International Experiments Onboard the Russian Segment of the International Space Station in the Frame of the Space Weather Program. "Obstanovka 1-st stage" (Interaction and Charge progect).

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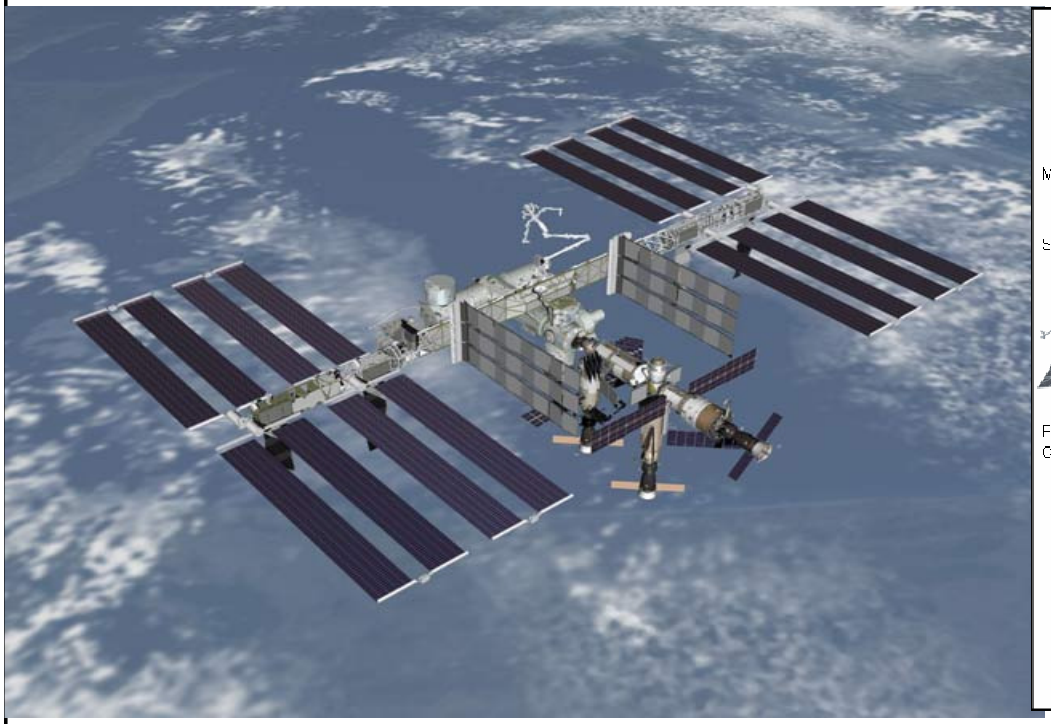
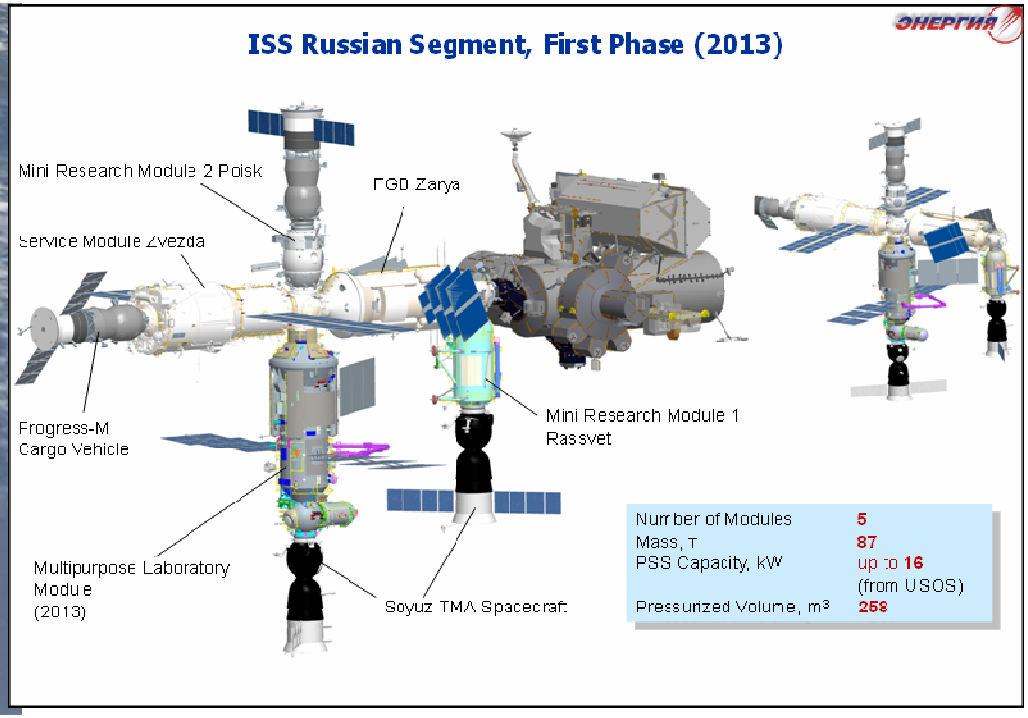
M.-P.Gough,
University of Sussex, Sussex, United Kingdom;
B.Kirov, G.Stanev, K.Georgieva
Institute for Space Research and Technologie, Sofia, Bulgaria;
H.Rothkaehl.

Space Research Center, Warsaw, Poland.

Fifth Workshop Solar Influences on the Magnetosphere, Ionosphere and Atmosphere. ***Nessebar, Bulgaria, 3-7 June 2013***

Infrastructure of the Russian Segment of the ISS





The ISS carries out its flight within the altitude range of 350 to 450 km in the Earth ionosphere which is a sensitive indicator of helio-geophysical phenomena. The ionosphere is an important area of geophysical research which determines importance and actuality of the part of the ISS research activities devoted to geophysical studies in near Earth space.

In the report 5 experiments, oriented to the study of the parameters of space weather, both those previously neglected, and planned to the starting, are examined:

1. Micro-satellite "Kolibri-2000" – realized at 2002.

2. Micro-satellite "Chibis-M" – 2012-2015.

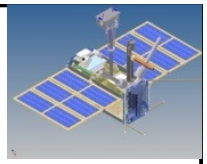
3. Experiment « Obstanovka 1-st stage » - 2013-2018.

4. Experiment « Obstanovka 2-nd stage » - 2015-2020.

5. Micro-satellite "Trabant" – 2015-2020.

Scientific instruments of these projects are developed and made on the basis of the international cooperation.

2. Micro-satellite “Chibis-M”, 2012-2015.

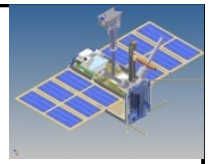


Российская академия наук

Микроспутниковая платформа «Чибис» Российской академии наук.

Fifth Workshop Solar Influences on the Magnetosphere, Ionosphere and Atmosphere. ***Nessebar, Bulgaria, 3-7 June 2013***

2. Micro-satellite “Chibis-M”.



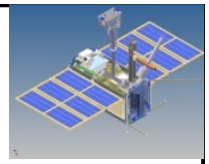
At **November 2, 2011** cargo ship “Progress M-13M” which also deliver microsatellite “Chibis-M” was docking with ISS.

The main purpose of “Chibis-M” is the study of physical processes in the vicinity of the lightning, during which the Terrestrial Gamma Ray Flashes (TGFs) are generated. TGFs are likely produced by beams of very energetic electrons, which are accelerated in the intense electric fields generated by large thunderstorm systems.

The deployment of “Chibis-M” on the circular orbit will be happened on the final stage of “Progress M-13M” operation. According plan of Russian Space Control Center undocking of “Progress M-13M” occur at **January 24 2012, 01:59 msk** and after two corrections it will be positioned at 500 km orbit.

At January 25 2012, 03:14 msk
“Chibis-M” was begun the own flight.

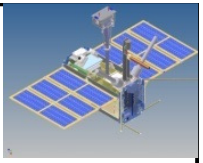
2. Micro-satellite “Chibis-M”.

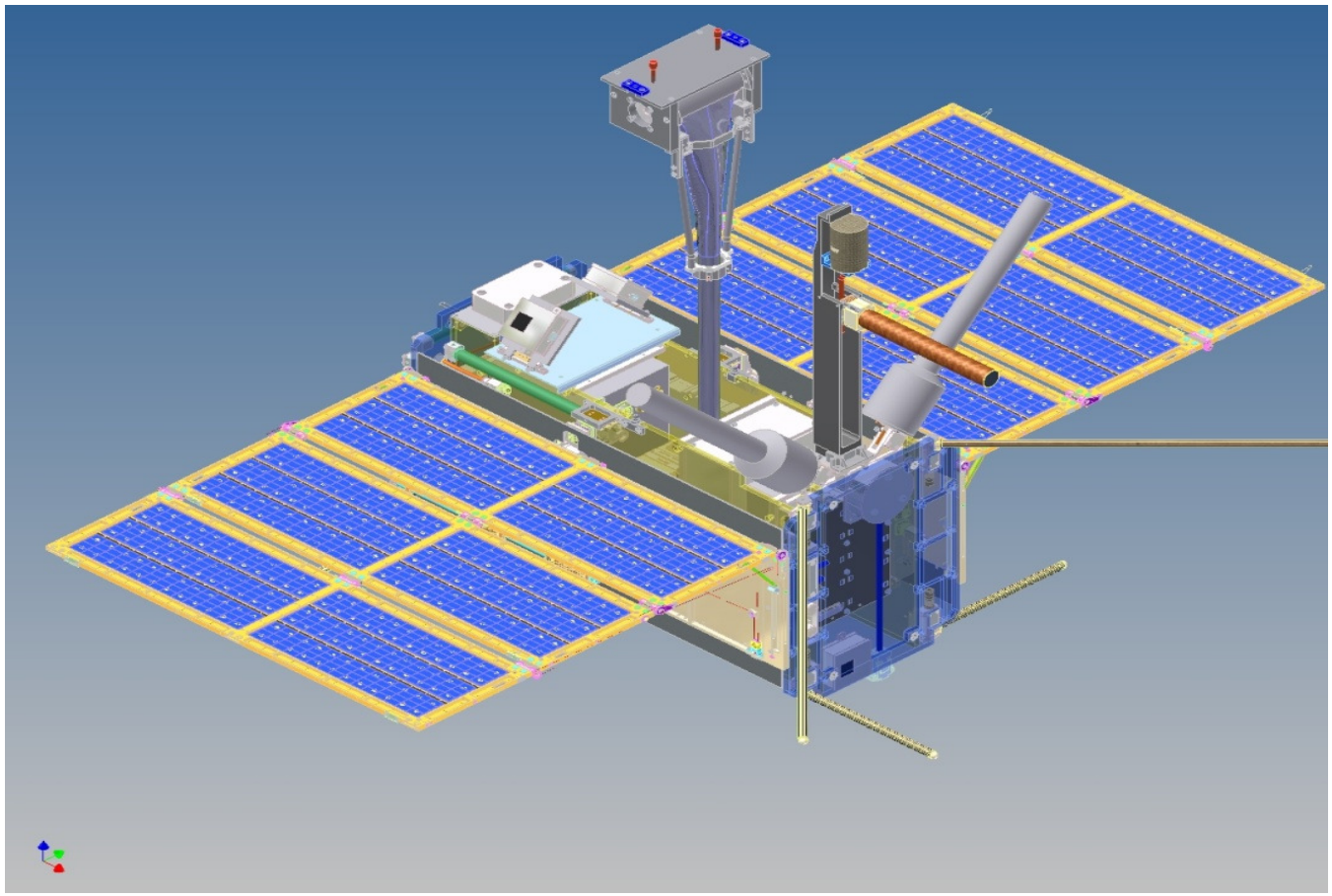


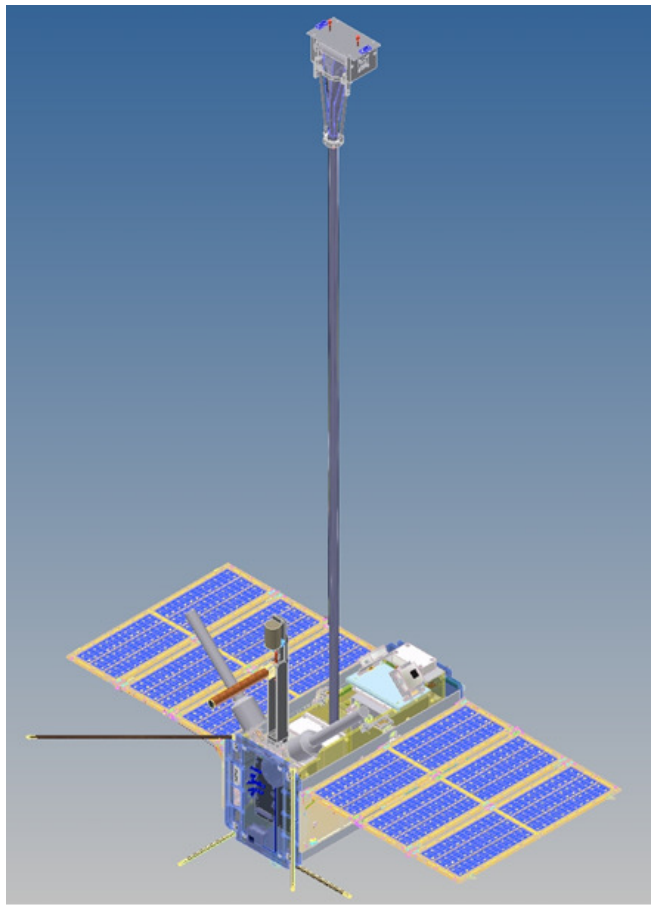
Composition of the complex of scientific instruments:

- Roentgen - gamma detector, range of X-ray and gamma emissions - 50-500 keV [RGD, SINP MSU, **Russia**];
- Ultraviolet detector, range of ultraviolet 300-450 nm and infrared 600-800 nm radiation [DUF, SINP MSU, **Russia**];
- Radio-frequency analyzer, 26-48 MHz [RChA, SRI RAS, **Russia**];
- Camera of optical range, spatial resolution 100-300 m [TsFK, SRI RAS, **Russia**];
- Magnetic- wave complex [MWC]: PSA, SC, CWP 1, CWP 2, FGM (0.1-40 kHz) [Etvos University, **Hungary**, LC SRI NANU-GKAU, **Ukraine**];
- Block of the accumulation of data of [BND- Ch, SRI RAS, **Russia**];
- Transmitter of scientific information [PRD2,2 , SRI RAS, **Russia**].

2. Micro-satellite “Chibis-M”.

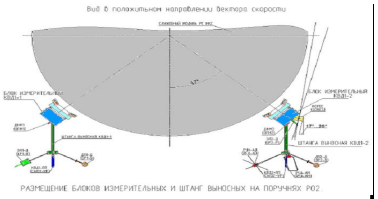






total mass of 40 kg

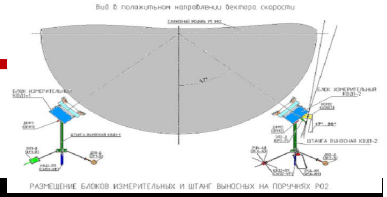
3. Experiment « Obstanovka 1-st stage

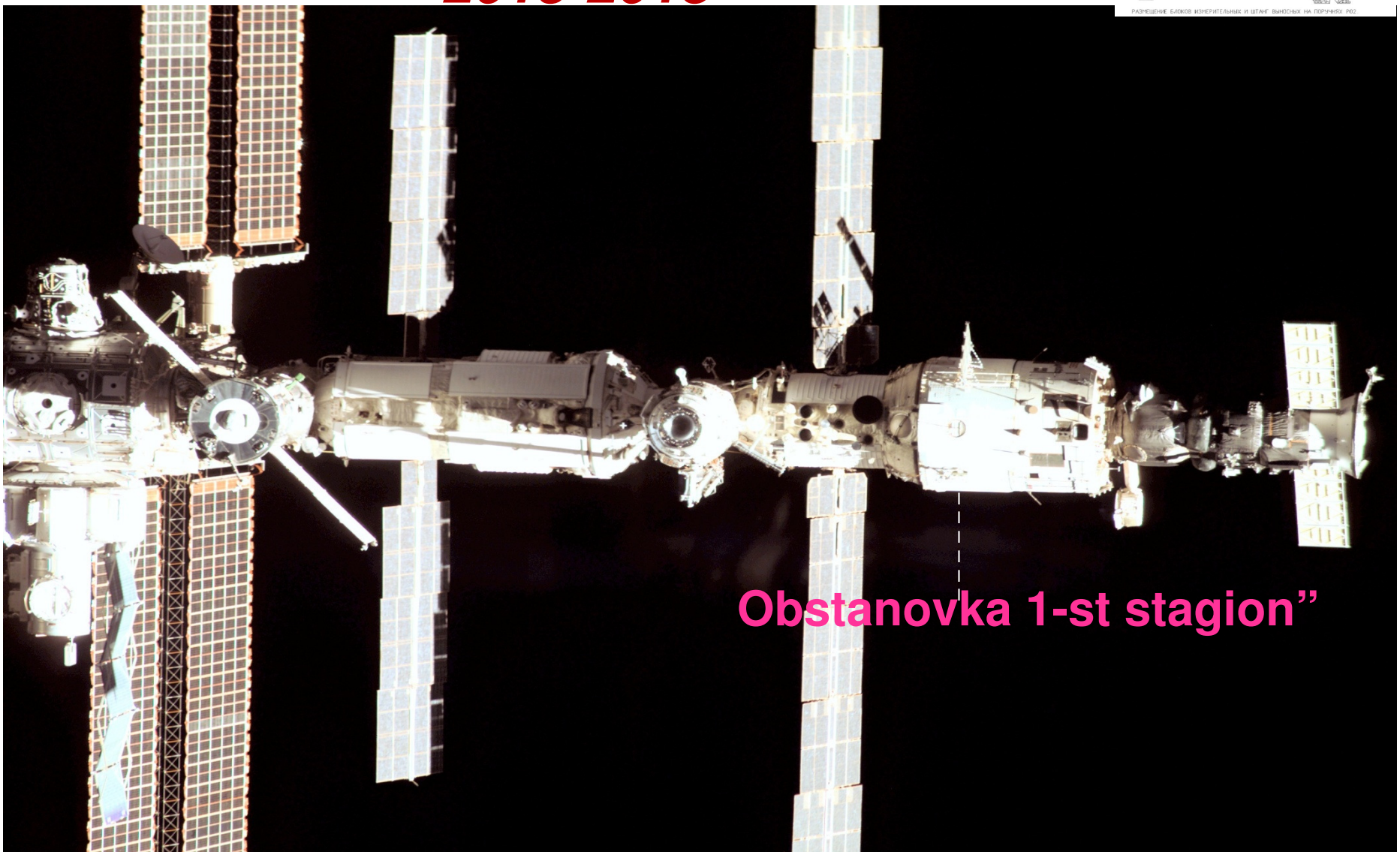


The International experiment “Obstanovka 1st stage” on the Russian Segment of the International Space Station (RS ISS) is first of all directed toward the global monitoring of the electromagnetic parameters of space weather (SW).

This experiment is at final development stage and will be launched in the begining of 2013, together with the European ASIM and Japanese GLIMS payloads for the other segments of the ISS.

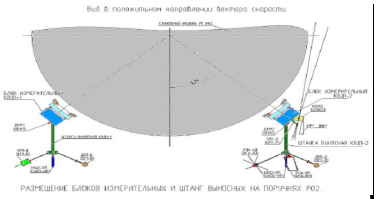
3. Experiment «Obstanovka 1-st stage» - 2013-2018





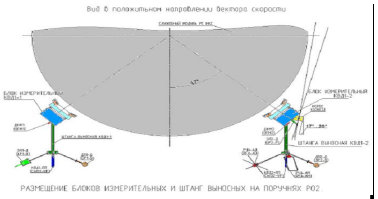
http://www.cosmos.ru/obstanovka/eng/index.htm

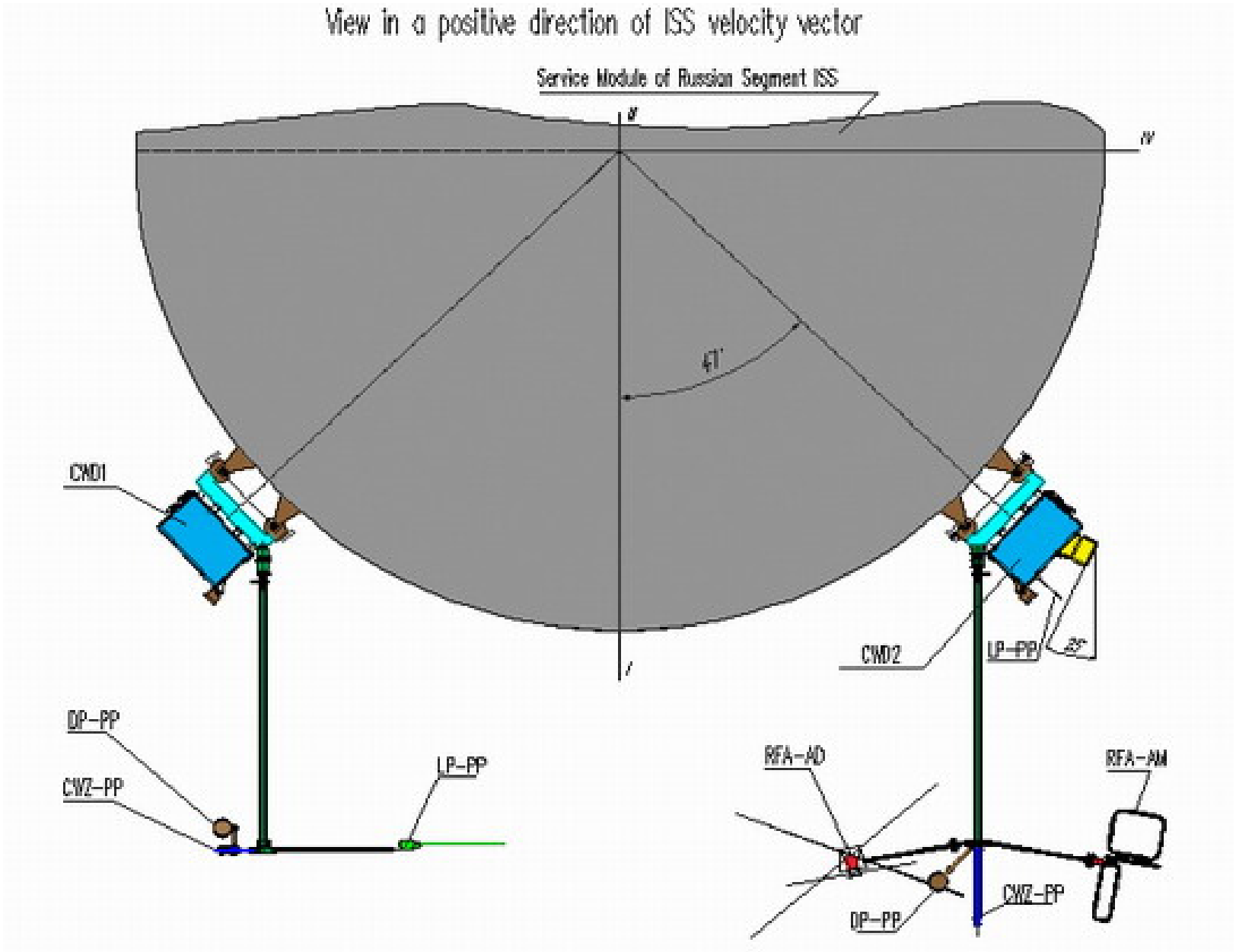
3. Experiment «Obstanovka 1-st stage»



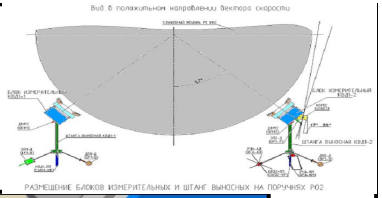
Unit	Responsible Institute
Combined wave sensor – CWS-1, CWS-2	LC ISR, Ukraine
Fluxgate magnetometer – DFM-1	IKI RAS, Russia
Fluxgate magnetometer – DFM-2	LC ISR, Ukraine
Langmuir probe – LP-1, LP-2	STIL BAS, Bulgaria
Spacecraft potential monitor – DP-1, DP-2	ISR BAS, Bulgaria
Correlating Electron and ion Spectrograph, CORES	Sussex University, United Kingdom
Radio Frequency Analyzer – RFA	SISP, Sweden; SRC PAS, Poland
Signal Analyzer and Sampler – SAS3	Eötvös University, Hungary
Data Acquisition and Control Unit – DACU	KFKI RMKI, Hungary
Block of Storage of TeleMetry – BSTM (inside ISS)	KFKI RMKI, Hungary
Automatic System of ThermoRegulation – ASOTR	IKI RAS, Russia
Booms with sensors	RKK “Energia”, Russia

3. Experiment «Obstanovka 1-st stage»





3. Experiment «Obstanovka 1-st stage»



2013 г.

Комплексные плазменно-волновые исследования

Адаптер МАД1 с блоком КВД1

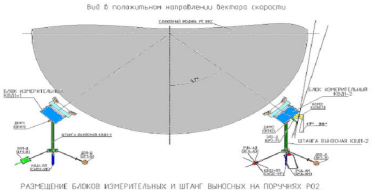
Адаптер МАД2 с блоком КВД2

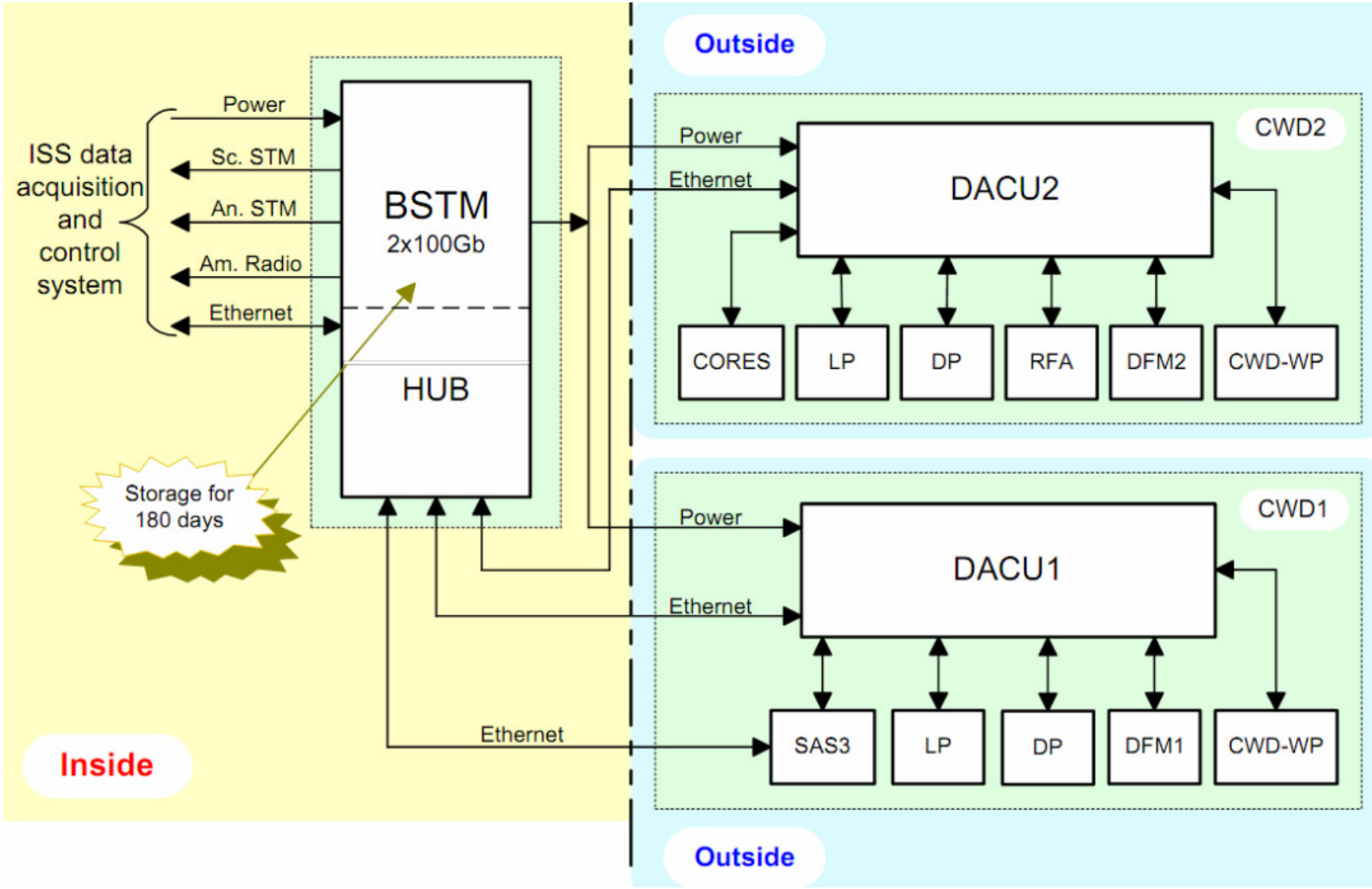
Штанга ШКД1 с датчиками

Штанга ШКД2 с датчиками

Масса НА с кабелями и элементами крепления ~ 140 кг

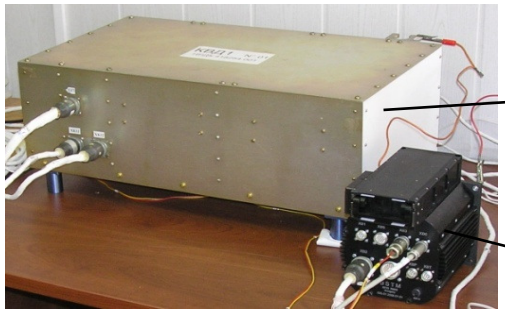
3. Experiment «Obstanovka 1-st stage»





3. Experiment «Obstanovka 1-st stage»

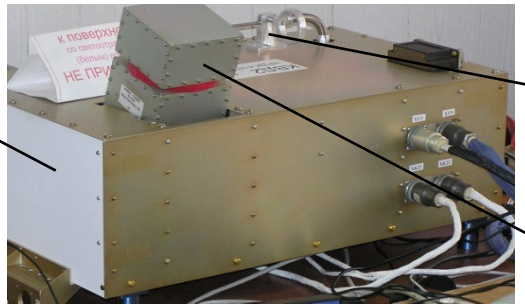
Аппаратура плазменно-волнового комплекса.



КВД-1
(ИКИ РАН)

КВД-2
(ИКИ РАН)

Блок хранения телеметрической информации БХТИ (Венгрия)



Зонд Ленгмюра ЗЛ-ПП (Болгария)

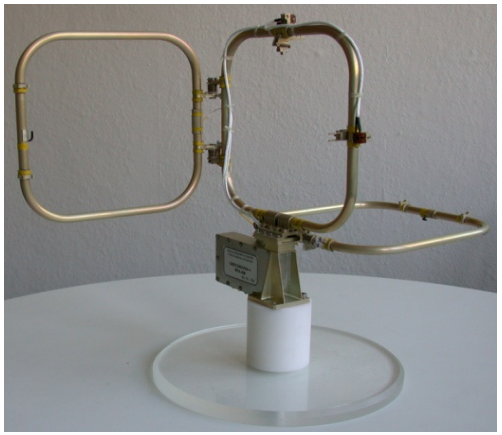
Прибор «Корес» (Великобритания)

ШКД1 ШКД2
(РКК «Энергия»)

Датчик потенциала ДП-ПП (Болгария)

Зонд КВЗ-ПП (Украина)

Зонд Ленгмюра ЗЛ-ПП (Болгария)



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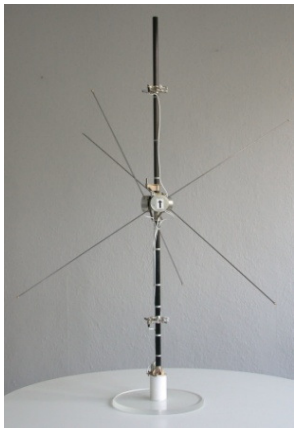

Антенна дипольная РЧА-АД (Польша)

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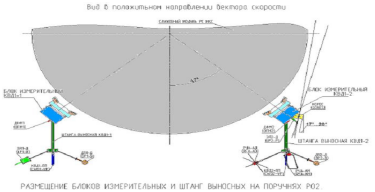
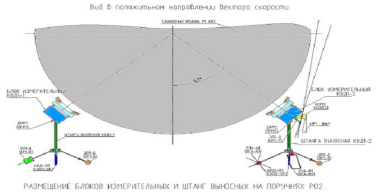
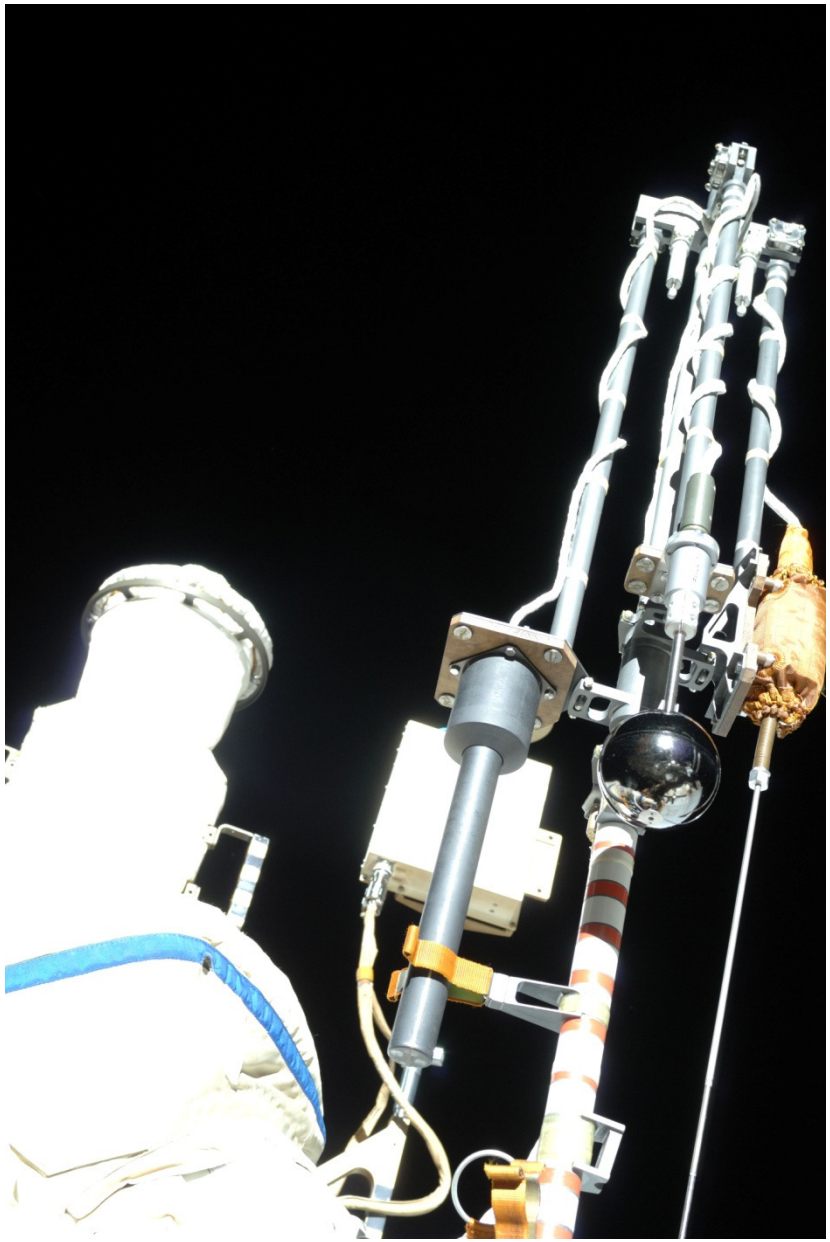
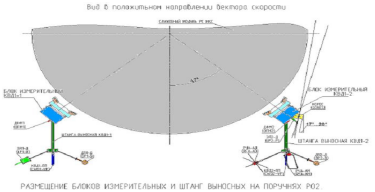


3. Experiment «Obstanovka 1-st stage»





3. Experiment «Obstanovka 1-st stage»



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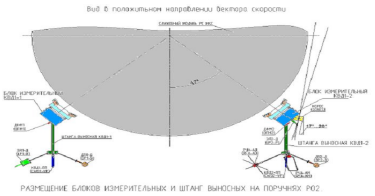

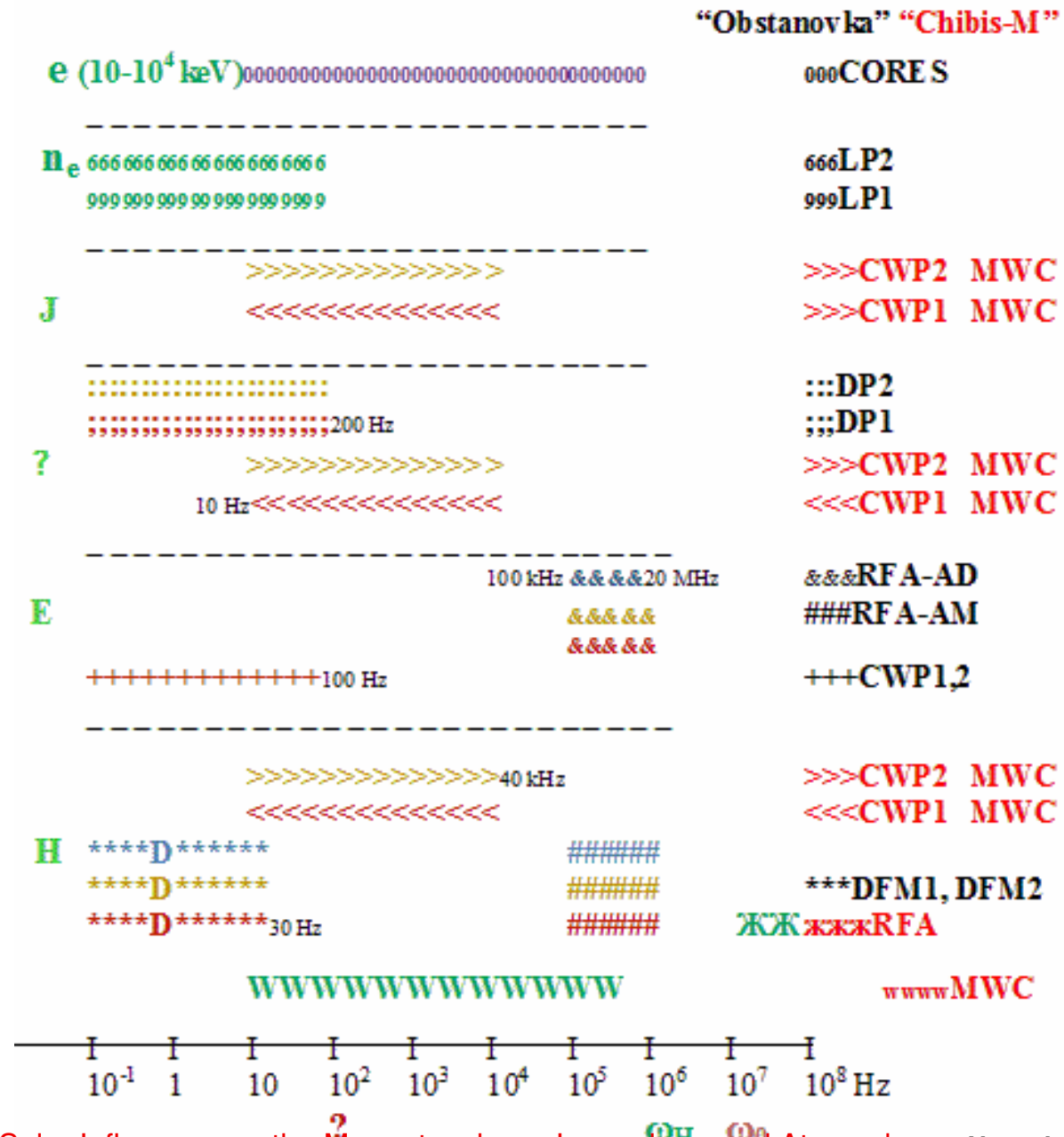

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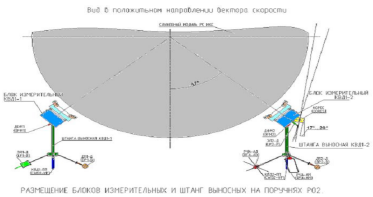
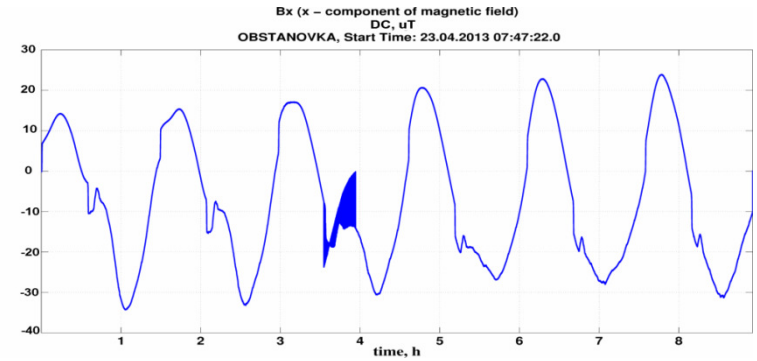
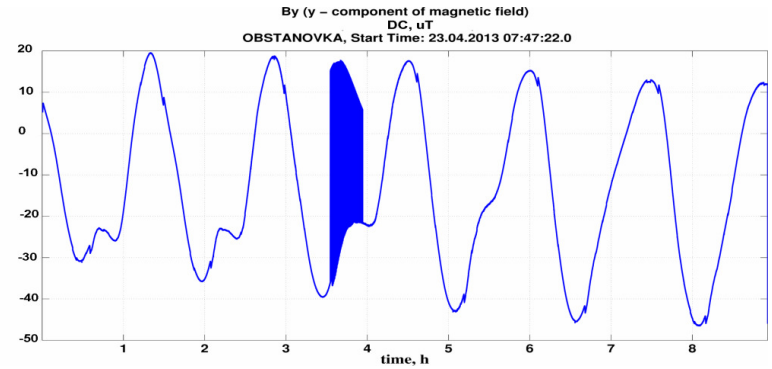
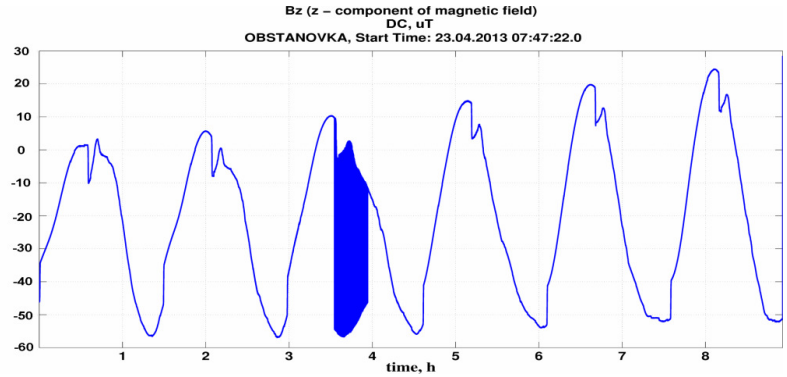
3. Experiment «Obstanovka 1-st stage»

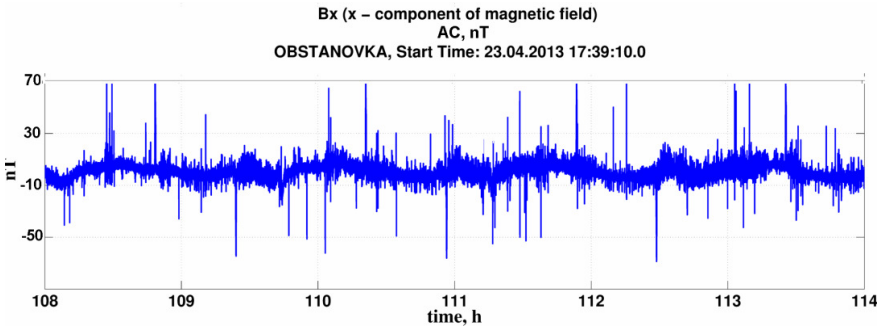
DFM1 data (DC and AC channels)

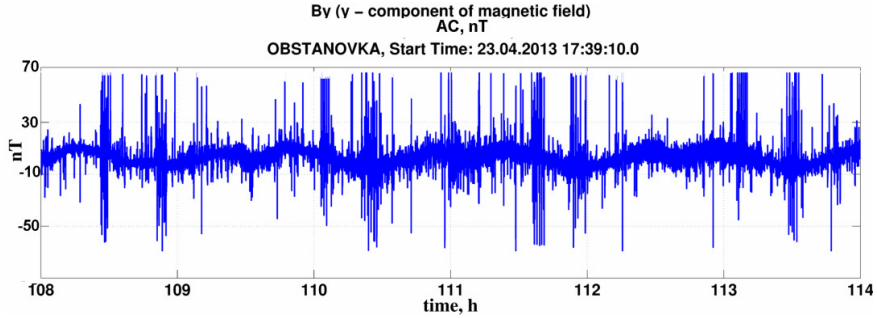


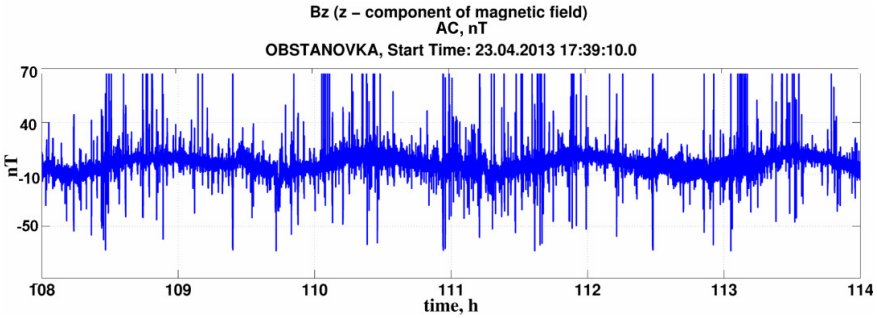












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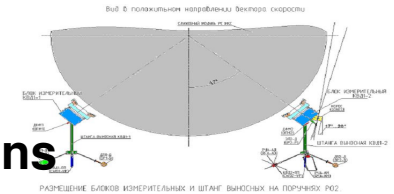
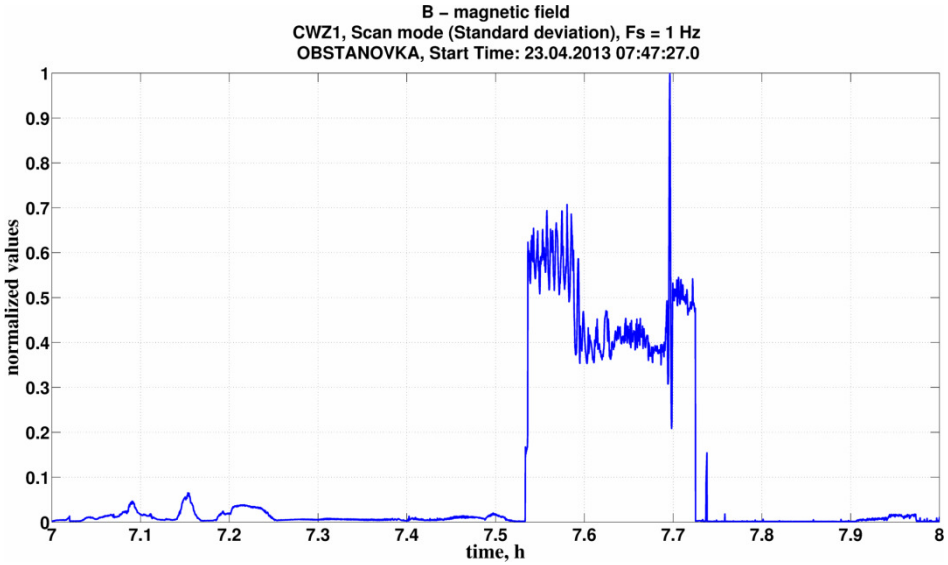
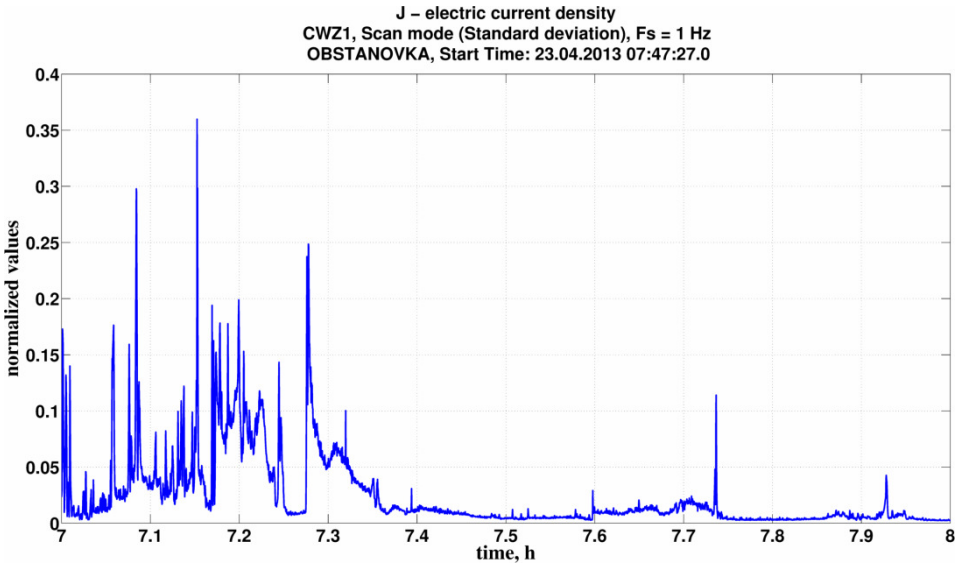
3. Experiment «Obstanovka 1-st stage»

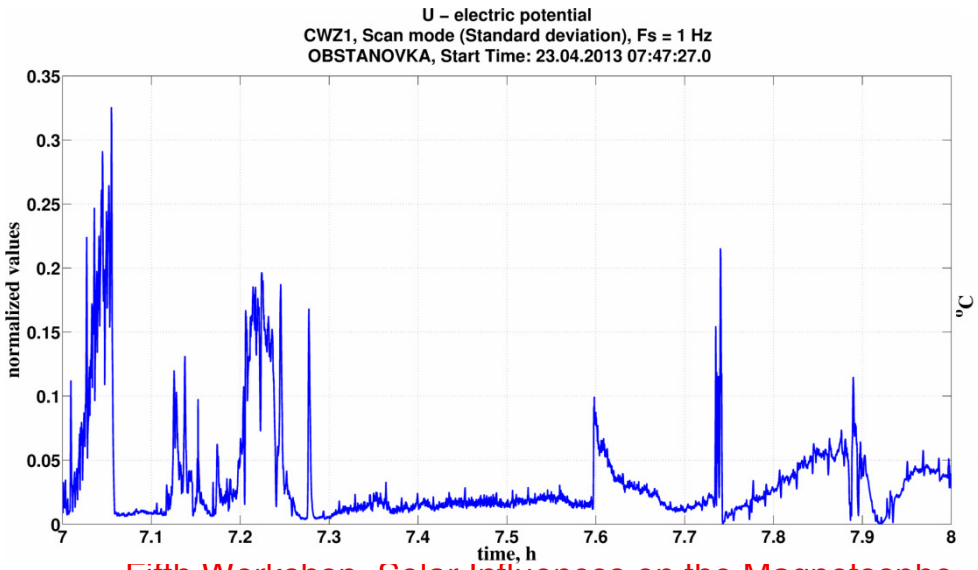


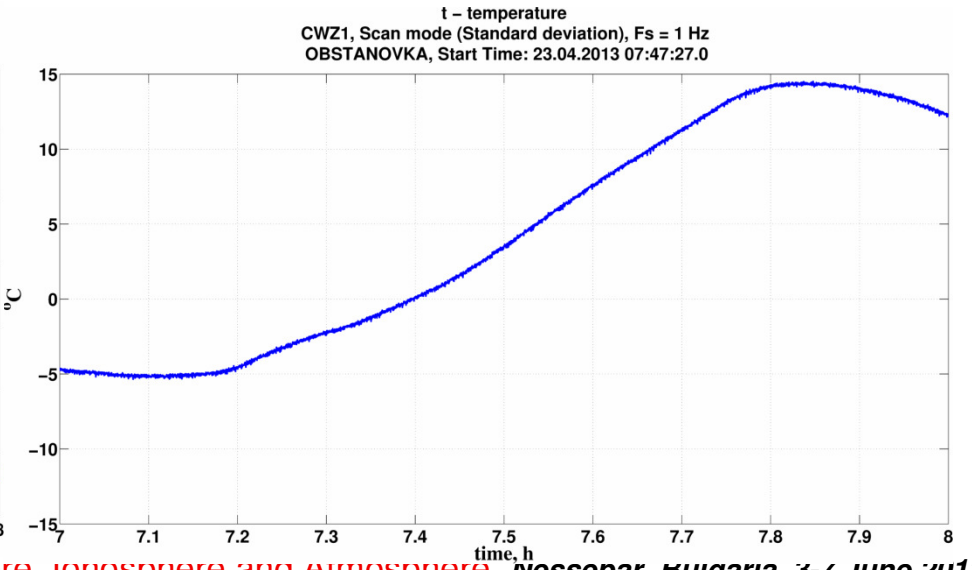
CWZ1 data zoomed

Normal mode – 1s (800 samples) average of squared signal variations



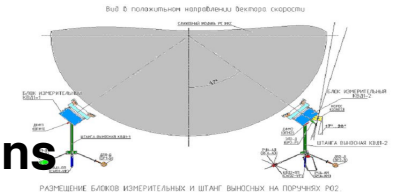






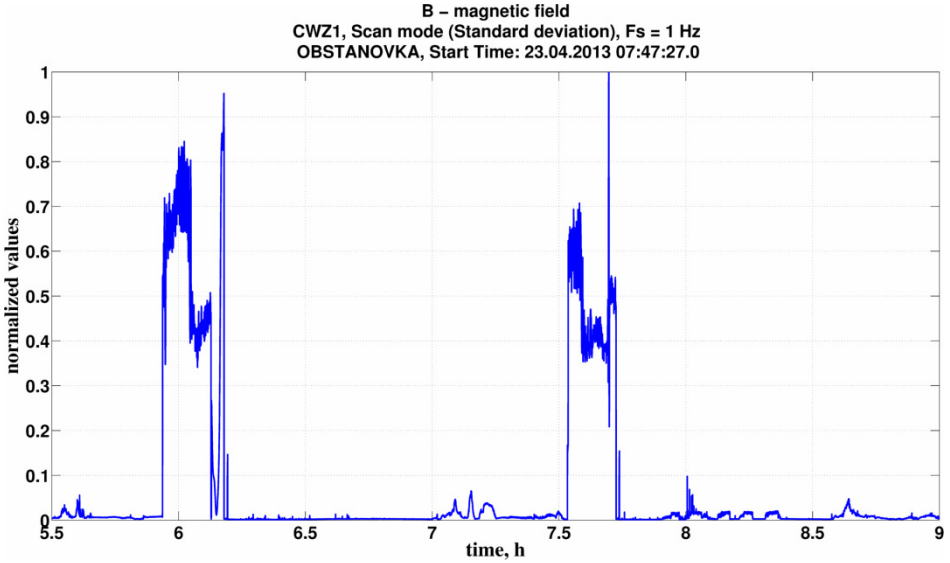
2013 04 23

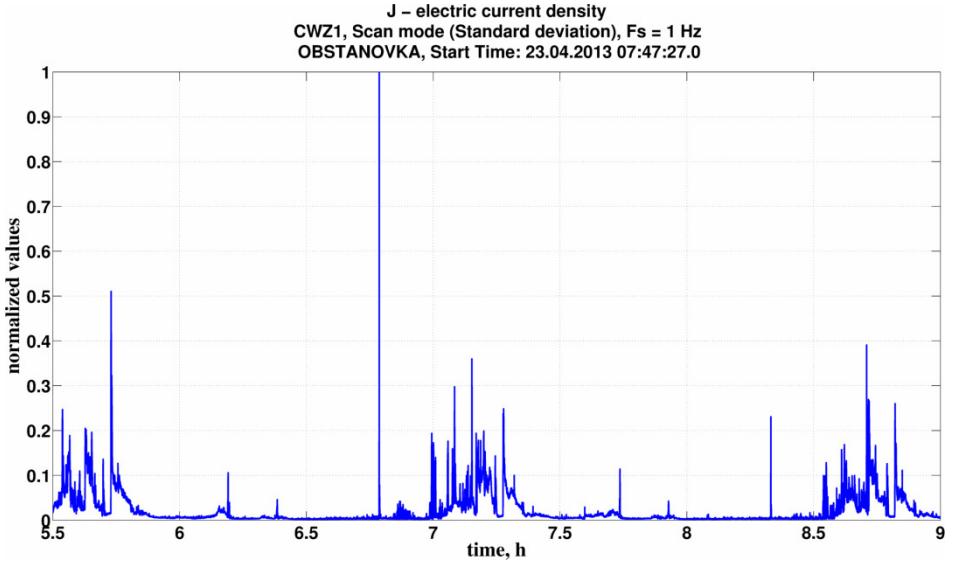
3. Experiment «Obstanovka 1-st stage»

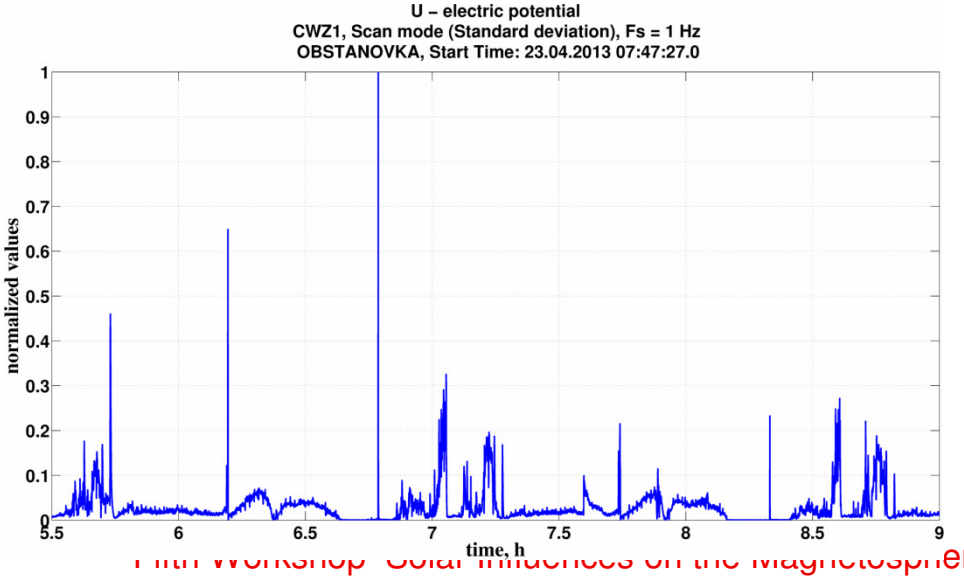


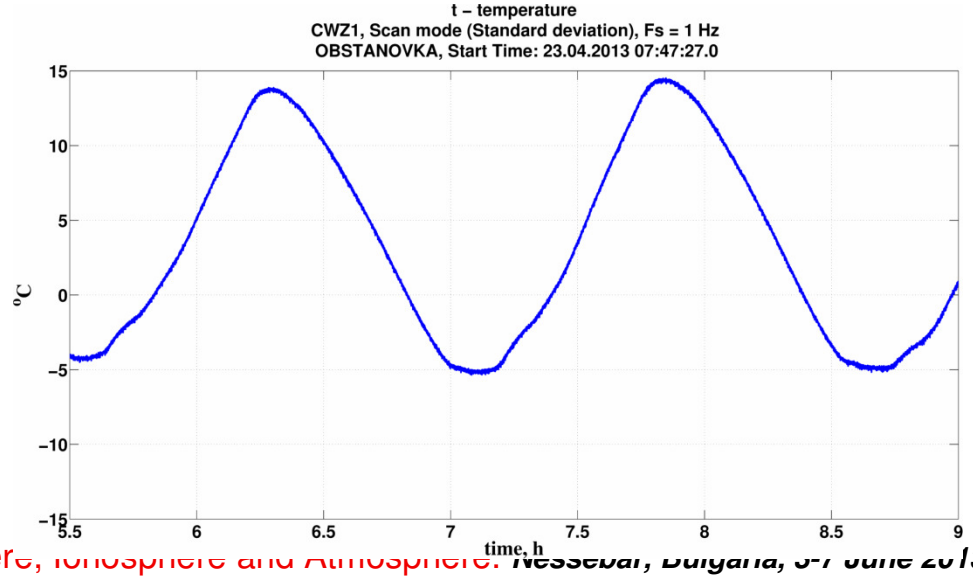
CWZ1 data zoomed

Normal mode – 1s (800 samples) average of squared signal variations

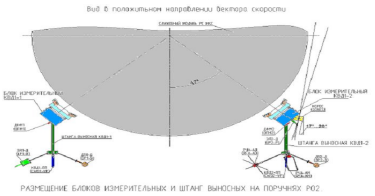








3. Experiment «Obstanovka 1-st stage»



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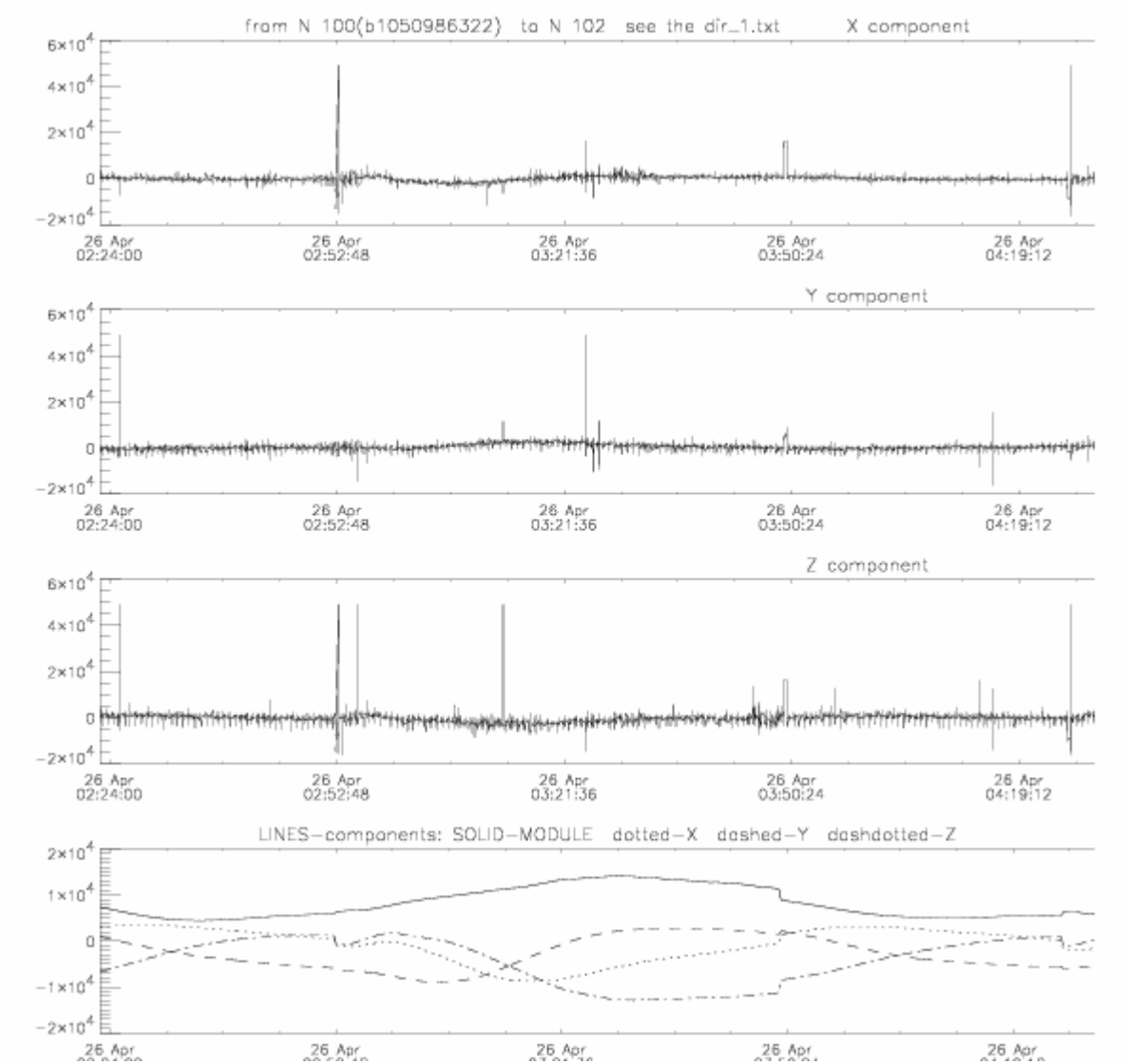
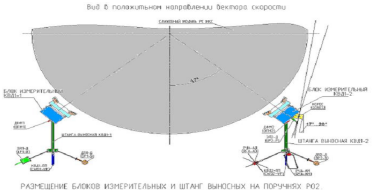


3. Experiment «Obstanovka 1-st stage»



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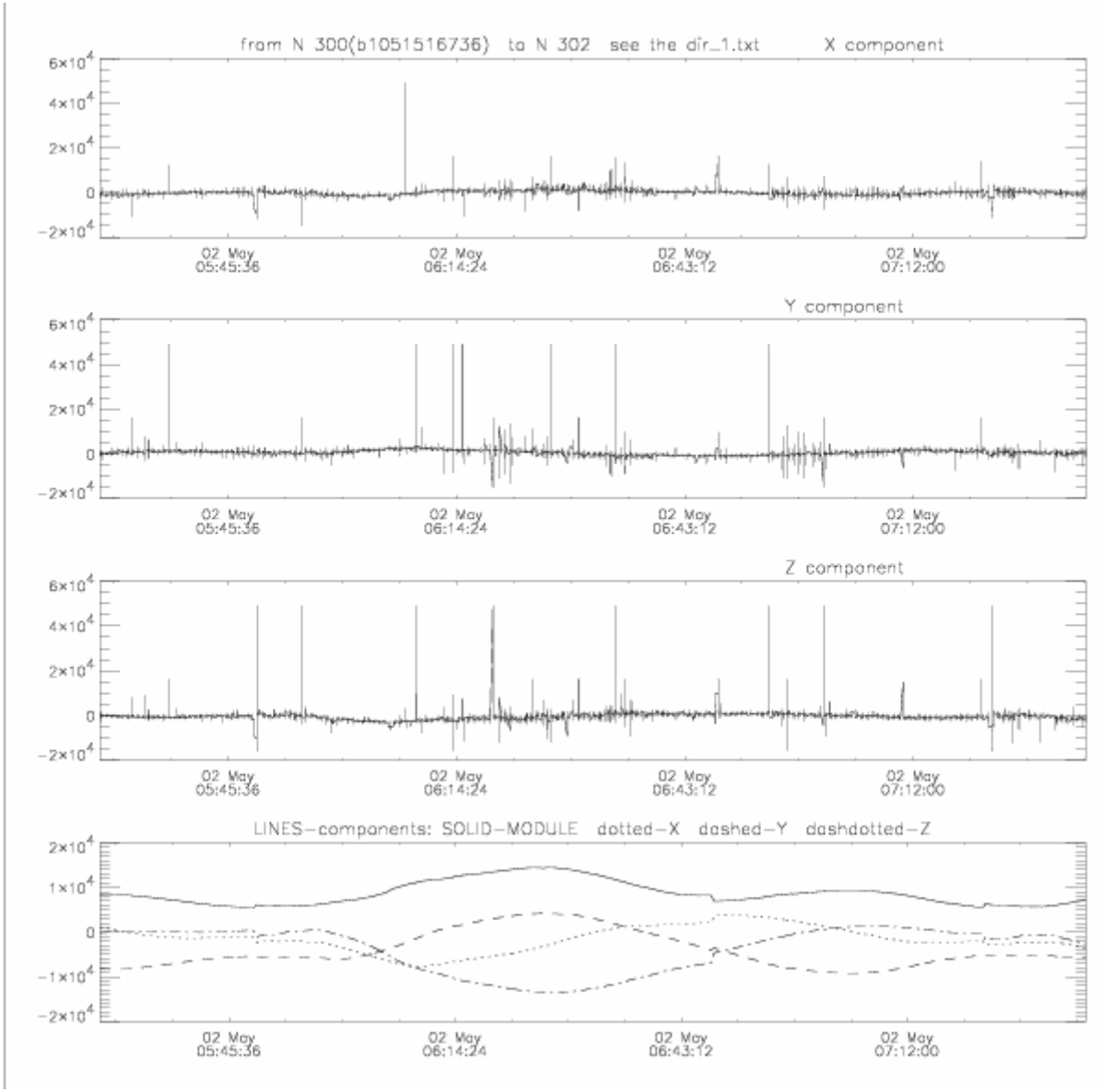
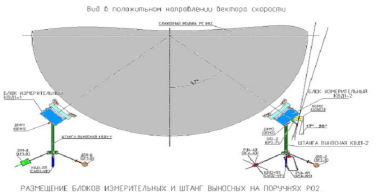


3. Experiment «Obstanovka 1-st stage»



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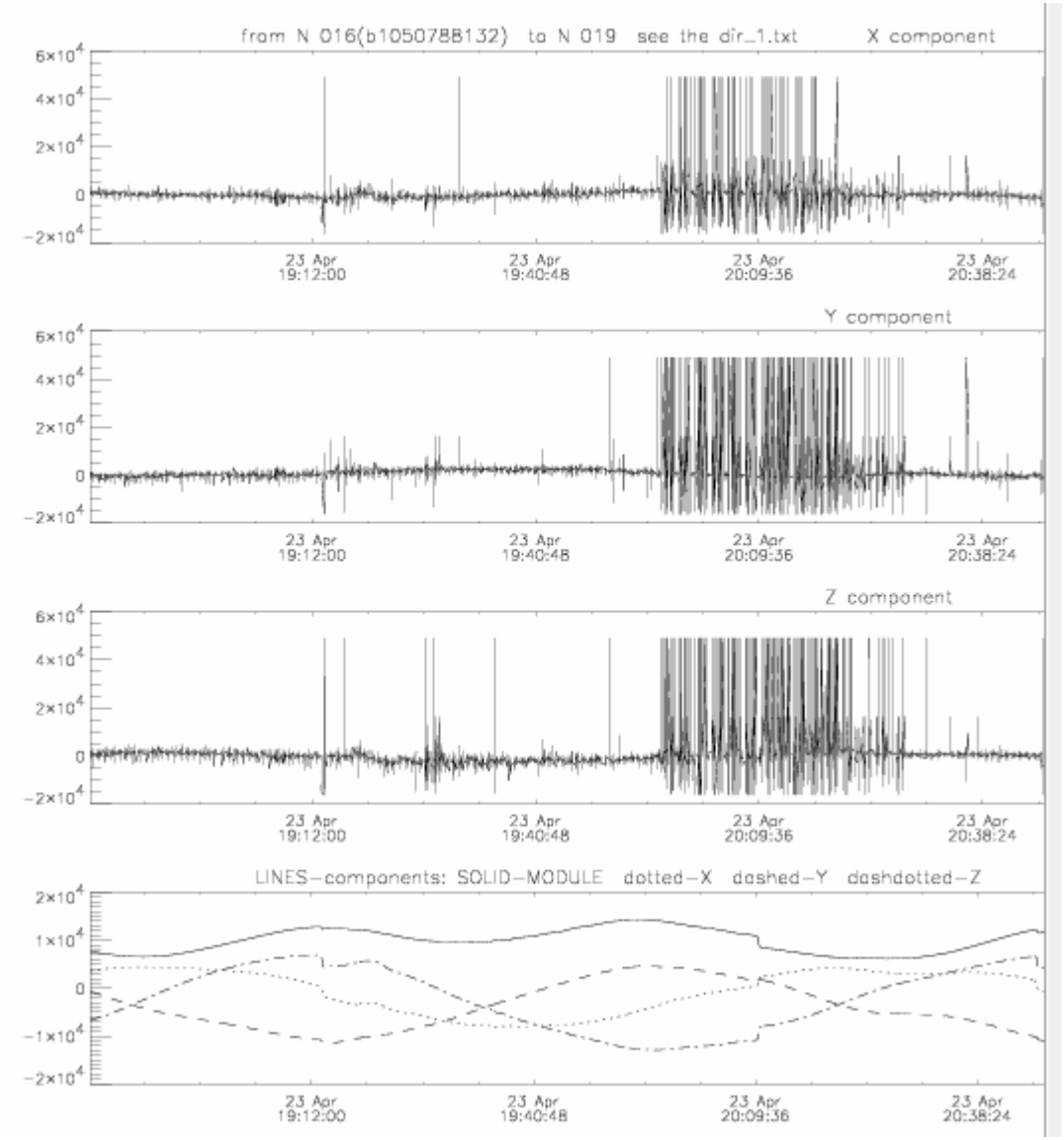
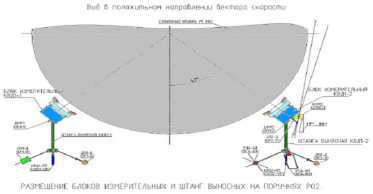


3. Experiment «Obstanovka 1-st stage»



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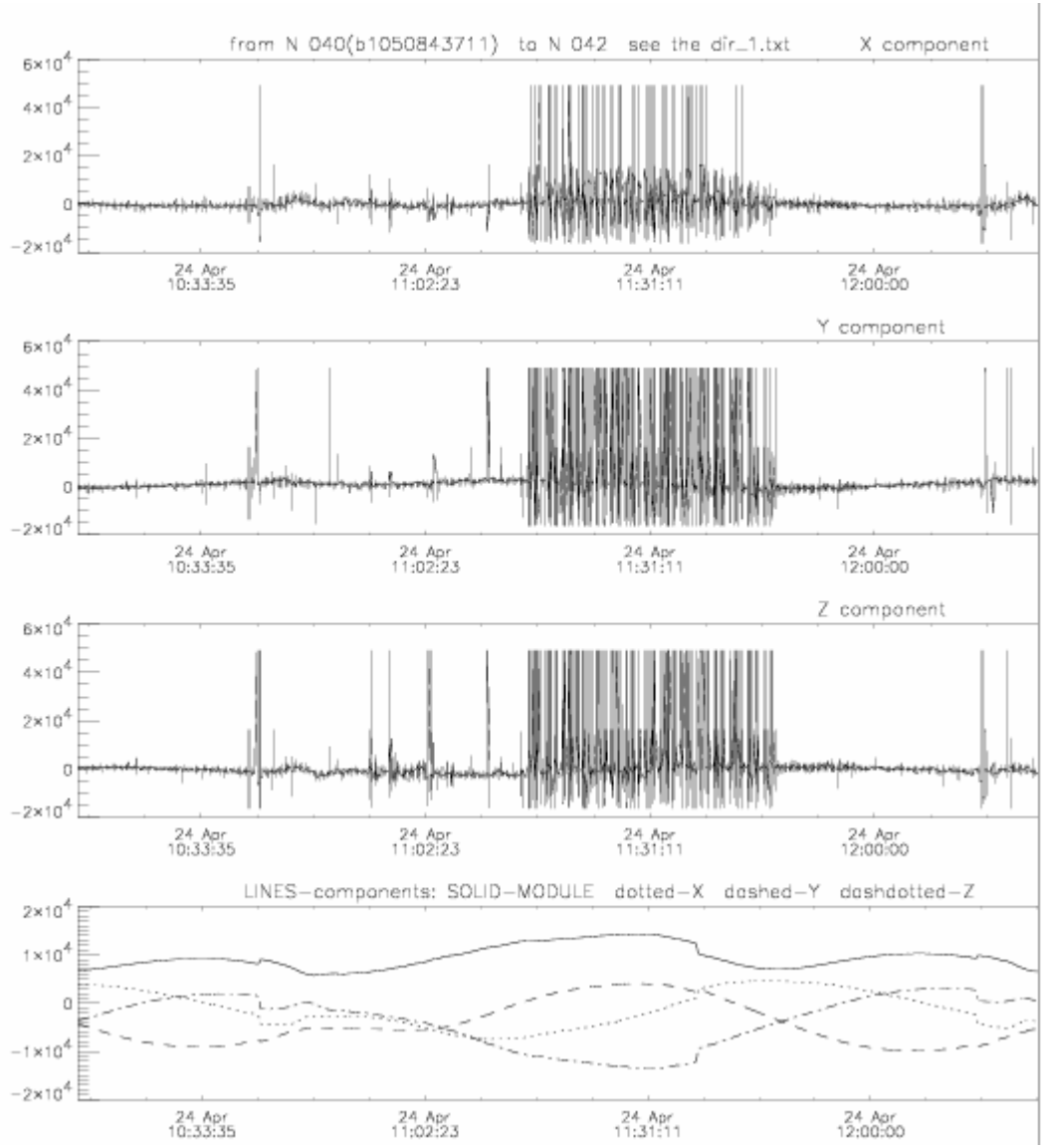

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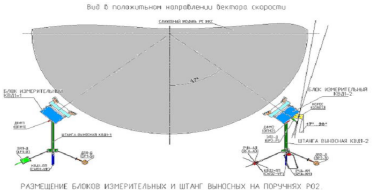

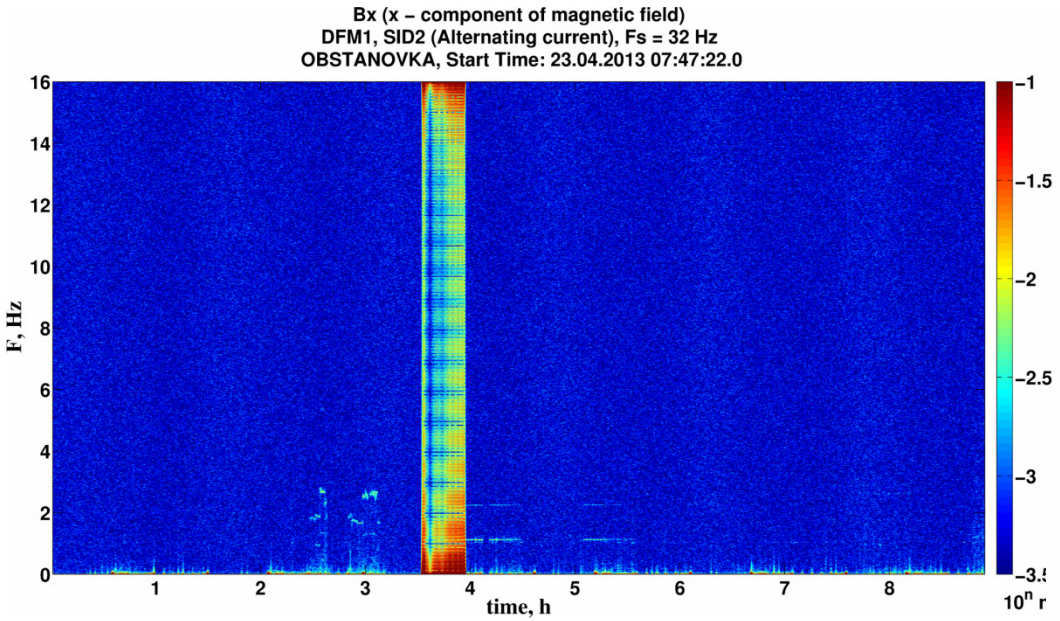

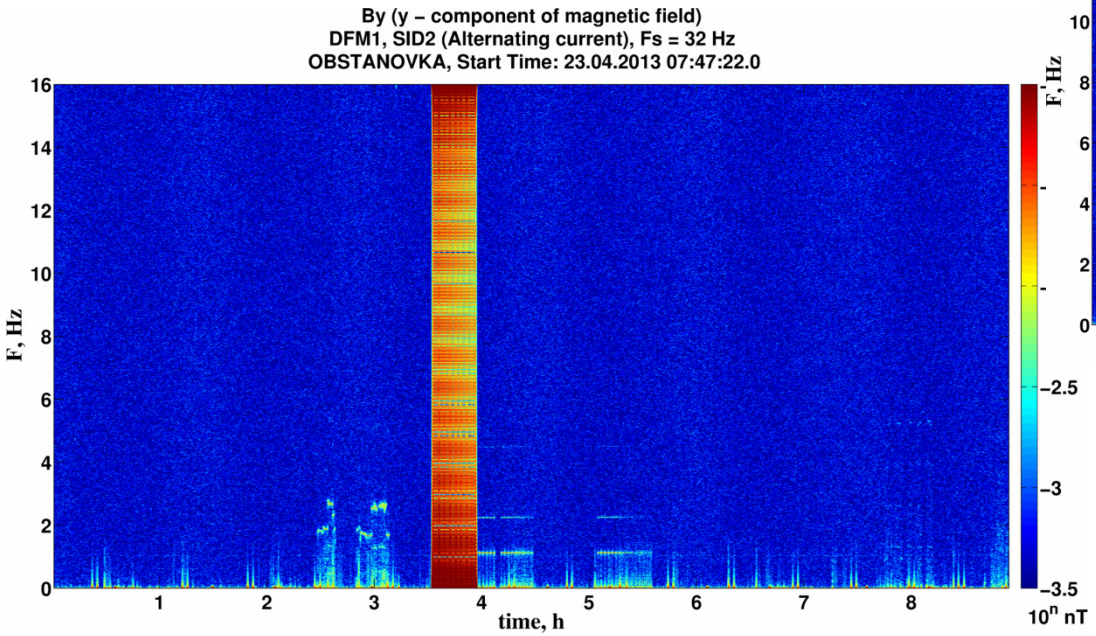

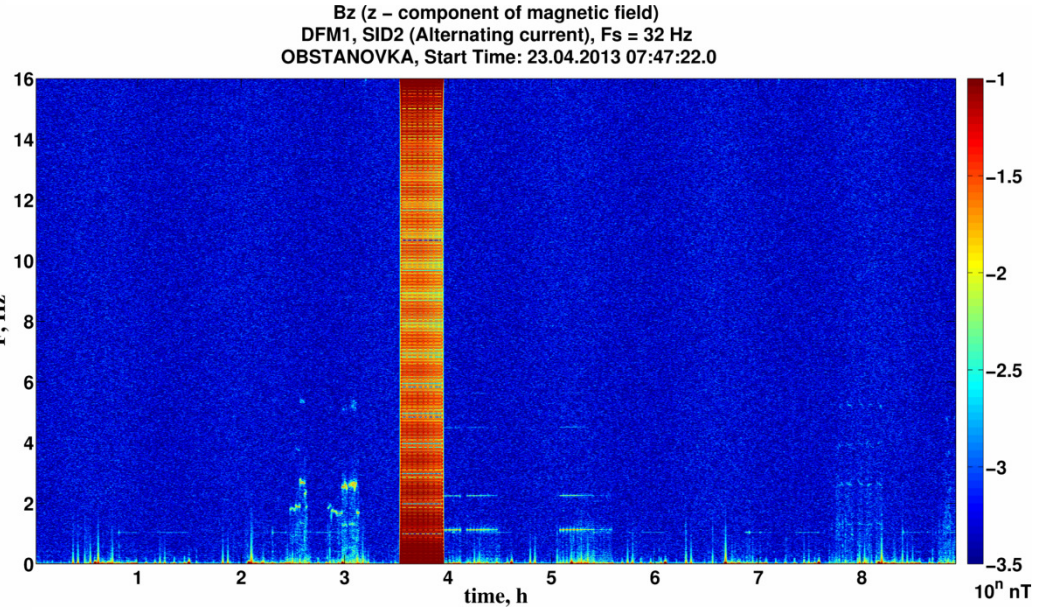

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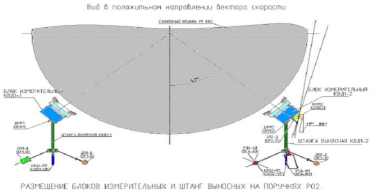

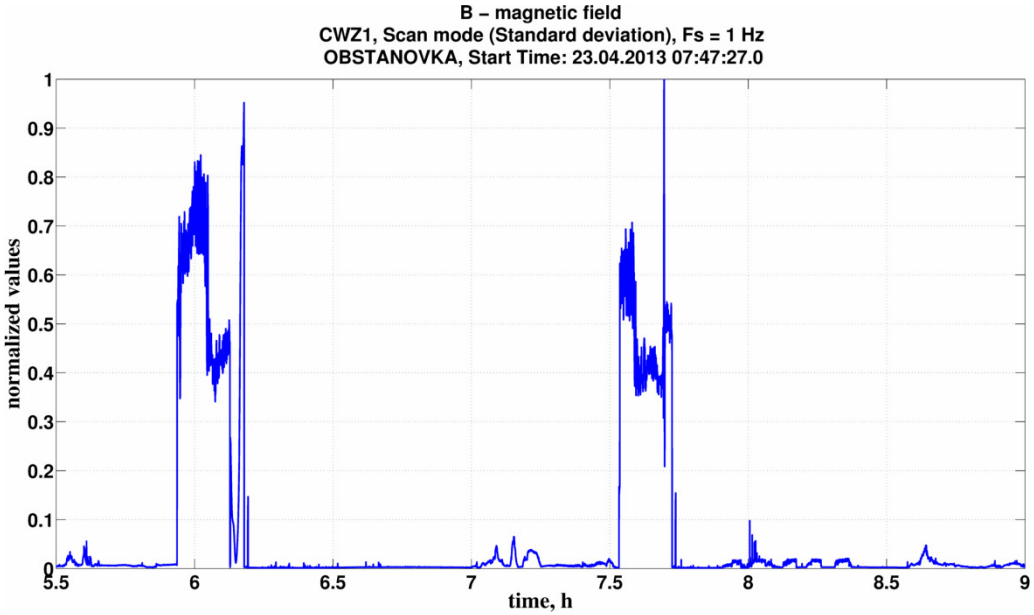

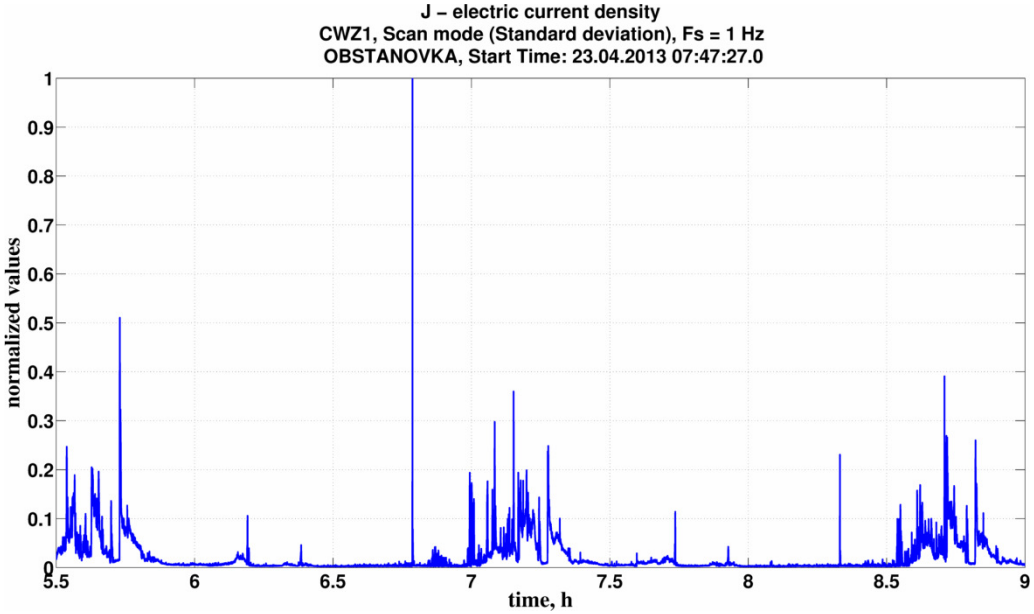

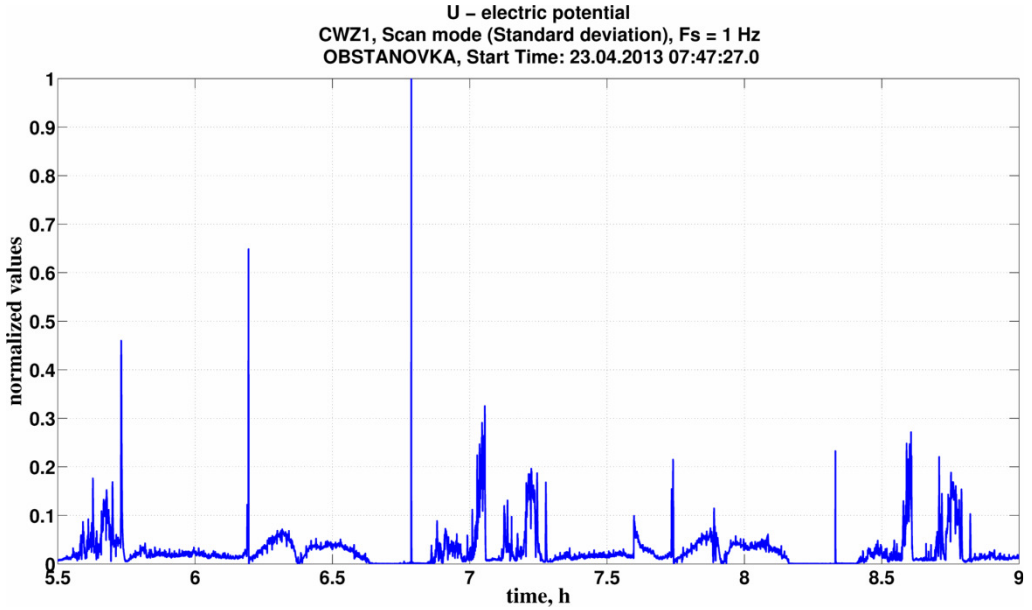

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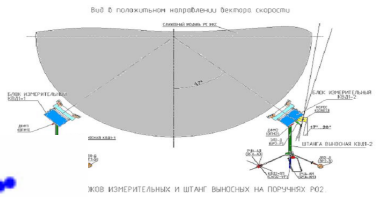

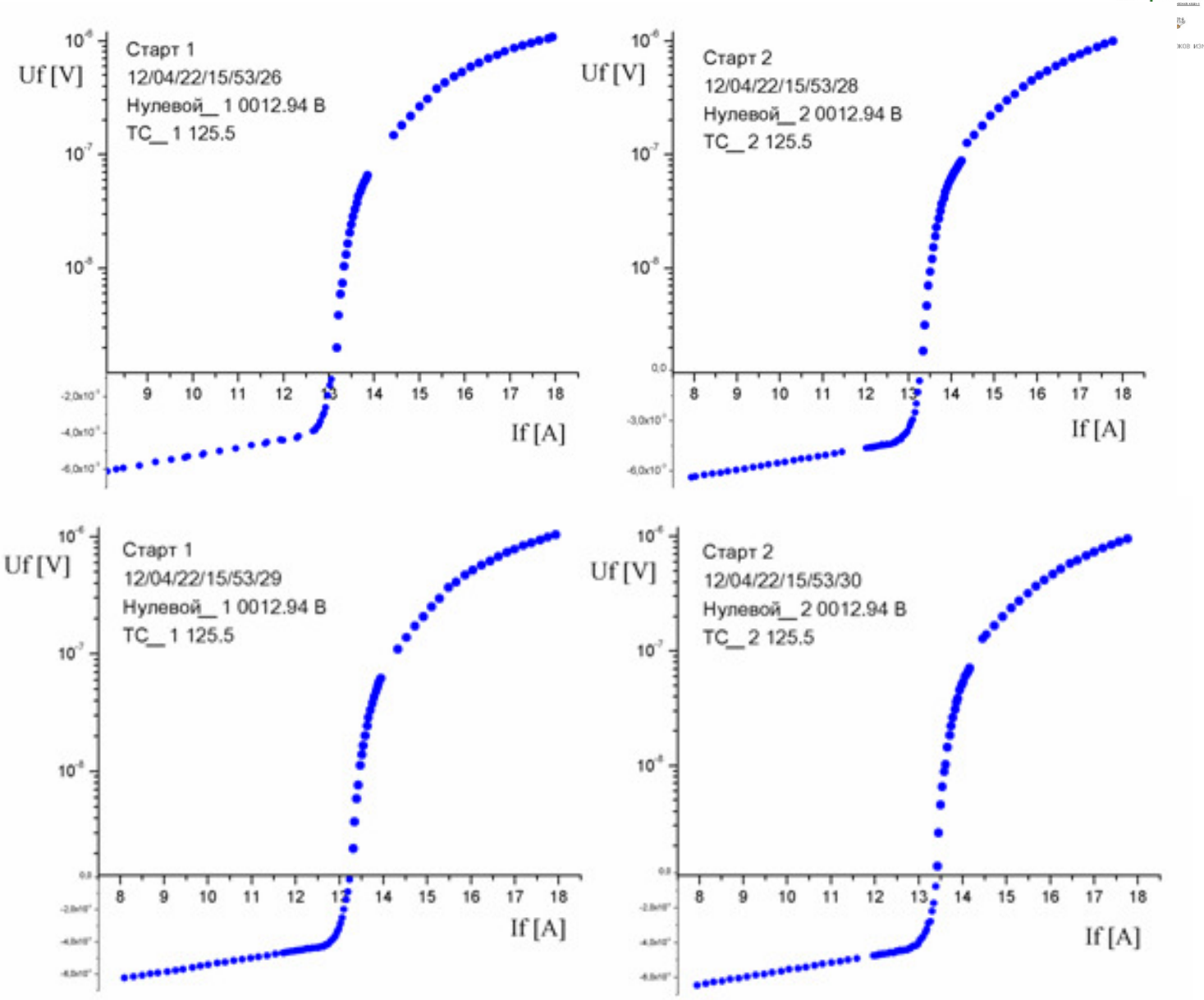

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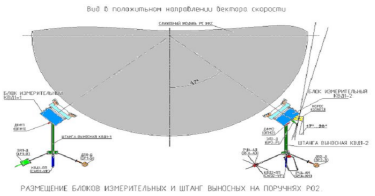
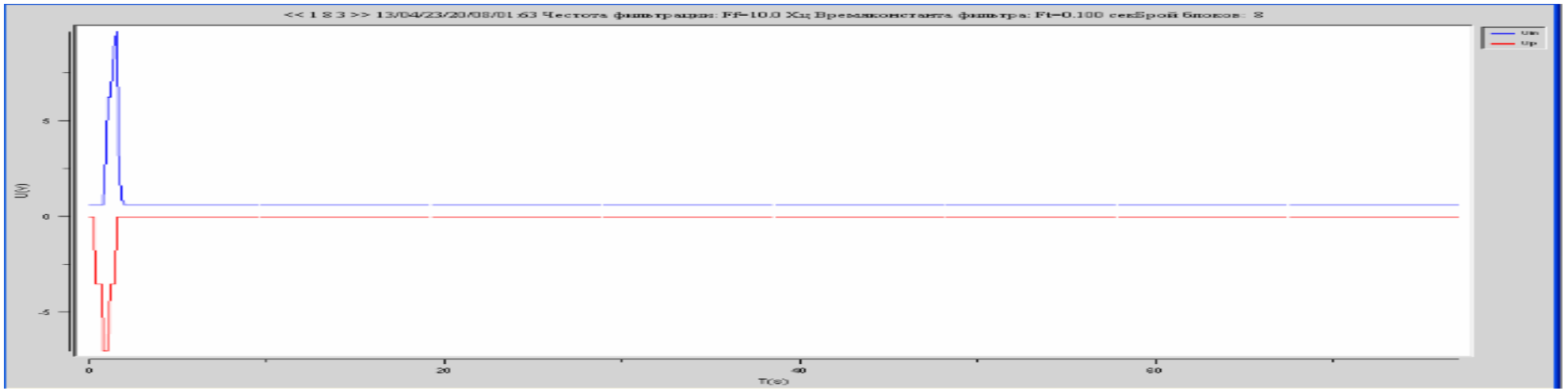
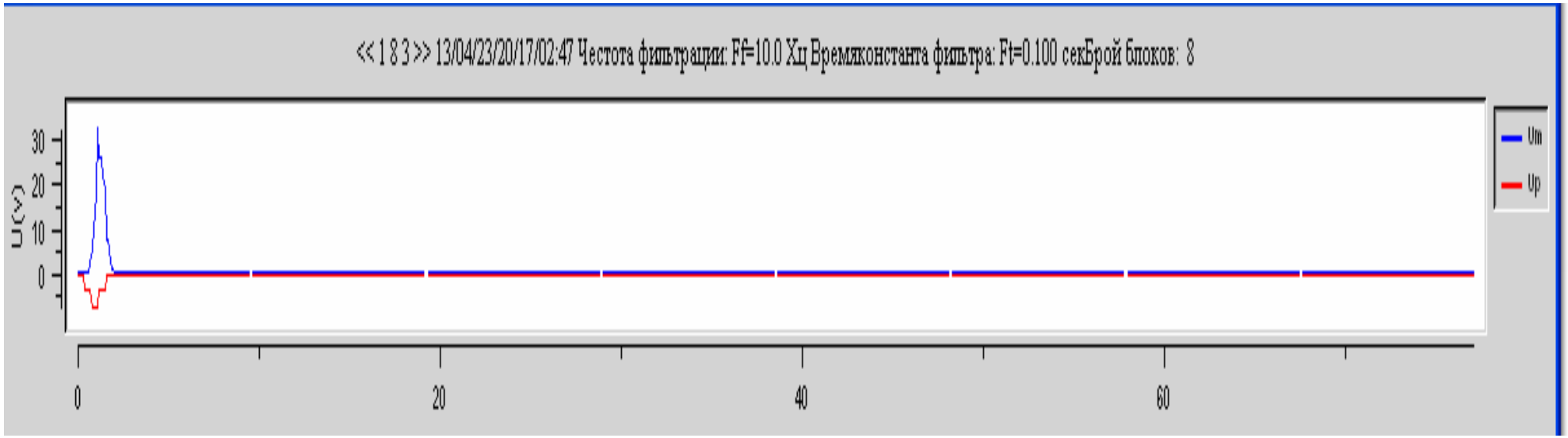






4. Experiment « Obstanovka 2-nd stage » - 2015-2020.

The subjects of the study “Obstanovka 2-nd stage” experiment (2015-20) they are:

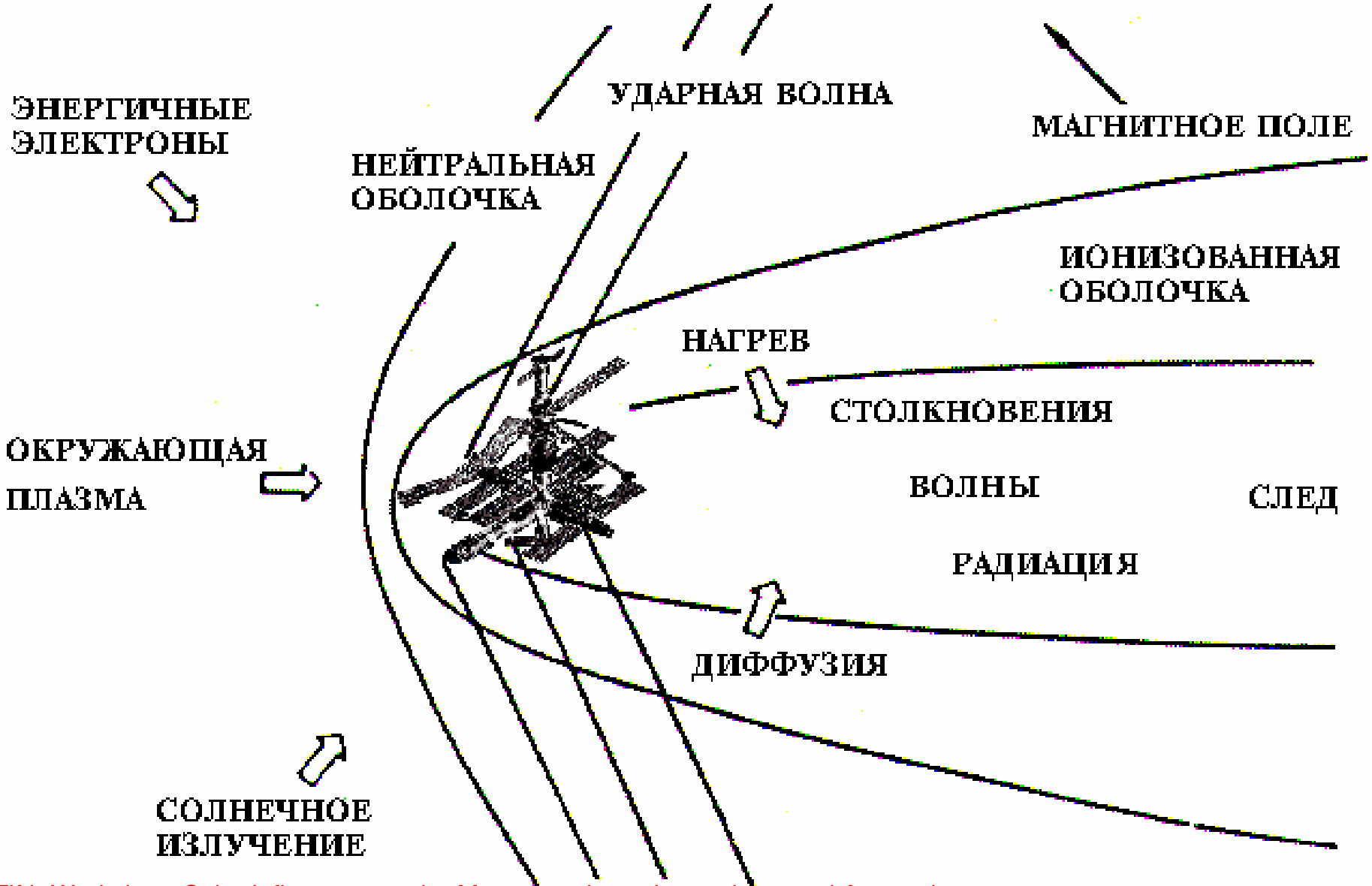
- Parameters of the electromagnetic situation with the vector measurements in the zone of the installation of equipment.
- Geophysical and anthropogenic processes against the background of interaction s with the ionosphere plasma.
- Recommendations regarding the guarantee of monitoring geophysical and anthropogenic processes with the use of a method of combined wave diagnostics.

5. Micro-satellite “Trabant” – 2015-2020.

Basic objective mission of the “Trabant” is the development of the electromagnetic- clean micro-subsatellite of that integrated into the infrastructure of the RS ISS. Only use of an infrastructure of the RS ISS, which makes it possible to, first of all, create highly informative, but with the small energy consumption, command- telemetric system, actually provides the electromagnetic cleanliness of subsatellite.

Furthermore, infrastructure of the RS ISS makes possible to support subsatellite in orbit (two yearly) for a long time (10-15 years), necessary for the ecological monitoring. The presence on the micro-subsatellite with the corrective engine installation makes it possible to form elliptic orbit around ISS with the semiminor axis 0.1-10 km and to thus conduct the monitoring of the electromagnetic situation (EMO) in the near and far zones’s .

5. Micro-satellite “Trabant” – 2015-2020.



Thanks for the attention

Distinguished Colleagues