

技术及应用

CMOS工艺微控制器瞬时电离辐射效应实验研究

金晓明¹; 范如玉^{1, 2}; 陈伟²; 王桂珍²; 林东生²; 杨善潮²; 白小燕²

1. 清华大学工程物理系, 北京100084 2.西北核技术研究所, 陕西西安710024

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摘要 利用CMOS工艺微控制器的实验测试系统, 在“强光一号”加速器上进行了瞬时剂量率效应实验。实验研究采用的γ脉冲宽度为20 ns, 剂量率(以Si原子计)为 $6.7 \times 10^6 \sim 2.0 \times 10^8$ Gy/s。在不同的剂量率水平下观察到了扰动和闭锁效应, 获得了微控制器的闭锁阈值, 分析了扰动时间、系统功耗电流与剂量率间的关系。瞬时电离辐射在CMOS工艺电路的PN结中产生光电流, 导致了电学和功能参数的退化。

关键词 [瞬时电离辐射](#) [微控制器](#) [扰动](#) [闭锁](#) [闭锁阈值](#)

分类号

Experimental Research on Transient Ionizing Radiation Effects of CMOS Microcontroller

JIN Xiao-ming¹; FAN Ru-yu^{1, 2}; CHEN Wei²; WANG Gui-zhen²; LIN Dong-sheng²; YANG Shan-chao²; BAI Xiao-yan²

1. Department of Engineering Physics, Tsinghua University, Beijing 100084, China; 2. Northwest Institute of Nuclear Technology, Xi'an 710024, China

Abstract This paper presents an experimental test system of CMOS microcontroller EE80C196KC20. Based on this system, the transient ionizing radiation effects on microcontroller were investigated using “Qiangguang- I ” accelerator. The gamma pulse width was 20 ns and the dose rate (for the Si atom) was in the range of 6.7×10^6 to 2.0×10^8 Gy/s in the experimental study. The disturbance and latchup effects were observed at different dose rate levels. Latchup threshold of the microcontroller was obtained. Disturbance interval and the system power supply current have a relationship with the dose rate level. The transient ionizing radiation induces photocurrent in the PN junctions that are inherent in CMOS circuits. The photocurrent is responsible for the electrical and functional degradation.

Key words [transient](#) [ionizing radiation](#) [microcontroller](#) [disturbance](#) [latchup](#) [latchup threshold](#)

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