§25. Magnetic Field and Thermal Effects on Nonrelativistic Bremsstrahlung in Magnetized Anisotropic Plasmas

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The magnetic field and thermal effects on the nonrelativistic electron-ion bremsstrahlung process are investigated in magnetized anisotropic plasmas. The effective electron-ion interaction potential is obtained in the presence of an external magnetic field. Using the Born approximation for the initial and final states of the projectile electron, the bremsstranhlung radiation cross section and bremsstrahlung emission rate are obtained as functions of the electron energy, radiation photon energy, magnetic field strength, plasma temperature, and Debye length. It is shown that the effects of the magnetic field enhance the bremsstranhlung radiation cross section for low plasma temperatures and, however, suppress the bremsstranhlung cross section for high plasma temperatures. It is also shown that the magnetic field effects diminish the bremsstrahlung emission rate in magnetized high temperature plasmas.

FIG. 1 The scaled bremsstrahlung radiation cross section $\partial_{\bar{\varepsilon}}\overline{\chi}_b$ as a function of the scaled photon energy $\bar{\varepsilon}$ when $\overline{E}=10$, $\overline{\lambda}_D=0.1$, and $\overline{B}=1$. The solid line represents the case of $\overline{T}=1$. The dotted line represents the case of $\overline{T}=10$.

FIG. 2 The scaled bremsstrahlung radiation cross section $\partial_{\bar{\varepsilon}}\overline{\chi}_b$ as a function of the scaled photon energy $\bar{\varepsilon}$ when $\overline{E}=10$, $\overline{\lambda}_D=0.1$, and $\overline{T}=10$. The solid line represents the case of $\overline{B}=1$. The dotted line represents the case of $\overline{B}=10$.

FIG. 3 The surface plot of the scaled bremsstrahlung radiation cross section $\partial_{\bar{\varepsilon}}\overline{\chi}_b$ as a function of the scaled magnetic field $\overline{B}$ and scaled temperature $\overline{T}$ when $\overline{E}=10$, $\bar{\varepsilon}=1$, and

$\overline{\lambda}_D=0.1$.

FIG. 4 The scaled bremsstrahlung emission rate $\overline{P}_{\varepsilon}$ as a function of the scaled photon energy $\bar{\varepsilon}$ when $\overline{\lambda}_D=0.1$ and $\overline{T}=10$. The solid line represents the case of $\overline{B}=1$. The dashed line represents the case of $\overline{B}=5$. The dotted line represents the case of $\overline{B}=10$.
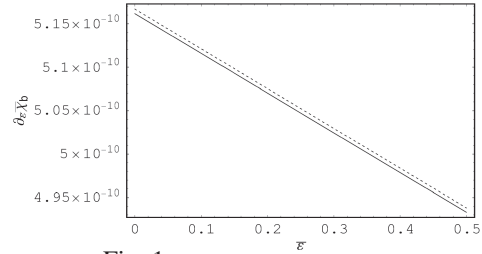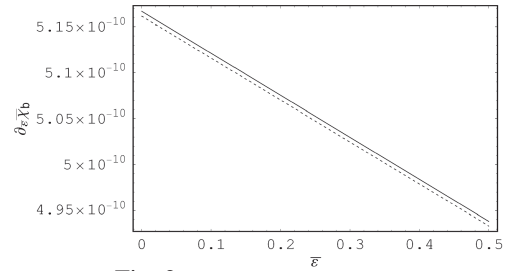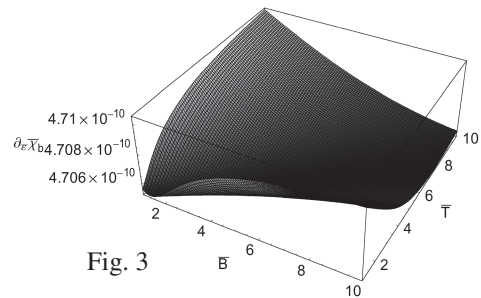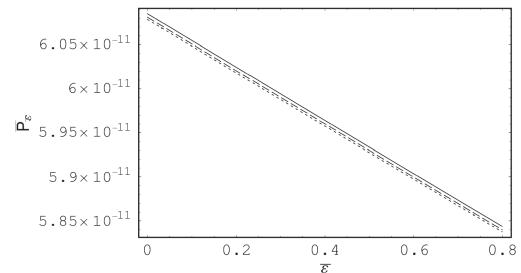

Fig. 1

Fig. 2

Fig. 3

Fig. 4