

Effect of Total Ionizing Dose Damage on 8-Transistor CMOS Star Sensor Performance

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The effects of total ionizing dose (TID) radiation from ⁶⁰Co gamma-rays on an 8-transistor global shutter exposure complementary metal-oxide semiconductor image sensor (CIS) within a star sensor is presented to analyze the sources of star sensor performance degradation and the decrease of attitude measurement accuracy. The dark current, dark signal non-uniformity, and photon response non-uniformity versus the TID are investigated. The signal-to-noise ratio, star diagonal distance accuracy, and star point centroid positioning accuracy of the star sensor versus the TID are also analyzed. By establishing the correlation between space radiation, CIS noise, and star sensor performance parameters, the transfer mechanism of CIS parameter degradation to star sensor parameter degradation is revealed.

Keywords: star sensor, 8-transistor CIS, total ionizing dose effect, performance degradation.

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