# ELECTRON COLLISION FREQUENCY AND HEAT CONDUCTIVITY IN METALS UP TO THE ELECTRON TEMPERATURES COMPARED WITH THE FERMI TEMPERATURE

***Petrov Yu. V.***, **Inogamov N. A.***

*ITP RAS, Chernogolovka, Russia*

**uvp49@mail.ru*

When ultrashort laser pulse acts onto the metal it creates a two-temperature state within the irradiation absorbtion depth of a metal target. Electron temperature $T_e$ essentially exceeds the ion temperature $T_i$. This state of a target matter is kept during some time interval (from several picoseconds to some tens picoseconds depending on the type of a metal ). Two-temperature stage of the interaction of a laser irradiation with metals is very important because it is just this stage which is characterized by the energy transfer from electrons to ions with their temperature relaxation. Electron-ion energy relaxation is simultaneously attended by the heat transfer from the surface into the bulk target (mainly through the electron heat conductivity) so that the heated layer of a metal target is formed for the most part during the two-temperature stage. This heated layer of a target, its thickness and state of a matter in it are of importance in the subsequent expansion of a target matter with its hydrodynamic motion, phase transitions and ablation. Dynamics of the energy transfer from electrons to ions, heat propagation into the bulk metal are essentially depend on the corresponding kinetic coefficients. These coefficients are rather well studied for the ordinary matter with moderate electron temperature but are known very bad for the condensed matter state with electrons having temperatures compared with the Fermi temperature. Estimation of such intrinsic characteristics of a condensed matter as the electron-phonon coupling constant for the electron-ion energy exchange $G$ and electron heat conductivity coefficient $\varkappa$ is of first importance in a true evaluation of a heated layer state and consequently in the obtaining the realistic ablation pattern when using the hydrodynamics or molecular dynamics simulation of a matter expansion. We have calculated the electron heat conductivity coefficient in the wide range of the electron temperature including the electron-ion and electron-electron scattering. For the electron-electron collision frequency calculation is made which is applicable in the range of electron temperatures less or comparable to the Fermi temperature as in contrast to the ordinary $\sim T_e^2$ dependence on the electron temperature at low temperatures. The theory is applied to the estimation of the electron heat conductivity coefficient of simple metals with s- and p- conduction electrons.