

This thesis is focused on study of charge transport in semiconducting radiation detectors. Theoretical calculations of current waveforms based on continuity equation and drift-diffusion equation are done. Useful approximations of current waveforms for detector with shallow electron trap are discussed. Monte Carlo simulation of the current waveforms is proposed and applied to fit experimental current waveforms measured using laser-induced transient current technique and for evaluation of charge transport parameters of the detector such as electric field profile, trapping and detrapping time of traps, drift mobility and other parameters. Detectors prepared from semi-insulating GaAs and CdZnTe single crystals are tested using electrical, spectroscopic and optical characterization techniques.