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The radiation damage of PIN diode detectors irradiated with heavy ions studied with the positron annihilation spectroscopy

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The damage of semiconductor detectors caused by the ionizing radiation is a widely known phenomenon. In particular, the radiation resistance of PIN diodes used in various measuring systems have been the subject of research in the past. The response of such detectors to the high flux of gamma quanta [1], neutrons [2], protons and electrons [3] was studied.

The deterioration of the quality of the registered particles'energy spectrum determines the scope of the detector's applicability. This is especially important when designing detection systems that are to operate with large fluxes of charged particles.

At the HIL in Warsaw [4] and at the JINR in Dubna an attempt was made to investigate the radiation damage process of the 300 μm PIN diode type detectors.

The spectroscopic properties of the PIN diode detector irradiated using the heavy-ion beam were monitored by measuring the spectrum collected off-beam with the 241Am α source. Structural defects caused by the heavy ions in the irradiated PIN diodes were tested using the positron annihilation spectroscopy. This is a sensitive tool for the investigation of the open-volume defects as vacancies and their clusters [5,6,7].

The results of the performed measurements will be presented.

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