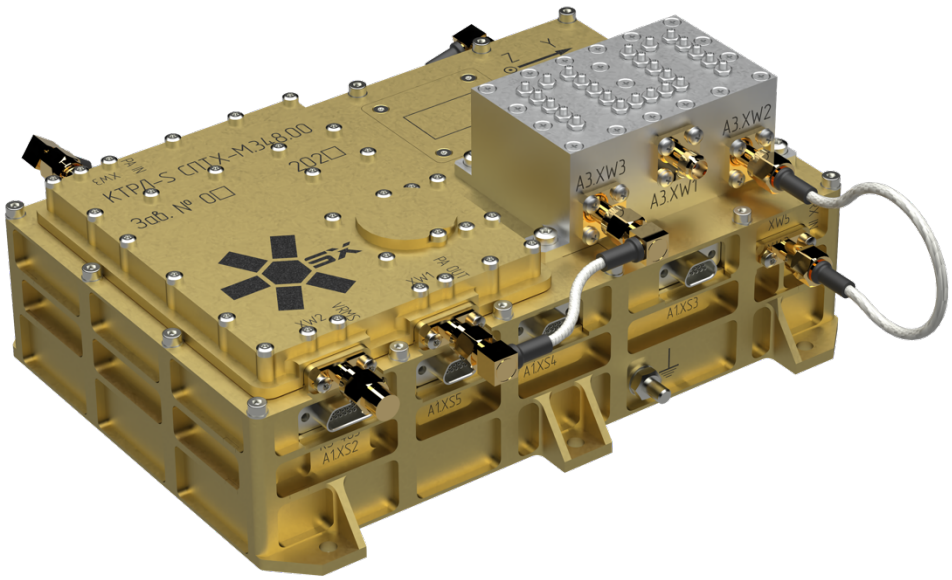
SPUTNIX
BY SITRONICS

# Line of microsatellite devices

## Radio devices

## *SX-SBOX*



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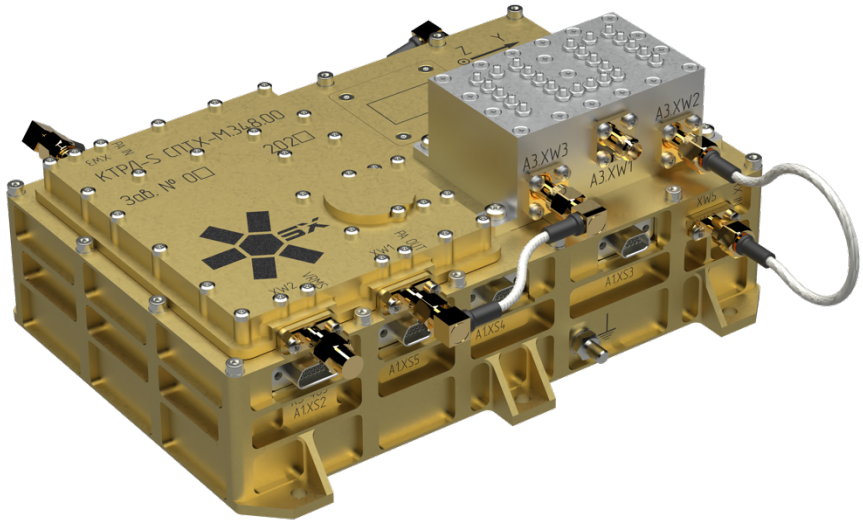
# *S-band TM/TC radio link*

## *SX-SBOX-TRX-S-01*




| Parameters | Value |
|---|---|
| Power consumption | 22 W (reception + transmission), 3 W(reception) |
| Power voltage, V | 22-34 V galvanic isolation 500 V |
| Dimensions | 171 x 111 x 48 mm (without fasteners and diplexer) |
| Mass | 850 g (without diplexer) |
| Operating mode | Full duplex |
| Operating frequency range reception<br>Operating frequency range transmission | 2025 – 2110, MHz<br>2200 – 2290, MHz |
| Output power level | 5 W |
| Symbol data transfer rate | 0,1 – 10 Mbps |
| Coding | LDPC NASA C2 (7/8) |
| Modulation | BPSK, QPSK, 8-PSK |
| Protocols | CCSDS 732.1-B-1, 131.0-B-3, 232.1-B-2 |
| Duplicated interfaces | SpaceWire, CAN2B, RS-485, Ethernet |
| Crypto protection | AES-128/256 |

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| | |
|---|---|
| Built-in ROM | 64 MB |

The S-band command-telemetry radio link is intended for the implementation of a full-duplex high-speed communication channel of small spacecraft with a ground control station, as well as for the formation of inter-satellite information exchange lines.

1. Full compliance with CCSDS standards
2. Using high efficiency LDPC encoder / decoder
3. Built-in hardware data encryption AES-128/256
4. Flexible ability to change modulation, data rate and encoder directly in orbit
5. Wide range of available interfaces: SpaceWire, CAN, RS-485, Ethernet

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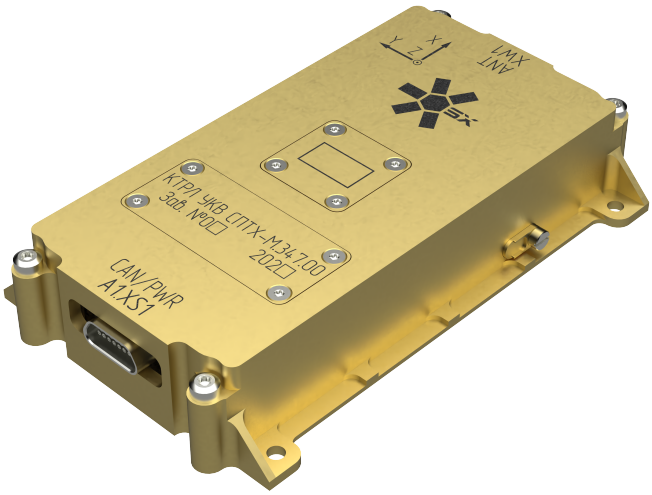
# *UHF TM/TC radio link*

## *SX-SBOX-TRX-UHF-01*




| Parameters | Value |
|---|---|
| Power consumption | 20 W (transmission), 1 W (reception) |
| Power voltage | 6 — 36 V, without galvanic isolation |
| Dimensions | 115 x 66 x 19 mm(without fasteners) |
| Mass | 135 g |
| Duplicated interfaces | CAN2B |
| Operating mode | Half duplex |
| Channel data transfer rate | Up to 19200 bit / sec |
| Data transfer protocol | AX.25, USP |
| Operating frequency range | 435 – 438 MHz |
| Output power level | 5 W |
| Receiving path sensitivity | minus 109 dBm |

The UHF transceiver makes it possible to organize communication between the ground control complex and the spacecraft in the VHF range of radio waves for control tasks and receiving telemetry. Suitable for use in low orbit as a primary or backup transceiver.

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Own development of the company according to company standards, compatible with ECSS recommendations, relatively low cost, light weight and energy consumption; adaptation to customer requirements; use of unified electrical, information and mechanical interfaces; availability of flight qualifications; compatibility with a network of VHF receiving stations around the world through the use of open communication protocols.

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# *Antenna-feeder system of the UHF band*
# *SX-SBOX-UHF_ANT_01*

| Parameters | Value |
|---|---|
| Antenna Type | monopole |
| Gain | at least 4 dB |
| Operating frequency range | 400 - 403 MHz |
| Standing wave voltage coefficient | no more than 2 |
| Mass | 21 g |
| Dimensions | 12.4 x 25 x 205 mm |
| Type of polarization | linear |

AFS-UHF It is a monopole antenna that converts electrical signals into electromagnetic vibrations and radiates them into free space.

The antenna has successfully passed the GEM cycle.

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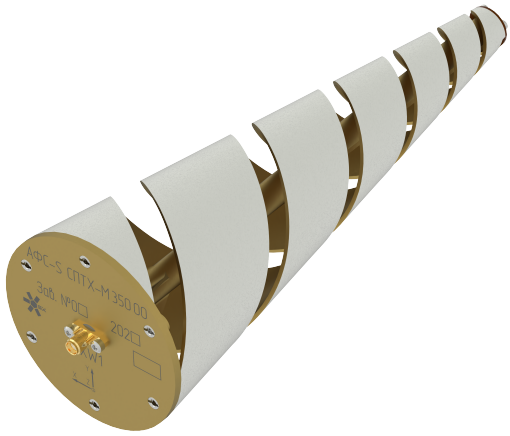
# *S band antenna-feeder system*

## *SX-SBOX-SBAND_ANT_01*



| Parameters | Value |
|---|---|
| Antenna Type | Two-way spiral |
| Gain | at least 4 dB |
| Operating frequency range | 2000 - 2290 MHz |
| Standing wave voltage coefficient | no more than 1.65 |
| The width of the radiation pattern at the level of minus 3 dB | at least 155 degrees |
| Ellipticity coefficient | no more than 4 dB |
| Mass | 190 g |
| Dimensions | 80 x 80 x 235 mm |
| Type of polarization | Circular, RHCP |

AFS-SBand It is a two-way spiral antenna made using 3D metal printing technology, designed for the organization of command and telemetry radio lines of the spacecraft. The antenna is characterized by a wide directional pattern close to the hemisphere and low mass.

The antenna has successfully passed the GEM cycle.

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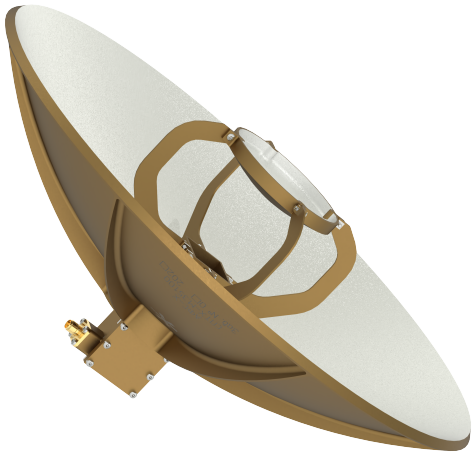
# *X band antenna-feeder system*
# *SX-SBOX-XBAND_ANT_01*



| Parameters | Value |
|---|---|
| Antenna Type | Mirror |
| Gain | at least 22.5 dB |
| Operating frequency range | 8000 - 8400 MHz |
| Standing wave voltage coefficient | no more than 1.5 |
| The width of the radiation pattern at the level of minus 3 dB | at least 7 degrees |
| Normal ellipticity coefficient | no more than 1 dB |
| Side lobe level | no more than minus 12 dB |
| Mass | 570 g |
| Dimensions | 138 x 317 x 317 mm |
| Type of polarization | Circular, RHCP |

AFS-XBand It is a two-mirror Cassegrain antenna designed for the organization of high-speed spacecraft radio lines. The antenna is characterized by low mass and the possibility of using a second input to organize simultaneous two-polarization data transmission (RHCP/ LHCP).

The antenna has successfully passed the GEM cycle.

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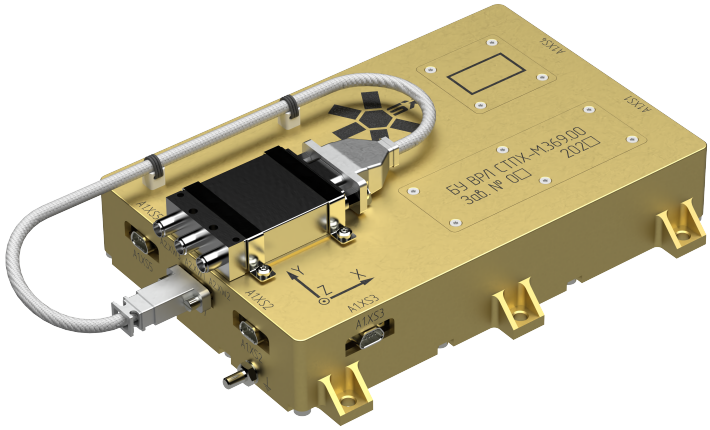
# *High-speed radio line control unit*
# *SX-SBOX-XBAND_CU_01*



| Parameters | Value |
|---|---|
| Power supply | 22...33 V, galvanic isolation 500 V |
| Control interface | CAN, duplicated |
| Output power parameters | +11...+16.5 V, 30 W |
| Parameters of the control output interface | x4 RS-422 |
| Mass | 750 g |
| Dimensions | 171 x 120 x 46 mm |

The control unit is designed to convert the input power supply and control interfaces in order to interact with high-speed transmitters of target information.

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*Options of devices delivery*

- EM – engineering model
- FM – flight model

The differences between the EM and FM options are in the scope of the tests. Options are shown in the table.

| № | Test | Model | | Comment |
|---|---|---|---|---|
| | | EM | FM | |
| 1 | Preliminary tests:<br>- Checking power supply circuits;<br>- Verification of information exchange (with the device and device nodes);<br>- Calibration (if necessary) | + | + | Carried out in the laboratory of SPUTNIX LLC under normal climatic conditions. |
| 2 | Functional Acceptance Tests (FAT) | -* | +* | Checks for compliance of the device with the functional characteristics specified in the Operational Manual and compliance with the MS |
| 3 | Vibrodynamic Acceptance Tests | - | +* | Tests for resistance to mechanical external influences specified in Technical conditions (or Operational Manual) |
| 4 | Thermovacuum Acceptance Tests | - | +* | Checks for resistance to thermal and climatic external influences |

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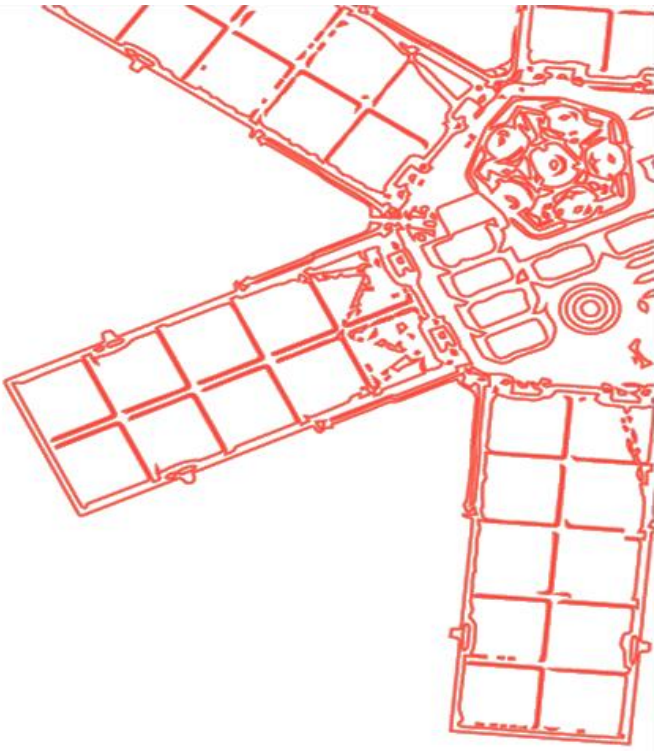
| | | | | |
|---|---|---|---|---|
| | | | | specified in Technical conditions (or Operational Manual) |
| 5 | Electromagnetic Acceptance Tests | - | +* | Tests for resistance to electrical external influences specified in Technical conditions (or Operational Manual) |
| Notes:<br>*Inspection can be carried out, carried out partially or excluded as agreed with the Customer | | | | |

If the requested device intended for laboratory testing will not be installed in a real satellite, EM with test type 1 (minimum test scope) should be used.

If the requested device is intended for use as part of a specialized functional stand, EM should be used with preliminary and functional acceptance tests (1 and 2).

If the requested device is intended for installation on a satellite, or for use as part of a stand for ground experimental testing of a flight product, it is required to use a FM with a full scope of tests (1, 2, 3, 4, 5).

If the requested device is intended for installation on a satellite (flight model), but for some reason it is not possible to conduct a full scope of tests, it is allowed to exclude certain types of tests for external influences (3,4,5) in a combination and sequence discussed with the Supplier. In this case, the responsibility for carrying out the missing tests lies with the Customer.

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