

SEFI Mitigation Techniques for Microprocessors

Abstract—Commercial microprocessors are challenged for use in high-speed satellite computers due to the damaging effects of space radiation, particularly single event functional interrupts (SEFI). Space Micro has developed innovations for mitigating the harsh environmental effects of SEU and SEFI, enabling the use of very high-speed commercial microprocessors (>1,500 MIPS) with improved SEU tolerances (>1E-5 unrecoverable errors/day). SEFI is solved through the use of a SEFI Watchdog Controller circuit, external to the microprocessor. Space Micro has completed research on an improved understanding of SEFI and development of the SEFI Watchdog Controller. SEFI Watchdog Control functions were placed into a control computer and within hardware on a Pentium III single board computer, then radiation tested at UC Davis Cyclotron (protons). Radiation test results showing successful mitigation and recovery from SEFI events on the Pentium III will be provided. Additionally, preliminary design and use of a SEFI Watchdog Controller will be discussed.