SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Small Space Science Missions (2)

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SMALL SATELLITE REIMEI FOR AURORAL OBSERVATIONS

Abstract

This paper describes the on-orbit results and the lessons-learned of the small scientific satellite "REIMEI" developed by ISAS/JAXA, Japan, for aurora observations and demonstrations of advanced satellite technologies is a small satellite with 72kg mass, and is provided with three-axis attitude control capabilities for aurora observations. REIMEI was launched into a nearly sun synchronous polar orbit on 2005 from Baikonur, Kazakhstan by Dnepr rocket. The REIMEI satellite has been working satisfactorily on orbit for 54 months as of February, 2010. Multi-spectrum images of aurora are taken at an 8-Hz imaging rate with 2-km spatial resolution to investigate aurora physics. REIMEI is performing the simultaneous observation of aurora images and particle measurements. These observations reveal fine structures of aurora as well as the physics of acceralating regions. Also simultaneous observations with ground ionospheric radars have been coordinated for the ion observations at the polar cusp regions and the auroral regions. Three axis control of the satellite attitude is achieved with an accuracy of 0.05 deg (1σ) by means of the magnetic control with one-axis bias momentum. We applied several novel ideas on the magnetic control such as the on-board estimation and the feed forward control of the residual moment as well as the singularity robust inverse method. Also we describe the cost-effective approaches at REIMEI project for high performance and reliable satellite systems. Satellite operations is simplied to reduce the operator's load, utilizing the Concurrent Version System(CVS) for managing satellite operation plans, satellite operation procedures (SOP) with Extensible Markup Language (XML) files, and the automatic closed loop simulations with software and hardware-in-the-loop.