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Wake potential in a strong coupling plasma from the AdS=CFT correspondence

With the dielectric function obtained from AdS/CFT correspondence, we investigate the strong-coupling wake potentials induced by the fast-moving charged particles with velocities v=0.55c and v=0.99c, respectively, and compare them with those in the weak-coupling case. We find that for v= 0.99c, the remarkable oscillation akin to Cherenkov-like radiation and the Mach cone in the weak-coupling wake potential does not appear in the strong-coupling wake potential, which may indicate that the phase velocity of the strong-coupling plasmon mode will not be lower than the speed of light. Besides this prominent difference, the wake potentials in strong and weak coupling are qualitatively similar except for some detailed discrepancies. For example, when v= 0.55c, the strong-coupling wake potential shows a deeper negative minimum in the backward direction than that in the weakcoupling wake potential, the depths and positions of the negative minimum for strong- and weak-coupling wake potentials display opposite variation tendencies with the increase of particle velocity, and the wake potential in strong coupling is less sensitive to the particle velocity than the weak-coupling wake potential.

Summary

With the dielectric function computed from the AdS/CFT correspondence, we studied the wake potential induced by a fast moving charge in a strong-coupling plasma and compared it with the weak-coupling wake potential for different particle velocities as v= 0.55c and v=0.99c. The most prominent difference between strong and weak wake potential is that, when v=0.99c, the remarkable oscillation due to Cerenkov-like radiation and the Mach cone in weak coupling disappears in strong coupling, which implies that the plasmon mode with phase velocity lower than the speed of light dose not exist in thestrong-coupling plasma.

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