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Primary Experimental Radiation Effects Results of 28 Nanometer Configuration System-on-Chip(Xilinx Zynq-7010 SoC)

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The experimental system we established for evaluating the single event effects (SEE) and total ionizing dose effects (TID) of Xilinx MicroZed Zynq-7010 SoC was introduced in the paper. The variation of the output current of the test SoC during 60Co gamma irradiation was measured. The irradiation dose rate was 0.04Gy(Si).s⁻¹. The test SoC output current changing characteristics under the condition of high temperature (70oC) and room temperature annealing after total gamma irradiation dose 1.69kGy(Si) were surveyed and analyzed. Meanwhile, the SEE sensitive electronic circuit elements including (D-Cache, programmable logic(PL),memory, and registers,etc. embedded in the SoC) and several typical external ports, such as DMA, QSPI and GIC, were tested with 239Pu alpha irradiation on SoC. The single event effects of DDRAM was tested by 1060nm laser irradiation on the bakside. The phenomena of SEU, SEFI and MBU happened in different parts induced by alpha or laser irradiation in the test system were observed.

Summary

The experimental results showed that the test 28nm SoC were sensitive to SEE and ionizing irradiation. The gamma irradiation total dose evaluation threshold value for the test system was about 1.26kGy(Si).

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