CORONAS Project

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SCIENTIFIC GOALS

TWO KEY PROBLEMS OF SOLAR PHYSICS WOULD BE CHOSEN AMONG MANY COMPLEX PHENOMENA OBSERVED ON THE NEAREST STAR. THESE ARE SOLAR FLARES, WHICH PRODUCE THE EXPLOSIVE RELEASE OF ENERGY IN THE SOLAR ATMOSPHERE, AND THE INTERNAL STRUCTURE OF THE SUN WHICH IS NOW ACCESSIBLE TO DIRECT OBSERVATION BY METHODS OF HELIOSEISMOLOGY.

1. EXPLOSIVE RELEASE OF ENERGY IN SOLAR FLARES PRODUCES ALL POSSIBLE TYPES OF EMISSION: RADIO, OPTICAL, UV, X-RAY, GAMMA-RAY EMISSION. THE FAST ACCELERATION OF NEUTRONS, ELECTRONS, NUCLEI PLASMA ERUPTION (TRANSIENTS) INTO SPACE, SHOCK WAVES DISTURBING SOLAR ATMOSPHERE OCCURS. CONSEQUENTLY, A FLARE IS VERY COMLEX PHYSICAL PHENOMENON INCLUDING SUCH BASIC LINKED PROCESSES AS RECONNECTION, PARTICLE ACCELERATION, TURBULENCE, INTERACTION WITH THE RADIATION COVERING ALL ELECTROMAGNETIC SPECTRUM, NUCLEAR REACTION, SHOCKS AND ETC.

THIS COMPLEX PHENOMENA IN STRONGLY INHOMOGENEOUS SOLAR PLASMA PERMEABLED BY STRONG MAGNETIC FIELD CAN NOT BE UNDERSTOOD WITHOUT SPACE OBSERVATIONS. GROUND BASED OBSERVATIONS ARE POSSIBLE ONLY IN THE OPTICAL AND RADIO RANGE OF SPECTRUM. CORONAS WILL OBSERVE ALL RANGE OF ELECTROMAGNETIC SPECTRUM INCLUDING ENERGETIC PARTICLES. NATURALLY, FIRST OF ALL, SOLAR FLARES PRODUCE INFLUENCES UPON SPACE AND EARTH AND MANIFEST SOLAR-TERRESTRIAL COUPLING.

2. THE POSSIBILITY OF DIRECT INVESTIGATIONS OF INTERNAL LAYERS OF THE SUN WAS OPENED LAST TWENTY FIVE YEARS DUE TO DEVELOPMENT OF HELIOSEISMOLOGY. IT IS NOW POSSIBLE TO HAVE INFORMATION ON DEPTH DEPENDENCE OF SOUND VELOCITY AND ROTATION. ESTIMATION OF INTERNAL MAGNETIC FIELDS AND INVESTIGATIONS OF NON-UNIFORMITY WILL BE POSSIBLE DUE TO INCREASING OF MEASUREMENTS ACCURACY. HELIOSEISMOLOGY OPENS POSSIBILITY TO CHECK THEORY OF STAR'S INTERNAL STRUCTURE AND GOES TO SOLVING OF DAVIS PARADOX.

QUASI-SINCHRONOUS ORBIT OF CORONAS PERMITS TO ARRANGE CONTINIOUS 20-DAYS OBSERVATIONS OF SOLAR LUMINOSITY FLUCTUATIONS. THUS, CORONAS SHOULD BE EFFICIENT IN THE SOLVING OF FOLLOWING PROBLEMS:

- DETERMINATION OF ENERGY TRANSPORT AND ACCUMULATION OF ENERGY IN UPPER SOLAR ATMOSPHERE;
- MEASUREMENTS OF SOLAR PLASMA PARAMETERS BY SPECTROSCOPIC METHODS;
- RADIO AND WHITE LIGHT OBSERVATIONS OF MASS EJECTION DURING LARGE FLARES;
- ENERGETIC PARTICLE ACCELERATION IN SOLAR FLARES;
- HELIOSEISMOLOGY OF STRUCTURE AND DYNAMICS OF THE SUN.

CORONAS-I SCIENTIFIC PAYLOAD

THE CORONAS-I SATTELITE CARRIES DIVERSE AND SOPHISTICATED SCIENTIFIC INSTRUMENTS FOR STUDY OF SOLAR ACTIVITY. A BRIEF DESCRIPTION OF EACH INSTRUMENT FOLLOWS.

No	Instrument	Code	Mass (kg)	Power (wt)	Principal contractor
1	2	3	4	5	5
1.	Solar XUV telescope	TEREK	45	40	FIAN, Moscow
2.	X-ray spectrometer	RES-C	35	30	FIAN, Moscow
3.	X-ray spectrometer and photometr for diagnostics of energy sourses and sinks in flares.	DIOGENESS	15,4	24	AI, Prague CBK, Wroclaw
4.	Scintillation X- and γ-ray spectrometer	HELIKON	35	10	LFTI, Leningrad
5.	Solar burst spectrometer	IRIS	30		LFTI, Leningrad

1	2	3	4	5	5
6.	Solar ultraviolet radiometer	SUVR--SP-C	3,6	12	IPG, Moscow
7.	Vacuum ultraviolet solar spectrometer	VUSS	18,5	20	IPG, Moscow
8.	Solar optical fotometer	DIFOS	6	18	IZMIRAN, Moscow
9.	Solar radiospectrometer	SORS	18,5	21,5	IZMIRAN,Moscow CBK,
10.	Solar cosmic rays spectrometer	SCL	63	26	NIIJAF,Moscow
11.	Processing unit for amplitude and time analysis of input signals	AVS	12	22	MIFI, Moscow
12.	System of technical security	SSNI	60	60	OKB MKI, Moscow GFI

TEREK - SOLAR XUV TELESCOPE/OPTICAL CORONOGRAPH WITH GRAZING AND NORMAL INCIDENCE MIRRORS AND CCD FRAME TRANSFER IMAGE SENSOR. IT REGISTERS IMAGES OF THE SUN CORONA IN THE RANGES OF 5-25A($\Delta\rho$~20"), 170-180A($\Delta\rho$~7"), 304A($\Delta\rho$~7") AND 4000-6000 A.

IT IS INTENDED FOR:

- STUDIES OF THE EVOLUTION OF LARGE AND FINE STRUCTURES IN THE SOLAR ATMOSPHERE;
- DETERMINATION OF THE HOT SOLAR PLASMA CHARACTERISTICS IN ACTIVE REGIONS;
- STUDIES OF CORONAL HOLES, ETC.

RES-C - SOLAR X-RAY SPECTROMETER. IT PROVIDES MONOCHROMATIC IMAGES OF THE SUN IN THREE SPECTRAL RANGES: 190-205 A (XUV CHANNEL), 8.41-8.43 A (MgXII CHANNEL) AND 1.85-1.87 A (FeXXV CHANNEL).

- XUV CHANNEL. THIS CHANNEL CONSIST OF THE TWO SUBCHANNELS WITH THE PERPENDICULAR DISPERTION PLANES. EACH CONTAINS GRAZING INCIDENCE PLANE GRATING (2400 LINE) WITH MULTILAYER COATING SPHERICAL MIRROR WORKING AT NORMAL INCIDENCE AND INTENSIFIED COOLED CCD FRAME TRANSFER IMAGE SENSOR. THE SPECTRAL RESOLUTION IS 0.03 A. THE ANGULAR RESOLUTION 6"x90".

- MgXII CHANNEL. IT COMPRISES THE BENT QUARTZ (D=4.25 A; 5 CM) CRYSTAL SPECTROMETER WITH SIMILAR IMAGE SENSOR AS ABOVE. THE SPECTRAL RESOLUTION IS ~ 7×10^{-4} A. THE ANGULAR RESOLUTION - 6" x 6".

- FeXXV CHANNEL. IT CONTAINS THE BENT SPHERICAL QUARTZ (D=1.18 A, R=30CM) CRYSTAL WITH SIMILAR IMAGE TRANSFER SENSOR. THE SPECTRAL RESOLUTION IS 2×10^{-4} A. THE ANGULAR RESOLUTION - 2".

DIOGENESS - DIAGNOSTICS OF ENERGY SOURCES AND SINKS IN FLARES. IT COMPRISES THREE INDEPENDENT UNITS. THESE ARE A BRAGG HIGH-RESOLUTION SPECTROMETER (BS), AN X-RAY SPECTROPHOTOMETER (BF) AND MICROCOMPUTER PERFORMING STEERING AND CONTROL FUNCTIONS FOR BS AND BF.

DIOGENESS IS INTENDED TO PROVIDE THE MEASUREMENTS WHICH WILL ENABLE THE STUDY OF BALANCE OF THE SOLAR FLARE ENERGY CONTAINED IN ITS MAIN THERMAL RESERVOIR.

BS CHANNEL: THE RANGE OF 2.835-3.356 A, THE MOST IMPORTANT LINES - CaXVIII, CaXIX, CaXX THE TIME RESOLUTION 0.1-10 S.

BF CHANNEL: THE RANGE OF 2-160 KEV; 6 ENERGY CHANNELS: 2-4; 4-8; 10-20; 20-40; 40-80 AND 80-160 KEV; THE TIME RESOLUTION: 2-8 KEV - 1 S, 10-160 KEV - 0.1 S.

HELIKON - X - AND GAMMA RAY SCINTILLATION SPECTROMETER.

THE MAIN CHARACTERISTIC OF IT:

- NUMBER OF DETECTORS	2 (SOLAR AND ANTISOLAR DIRECTIONS)
- ENERGY RANGE	10KEV-8MEV
- ENERGY WINDOWS FOR THE INVESTIGATIONS OF TIME HISTORIES	10-50KEV, 50-250KEV, 250-800KE
- SENSITIVE AREA OF EACH DETECTOR	314 CM^2
- SENSITIVITY TO FLARE WITH FLUENCE	$\geq 10^{-7}$ ERG/CM^2S
- STATISTICAL CRITERIUM FOR IDENTIFICATION OF FLARE	G_σ ABOVE THE BACKGROUND
- NUMBER OF PHA CHANNELS	64 FOR EACH DETECTOR, 256 FOR SOLAI
- NUMBER OF SPECTRA REGISTRED DURING ONE FLARE	UP TO 64 (DEPENDING ON FLARE POWER
- ACCUMULATION TIME FOR SINGLE SPECTRA	2MS TO 8S (DEPENDING ON MAGNITUDE OF FLARE
- NUMBER OF TIME ANALYSIS CHANNELS	4096
- TIME RESOLUTION	FROM 2MS TO 0.25
- BACKGROUND SPECTRUM CONTROL	EACH 2 MIN
- DURATION OF TIME HISTORY RECORDING	UP TO 4 MIN

IRIS - SOLAR BURST SPECTROMETER FOR:

- STUDIES OF INTEGRAL INTENSITY AND SPECTRA OF X-RAYS INTENSITY AND SPECTRA IN THE RANGE 2-300 KEV IN 12 ENERGY CHANNELS: 2-4, 4-8, 8-12, 12-20, 20-30, 30-40, 40-60, 60-90, 90-120, 120-150, 150-200 AND 200-300 KEV;
- STUDIES OF X-RAY PRECURSORS OF SOLAR FLARES IN THE RANGE OF 2-20 KEV WITH A SENSITIVITY OF 10^{-7} ERG CM^{-2} S^{-1};
- STUDIES OF THE DYNAMICS OF HARD X-RAY SPECTRA IN THE RANGE OF 30-120 KEV WITH A TIME RESOLUTION OF ABOUT 0.01 S.

SUVR-Sp-C - THE SOLAR ULTRAVIOLET RADIOMETER. IT IS INTENDED FOR PATROL OF SOLAR RADIATION INTENSITY IN EXTREME ULTRAVIOLET RANGE $\lambda<130$NM. THE SUVR INSTRUMENT REGISTERS THE SOLAR EUV RADIATION USING THERMOLUMINESCENT PHOSPHORE (24 SPECIMENTS ARRANGED ON A ROTATING WHEEL). THE PHOSPHOR $CaSO_4(Mn)$ IS USED WHICH IS PRACTICALY UNSENSITIVE TO RADIATION AT $\lambda\geq130$NM. UNDER HEATING IT RE-RADIATES STORED ENERGY IN THE VISIBLE REGION ($\lambda=500$NM). A PHOTOMULTIPLIER AND ELECTRONIC SCHEME TRANSFORM VISIBLE LIGHT FROM PHOSPHOR INTO A SIGNAL WHICH IS TRANSMITTED TO A TELEMETRIC SYSTEM.

THE DYNAMIC RANGE OF THE MEASUREMENTS OF SOLAR EUV RADIADION IS 0.1-30 ERG CM^{-2} S^{-1}. THE INSTRUMENTS CONTAINS 24 SCREENS: ONE WITHOUT FILTERS MEASURING THE TOTAL EUV RADIATION FLUX, OTHERS - WITH FILTERS (MgF_2, AL FOIL, MYLARFILM). THE FILTERS ISOLATE FOLLOWING WAVEBANDS: SOFT X - RAYS 0.3-2.5NM; SOFT X - RAYS 0.3-12NM, HLy_α 121.6NM; TOTAL INTENSITY AT $\lambda<130$NM. THE ABSOLUTE ERROR DOES NOT EXCEED 15%. EXPOSURE TIME FOR ONE SCREEN AND TIME OF MEASURING ITS THERMOLUMINISCENT SIGNAL IS 18.5 ∓ 0.5S. THE WHOLE MEASUREMENT CYCLE LASTS 8 MIN.

PERFORMS ABSOLUTE MEASUREMENTS OF SOLAR LINE INTENSITIES IN THE WAVI LENGHTS REGION 20-58NM. ITS OPERATION IS BASED ON THE NEW CONCEPT OI COLLISION PHOTOIONISATION SPECTROSCOPY. THE USE OF DUAL-CHANNEI DIFFERENCE MEASUREMENTS SCHEME MAKES SPECTROMETER UNSENSITIVE TO MECHANICAL AND ELECTRICAL DISTRUBANCES. THE ABSENCE OF OPTICAI ELEMENTS AND MOVING PARTS IN THIS INSTRUMENT ALLOWS TO SAVE ITS CHARACTERISTICS DURING MANY YEARS OF EXPLOITATION. AS A RESULT VUS: INSTRUMENT SEEMS TO BE AN APPROPRIATE CHOICE WHEN SOLVING PROBLEM OI LONG-TIME MONITORING THE VUV - RADIATION OF THE SUN. THE MAIN PART OF THE INSTRUMENTS IS CYLINDRICAL CAMERA FILLED WITH A MONOATOMIC GAS (NE) AND PROVIDED AT ONE END WITH A 16x20MM WINDOW IN THE FORM OF MICROCHANNEL PLATE. TWO ELECTRON MIRRORS OF ORIGINAL DESIGN ARE PLACED INSIDE THE CAMERA. WITH SUCH MIRRORS IT IS POSSIBLE TO MINIMIZE ELECTRON LOSSES AT THE ELECTRODES. PERMANENT MAGNETS LOCATED IN CAMERA PRODUCE MAGNETIC FIELD ABOUT 300 OE ORIENTED PARALLEL TO PLANE ELECTRODES. CAMERA WITH GAS AND POWER SUPPLY SYSTEMS ARE MOUNTED ON THE METAL FRAME.

THECHNICAL CHARACTERISTICS:

SPEATRAL REGION	20-58NM
MAXIMUM SPECTRAL RESOLUTION	$\lambda/\Delta\lambda \approx 400$
THRESHOLD SENSITIVITY	$5 \cdot 10^6$ QUANTS $\cdot$ CM^{-2}S.

DIFOS - THE 3-CHANNAL SOLAR WHITE LIGHT PHOTOMETER. PHOTOMETER IS AIMED TO OBSERVE THE GLOBAL OSCILLATIONS. IT WILL REGISTRATE INTENSITY OF THE CONTINUUM IN THE NEXT OPTIC SPECTRAL RANGES:

- MEAN FREQUENCY 520 NM WITH BANDPASS 100 NM;
- MEAN FREQUENCY 710 NM WITH BANDPASS 120 NM;
- 400-1000 NM.

INSTRUMENTS HAS A RELATIVE LIGHT FLOW RESOLUTION ABOUT ONE PART PER HUNDRED THOUSAND. TIME RESOLUTION IS 16 S. THE THERMOSTAT SUPPORTS THE CONSTANT TEMPERATURE OF PHOTOSENSORS DURING OBSERVATIONS. POINTING ACCURACY IS ABOUT 3-10 ARC.MIN. SUPPORTED BY ORIENTATION SYSTEM OF SATTELITE.

THE MAIN SCIENTIFIC GOAL IS INVESTIGATION OF THE DYNAMICS AND STRUCTURE OF THE INTERIOR OF THE SUN BY MEANS OF THE HELIOSEISMOLOGY. IT INCLUDES:

- REGISTRATION OF THE FIVE-MINUTES P-MODES OF GLOBAL OSCILLATIONS. DETERMINATION OF THEIR EXACT PERIODS AND RELATIVE AMPLITUDES;
- INVESTIGATION OF THE CONDITIONS IN THE NEAR CORE AREAS WITH AIM TO REFINE THE STANDARD SOLAR MODEL;

- DETERMINATION OF DIFFERENTIAL ROTATION OF THE SOLAR INTERIOR FROM OBSERVATION OF THE LINE SPLITTING;

- ATTEMPT TO DETECT THE G-MODES OF GLOBAL OSCILLATIONS WITH PERIODS UPPER ONE HOUR.

THE DIFOS-PHOTOMETER WILL OBSERVE THE SUN AS A STAR, CONSEQUENTLY THE SELECTION OF LOW DEGREE OSCILLATION MODES WITH l UP TO 3 WILL BE ONLY POSSIBLE USING THIS INSTRUMENT.

SORS - SOLAR AND IONOSPHERIC RADIOSPECTROMETER. IT WILL BE USED FOR INVESTIGATION OF SOLAR RADIOBURSTS OF DIFFERENT TYPES, SO AZ FOR DIAGNOSTIC OF SURROUNDING IONOSPHERIC PLASMA. IT HAS TWO SWEEPING RECEIVERS IN THE FREQUENCY RANGES 50kHz - 30MHz AND 25MHz - 300MHz. ON THE CORONAS - F SATELLITE THE MULTICOMPONENT MEASUREMENTS WILL BE DONE TO DETERMINE THE DIRECTION OF ARRIVAL AND POLARISATION OF THE SOLAR RADIO EMISSION (3 MAGNETIC COMPONENTS; 3 ELECTRIC COMPONENTS). TO STUDY THE DETAILED STRUCTURE OF RADIOBURSTS IN THE TIME SCALE OF MS THE WIDE-BANDE (ΔF=4MHz) CHANNEL WILL BE USED WHISH COULD BE TUNED WITHIN THE RANGE 50kHz - 30MHz. FOR PLASMA DIAGNOSTIC PURPOSES THE IMPEDANCE PROBE IS PROVIDED IN THE RANGE 50kHz - 30MHz. WITHIN THE SAME RANGE THE PULSED HF TRANSMITTER WILL BE USED IN RELAXATION SOUNDER REGIME.

THE MEASUREMENTS MENTIONED ABOVE OF SOLAR RADIOEMISSION IN LOW FREQUENCY RANGE < 25MHz WILL COMPLEMENT THE GROUND - BASED RADIOASTRONOMICAL MEASUREMENTS WITH GOOD TIME RESOLUTION. THE DIRECT MEASUREMENTS ON THE SAME SATELLITE OF UV EMISSION AND OF LOCAL PLASMA DENSITY WILL IMPROVE IONOSPHERIC MODELLING AND FORECAST.

THE MEASUREMENT OF IONOSPHERIC PARAMETERS SIMULTENIOUSLY WITH INVESTIGATION OF SOLAR ACTIVITY WILL IMPROVE OUR KNOWLEDGE ON THE SOLAR ENERGY TRANSFER TO THE NEAR-EARTH MEDIUM. THE MAIN CHARACTERISTICS:

- HF FREQUENCY 0.05 - 30MHz
- FREQUENCY STEPS (0.05 - 15MHz) 25kHz; 50kHz; 100kHz
- NUMBER OF STEPS 400 .
- SENSITIVITY 10^{-20} W/M^{2}Hz
- SWEEP PERIOD 3s; 30s
- VHF FREQUENCY RANGE 25 - 300MHz
- FREQUENCY STEPS 0.5 AND 1MHz .

HIGH RESOLUTION REGIME

- FREQUENCY RANGE F_o + 4MHz
- FREQUENCY STEP 10kHz
- RELAXATION SOUNDER 0.05 - 15MHz
- PULSE DURATION 100μs
- PULSE REPETITION RATE 10 - 20 ms
- EMITTED PULSED POWER 1w; 10w; 100w

SKL - THE COMPLEX (SKT-3; MKL; SONG) WHICH INTENDED TO MEASURE THE CHARACTERISTICS OF THE ENERGETIC CHARGED AND NEUTRAL COMPONENTS:

- THE ENRGY SPECTRA OF PARTICLES;
- THE ELEMENTAL, ISOTOPIC AND CHARGE COMPOSITION.

SKI-3 - MEASURES THE FLUXES OF NUCLEIR WITH CHARGES RANGING FROM Z=1 TO 10 AND WITH ENERGIES FROM 1.5 - 19MEV/NUCL FOR ^{4}HE AND 3.7 - 4.6MEV/NUCL FOR ^{20}NE. FOUR DETCTORS (DT1 - DT4) ARE (N-P) SEMICONDUCTORS WHICH FORM THE TELESCOPE SYSTEM. THE SIZE DT1 IS 0.8 cm^{2}x25μ, DT2 - 2.3cm^{2}x100μ, DT3 - 3.1cm^{2}x2000μ, DT4 - 4.5cm^{2}x2000μ. THE DETECTOR HAVE A 0.2cm^{2}sr GEOMETRIC FACTOR AND MASS RESOLUTION 0.2 MASS UNIT (FOR HE). THE TIME RESOLUTION OF THE SKI-3 IS 1/128 - 4s.

MKL - COSMIC RAY MONITOR FOR MEASURING THE SPECTRA OF THE 0.5-12.0 MeV ELECTRONS, 1-200 MeV PROTONS AND THE 120-240 MeV ALPHA-PARTICLE FLUXES. THE MAIN CHARACTERISTICS OF THIS INSTRUMENT:

DT1 - PLASTIC SCINTILLATOR (h=7.5mm; ø 60 mm), GEOMETRIC FACTOR 120 sm^2sr; ENERGY RANGE: PROTONS 17 - 60MeV; ELECTRONS 0.5 - 1.3MeV. TIME RESOLUTION 2.5s;

DT2 - (N-P) SEMICONDUCTOR DETECTOR (h=2mm, ø 20mm); ENERGY RANGE E_E > 13MeV; E_P > 10MeV; TIME RESOLUTION - 2.5s; TELESCOPE (DT1+DT2): $10sm^2sr$ - GEOMETRICAL FACTOR; ENERGY RANGE: E_P = 30 - 200MeV; E_P > 200MeV; E_E > 2MeV; E_α = 120 - 240MeV;

DT3 - (N-P) SEMICONDUCTOR DETECTOR (ø 14mm; h = 50μ);

DT4 - (N-P) SEMICONDUCTOR DETECTOR (ø 12mm; h = 2000μ);

DT5 - COMPOSITE SCINTILLATOR DETECTOR: PLASTIC SCINCILLATOR + GI CRYSTALL (10x10 mm^2; ø 10mm; h ~ 10mm);

TELESCOPE (DT3+DT4+DT5): $1sm^2sr$ - GEOMETRIC FACTOR; ENERGY RANGE: E_E = 0.5 - 12MeV; E_P = 1 - 25 MeV.

SONG - PROVIDES THE MEASURING OFTHE SOLAR NEUTRONS, GAMMA - RAYS (CONTINUUM AND LINES), DETECTING CHARGED PARTICLES (MAINLY ELECTRONS AND PROTONS). THE DETECTOR IS Cs(Te) ø 200x100mm, SURROUNDED BY A 4π ANTICOINCIDENCE SHIELDING OF A PLASTIC SCINTILLATOR. SONG INSTRUMENT MAKE IT POSSIBLE TO DETECT NEUTRONS WITH E ≥ 30MeV (5 CHANNEL; GAMMA - RAYS OF 0.1 - 100MeV (9 CHANNELS) AND 0.3 - 16MeV (236 CHANNELS); HIGH-ENERGY PROTONS 200 - 500MeV AND 11 - 108MeV (6 CHANNELS). THE INSTRUMENTS WORKS IN TWO MODES ("FLARE" AND "MONITORING") WITH TIME RESOLUTION 0.04s; 2.5s; 120s. SIGNALS "FLARE" AND "MONITORING" ARE FORMED IN SONG INSTRUMENT FOR CONTROL OF WORKING REGIMES OF THE OTHER SCIENTIFIC INSTRUMENYS OF CORONAS PAYLOAD.

AVS - PROCESSING UNIT FOR AMPLITUDE AND TIME ANALYSIS OF INPUT SIGNALS. THE INSTRUMENT IS DESIGNATED FOR SEARCH OF SHORT-TIME SCALE VARIATIONS X-RAY AND γ-RAY SOLAR FLARES; FOR ANALYSIS OF ENERGY SPECTRA EVOLUTION; FOR PRODUCING THE SIGNALS WHICH COMMANDS THE OTHER INSTRUMENTS OF PAYLOAD TO FUNCTION IN THE FLARE REGIME. ENERGY RANGE: 2-30keV; 0.15-10.0MeV; TEMPORAL RESOLUTION ~ 1.0 ms; NUMBER OF CHANNELS - 128 FOR "FLARE" REGIME (WITH TIME RESOLUTION 0.25[0.5] s).