§17. Effects of Turbulence on the Elastic Electron-ion Collision in Turbulent Plasmas

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The effects of turbulence on the elastic electron-ion collision are investigated in turbulent plasmas. The eikonal method and effective interaction potential including the far-field term associated with the plasma turbulence is employed to obtain the eikonal phase and differential eikonal collision cross section as functions of the diffusion coefficient, impact parameter, collision energy, thermal energy, and Debye length. The result shows that the contribution of the turbulence effects is found to be given by the second-order eikonal phase. It is shown that the turbulence effects suppress the eikonal cross section as well as eikonal phase for the elastic electron-ion collision (see Fig. 1). It is also found that the thermal energy enhances the collision cross section. As shown in Fig. 2 and 3, it is found that the eikonal collision cross section decreases with increasing the impact parameter and diffusion coefficient.

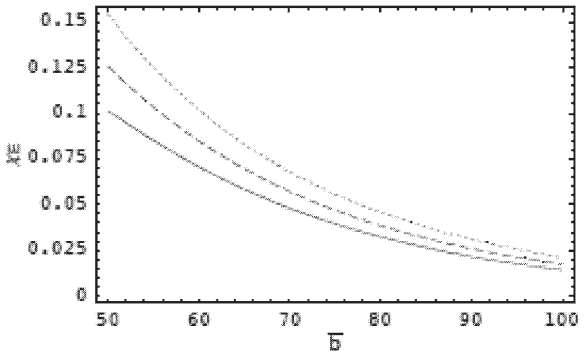

FIG. 1 The eikonal phase (χ_E) as a function of the scaled impact parameter ($\bar{b}$) when $\bar{\lambda}_D = 30$, $\bar{E} = 5$, and $\bar{E}_T = 20$. The solid line is the case of $\bar{D} = 0.08$. The dashed line is the case of $\bar{D} = 0.06$. The dotted line is the case of $\bar{D} = 0$.

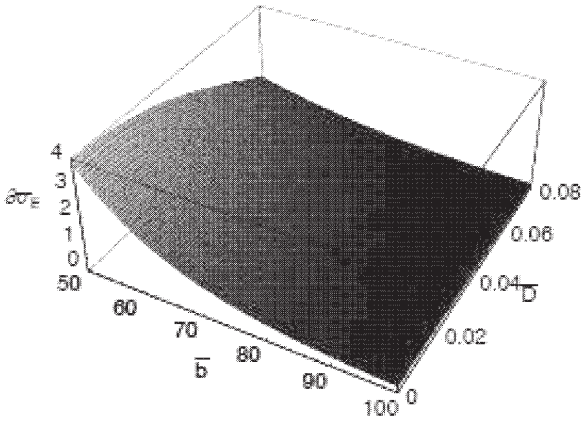

FIG. 2 The surface plot of the scaled differential eikonal collision cross section ($\partial\bar{\sigma}_E$) as a function of the scaled impact parameter ($\bar{b}$) and scaled diffusion coefficient ($\bar{D}$) when $\bar{\lambda}_D = 30$, $\bar{E} = 3$, and $\bar{E}_T = 15$.

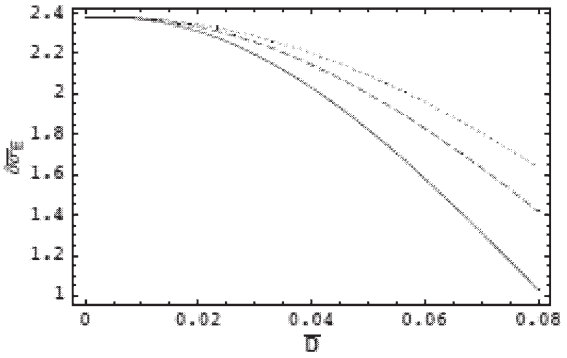

FIG. 3 The scaled differential eikonal collision cross section ($\partial\bar{\sigma}_E$) as a function of the scaled diffusion coefficient ($\bar{D}$) when $\bar{b} = 50$, $\bar{\lambda}_D = 30$, and $\bar{E} = 5$. The solid line is the case is the case of $\bar{E}_T = 20$. The dashed line is the case of $\bar{E}_T = 30$. The dotted line is the case of $\bar{E}_T = 40$.