Sandia National Laboratories

Exceptional service in the national interest

TECHNOLOGY SUMMARY

U.S. Patent No. 9,274,895
Technology Readiness Level: 5
Components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment

The Xilinx Virtex-5QV is a field programmable gate array (FPGA) designed for use in space applications. Despite radiation hardening of this particular FPGA, single-event upsets still occasionally corrupt the configuration memory of the device, requiring the use of a "scrubber" to correct these upset bits. Though scrubbing has historically required a separate external device, Sandia Labs developed a "self-scrubber" that scrubs the configuration memory of the same device in which it is implemented. This eliminates the need for a separate external device, significantly reducing the cost and complexity of programs that utilize Xilinx Virtex-5QV FPGAs.

The "self-scrubber" is a module written in VHDL that is intended to be integrated into a larger FPGA design. The self-scrubber module accesses the FPGA configuration memory through the internal ICAP configuration port and continually reads through the memory contents looking for errors. The self-scrubber corrects single-bit errors as they are discovered and is capable of reliably detecting double-bit errors in each frame. For frames with two or more bits in error, the errors are corrected by reloading the frame in error from an external memory.

The "self-scrubber" is an extremely cost effective, power conservative, and reliable alternative to external scrubbing when mitigating errors in the configuration memory of the Virtex-5QV FPGA.

TECHNOLOGICAL BENEFITS

• Eliminates the use of expensive external devices to mitigate radiation damage
• Cost-efficient
• Easily programmable onto the device
• Continuous error correction in the configuration profile

POTENTIAL APPLICATIONS

• Space-based computing platforms that utilize Xilinx Virtex-5QV FPGA parts

CONTACT US

For more information, please contact:
ip@sandia.gov
Refer to SD#12505
Or to learn more, please visit our website at:
https://ip.sandia.gov