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PRELIMINARY IN-ORBIT RESULTS OF STAR OF AOXIANG

Abstract

Standard CubeSats have a volume range from 1U to 3U, which limits their applications due to the difficulty of miniaturizing payloads. To facilitate the needs on a larger but low cost satellite platform, a 12U CubeSat called "Star of AoXiang" (SAX) has been developed by students and young professionals in Shaanxi Engineering Laboratory for Microsatellites (SELM), Northwestern Polytechnical University (NPU), China. The main objectives of SAX are three-folds: 1) To investigate the feasibility of using polarized sun light for spacecraft attitude determination and navigation; 2) To perform micro-gravity research using a miniaturized gravimeter; and 3) To demonstrate hopefully the world first 12U CubeSat platform and relevant technologies.

Polarized sun light has useful information for spacecraft attitude determination and navigation. The onboard Polarization Light Sensor (PLS) developed by SELM is based on the bionic research. The PLS can get the maximum polarization angle which is vertical with the solar meridian plane, and then the attitude and navigation information of the satellite could be collected from the polarization angle information. As the main payload of SAX, the PLS can effectively detect the Earth's atmosphere polarization mode with the data collected in orbit, and provide a basis for the application of polarization in satellite navigation.

Apart from PLS, another interesting experiment onboard SAX is gravity field measurement, which could contribute to e.g. seismic survey and forecast, oil and gas exploration and etc. Traditional gravimeters are very big and consume high power; therefore they are only suitable for big satellites such as GOCE. The researchers in NPU have developed a new gravimeter that is small enough and could be carried by CubeSats. By sensing the density of the micro-gravity, the gravimeter onboard SAX could depict the distribution of the micro-gravity in LEO.

To demonstrate the satellite platform, SELM has developed many components and subsystems for SAX, such as a digital 3-axis magnetorquer system, a small but highly reliable 3-axis reaction wheel system, a fault tolerant onboard computer, a GPS/COMPASS receiver, a 12U structure and etc. At present, SAX has passed all the tests and is ready for launch in the middle of 2016 onboard a Chinese launch vehicle. The preliminary in-orbit results of payloads and the platform will be presented in this paper.