

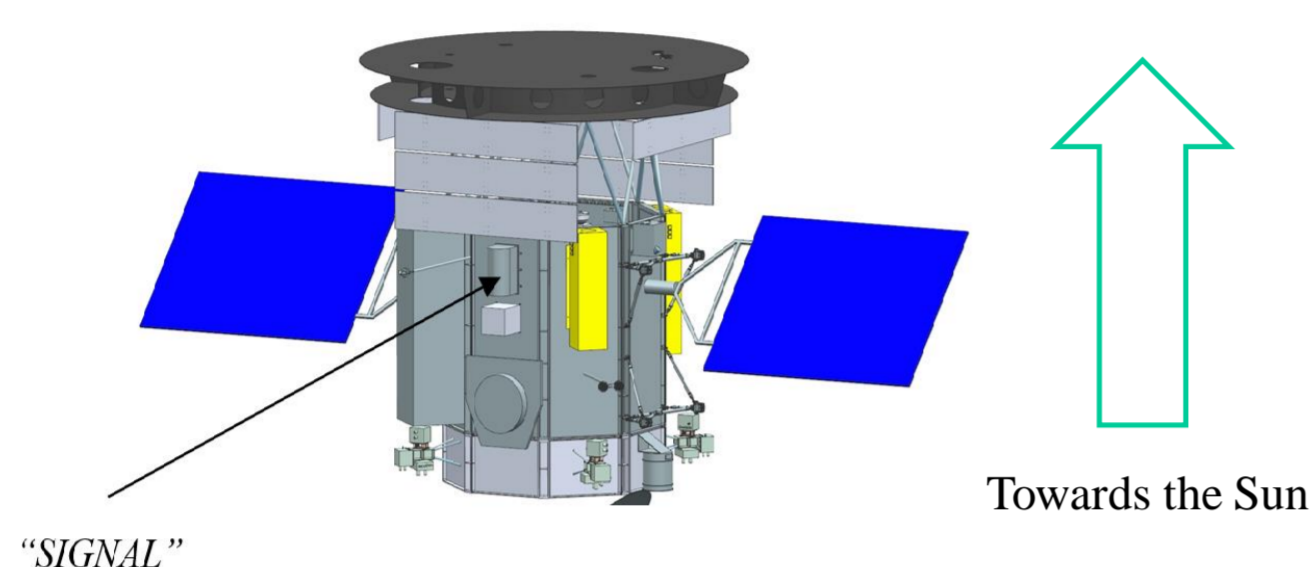
Data acquisition system for experiment “Signal” onboard spacecraft “Interhelioprobe”



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“Interhelioprobe” Mission



The “Interhelioprobe” mission aims at study of the inner heliosphere and the Sun at close distance and from out-of-ecliptic orbit.

“Signal” Electronics Prototype



1. Receiving and digitizing of electrical signals coming from XGD.
2. Receiving signals from ACD and forming a veto signal.
3. Processing of each digitized pulse from XGD according to the implemented in FPGA algorithm taking the veto signal into account.
4. Calculating the spectrometer dead time.
5. Forming energy distribution.
6. Transferring the obtained energy spectra and dead time values to the data collection and accumulation system.

Data size

Long-term storage (Data Collection and Accumulation System, DCAS)	400 Mbyte – 20 days
“Signal” internal memory	128 Mbyte
Data packet size	2032 byte

Number of commands – 32 (1024 bytes)

Data transfer

Average	20 Mbyte/24 hours
Average per observation session	2 kbit/sec
Peak	16256 bit/sec

Timestamps

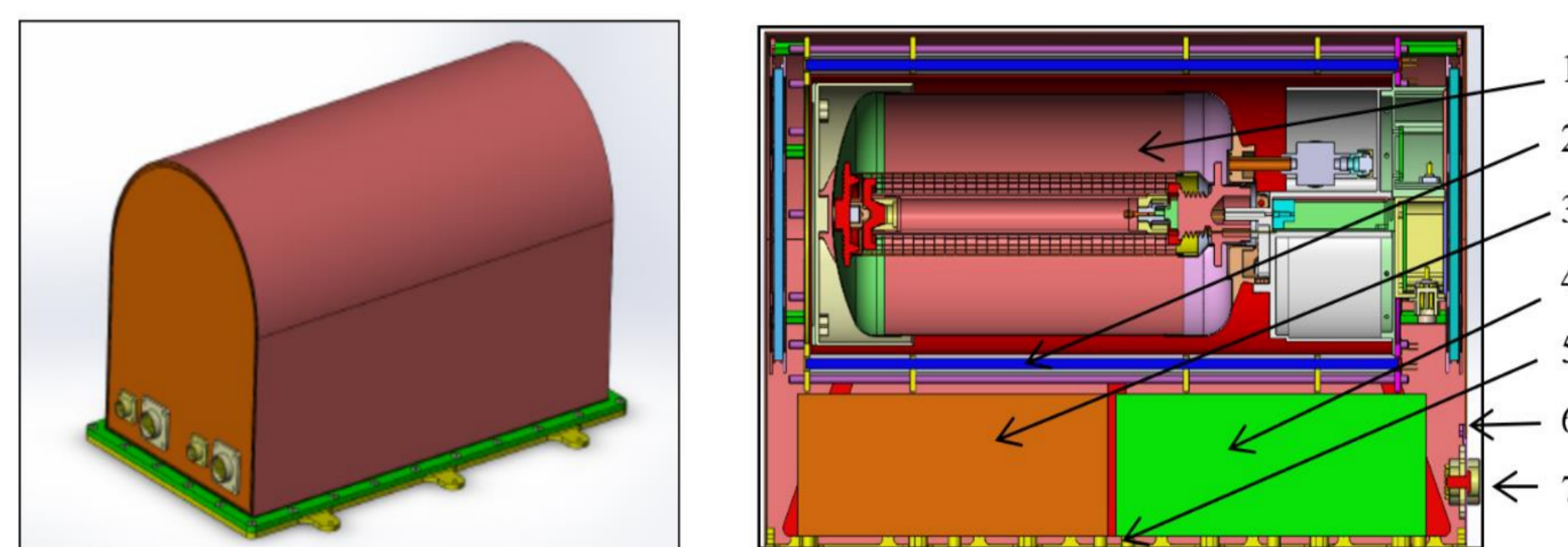
Time accuracy in relation to the spacecraft time < 1 ms

Timestamps are included into scientific data packets

References

1. Novikov, A. S. et al, “New modification of xenon gamma-ray detector with high energy resolution” // Opt Eng, 53(2), 021108 (2014)
2. A E Shustov et al, “Development of anticoincidence system for “Signal” experiment” // J. Phys.: Conf. Ser. **798** 012163 (2017)
3. Novikov, A. S. et al, “Xenon gamma-ray detector’s electrical signals digital processing technique” // Proc. of XXIV Int. Symp. on Nuclear Electronics & Computing (NEC’2013), 192-197 (2013)

“Signal”



- 1 – xenon gamma-ray detector (XGD);
- 2 – scintillator anti-coincidence detector (ACD), polyvinyl toluene with silicon photomultipliers (SiPMs);
- 3 – power supply and voltage conversion and stabilization unit;
- 4 – digital electronics unit; 5 – platform; 6 – protective case;
- 7 – connectors.

“Signal” will operate in two modes:

1. Continuous measurement
2. γ -ray-bursts registration

“Signal” is planned to be turned on after SC insertion into the Earth’s orbit and completion of all operations testing its systems’ functioning. The “Signal” scientific equipment will then operate continuously during the entire spacecraft mission.

