
ABSTRACTS (MASTER THESIS)

**Study on Minituarization of Sweep Frequency Analyzer
for Observation of Space Electromagnetic Environment**

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This thesis presented our attempt toward realizing a small-size Sweep Frequency Analyzer (SFA) using the ASIC (Application Specific Integrate Circuits). To get information on energy exchange process between plasma waves and particles, very small SFA is essential. In our previous study, components for SFA such as Phase Locked Loop (PLL) and Band Pass Filter (BPF) were designed and manufactured. However, each component did not operate as we designed and satisfy the required specifications. In this thesis, we studied the reason why the BPF and PLL which have manufactured in present study didn't operate as designed and redesigned these components. After discussing the problem of the previous study, we discussed the performance of each component and frequency conversion circuit. First, we studied the reason why the manufactured BPF was unstable and didn't have enough attenuation. It was because that the switching frequency of the BPF was 10 MHz which was higher against working speed of the used op-amp. By changing this switching frequency from 10 MHz to 2.5 MHz, we realized a stable BPF. In addition, by improving the measurement environment, the BPF can realize high attenuation. Moreover, we found that the lower attenuation of the manufactured BPF was due to the switching noise of the BPF. Regarding the PLL, we addressed the problem that it could not oscillate lower frequency signals. We found that the Voltage Controlled Oscillator (VCO), which worked in the PLL, also could not oscillate lower frequency signals. This was because that the OTA which was used in the VCO did not work as we designed. Moreover, we also found that the spectrum of the oscillation signal of PLL was too broad to work in the SFA. Finally, we manufactured these circuits in a one-chip and conducted performance test. We succeeded frequency conversion of the observation wave. In addition, when it comes to the frequency conversion part which composed of the mixer and the BPF, we succeeded to reach the dynamic range of 60dB.