

GAMMA10セントラル部における多チャンネルマイクロ波干渉計によるプラズマの電子密度測定

Plasma electron density measurement by using a multi-channel microwave interferometer in GAMMA 10 central cell

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Electron density radial profile measurements is the one of the most important study in the plasma and fusion experiments. Microwave interferometer is the useful method for plasma density measurement. We are constructing a multi-channel microwave interferometer to measure the plasma density profile in a single plasma shot. The tandem mirror GAMMA10 utilizes various heating apparatus such as the electron cyclotron resonance heating (ECRH), ion cyclotron range of frequency (ICRF) and neutral beam injection (NBI) in order to produce, maintain and heat the plasma.

The schematic diagram of the multi-channel microwave interferometer system is shown in Fig. 1. The system is configured as a heterodyne interferometer consisting of a 70 GHz (500mW) Impatt oscillator and a 150 MHz oscillator. The output of the Impatt oscillator is divided into two microwave beams. One is a probe beam that goes through the plasma, and another is a reference beam that is combined with the output of the 150 MHz oscillator using an up-converter. A probe beam is injected into the plasma by the transmission horn and a spherical mirror from the upper port of GAMMA 10 and received by the six receive horns at the down side port.¹ In the previous system the microwave was directly injected to plasma from transmission horn and Teflon lens. At that time, the signal intensities of microwave through the plasma were very weak. Then, we installed a spherical mirror in the multi-channel microwave interferometer in order to make probe beam intensity strong. The angle of the spherical mirror is adjusted to make microwave injection vertically. The signal of

probe beam becomes stronger, because it is condensed by the spherical mirror. The multi-channel microwave interferometer has the six receive horns. We decided the measurement position of each receive horns. We compared the data of the multi-channel microwave interferometer with that of movable microwave interferometer and confirmed that the multi-channel microwave interferometer is able to obtain the electron densities on the different plasma heating sequences.

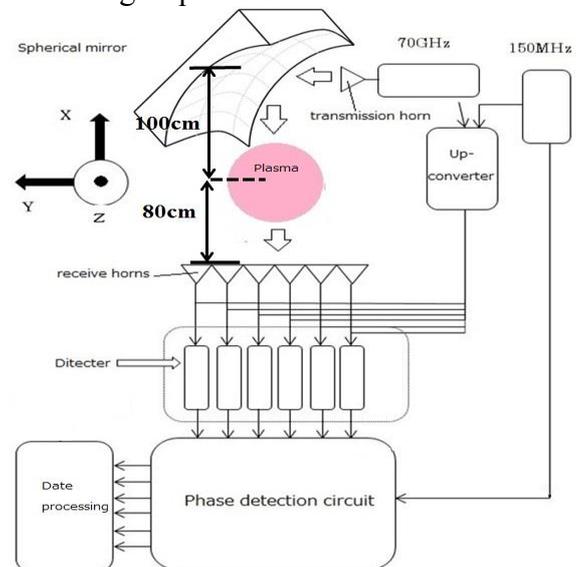


Fig. 1 The schematic diagram of the multi-channel microwave interferometer system.

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- [2] M. Yoshikawa, *et al.*, Rev. Sci. Instrum., **77** (2006) 10E906.
- [3] Y. Ishii, *et al.*, Plasma Fusion Res., **5** (2010) S2094