

新型ワンチップ周波数掃引スペクトル受信器の開発

萩行 憲輔 [1]; 小嶋 浩嗣 [2]; 山川 宏 [2]
[1] 京大・生存研; [2] 京大・生存圏

Development of a New-Type of the one-chip Sweep Frequency Analyzer

Kensuke Hangyo[1]; Hirotsugu Kojima[2]; Hiroshi Yamakawa[2]
[1] Rish,Kyoto Univ.; [2] RISH, Kyoto Univ.

Plasma filling the space is very rarefied. They don't exchange their kinetic energy through their collision but through plasma waves. Hence observing plasma wave is essential for studying the electromagnetic environment in space. Two types of plasma wave receivers have been developed, Sweep Frequency Analyzer (SFA) and Wave Form Capture (WFC). The SFA is the spectrum receiver, which has the capability to observe plasma wave spectra in good S/N ratio. On the other hand, the WFC observes amplitudes and phase of plasma waves. These receivers play complimentary roles in space plasma wave observation, so both of the receivers expected to be used to observe space plasma wave. However, since the SFA makes use of the superheterodyne method, the size of the electrical circuit is much larger than the WFC. Because of this size issue of the SFA, in the recent space mission, only the WFC is loaded and we obtain spectra by operating FFT to wave form data obtained by the WFC. However, in this method, it is difficult to get continuous spectrum data, because it need a lot of power consumption. Accordingly, a small size SFA is need to be developed.

Our attempt is to develop a small size SFA by designing the ASIC. By using ASIC, we can miniaturize the SFA, which was conventionally two A4 size, to business card size. The SFA contains the PLL synthesizer, band pass filters and frequency mixers. Furthermore, based on the ASIC SFA, we propose a new type of the SFA. In the conventional SFA, it sweeps the frequency band at very fine frequency step, so it takes long time to sweep all frequency range and time resolution becomes worse. However, the new SFA which we design, is the combination of the analog frequency conversion and digital FFT frequency analyses. By using this method, we can realize both good frequency resolution and good time resolution. In our presentation, we will show you our attempt in developing the miniaturized new-type SFA.