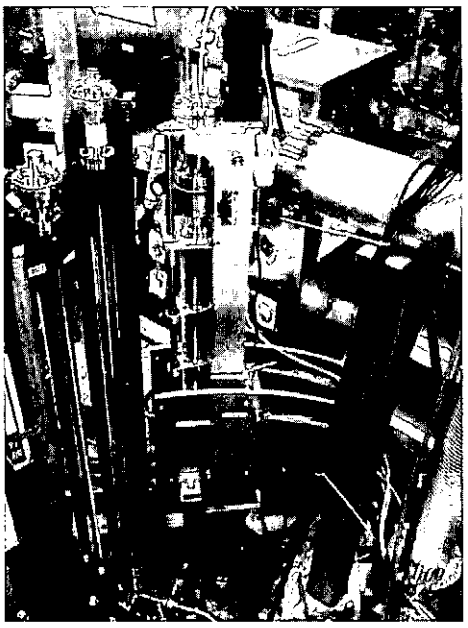

Figure 2. The two dimensional probe drive system installed in 7M port in CHS.

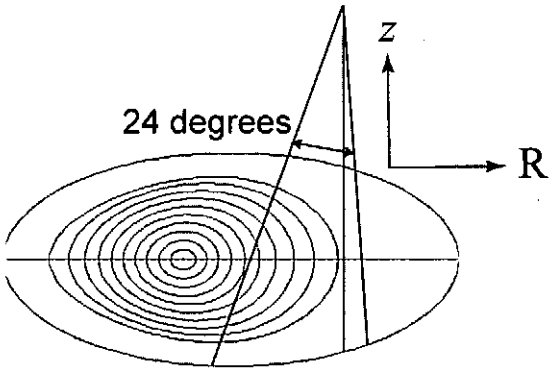

Figure 3. The scannable area by the two dimensional probe drive system and a plasma position at Rax=92.1cm (standard configuration) in CHS