

Radiation Tolerant Single Board Computer

Anthony Lai
Aitech Space Systems Inc.

Introduction

As the demand of processing capabilities increased in space applications, Aitech will meet these new challenges in our new generation of radiation tolerant processor boards by introducing several elements that can enhance radiation tolerance by design and selection of components.

Brief summary of related work and references

The design discussed in this paper and presentation is performed by Aitech design teams to specifically target two new radiation tolerant processor products: S220 and S320. S220 is a 6U VME processor card and S320 is a 3U cPCI processor card. The S320 will be available for production by the end of this year and prototype based on the design as described in this presentation/paper will be completed by Q3 of 2003.

The brief technical summary of the features of these processor cards and the unique design elements can be found in the corresponding data sheets available at our web site:

<http://www.rugged.com/products/space/s220/s220bullets.html>

<http://www.rugged.com/products/space/s320/s320bullets.html>

Discussion of the essential elements of the paper

The paper will address the key design elements to produce a radiation tolerant computer module using COTS components. The key design elements are:

- Implementation of a FPGA chipset to replace COTS memory and PCI bus controller
- Triple-voting SDRAM controller to enhance radiation reliability
- Dual boot firmware images controlled by hardware logic
- ECC and software programming techniques for user flash memory
- Component selections to accommodate LEO as well as GEO missions

Conclusions

In this paper, we have presented the key design elements for the next generation of Aitech radiation tolerant single board computers. Various techniques are discussed to offer insight to key functional elements of a general-purpose processor board that is suitable for use in both LEO and GEO environment.