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Investigation of neutron, proton, and gamma irradiated planar sensors using the Two Photon Absorption –Transient Current Technique

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The Two Photon Absorption –Transient Current Technique (TPA-TCT) is a newly developed tool for the characterisation of particle detectors. Contrary to present state of the art TCT, it allows to perform characterisation with a three dimensional spatial resolution. The setup at CERN is used to pioneer the technique with a tabletop setup that is designed for the investigation of silicon based detectors. It uses a 430 fs pulse fiber laser with a wavelength of 1550 nm, which is well beyond the linear absorption regime of silicon. Excess charge carriers are only generated in a small volume (approximately 1 µm × 1 µm × 20 µm) around the focal point of the laser beam, which allows a resolution in all three spatial directions.
This talk presents the TPA-TCT setup at CERN SSD and shows recent investigation of radiation damage in 150 µm thick FZ planar sensors fabricated by CIS. The dependence of the parasitic single photon absorption background on the fluence is presented, as well as a summary of available correction techniques. Further, CCE measurements conducted with TPA-TCT are presented and compared to 90Sr measurements. Finally, a comparison between the influence on the TPA-TCT of neutron, proton, and gamma irradiation is presented.

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