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Qualification of radiation tolerance with fault-injection

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The new ALICE Inner Tracking System (ITS) is currently in its commissioning phase. The ITS sensors are read out by 192 ITS readout units, which send the data to the counting room. These readout units are located 4 m from theALICE experiment beam collision point and are therefore in a radiation zone. Thus, the components on the readout unit are radiation tolerant. The sensor data are collected and transmitted by a Xilinx FPGA on the readout unit. An auxiliary and radiation tolerant Microsemi ProASIC3 (PA3) FPGA is on the readout unit to provide configuration and scrubbing of the Xilinx FPGA design. The fault injector is a new module of the PA3 design. With this fault injector it is possible to run a radiation qualification test for the Xilinx FPGA design without any radiation facilities. Since this module runs stand-alone, the entire detector system is available and ready when the faults are injected. This allows one to observe the system effects of SEUs in the Xilinx FPGA which will significantly increase the design iteration speed when doing radiation qualification of the design. An upgrade during a technical stop can be qualified for the equivalent of a 9 months run in just 4.4 hours because of the error injection rate of this design, which runs orders of magnitude faster than in real time.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

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