BASIC KINETIC MODEL OF THE X-RAY CONDUCTIVITY OF SEMICONDUCTORS

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During the registration of x-ray quantum by semiconductor detector we have a generation of free-carriers of charge in a small volume (diameter < 0,5 mkm). When we attach to the electrodes of semiconductor the difference of potentials, there is the directed motion of generated free-carriers and impulse of current in an external circle. We offered the logical scheme of construction of basic kinetic model of the x-ray conductivity of semiconductors, which bases on consecutive in time calculation of the spatial distribution of free-carriers of charge and uses the diffusive drift model of motion of free-carrier in solid. The basic form of current impulse in external circle we have got in analytical form in the case of ideal semiconductor, in other words semiconductor which does not contain deep traps and centers of recombination. Nonequilibrium free-carriers of charge are distributed in space and have the surplus of kinetic energy. Energy relaxation of these carriers happens as a result of dispersion on optical and acoustical phonons. We calculated the expansion of the spatial distribution of carriers as a result of dispersion on optical phonons and time dynamics of own electric-field of carriers. Localization of carriers on deep and shallow traps happens when carriers drifts to electrodes in the external electric field. The analysis of free-carriers motion is conducted taking into account their intermediate localizations on shallow traps and we have calculated the form of current impulse of the x-ray conductivity in the external electric circle of flat semiconductor detector. We offered physical model of motion kinetics of carriers when traps are available. This model allows to determine such parameters of current impulse of x-ray conductivity as amplitude, duration and form of impulse, depending on the place of x-ray quantum absorption and the value of enclosed electric field.

Actually, we have got current impulse kinetics when one x-ray quantum absorbs. So it is possible in following investigations to determinate the x-ray conductivity kinetics when we have the stream of x-ray quantum.