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GROUND FAILURE STATISTICAL ANALYSIS AND SUGGESTIONS FOR CHINESE COMMUNICATION SATELLITES

Abstract

In the development of satellite, many unit and system level tests, which are costly and time-consuming, are performed to detect failures. By analyzing the failure data, the effectiveness of tests is evaluated, which is the foundation of experimental optimization. Since 2006, 398 ground failure data of Chinese communication satellites have been identified and collected, including DFH-3, DFH-4 and other satellite platforms. In this paper, the stage of failure ccurrence,failure causes, affected subsystem and affected unit type are studied and discussed. The results indicate that in all satellite system level tests, the electrical performance test detects most failures, followed by thermal vacuum test. EMC test has the lowest failure detection rate among all system level tests. In the AlT performance test, A/A1 status test, CM status and B status detect the most failures. Thus when optimizing the testing process, it is important to focus on the testing phase, which have been tested more than once or have a low failure rate. Since thermal vacuum test is a very effective test, it is beneficial for detecting failure to improving test coverage.During unit level test, the failures detected in thermal cycle and thermal vacuum tests are approximately almost 3 times than that of mechanical test. Corona test has the lowest failure detection rate among all unit level tests. The effectiveness of thermal vacuum test in detecting failures in microwave electronic equipment is higher than that of ordinary electronic equipment.Mechanical test have the highest failure detection rate for microwave passive equipment.Therefore, attention should be paid to the mechanism design of microwave passive equipment.Finally, summarizes and suggestions are given on improving the ground tests of equipment and satellite.