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Influence of radiation damage on the absorption of near-infrared light in silicon

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To study the charge collection efficiency of radiation-damaged silicon sensors, frequently red and near-infrared light is used to generate electron-hole pairs . In order to determine the absolute number of produced charge carriers, the light absorption coefficient, α, has to be known.

To study the change of α due to radiation-induced defects, we have measured the transmission of light with wavelengths between 1-2\,μm through silicon samples irradiated to 1 MeV-neutron-equivalent fluences between 0 and 1×10^{17} cm^{-2}.

In this contribution, the results of these measurements will be presented: the contribution of the irradiation to α was found to scale with fluence for the entire fluence range investigated. In the wavelength region around 1.8\,μm, evidence for the production of the radiation-induced divacancy defect V_{2i}^0 with a density approximately proportional to the fluence was found. For the band-gap energy, no fluence dependence was found within the experimental uncertainties.

Authors: VAUTH, Annika (Universität Hamburg); FRETWURST, Eckhart (Hamburg University (DE)); SCHWANDT, Joern (Hamburg University (DE)); KLANNER, Robert (Hamburg University (DE)); MARTENS, Stephan (Universität Hamburg)

Presenter: VAUTH, Annika (Universität Hamburg)

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