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A GROUND-BASED COMPLEX FOR RECEIVING DATA OF REMOTE SOUNDING OF THE EARTH FROM SATELLITES

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The paper presents a brief review of the ground-based complex for receiving and logging data of the Earth remote sounding on the territory of Ukraine. This complex receives data from Earth artificial satellites.

The space technology development program of the National Space Agency of Ukraine provides for the launch of a number of Earth artificial satellites, including the space vehicles with equipment for the Earth remote sounding, satellite communications, data transmission, etc. [1–4]. The ground-based complex for receiving and recording data of the Earth remote sounding is an integral part of the ground-based scheduling-and-technical system distributed over the territory of Ukraine. This system provides the scheduling and coordination of activities to collect data of the Earth remote sounding (ERS), receive, log, process, and distribute the space information which may be downlinked.

This complex performs the following functions: the reception of the job schedule for the specified period (3–7 days) and initial conditions from the scheduling and data processing center; holding sessions to pickup data of remote measurements; logging of data received and their tying to the universal time; distribution of data stream of remote measurements by instruments and spectral channels; the attachment to geographical coordinates on the basis of ballistic data; the time reference of data; framing of video data; elimination of instrument distortions; correction of video data by calibration characteristics; annotation of information, generation of arrays of remote measurement data for their transmission to the scheduling and data processing center; on-line quality assessment of remote measurement data, generation of an array of pending requests using the reception results; execution of a reception session and the logging of data on magnetic media.

The ground complex for receiving and logging information (see Fig. 1) is equipped with antenna complex *1* having the parabolic 12 m diameter antenna, and the equipment implementing the giant oscillations technique for satellite tracking. This equipment includes primary receivers *2*, compensators and basic selection circuits *3*, compensators and demodulators *4*, equipment for interfacing, demultiplexing, and logging *5*, data processing equipment *6*, control, monitoring, and measurement equipment *7*, power supply system *8*.

The tracking rate of up to 8°/s enables us to track the low-orbit satellites having the orbit height of about 400 km. The application of low-noise amplifier with $T_n = 55$ K ensures the signal-to-noise ratio at the receiver input equal to 16 dB in the ten-degree area while receiving an on-board signal of the spacecraft. It is assumed that the antenna features the gain of 5 dB at the output power of 10 W in the 120 MHz band, provided the intensity of precipitations does not exceed the statistical average level for the central part of Ukraine within 99% of annual time.

The complex design involves the triple redundancy of basic units (see Fig. 1). The types of signals received feature: modulation types PM-2, PM-4, differential phase-shift modulation (DPSM-2 and DPSM-4); transmission rates 18–256 Mbit/s; convolution encoding, encoding rates 1/2, 2/3, 1. The equipment enables us to adapt the circuit for various formats of signals and change the pattern of scrambling sequence. The receiving circuit converts the input range 8.0–8.4 GHz into the demodulation frequency with step 100 kHz. Frequency $f_{if1} = 1.75 \pm 0.07$ GHz is used for the demodulation of signals having

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