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Radiation resistance of SiC and Si detectors after irradiation with alpha particles

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The results of research of semiconductor detectors made of silicon carbide (SiC-SCD) [1-3] and silicon (Si-SCD) are presented. The irradiation was carried out using a standard spectrometric α -source ^{226}Ra with energies $E = 4.8; 5.5; 6.0; 7.7$ MeV. The thickness of the sensitive layer of the SiC detectors of n-type was $25\text{ }\mu\text{m}$ and $50\text{ }\mu\text{m}$, and the diameter of the working area was 3.0 mm . The initial energy resolution of the detectors was 25 keV . The Si detectors were manufactured using planar technology from n-type silicon with a working area of 7 mm^2 and a sensitive thickness of $100\text{ }\mu\text{m}$. The radiation hardness of SiC and Si detectors was studied before and after irradiation with alpha particles at integral fluxes up to $\sim 2 \times 10^{11}\text{ }\alpha/\text{cm}^2$. It was shown that degradation was observed after irradiation: the peaks from alpha particles shifted towards the lower channels and became wider. It was found that as the radiation dose increased, the energy resolution deteriorated by more than an order of magnitude for SiC-SCD $50\text{ }\mu\text{m}$, by a factor of 4 for SiC $25\text{ }\mu\text{m}$, and by more than a factor of 2 for Si-SCD. At the same time, the charge collection efficiency (CCE) decreased from 100% to 80% (operating voltage 300 V) for SiC-SCD $50\text{ }\mu\text{m}$, from 100% to 90% (operating voltage 200 V) for SiC-SCD $25\text{ }\mu\text{m}$, and from 100% to 95% (operating voltage 100 V) for Si-SCD at the maximum irradiation dose.

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2. Yu.B. Gurov et al. // Instrum. Exp. Tech. 2024, V. 67, No. 6, pp. 1095–1101.
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