## §14. Quantum Effects on the Entanglement Fidelity in Elastic Scatterings in Strongly Coupled Semiclassical Plasmas

Jung, Y.-D. (Hanyang Univ.),
Kato, D.

The quantum effects on the entanglement fidelity in elastic electron-ion scatterings are investigated in strongly coupled semiclassical plasmas. The screened pseudopotential model and partial wave analysis are employed to obtain the entanglement fidelity in strongly coupled semiclassical plasmas as a function of the thermal de Broglie wavelength, Debye length, and projectile energy. In Fig. 1, it is shown that the quantum effect significantly enhances the entanglement fidelity in strongly coupled semiclassical plasmas. In addition, it is shown that the plasma screening effect slightly increases the entanglement fidelity. From Fig. 2 and 3, it is found that the entanglement fidelity increases with increasing the projectile energy.

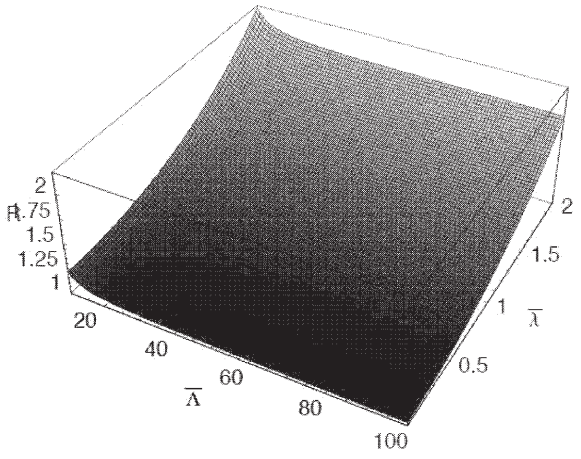


FIG. 1 The surface plot of the ratio $R(\bar{E},\bar{\lambda},\bar{\Lambda})$ of the entanglement fidelity for the elastic electron-ion scattering in strongly coupled semiclassical plasmas $V^{SCSP}$ to that for the Coulomb potential $V^{Coul}$ as a function of the scaled Debye length $(\bar{\Lambda})$ and scaled thermal de Broglie wavelength $(\bar{\lambda})$ when $\bar{E}=0.1$.

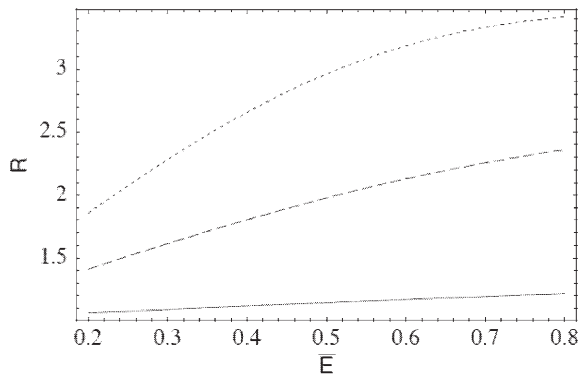


FIG. 2 The fidelity ratio $R(\bar{E},\bar{\lambda},\bar{\Lambda})$ as a function of the scaled projectile energy $(\bar{E})$ when $Z=6$. The solid line represents the case of $\Gamma=0.1$, $r_s=54.8$, and $\theta=5895.3$. The dashed line represents the case of $\Gamma=1.2$, $r_s=189.7$, and $\theta=1700.6$. The dotted line represents the case of $\Gamma=2.9$, $r_s=294.9$, and $\theta=1093.9$.

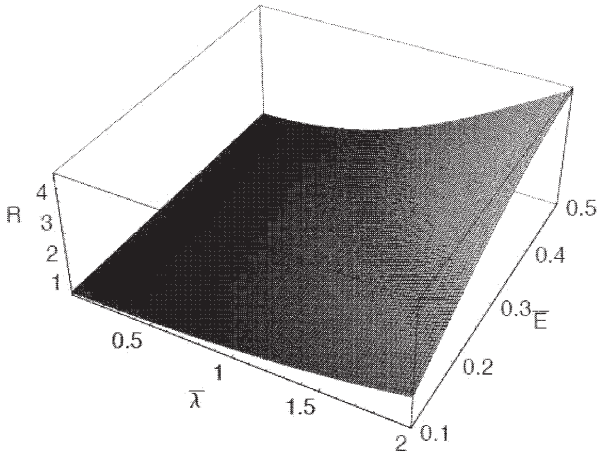


FIG. 3 The surface plot of the fidelity ratio $R(\bar{E},\bar{\lambda},\bar{\Lambda})$ as a function of the scaled thermal de Broglie wavelength $(\bar{\lambda})$ and scaled projectile energy $(\bar{E})$ when $\bar{\Lambda}=100$.