

Bridging methodology from component to system-level for the assessment of radiation effects in digital systems

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The objective of this work, in the context of the European RADSAGA project, is to propose a new methodology for radiation hardness assurance of digital systems. We investigate the possibility to define an intermediate approach that would combine the concept of system-level testing with the existing knowledge and best practices of component-level methods. Our methodology is developed and applied to two recent generations of system-on-modules based on 28-nm Planar and 16nm FinFET system-on-chips. A specific instrumentation was designed and added to the case study software and firmware application to improve the observability of the failures during system-level test campaigns performed with atmospheric-like neutrons, high-energy protons, pulsed laser and X-rays. The results are analyzed and the lessons learned from the experimental campaigns are summarized. Finally, the methodology limitations and possible improvements are reviewed.

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