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Development of Radiation-tolerant Slow-Control Board based on Atom Switch-based FPGA

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Atom Switch-based FPGA (AS-FPGA) is a potential candidate for use in high radiation environments like future particle physics experiments using accelerator. We performed neutron and gamma-ray irradiation tests for the AS-FPGA. No Single Event Upsets (SEUs) were found at least up to 10^{11} and 10^{12} n/cm² with and without applying voltage, respectively. It tolerated Displacement Damage Doses (DDD) at least up to 10^{14} n/cm² and showed no Total Ionizing Dose effects (TIDs) at least up to 2 and 5 kGy with and without applying voltage. We confirmed the suitability of the AS-FPGA for such environments. More tolerances for SEUs, DDDs, and TIDs for higher radiation levels are expected, and these tests are ongoing. To apply the AS-FPGA realistically to the experiment, some evaluations and improvements are needed. We have developed an evaluation board for slow control to assess performance. It was used for logic, function, and operational tests under irradiation, and we have successfully operated the AS-FPGA in the high radiation environment. In this presentation, we report more details about the irradiation tests of AS-FPGA and the development of the slow-control board.

Minioral

Yes

IEEE Member

No

Are you a student?

No

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