Geophysical Research Abstracts
Vol. 12, EGU2010-2163, 2010
EGU General Assembly 2010

Combined sensor for electromagnetic measurements in space

Vira Pronenko (1,2), Nickolay Ivchenko (2), and Valery Yelizarov (1)

(1) Lviv Centre of Institute of Space Research, Laboratory for Electromagnetic Investigation, Lviv, Ukraine (pron@isr.lviv.ua), (2) Royal Institute of Technology (KTH), Stockholm, Sweden

Ionospheric processes and wave activity in space plasmas in general are governed by electric and magnetic fields there. Thus, electric and magnetic fields are measured onboard practically all scientific ionospheric missions. The miniaturisation of the spacecrafts as well as the lack of place for booms at rocket experiments poses new requirements to the measuring devices.

The electric field intensity in space plasma is measured by electric field sensors - a pair of spherical probes spaced at a known distance, the magnetic field – with the help of flux-gate or induction magnetometers. To combine both these devices in one body would greatly help technological problems solution onboard, especially with necessary booms number decreasing. An attempt in this direction was made at the creation of so called “wave probe” – a device which united in one body the sensors of magnetic field, electric potential and spatial current density. This instrument was successfully used in space experiment [1]. Another combined instrument was made for Rosetta mission - the device consisting of flux-gate magnetometer, electrostatic analyzer and Faraday cup sensors [2].

In the present report a combined electromagnetic probe is proposed. This probe consists of three-component induction sensor placed into a sphere working as electric probe. The overview of the sensor design as well as expected noise level calculation for three-component induction magnetometer is made.

The next important requirement for this instrument proposed for small spacecrafts is as low as possible power consumption. This aspect is also studied and the possibility of using super –low power amplifiers as well as their influence on total noise level is considered.

Finally, the influence of electric probe conductive body on induction sensor sensitivity and noise level is analyzed. The experimental data obtained at the laboratory experiment are presented.

It is planned to test the new sensor as a part of the SQUID experiment (www.squid-kth.se) onboard the REXUS sounding rocket, to be launched in 2011 from Esrange Space Center in northern Sweden. The REXUS / BEXUS programme is realized under a bilateral Agency Agreement between the German Aerospace Center (DLR) and the Swedish National Space Board (SNSB).

References:

1. F. Dudkin, V. Korepanov, G. Lizunov. Experiment VARIANT – first results from Wave Probe instrument. Adv. Space Res., Vol.43, Issue12, pp.1904-1909 (2009)
2. H. U. Auster et al. ROMAP: Rosetta magnetometer and plasma monitor. Space Science Rev. (2007) 128: 221-240 DOI: 10.1007/s11214-006-9033-x.