

OPTIMIZATION OF REDUNDANT ANALYSIS AND DESIGN

FOR SPACEWIRE BUS

Session: SpaceWire components

Short Paper

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ABSTRACT

With the limited resources of FPGA chips, a design method which is based on the redundancy backup of the various functional sub-module in SpaceWire bus of FPGA in order to find the optimization design of redundancy backup of SpaceWire bus is brought forward. And the design method we talked above can improve the reliability of the whole system.

Firstly, according to failure rate of λ , the reliability of control module, transmitter module, receiver module, recovery module, error module, timing module, reliability module and baud rate selection module is calculated. And the calculated reliability of the whole system is 0.8675. Secondly, in order to meet the reliability of the whole system of space-solar telescope for SpaceWire bus is 0.95 after working in the 750 km sun-synchronous-orbit for three years, the reliability targets meeting the requirements of every module mentioned above is calculated and got, according to grading distribution. Finally, using the optimal solution based on non-linear programming in the theory of Lagrange multipliers method which worked out "optimal allocation of spare parts" problem, the optimization design of redundancy backup of the various functional sub-module is obtained. And the simulation results showed the Validity of this design, and this means that a new method of improving reliability of the redundancy backup in SpaceWire bus system has found.