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THE MULTICHANNEL SCANNING ANTENNA SYSTEM OF THE EHF RADIOMETER COMPLEX FOR SPACE VEHICLES

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The paper considered the design and operating principle of the mechanical scanning antenna system for the satellite multichannel radiometer complex possessing high manufacturing adaptability and not needing additional elements for statistical and dynamic balancing.

The installation of the multichannel radiometer complex (RMC) on the space vehicle lend to all its components, in particular, its scanning antenna system (SAS), a number of specific requirements one of which, no doubt, should be met, while others are only of recommendation nature:

1) All revolving components should be completely balanced statically and dynamically, given all speeds of their evolution provided by the functioning protocol.

2) RMC performance data provided for by the specifications should be secured at minimal possible revolution speed of the SAS components.

3) The reflecting mirror (as technologically most complex and expensive antenna element, whose cost is proportional to the third degree of its aperture) should have the simplest technologically-adaptable shape and minimal possible dimensions and weight.

4) SAS should ensure the reception of the proper thermal radiation of the Earth's surface in all frequency channels from one or from several overlapping sections of the Earth's surface.

5) SAS should ensure surface resolution of luminance temperature of the Earth's surface sufficient for subsequent restoration of the luminance temperature relief of the Earth's surface having the required surface resolution.

6) Observation time of each element of surface resolution in all frequency channels should be maximum possible.

7) The scanning method should ensure the scanning of the prescribe width of the observation width on the Earth's surface so as luminance temperature measured and related to the space vehicle (SV) inertial system is mapped in the simplest and most accurate way on the map graticute of the Earth's surface.

8) SAS transportation and operating positions on the orbit should not differ one from the other, which substantially simplified the RMS kinetics ruling out the procedure of mechanical installation, reduces the RMS weight, its cost, increasing reliability, etc.

These requirements are satisfied by the SAS design of RMS consisting of a multichannel feed and reflecting mirror in the form of a straight electro-conducting prism rotating around the axis located in the orbit plane or in the plane parallel to it, at the prescribed angle to the local vertical. Fig. 1a (where *1* is the scanning sector, *2* is a cold load, *3* is the multichannel feed, *4* is the hot load (HL1), *5* is the hot load (HL2), *6* is the prism-scanner) shows the cross section of SAS by the plane perpendicular to the rotation axis of the three-face prism. Such a mirror-reflector has reflecting surfaces — planes, i.e., the simplest manufacturing adaptable surfaces, while the prism itself possesses the symmetry of the *N*th order with respect to the rotation axis and therefore does not require additional elements for static dynamic balancing. To offset kinetic moments of the responses of the supports both of the prism and electric motors (main and standby) of the drive of its rotation, a