单粒子多瞬态诱导的组合电路软错误敏感性评估

鄂长江，李少甫，齐艺轲

（西南科技大学 信息工程学院，四川 绵阳 621010）

摘　要：为了评估数字电路的软错误敏感性，研究了一种适于 FPGA 的单粒子多瞬态（SEMT）诱导的组合电路软错误评估方法.考虑脉冲传输过程中受到的电气屏蔽的影响和辐射粒子入射的随机性，控制不同脉宽的 SEMT 脉冲对所有 SEMT 故障位置进行故障注入，统计错误结果.实验结果表明，该方法能对单粒子两个及以上瞬态诱导的组合电路软错误敏感性进行分析，得到各故障位置敏感度信息，供电路设计前端参考改进.

关键词：FPGA；组合电路；单粒子多瞬态；软错误

Soft error sensitivity estimation of single event multi-transient induced combination circuits

E Chang-jiang, LI Shao-fu,QI Yi-ke

(School of information engineering, Southwest University of Science and Technology, Mianyang 621010, China)

Abstract：In order to evaluate the soft error sensitivity of digital circuits, a single event multi-transient (SEMT) induced soft error analysis system for combinational circuits based on FPGA is proposed. Considering the influence of electrical shielding and the randomness of incident radiation particles in the process of pulse transmission, we control the different pulse width of the SEMT pulse to inject all the fault locations of the SEMT, and statistics the error results. The experimental results show that the system can analyze the soft error sensitivity of two or more transient induced combinational circuits. The sensitivity information of each fault location can be obtained, and the front-end of power supply circuit design can be improved.

Key words：FPGA; combinationa circuit; single event multi-transient; soft error

作者简介：

鄂长江　男，（1993-），硕士研究生.研究方向为数字集成电路软错误分析和预测.

李少甫(通讯作者)　男，（1966-），博士，教授.研究方向为高速通信系统.

E-mail：shaohu.li@qq.com.

齐艺轲　男，（1992-），硕士研究生.研究方向为数字集成电路抗辐射加固研究.