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Author: Prof. Taig Young Kim
Korea Polytechnic University, Korea, Republic of, tagikim@kpu.ac.kr

Mr. Yeon Cho
Korea Polytechnic University, Korea, Republic of, y.cho@kpu.ac.kr
Dr. Joung-Ki Seo
Satellite Technology Research Center(SaTReC), KAIST, Korea, Republic of, hagis@kaist.ac.kr
Dr. Tae Seong Jang
Satellite Technology Research Center, KAIST, Korea, Republic of, tsjang@kaist.ac.kr
Dr. Hong-Young Park
SaTReC, Korea, Republic of, hypark01@kaist.ac.kr

DEVELOPMENT OF THE THERMAL CONTROL UNIT USING THE SOLID-LIQUID PHASE CHANGE MATERIAL FOR MULTI-HEAT SOURCES INSTALLED ON THE KOREAN NEXTSAT-2

Abstract

A thermal control unit using a solid-liquid phase change material (PCM) for multi-heat sources to be installed on the Korean small science satellite, NEXTSat-2, was tailored design and manufactured. The unit design has been already qualified via various required environmental tests such as thermal vacuum/balance, sine/random vibrations, shock, space radiation, internal bursting pressure, and long-term melting-freezing cycling. According to the qualified process, the flight model was manufactured and then assembled on the satellite main-body. In this study, we present the results of system level numerical analyses to verify the on-orbit performance, and the results of system acceptance level thermal vacuum test to confirm the verified performance furthermore the stability of manufacturing and assembly. The PCM unit effectively controls the component temperatures in designed range under the different heat generations and operation duties of each component. The NEXTSat-2 is scheduled to be launched in the second half of 2022 using the Korean Launch vehicle.