MODELING OF RADIATION TRANSFER IN EXPANDING LASER-INDUCED PLASMA OF Al VAPOUR

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ABSTRACT. The influence of radiation transfer on dynamics of laser-induced plasma of Al vapor is analyzed numerically. Mathematical description of the plasma is performed in the framework of the transient 2D radiation gas dynamics (RGD); the multi-group diffusion approximation with 7-1000 spectral intervals is used to describe plasma radiation transfer. The performed research allows us to conclude that radiative transfer substantially affects the expansion of laser plasma for the nanosecond action intensity of 10^9-2×10^{10} W/cm^2 and the pulse energies of 0.01-0.4 J. The radiative energy losses can reach 60% of the laser pulse energy absorbed by the plasma. The spectral composition of escaping radiation is non-equilibrium and qualitatively corresponds to the optically thin approximation. The application of the Planck averaging technique make it possible to predict the correct values of total quantities (integrated over the entire frequency spectrum) using several tens of groups.