

## Basic study on search coil magnetometer for improving magnetic sensitivity

\*Yohei Yamaka<sup>1</sup>, Yuya Tokunaga<sup>1</sup>, Mitsunori Ozaki<sup>1</sup>, Satoshi Yagitani<sup>1</sup>

1. Kanazawa University

In order to safely operate satellite services, we have been investigating the plasma waves from 1 Hz to 10 kHz. To probe the magnetic field vectors of plasma waves, we use search coil magnetometers along with preamplifiers. The magnetic sensitivity are important profiles to determine the electrical performance of search coil. The lower value of magnetic sensitivity is better for probing the weaker plasma waves. In this study, we propose two methods for improving the magnetic sensitivity of previous search coils. The noise components characterized by the search coil impedance are dominant of the magnetic sensitivity in the frequency range from 100 Hz to 10 kHz, so decreasing the inductance values of search coils is necessary to achieve the better magnetic sensitivity. By using two search coils connected in parallel, the first method decreases a total inductance. The decreased inductance improves the magnetic sensitivity from 100 Hz to 10 kHz. In the second method, we use an adder circuit to synthesize the outputs of three search coils each having preamplifiers. The magnetic sensitivity from 1 to 10 kHz is better than the previous search coil because of decreasing the inductance of each search coil. We evaluated the magnetic sensitivity for two methods of the search coils. From the measurement results, the magnetic sensitivities at 2.5 kHz of first and second methods improve by 5.37 dB and 4.19 dB compared with that of the previous search coil, respectively. The magnetic sensitivity of first method is better than that of the second one, but the first method is impractical for scientific satellites due to having the mass and volume with 2 times larger than those of the previous search coil. On the other hand, the search coil by the second method increases the total power consumption depending on the number of preamplifiers, but it can be practical because of suppressing power consumption using application specific integrated circuit technology. In this presentation, we will present the basic study on the search coil magnetometers for improving the magnetic sensitivity in detail.

Keywords: Plasma wave observation, Magnetic field measurement, Search coil magnetometer