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Motion of test particles around a magnetized black hole surrounded by quintessence

We investigate the dynamics of test particles near a magnetized black hole surrounded by quintessence which is modeled as an anisotropic fluid with a specific equation of state [1,2]. The motion of both massive and massless test particles is analyzed using the Lagrangian formalism, with particular focus on the effective potential governing their trajectories. Quintessence modifies the spacetime curvature at large distances, while the magnetic field introduces Lorentz-like forces acting on charged particles[3,4]. We determine the conditions for the existence and stability of circular orbits and examine how the quintessence and magnetic field parameters influence the location of the innermost stable circular orbit (ISCO) and the presence of bounded trajectories. Our findings highlight the intricate interplay between dark energy effects and magnetic interactions, offering potential insights for astrophysical observations near active galactic nuclei and magnetized black holes.

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