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SYSTEMS AND FACILITIES OF EARTH REMOTE SOUNDING

THE SPACEBORNE DATA PROCESSING OF THE "KYI" MULTI-CHANNEL RADIOMETRIC COMPLEX

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Main problems of on-line data processing for the "Kyi" microwave radiometric complex are considered. A structural algorithm of data processing for the spaceborne segment of the computational complex is presented.

The future microwave radiometric complex (RMC) "Kyi" to be launched by a Ukrainian spacecraft of the "Sitch" series may be categorized as a multi-channel (multi-frequency) microwave radiometric system that permits obtaining radio-thermal images of the Earth surface in six spectral bands at frequencies of the electromagnetic radiation spectrum in the range of 6.6–90 GHz with two linear orthogonal polarizations and a spatial resolution high enough for these systems (3–50 km) [1].

The main feature of the "Kyi" RMC, as distinct from already known systems of this class, is the use of an individual optimized feed of the antenna for every pair of polarization channels for a specific frequency range (in order to "linkup" the lines of the image in the 90 GHz range, two feeds and, hence, two pairs of polarization channels are used). This concept of RMC offers several advantages over a common multi-frequency feed installed in such systems as SSMR and SSM/I [2, 3]: an increased aperture surface utilization ratio of the main antenna reflector for high-frequency RMC channels making it possible to obtain theoretically achievable spatial resolution for the given antenna dimensions; reduced active losses in the input path of the radiometric channel; improved discrimination between polarization channels; a simpler input path of the system.

On the other hand, the use of this RMC imposes new requirements on the on-line spaceborne processing. Particularly, the chain-type arrangement of the feed in the focal plane of the main reflector causes the mutual spatial displacement of scanning zones for different frequency channels, and timing disturbance when observing particular surface elements and calibration standards. Thus, the effective account of all factors involved in the course of spaceborne data processing is necessary.

Stages and methods of processing. The processing of radiometric information may be divided into two separate stages. The first step task is to produce radiothermal maps for the "surface–atmosphere" radiating systems with maximum achievable accuracy of reproduction of the radiothermal pattern (taking into account feasible parameters of spatial and radiometric resolution for a particular measuring channel), and to generate, for each RMC channel, the spatially fixed numerical readings for the measured intensity of thermal radiation in terms of the "radio-brightness" units. At this stage of data-processing an accent is made on elimination of instrumental distortion of information arising when performing the radiothermal survey and depending on the non-ideal nature of the RMC elements, instantaneous variations of their thermal conditions, transformation errors of the picked-up signals into output readings, and variations in the radiothermal survey pattern due to changing spacecraft flight parameters. The radio images produced represent the primary medium for the

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