

R006-22

A 会場 : 11/6 AM2 (10:45-12:30)

12:15~12:30

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Design and Performance Evaluation of an ASIC Chip Dedicated to Fundamental Mode Orthogonal Fluxgate Magnetometers

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We are working on the design of an analog circuit chip dedicated to Fundamental Mode Orthogonal Fluxgate Magnetometers (FM-OFG) for future scientific satellites. Fluxgate magnetometers are often used on space missions to measure variations in DC and low-frequency magnetic fields. Conventional parallel type fluxgate magnetometers use ring-core sensors, which have excellent noise characteristics and output offset voltage stability. On the other hand, a sufficiently large core is required to achieve low-noise detection, which is not suitable for miniaturization. However, recent development of micro and nano-satellites has increased the need for smaller onboard devices.

Therefore, we focused on a new type of fluxgate magnetometer. The sensor of the FM-OFG magnetometer consists of a pair of amorphous wire cores and a pickup/feedback coil. There is no need of excitation coils that are necessary for the ring-core sensor. While it is difficult to get below 10 gram per axis with a ring-core sensor, the FM-OFG sensor can be made much lighter at about 1 gram per axis.

In order to pursue smaller and lighter fluxgate magnetometers, it is also important to reduce the size of the electronic circuit. In this research, we focus on developing an analog chip called ASIC (Application Specific Integrated Circuit) to miniaturize the electronic circuit of the FM-OFG magnetometer. The electronic circuit of the FM-OFG consists of a drive circuit that excites the wire core, and a pickup circuit that picks up the signal from the sensor head and extracts the waveform of detected magnetic fields based on the feedback system. In this paper, we have designed the ASIC chip for the latter circuit by using the circuit simulator T-Spice and the layout tool Virtuoso. In addition, the designed ASIC chip was embedded in the evaluation board and performance test was conducted.