PROFESSIONAL MULTICHANNEL RECEIVER OF HF FREQUENCY BAND WITH DIGITAL SIGNAL PROCESSING "GALAKTIKA-4k"

Receiver "Galaktika-4k" is a functionally complete four-channel receiving and computational complex of new generation with flexible architecture providing a possibility of upgrading for solving new tasks by means of adding or replacing any units and software development.

Receiver is built on the scheme of direct signal transform with digitizing by 16-resolution ADC and DDC-converting into LF signal with following processing by high-end DSP processor with floating arithmetic.

Such construction of the radio channel sufficiently reduced and simplified analogue part of the circuit and increased metrological properties of the device.

High stability and repetition of parameters provides a possibility of further increasing of number of channels in the device of up to 8, 12 and so on for solving necessary tasks.

Absence in radiochannel of analogue units such as mixers and heterodynes made it possible to get rid of variety of drawbacks traditional analogue principle of signal processing:

- reception on side channels (IF channel, image channel, channels of ±mFc±nFrr type and other);
- acoustic effect;
- increased electromagnetic susceptibility due to spurious heterodyne emission;
- increased sensitivity to mechanical and climatic exposure.

Analogue circuit of signal processing in receiver "Galaktika-4K" is a tunable narrowband preselector (bandwidth not more than 5% relative to adjustment frequency) with adjustable gain factor. Narrowband preselection, adjustable transmission gain together with 16-resolution ADC increased sufficiently real selectivity of radio channel what enabled operation of complex with highly efficient antenna systems under conditions of interferences.

Receiver "Galaktika-4k" has computer control via USB and COM-ports. Information from receiver comes to computer in form of four independent analogue signals for mutual operation with graphic card and also in form of quadrature signal samples grouped into one signal coming to computer via USB-port.

Constructively device is placed in crate 3U.

Power supply of receiver can be provided either from vehicle power supply system 27 V or from industrial network of 220 V, 50 Hz.

External view of "Galaktika-4k" receiver

Composition:

- Unit of tunable preselector – 4 pcs.
- Unit of amplification and DDC-converter – 4 pcs.
- Unit of controller and DSP-processor – 1 pcs.
- Reference frequency generating unit – 1 pcs.
- Unit of secondary power supplies – 1 pcs.
- Unit of mains supply source – 1 pcs.
- Housing
- Complete set of connecting cables
- CD with receiver control program library

TECHNICAL PARAMETERS

• Operating frequency band	**1.0 … 30.0 MHz**
• Number of receiving channels	**4**
• Antenna input	**Z_{in} = 50 Ohm or 2 • Z_{in} = 50 Ohm**
• SWR_{in} antenna input	**< 1.8**
• Sensitivity with SNR = 10 dB, BW = 3 kHz	**< 0.5 µV**
• Dynamic range by compression of output signal by 2 dB under one-signal interference when detuning:	
within preselector bandwidth	**100 dB**
out of preselector bandwidth	**126 dB**
• Dynamic range by third order intermodulation	**> 90 dB**
• Radiocircuit bandpass (by level -3 dB)	**$0.05 \cdot f_o$**
• Filter bandpass (is set with 1 Hz step)	**0.03 … 4 / 8 / 12 / 16 kHz**
• Rectangularity of filter amplitude-frequency characteristic	**1.1 … 1.5**
• Selectivity by adjacent channel	**> 85 dB**
• Attenuation adjustment of input attenuator	**0 … 42 dB, step 6 dB**
• AGC adjustment depth	**120 dB**
• AGC time constant:	
"charge"	**5 ms**
"discharge"	**0.1 / 0.5 / 1 / 5 / 10 s**
• ADC resolution of digital circuit	**16 bit**
• Suppression of side receiving channels	**> 100 dB**
• Relative frequency instability	**$\pm 5 \cdot 10^{-7}$**
• Frequency tuning time of receiver	**3 ms (max)**
• Frequency tuning step	**1 Hz**
• Spectral density of heterodyne noise (1 kHz detuning)	**≤ –115 dBs/Hz**
• Quality assessment of received signal level	in dB
• Signal demodulation	**AM, CW, USB, LSB**
• Adjusting of tonal heterodyne frequency (BFO)	**±3 kHz, step 10 Hz**
• Volume control of LF-signal	**0 … 40 dB, step 1 dB**
• Number of LF-outputs	**4**
• Parameters of LF outputs:	
LF-output for connecting headphones	**68 Ohm, 2 V**
LF-output for connecting balanced line	**600 Ohm, 2 V**
• Remote control	**USB, RS232**
• Sampling rate of input I/Q-samples	**11.025 kHz / 22.050 kHz**
• Power consumption	**220V/50 Hz, 27 V**
• Consumed power	not more than **65 V·A**
• Overall dimensions (crate 3U)	**150 × 480 × 450 mm**
• Weight	not more than **20 kg**

«Scientific-Engineering Center of Radio Engineering Systems of Applied Radioelectronics of Academy of Science» Ltd.
✉ 7/8, Vosstaniya sq, Kharkov, Ukraine, 61001
☎ +38 (057) 732-25-53, fax +38 (057) 732-68-63,
E-mail: ntcrts@kharkiv.com , www.ntcrts.com