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STARS-E CLIMBER'S RADIATION ENVIRONMENT AND COMPONENT ANALYSIS RESULTS

Abstract

The Space Elevator has been a controversial topic for many years, though the concept of tethering satellites together is entirely possible, and has even been demonstrated many times to date. However, never before have tethered satellites been used to test the feasibility of using such a system as an in-orbit elevator.

The practical skills and techniques useful to the development of such a system have been acquired from the nearly annually held Space Elevator Challenge (SPEC), hosted in either Japan or Germany for the past few years. The highest vertical climb height achieved to date is 1[km]. However, each of these climb tests were performed from the ground up, and no testing has yet been done in space.

Thus, the STARS-E satellite is being built to test a TSS (TSS: Tethered Satellite System) with a robotic climber that can change its orbit, inspect the tether for damage or carry payloads between different systems, among other applications. Once the satellite system is released into orbit, it will deploy a tethered daughter satellite. After this satellite is fully deployed and the two satellites have stabilized, the robotic climber within the main satellite will begin driving up the tether. What effect the climber will have on the end-masses and tether itself is a point of great interest, and data on the motion of the entire system as the climber moves will be logged for further study. The robotic climber's electronics will be designed with mostly COTS (COTS: Commercial off-the-shelf) components.

This paper deals specifically with the predicted radiation environment, and the selection of components (preferably COTS) that can survive this environment for the duration of the mission. Testing was performed on DC/DC Boost Converters, Linear Regulators, Maximum Power Point Tracking ICs, Ideal Diodes and Microcontrollers. The internal circuit schematic on the component's datasheets were used to try and identify what parts would cease to function first, in an effort to predict the type of failure that might occur. Radiation testing was then performed to compare the results with the predictions, to come up with an outline for identifying likely failure of components that will be selected in the future.