

Single Event Transient in the Pixel Array of CMOS Image Sensor Induced by Neutrons

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Abstract

The Single Event Transient (SET) due to neutrons with different energy is studied in the CMOS image sensor pixel array with experiment and Monte Carlo method. The neutron irradiation experiments are carried out at back-streaming white neutron (Back-n) at the China Spallation Neutron Source (CSNS). The SET is measured during the dynamic operation of the CMOS image sensor imaging system. The 3-D CMOS image sensor model is established, and the SET in the pixel array is simulated using Geant4. The characteristics of the SET are analyzed. The Convolutional Neural Networks (CNN) method is used to detect and remove the SET. The CMOS image sensor is vulnerable to the SET, and the typical characteristic of the SET in the CMOS image sensor is the bright point and bright straight line which is produced by secondary particles (such as the proton, alpha, etc.) of neutrons. The neutron energy greatly affects the SET in the pixel array of the CMOS image sensor, and the CNN is suitable to detect and remove SET induced by neutrons with different energy.