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Development of the small probe system to measure plasma wave for the sounding rocket experiment

ONISHI, Keisuke[1*] ; ZUSHI, Takahiro[1] ; KOJIMA, Hirotsugu[1] ; YAMAKAWA, Hiroshi[1]

[1]Research Institute for Sustainable Humanosphere, Kyoto University

Plasma filling the space is very rarefied. Ions and electrons in space plasma don’t exchange their kinetic energy through their collision but through plasma waves. Hence observing plasma wave is essential for measuring space electromagnetic environment. We propose the multipoint plasma wave observation system that consisted of some sensor probes.

The present paper shows the achievements in designing the small sensor probe system which is dedicated to the sounding rocket experiment. The experiment is performance test of the small sensor probe which measures the standard wave in outer space. The necessary components for the small sensor probe are Li-Ion battery, wireless LAN device, plasma wave receiver, A/D converter, and CPU. All of them should be installed in the cubic body with an edge of 10 cm. Therefore, we chose one-chip microcomputers as wireless LAN device, A/D converter, and CPU. The wave receiver is miniaturized by designing the analog ASIC (Application Specific Integrated Circuit).

The wave receiver has the function of observing electromagnetic waves in the frequency up to 100 kHz and we want to take three-axis data at the same time. So, we should design A/D converter which has three simultaneous sampling and sampling frequency over 200 kHz to fulfill the sampling theorem.

We also designed other necessary systems, such as attitude sensor and wireless communication system with the sounding rocket.

Keywords: Space plasma, Plasama wave, Small sensor probe, Sounding rocket