

Master 2020

Ms. Navya Ashok Kumar

Space Environmental Tests for Commercial Discrete Electronics.

ABSTRACT - Masterthesis

The thesis was carried out at Deutsches Zentrum für Luft- und Raumfahrt (DLR) in the Institute of Communication and Navigation. The purpose of this work is to investigate Total Ionizing Dose Effects and Single Event Effects on discrete electronic components.

The space radiation has strong influence on electronics in the payloads as far as performance of satellites are concerned. In fact, different sources of space radiation can cause performance degradation and failures of electronic devices inside the spacecraft. Discrete components such as diodes, transistors and MOSFETs are the most important commercially available electronic components. Due to the recent commercialization of the space sector, whenever possible commercial EEE components are tried to be used in the optical communication systems of the satellite payloads so as to reduce the cost. But these components face the issue of performance degradation and functional failure due to radiation effects. The radiation effects include accumulative effects which causes performance degradation and single event effects which causes catastrophic failure of the device. Therefore, to ensure functionality of the systems even in harsh space environments, it is necessary to choose these electrical components wisely and to test them under realistic conditions for their specified parameters. These tests include total ionizing dose and single event effect testing. This thesis mainly investigates TID testing of chosen MOSFETs using gamma ray irradiation by building circuits for the measurement of parameters affected due to radiation. It also investigates SEE testing of chosen MOSFETs using proton irradiation. Mainly it presents a theoretical evaluation of TID and SEE ground based testing to be performed on MOSFETs.