

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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SPACE QUALIFICATION TEST OF VIBRATION ISOLATOR FOR LOW AMPLITUDE VIBRATION

Abstract

Micro-vibration induced by actuating components of the satellite can severely degrade the optical performance of high precision observation satellites. The performance degrading vibration comes from the operation of critical components of a satellite such as reaction wheel assembly used for attitude control and is ever present throughout the lifetime of a satellite. Therefore, various isolation systems have been developed to improve the performance of the optical payloads under the micro-vibration environments. In this paper, viscous fluid isolator for the external micro-vibration induced by the reaction wheel assembly is developed and tested for space qualification. The space qualification tests includes thermal and vacuum test (on-orbit environment) and sine and random vibration test (launch environment). The qualification test conditions are derived from standard documents such as MIL-STD-1540E. The thermal vacuum test is performed under 4×10^{-5} torr vacuum condition and the space extreme temperature range. The performance of the vibration isolator under vacuum and thermal conditions is examined to guarantee its on-orbit performance. The test results show that changes in isolation performance remain within the specified range. Next, sine and random vibration test is performed to check isolator's mechanical integrity under launch environment. Vibration isolation performance of the developed isolator before and after the sine and random vibration test is compared, and the results show that the performance remains within the tolerance. The space qualification test results show that the developed isolator satisfies the requirements of space and launch environment.