

SPRINT-B/ERG 高周波受信機の開発

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Development of the high frequency receiver for SPRINT-B/ERG

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In the SPRINT-B/ERG mission for exploration of the earth's radiation belt, we have to perform wave observation in high frequency range (10kHz-10MHz) for the purpose of (1) determination of electron number density of the plasmasphere based on UHR wave measurements, (2) observation of the high frequency magnetic field component of the chorus emissions in low altitude range, and (3) observations of plasma wave generation process and conversion process to the electromagnetic waves during geospace storms. Due to cost limitation and short development period, we are planning to develop high frequency receiver based on the receiver of radar sounder installed on the lunar orbiter Kaguya (SELENE). The high frequency receiver is to be installed as subsystem of Plasma Wave Experiment (PWE). The signals from the preamplifier of two electric field antennas and one magnetic field antenna in a frequency range of 10k-10MHz are fed to the receiver, sampled with a frequency of 25 MHz, and sent to the MDP via Space Wire interface after the digital signal processing of FFT and averaging by Field Programmable Gate Array (FPGA). In order to satisfy the radiation regulation of SPRINT-B/ERG (100krad), we don't use memory-load type FPGA, which used for Kaguya's receiver, but anti-fuse type FPGA. Development of the Evaluation Model (EM) of the SPRINT-B/ERG HF receiver can be also development of EM of high frequency receiver, which is applicable for future missions such as planetary explorations, low frequency interferometry in space and on the Moon. Generally, direct sampling method has merits in reductions of size and weight of the receiver. On the other hand, the method also has demerits in reductions of power consumption of the receiver. Trade-off study is therefore important for this kind of receiver system. The details of the specifications and progress of the development will be reported in the presentation.