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RUSSIAN TECHNOLOGIES OF MONITORING AND REMOTE SENSING USING NANOSATELLITES

Abstract

The nanosatellites development program with different purposes payload onboard has being realized in JSC "Russian Space Systems" since 2008. Three main tasks have been considered in this program: AIS signals registration from marine vessels in space, ionosphere plasma state monitoring and atmospheric GLONASS/GPS radio occultation space-based technology. The objects monitoring system base elements, including nanosatellite with AIS receiver onboard ("CosmoAIS"), began to develop in 2011. In addition the problems of perspective AIS satellite segment modeling, ground segment deployment, AIS payload for meteorological and resource low orbit satellites development has been investigated under the umbrella of the research. AIS receiver both for CubeSat and other platforms has been successfully developed. The major characteristics of CubeSat device are following: total power consumption – 2.5 Watts, sensitivity – -117 dBm. The CosmoAIS platform and AIS receiver integration tests and submission of the CosmoAIS satellite to lunch provider are assumed to be done until the end of the current year. The other enterprise activity direction is the ionosphere monitoring technologies based on radio tomography method. More than 10 special tomography stations for 150/400 MHz signals receiving have been deployed in Russian Federation territory at the present time. Unfortunately, the amount of satellites with 150/400 MHz transmitters onboard has significantly decreased because of the end of their lifecycle. Only 3-4 operational satellites exists that is not enough for the comprehensive research. It is important to fill this gap for active satellites, so quick and relatively low-cost solution of this problem is nanosatellite development especially for the ionosphere tomography research. The CubeSat's formfactor transmitter prototype with total power consumption less than 6 Watts has been developed by our team. This equipment is fully compatible with the ground stations have been deployed in Russia already. According to the technological nanosatellite development experience (TNS-0 was launched from ISS in 2005) the atmosphere radio occultation nanosatellite concept was created. It was shown that this technology could be realized on satellite lighter than 10 kg. Thereby this research presents the successful development examples of the special nanosatellites payloads and technologies in Russia. These devices might become the commercial products in the case of their successful tests in space. Taking into account the potential commercialization process of the CubeSat's payloads for the different monitoring and remote sensing space systems the possibility of the international cooperation with relatively reasonable "entry ticket" price for the countries are new in space industry is starting.