

Investigation of electric field and charge multiplication in irradiated silicon detectors by Edge-TCT

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A Transient Current Technique (TCT) utilizing IR laser with 100 ps pulse width and beam diameter of FWHM=8 μm was used to evaluate non-irradiated and irradiated p-type silicon micro-strip detectors. The beam was parallel with the surface and perpendicular to the strips (Edge-TCT) so that the electron hole pairs were created at known depth in the detector. The pulse shapes were analysed in a new way, that does not require the knowledge of effective trapping times, to determine: drift velocity, charge collection and electric field profiles in heavily irradiated silicon detectors.

The profiles were studied at different laser beam positions (depth of carrier generation), voltages and fluences up to 5×10^{15} neutrons $1/\text{cm}^2$. Strong evidences for charge multiplication at high voltages were found for detector irradiated to the highest fluence.

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