

Preliminary Results of Magnetic Field Observation by SS-520-2 Sounding Rocket

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The sounding rocket, SS-520-2 was launched at Ny-Alesund in Norway for the purpose to study ion outflow phenomena in the dayside cusp region. A magnetometer have carried for detecting magnetic field perturbations and rocket attitude. The magnetometer is a tri-axial fluxgate magnetometer with the sampling rate of 100 Hz and the resolution of about 2 nT/digit. As a preliminary result of attitude determination, the rocket have flown in a stable flight with the spin rate of 1.5 rps and the precessional angle of 2 degrees and the period of 8.5 seconds. We will present here preliminary results of magnetic field perturbation in this flight.

The sounding rocket, SS-520-2 was launched at 09:16(UT) on December 4, 2000 at Ny-Alesund in Spitzbergen Island, Norway for the purpose to study ion heating or acceleration processes and associated ion outflow phenomena in the day-side cusp region. A magnetometer have carried for detecting magnetic field perturbations and rocket attitude. The magnetometer is a tri-axial fluxgate magnetometer with the sampling rate of 100 Hz and the resolution of about 2 nT/digit. We present preliminary results here.

1. Magnetometer

Specification of the fluxgate magnetometer shows Table 1. The sampling rate of each axis for detecting magnetic field is 100Hz and the resolution has 2 nT/digit, respectively.

Table 1. Specification for the Magnetometer

Sensor Type	3-component ring core
Dynamical Range	+/-65,536 nT/component
Sampling Response	195 Hz
Resolution	2 nT/digit
Size/Weight	
Sens.	150x114x54 mm3/0.73 kg
Elec.	150x170x43 mm3/0.64 kg
Output Format	Digital 16bits/axis

2. Calibration and Data Analysis

2.1 Calibration for the magnetometer

The magnetometer have tested at Kakioka Magnetic Observatory Facility for ground calibration test and at ISAS (Institute of Space and Aeronautical Science) Magnetic Shield Room for detecting magnetic offset from other instruments. As the results, main characteristic of magnetometer, the sensitivity and offset are shown in Table 2.

Tabel 2. Characteristic of the Magnetometer

	X	Y	Z
Electronics offset(nT)	-17	-14	+12
Linearity of output(%)	0.09	0.05	0.05
Sensitivity(nT/digit)	1.99	2.02	2.00
Axis Orthogonality(90deg+/-)			
X-Y:	-0.458		
Y-Z:	-0.3438		
Z-X:	0.00		
Magnetic Offset (nT)	+195	284	-349

2.2 Data Analysis

We have determined tri-axial magnetic field intensities on the rocket by using the sensitivities and offset values. As the rocket motion, spin and precession has nearly shown stable during after the flight at 105 seconds from the launching, we have reduced the output changes from the motional changes. We will get perturbation from current layers if it exists. We assumed the resolution of magnetic field is about +/- 5-10 nT including analysis ambiguity.

3. Result of Attitudinal Performance

As a preliminary result of rocket attitude determination, the rocket have flown in a stable flight with the spin rate of 1.5 rps after the flight of 174 seconds from the launching. The spin showed a change from 1.8 rps, when some antennas extended at 90 seconds. The precession angle was 2 degrees on half angle and the period was 8.5 seconds. We will present here preliminary results of magnetic field perturbation in this flight.

4. Analysis magnetic perturbation

We are analyzing to get perturbation of magnetic changes associated from a current layer or line current or field-aligned current. We will expect intensity and size of current system by detecting perturbation, if it exist.