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DEVELOPMENT OF SMALL SATELLITE NEXTSAT-2 FOR X-BAND SAR DEMONSTRATION

Abstract

The radar satellites, unlike optical satellites, can acquire the Earth surface images of interest even in clouds or at night; thus, they have a great advantage that they can be used for Earth observation under almost all-weather conditions. Recently small satellites have become more attractive even in SAR (Synthetic Aperture Radar) applications due to their low cost of development and satellite constellation. The NEXTSat-2 is also a small radar satellite equipped with X-band SAR for Earth observation regardless of the weather condition. The primary mission of NEXTSat-2 is to demonstrate its SAR imaging capability on orbit in order to increase the availability of small satellite in remote sensing applications. For this purpose, the NEXTSat-2 was built for enabling Earth-imaging by SAR; it has total wet mass of 180kg and dimension of 1.3(L)x1.0(W)x0.7m(H) for stowed configuration. The spacecraft has the bus power capacity of 36Ah, the payload data transmit rate of 320Mbps, the data storage of 384Gb and the pointing accuracy of 0.04deg (3σ). The SAR payload operates at the center frequency of 9.65GHz and has the look angle of 20-35deg. It can produce the SAR imagery having the resolution of 5m and the swath of 40km in StripMap mode. In addition, the NEXTSat-2 adopts affordable large-deployable simple antenna system to provide the entire area of 5.2mx0.55m when radiating on orbit during SAR mission. The planar SAR antenna consists of total five panel-antennas; one is fixed to spacecraft body and four are mechanically deployable. The SAR antenna is sub-divided into 14 subarray antennas and their dedicated TRMs. A subarray antenna consists of a 16x24 element micro-strip patch antenna array. The entire SAR system comprises a modular SAR Central Unit, a compact Power Supply Distribution Unit, deployable antennas and Transmit/Receive Modules (TRMs). The NEXTSat-2 has been operating on a dawn-dusk orbit with 550km altitude since its launch at Naro Space center by KSLV-II in 2023. This paper describes the system

configuration, main features and operating status of affordable small satellite NEXTSat-2 equipped with X-band SAR. It can provide the medium-resolution radar images with relatively wide swath in order to meet the needs of identifying and monitoring of natural anomalies on a larger scale.