§24 Turbulence Effects on Soft-photon Bremsstrahlung Emissions in a Turbulent Plasma

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The turbulence effects on the soft-photon bremsstrahlung emission due to the electron-ion interaction are investigated in a turbulent plasma. The effective interaction potential taking into account the correction factor to the non-linear dielectric function due to plasma turbulence and impact parameter method are employed in order to obtain the bremsstrahlung radiation cross section in a turbulent plasma as a function of the impact parameter, diffusion coefficient, radiation photon energy, projectile energy, and plasma parameters. It is shown that the turbulence effects considerably enhance the bremsstrahlung radiation cross section. In addition, it is found that the turbulence effects on the bremsstrahlung cross section increase with increasing the radiation photon energy and, however, decrease with increasing the thermal energy.

Fig. 1: The scaled bremsstrahlung radiation cross section ($\partial_{\bar{\varepsilon},\bar{b}}\bar{\chi}_b$) in units of πa_0^2 as a function of the scaled impact parameter ($\bar{b}$) when $\bar{\varepsilon}=0.18$, $\bar{E}=0.8$, $\bar{E}_t=10$, and $\bar{\lambda}_D=30$. The solid line is the case of $\bar{D}=0.08$. The dashed line is the case of $\bar{D}=0.04$. The dotted line is the case of $\bar{D}=0$, i.e., without the turbulence effects.

Fig. 2: The surface plot of the function (F_{TE}) of the turbulence effects on the bremsstrahlung cross section as a function of the scaled radiation photon energy ($\bar{\varepsilon}$) and scaled impact parameter ($\bar{b}$) when $\bar{E}=0.8$, $\bar{E}_t=10$, $\bar{\lambda}_D=30$, and $\bar{D}=0.02$.

Fig. 3: The function (F_{TE}) of the turbulence effects on the bremsstrahlung cross section as a function of the scaled impact parameter ($\bar{b}$) when $\bar{E}=0.8$, $\bar{E}_t=10$, $\bar{\lambda}_D=30$, and $\bar{D}=0.01$. The solid line is the case of $\bar{\varepsilon}=0.01$. The dashed line is the case of $\bar{\varepsilon}=0.02$. The dotted line is the case of $\bar{\varepsilon}=0.03$.

Fig. 4: The function (F_{TE}) of the turbulence effects on the bremsstrahlung cross section as a function of the scaled impact parameter ($\bar{b}$) when $\bar{\varepsilon}=0.02$, $\bar{E}=0.5$, $\bar{\lambda}_D=30$, and $\bar{D}=0.01$. The solid line is the case of $\bar{E}_t=10$. The dashed line is the case of $\bar{E}_t=15$. The dotted line is the case of $\bar{E}_t=20$.

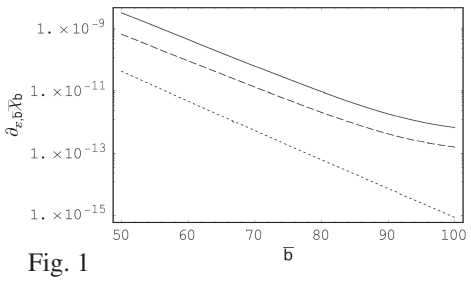

Fig. 1

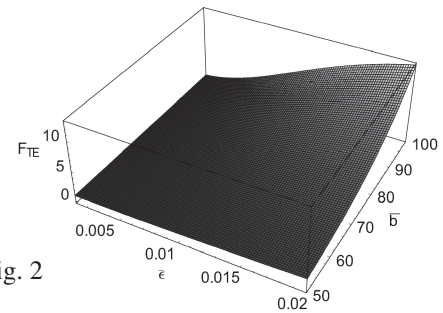

Fig. 2

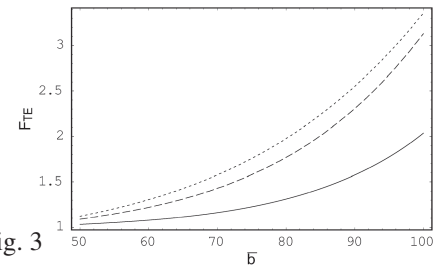

Fig. 3

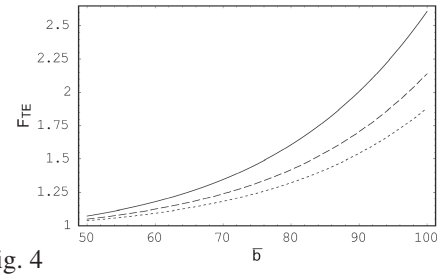

Fig. 4