

INFLUENCE OF PRELIMINARY IRRADIATION BY GAMMA-QUANTA ON DEVELOPMENT OF CATASTROPHIC FAILURES DURING OPERATION OF IR-LEDs

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Infrared wavelength range light-emitted diodes (IR-LEDs) operate under conditions of various ionizing radiation, which leads to combined action of ionizing radiation, and long operating time factors limited their efficiency.

As a result of the preliminary investigation we have established that reliability of the LEDs and, therefore, their lifetime are limited by catastrophic failures (CFs).

Previously our research results of preliminary irradiation by neutrons influence on changes of IR-LEDs characteristics and on probability of development of catastrophic failures during their further operation have been presented in [*Gradoboev A.V., Orlova K.N., Asanov I.A., Salchak Y.A. // ISROS 2014: Proceedings of the International Symposium on Reliability of Optoelectronics for Systems, Toulouse. – 2014. – P. 1–7*]. By-turn only investigation results of preliminary irradiation by gamma-quanta influence on reliability Of LEDs have been considered in [*Gradoboev A.V., Simonova A.V., Orlova K.N. // E-MRS Spring Meeting 2016, Lille, France. Symposium BB.12.7. – 2016*].

Hence, the purpose of this paper is research the influence of ^{60}Co gamma-quanta preliminary irradiation on catastrophic failures development of IR-LEDs during long operating time. Matter of research is IR-LEDs based on double AlGaAs heterostructures. Irradiation has realized by ^{60}Co gamma-quanta in passive power mode. Reliability indices have assessed at results of step-by-step tests.

Consequently the investigation was determined that preliminary ^{60}Co gamma-quanta irradiation of dose less than $1 \cdot 10^5$ Gy has increased useful lifetime. However, increase of irradiation dose leads to decrease of LEDs reliability and reduction of lifetime.

Main causes of observable investigation results are discussed.

Keywords: LED, AlGaAs, reliability, gamma-quanta, catastrophic failures.