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Author: Mr. Tae-Yong Park
Chosun University, Korea, Republic of

Mr. Seong-Cheol Kwon
Chosun University, Korea, Republic of
Prof.Dr. Hyun-Ung Oh
Chosun University, Korea, Republic of

DEVELOPMENT OF 1U STANDARDIZED CUBESAT OF STEP CUBE LAB. FOR ON-ORBIT
VERIFICATION OF SPACE RELEVANT RESEARCH OUTPUTS FROM UNIVERSITIES IN KOREA

Abstract

STEP Cube Lab. (Cube Laboratory for Space Technology Experimental Project) is the first 1U (Unit)-sized cube satellite that has been developed by space technology synthesis laboratory (STSL) of Chosun University in Korea. The main mission objective of the STEP Cube Lab. is to excavate core space technologies that have been researched in domestic universities, which will be potential candidates for future space programs, and to verify the technical effectiveness of these technologies through mission data obtained by an on-orbit operation of the cube satellite. The effectiveness of these technologies have never been validated through an actual operation in space or space-simulated environmental tests considering harsh on-orbit and launch environments, although their functionality and performance were fully verified in laboratory-level tests in domestic universities. For the mission of the STEP Cube Lab, five technologies have been selected as payloads, which comprises of a variable emittance radiator (VER), a phase change material (PCM), a MEMS-based solid propellant thruster, a novel non-explosive holding and release mechanism (HRM), and a concentrating photovoltaic (CPV) system employing commercial fresnel lens system. In this paper, a background on the cube satellite development for on-orbit verification of core space technologies, and a mission definition were introduced. In addition, we described a design results of the STEP Cube Lab. from system to subsystem level, and a verification process to validate the design of the STEP Cube Lab. from payload to system level was also described. The verification results, such as functional performance test, on-orbit and launch environmental tests, and long-range communication test, indicated that the designed STEP Cube Lab. is effective for realization of the mission objectives.