

## REQUIREMENTS FOR THE PARAMETERS OF SYNTHETIC APERTURE RADARS ONBOARD SMALL SATELLITES FOR EARTH REMOTE SENSING

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Present-day small satellites for Earth remote sensing have found wide practical application in solving different problems in the socio-economic and defense areas. The use of small satellites is justified as a basis for the formation both of large constellations and constellations of several spacecraft or single spacecraft with the aim to reduce the cost of Earth remote sensing information. The miniaturization of electron components and the latest technological advances have made radar systems compatible with small satellites. The goal of this paper is to present, based on small satellites, expressions for calculating the key parameters of radar systems and their analysis and to calculate possible values of the parameters considered. Possibilities in principle of using synthetic aperture radars (SARs) are considered. The paper presents an overview of Internet sources that give broad information on the recent trends, technologies, and use SAR-equipped satellites. Particular attention is paid to the development of mini- and microspacecraft with X-band SARs operating, in particular, in the stripmap and spotlight modes. The key parameters that have an effect on the SAR possibility of producing high-quality images are presented. By the example of the ICEYE constellation of small satellites, important technical characteristics and parameters of modern radar systems equipped with an active phased array antenna are presented. A model of SAR imaging in the stripmap mode is considered. In the approximation of a rectangular antenna aperture, expressions are given to estimate the slant and the horizontal range resolution and the azimuthal resolution. The available range of the small-satellite SAR pulse repetition frequency is estimated. Relationships between the maximum swath width and the minimum SAR pulse repetition frequency are presented. Expressions are given to estimate the antenna dimensions, the SAR sensitivity, and the signal-to-noise ratio. The presented expressions allow one to analyze the effect of the main technical characteristics and parameters of minisatellite SARs on the design and power characteristics of small satellites and the orbit parameters. The obtained results make it possible to develop recommendations on the design of imaging equipment for home low-orbit satellites and their constellations.

**Keywords:** *Earth remote sensing, small satellite, stripmap mode imagery, synthetic aperture radar, resolution, pulse repetition frequency, signal-to-noise ratio.*

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