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Investigation of inverse bremsstrahlung absorption in unmagnetized and inhomogeneous plasmas

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Abstract

One of the ways to absorb laser energy by plasma in thermonuclear fusion is called inverse bremsstrahlung absorption. In this process, energy is deposited through inverse bremsstrahlung radiation by plasma electrons. In the current work, inverse bremsstrahlung absorption in unmagnetized and inhomogeneous plasma is calculated. For this purpose, kinetic theory and Fokker-Planck equations are used and the Maxwellian distribution function is considered as the first isotropic distribution function. Then a numerical solution for solving the the laser electric field and the plasma dispersion function is proposed. After determining the inverse bremsstrahlung absorption, the effect of laser wavelength and plasma electron temperature on the absorption rate was studied. The results show that increasing the electron temperature and decreasing the laser wavelength increases the amount of absorption in unmagnetized and inhomogeneous plasma. Finally, The difference in inverse bremsstrahlung absorption in homogeneous and inhomogeneous plasmas was investigated.

Keywords: thermonuclear fusion, inverse bremsstrahlung absorption, plasma disperdion function, Fokker-Planck

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