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SDS-4 ATTITUDE CONTROL SYSTEM: THREE YEARS IN-ORBIT OPERATION RESULTS

Abstract

The Small Demonstration Satellite (SDS) program is a JAXA technology demonstration program, targeting the in-orbit demonstration of advanced technologies using small satellites. Following the success of SDS-1, the SDS-4 spacecraft was successfully launched on 18 May 2012 and continues the in-flight demonstration of a space-based Automatic Identification System (AIS) as well as numerous flight experiments.

The SDS-4 evolves on a 677-km Sun-synchronous orbit with ascending node at 13:30 PM and the inclination of orbit is 98 degrees. The SDS-4 attitude control subsystem provides 3-axis zero-momentum stabilized control by using reaction wheel with three magnetic torquers for momentum dumping. The attitude determination is based on Kalman filter estimation using a star tracker (STT), digital sun sensor (DSS), MEMS three axis gyro (VSGA) and a magnetic sensor (MAGS). The SDS-4 is controlled in an inertially-fixed sun-oriented attitude and the required pointing accuracy from missions is 5 deg (3). During experiments of AIS, the attitude is controlled with respect to the orbital frame for nadir pointing and over one hundred nadir pointing experiments was conducted in orbit.

This paper describes the in-flight results of the three years operation of Attitude Control System for 50 kg class small satellites. The result of three years trend analysis of ACS components and dynamics of attitude control system including seasonal effects are described.