

Development of white-noise-applied impedance probe for high resolution electron density measurements in the ionosphere

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Impedance probe is an instrument for electron number density measurements by using frequency dependence of the capacitance of the probe antenna extended into the space plasma. Due to its high accuracy and independency from probe shapes and plasma conditions, it has been installed on numerous sounding rockets and provided vertical profiles of electron number density in the ionosphere. The spatial resolution of the current impedance probe system, 100 m, is determined by the sweep period of frequency of the local signal applied to the AC bridge. On the other hand, the spatial scale of the field aligned irregularity (FAI) in the ionosphere, which has been observed by the radars on the ground, is several meters. Therefore, those phenomena can not be observed by the current impedance probe system. In order to solve the problem, we are now planning the development of a new impedance probe system which uses white noise instead of the swept-frequency signal. The results of preliminary plasma chamber experiment and development plan will be shown in the presentation.

Keywords: Impedance probe, Electron number density, Field aligned instability (FAI)