

RAD750 SPACEWIRE-ENABLED FLIGHT COMPUTER FOR LUNAR RECONNAISSANCE ORBITER

Session: SpaceWire Onboard Equipment and Software

Long Paper

Richard Berger, Alan Dennis, David Eckhardt, Suzanne Miller, Jeff Robertson, Dean Saridakis, Dan Stanley, Marc Vancampen

BAE Systems, 9300 Wellington Road, Manassas, Va 20110 USA

Quang Nguyen

NASA Goddard Space Flight Center, Greenbelt, Md 20771 USA

E-mail: richard.w.berger@baesystems.com, alan.dennis@baesystems.com, david.g.eckhardt@baesystems.com, suzanne.miller@baesystems.com, jeff.robertson@baesystems.com, dean.saridakis@baesystems.com, dan.stanley@baesystems.com, marc.vancampen@baesystems.com, quang.h.nguyen@nasa.gov

ABSTRACT

An additional version of the RAD750TM CompactPCI[®] 6U radiation hardened single board computer has been developed and delivered for use on the Lunar Reconnaissance Orbiter (LRO) mission developed by NASA Goddard Flight Center, scheduled to launch in late 2008 as the first mission in preparation for manned missions to the Lunar surface. This new variant of the RAD750 processor incorporates both a SpaceWire router and 1553 interface. The LRO mission processor architecture represents a hybrid implementation in which the SpaceWire links, 1553 bus, and PCI bus are all utilized to interconnect the flight computer and on-board instruments. The RAD750 computer includes 36 MB of radiation hardened SRAM, 4 MB of non-volatile memory, and the ability to support PROM or EEPROM in its SUROM locations. The computer also includes an additional 8 MB of radiation hardened SRAM dedicated to supporting the SpaceWire ASIC that provides a four port router through a PCI interface. The 1553 interface consists of an Actel FPGA, Aeroflex "S μ MMIT DXE" ASIC, and dedicated memory. SpaceWire transport layer software was developed for the embedded microcontroller that resides on the SpaceWire ASIC using a C compiler developed by BAE Systems.

This paper discusses the definition of the new processor board configuration, definition and development of the software, and validation of the board through delivery to the mission. In addition, a preview of the next generation RAD750 processor board will be discussed, in which an improved four port SpaceWire router is incorporated directly into the third generation Power PCI bridge ASIC. This increased level of integration improves size, weight, and power of the flight computer while also adding features and increasing performance.

Approved for public release