

PEM030-P07

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Development of the impedance probe and plasma wave receiver by using FPGA

Tomonori Suzuki^{1*}, Atsushi Kumamoto¹, Takayuki Ono¹, Jyunpei Uemoto²

¹Tohoku University, ²NICT

The impedance probe is a powerful tool for in-situ measurements of the local electron density. By identifying the upper hybrid resonance (UHR) frequency through the measurement of the probe impedance, we can accurately determine the electron density. The impedance probe has been installed on many sounding rockets and spacecrafts for electron density measurements in space plasmas.

Based on the results of the previous rocket experiments, it has been recognized that the improvement of the time/space resolution of the impedance probe is necessary to observe fine structures of the ionospheric plasmas, such as a sporadic-E layer. Reduction of the data size is also required to improve the capability of the impedance probe.

We have developed a new impedance probe instrument and plasma wave receiver for sounding rocket experiments scheduled in 2010. We have performed digitalization of the electric circuit part of the instruments by using FPGA which enables us to miniaturize the instruments. In addition, the signal processing performed by the FPGA is appropriate to realize the automatic detection of the UHR frequency for improving the time/spatial resolutions. The automatic detection also contributes to reduce the data size. These improvements will significantly contribute to the improvement of the capability of the instruments.

We have performed software developments of the impedance probe and plasma wave receiver by VHDL programming so far. We have successfully conducted operation tests by using evaluation board. In this presentation, we will introduce the impedance probe technique and report on the present state of the instrumental developments for the sounding rocket experiments.