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Response function of GaAs:Cr X-ray sensors

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In this work an investigation of current-voltage dependencies on temperature and time were carried out in order to analyze relaxation time of electric field distribution in Me-GaAs:Cr-Me structures. To make conclusions of the possibility of deep levels recharging the charge collection efficiency dependency on the temperature was measured when irradiating with gamma radiation source and IR pulses. Slight increase of electron lifetime was observed with the increase of the temperature which corresponds to the improvement of the response function of GaAs:Cr sensors shown before [1, 2]. For the tests pad GaAs:Cr samples with active area size $3 \times 3 \text{ mm}^2$ and thickness $500 \text{ }\mu\text{m}$ were used.

The calculation of photocurrent dependency on the dose of irradiation was done. Saturation of the current is observed with the increase of the dose. This can be explained with the change of electric field distribution over a time under the generation of big charge –when increasing the applied voltage the dependency becomes linear.

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1. A.N. Zarubin et al., Evaluation of suitability of GaAs:Cr sensors for X-ray transmission technology of diamond-bearing ore enrichment, Nuclear Science Symposium, Medical Imaging Conference and Room-Temperature Semiconductor Detector Workshop (NSS/MIC/RTSD), 2016, DOI: 10.1109/NSSMIC.2016.8069941
2. J. Becker et al., Characterization of chromium compensated GaAs as an X-ray sensor material for charge-integrating pixel array detectors, 2018 JINST 13 P01007, <https://doi.org/10.1088/1748-0221/13/01/P01007>

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