國立中央大學太空科學與工程學系

Department of Space Science and Engineering, National Central University

專題演講

Implementation of Hardware in-the-loop Test Platform for Spacecraft Electrical Power Subsystem

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Time： 111 年 5 月 13 日 星期五 10:00 - 12:00

Place： 健雄館(科四館) S4-817-1 教室

摘 要/Abstract：

For spacecraft such as satellites that execute space missions, a successful mission will bring countless valuable achievements, such as technological improvements, exploration of unknown scientific phenomena in deep space, and education and training of skilled professionals, etc. However, the spacecraft must operate in the extremely harsh space environment, withstanding a considerable temperature difference and the impact of high energy charged particles. Once launched by a rocket, if there is an abnormal event, it can only be addressed remotely by uplinking commands from a ground station. Therefore, space missions can be regarded as high-value, high-cost, and high-risk projects. In order to ensure that the project can be successfully completed, functional and integration tests are essential before launch. However, tests conducted on the ground may still have potential problems that are difficult to diagnose due to differences between the ground and the actual space environment. Hardware in the Loop (HIL) technology enables the system under test to perform functional tests under the conditions close to the real operating environment in a low-cost manner.

This thesis will conduct HIL tests on a spacecraft Electrical Power Subsystem (EPS) which is a subsystem with a high probability of abnormality in satellite missions, and build an EPS Hardware in the Loop (EHIL) test platform. The platform uses the EPS from a 3U CubeSat mission, the Ionospheric Dynamics Exploration and Attitude Subsystem Satellite (IDEASSat / INSPIRESat-2), already launched in January 2021 as the simulation object for developing EHIL. Moreover, it also tests the ability and stability of the IDEASSat EPS in power generation, storage, and distribution under long-term operations. The performance of the platform is verified by comparing the simulation results from EHIL with the beacon packet data which downlinked during the commissioning of the spacecraft. It is expected to be applied to the long-term endurance and functional verification of EPS units for future satellite missions.

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