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Analysis of the motion of particles in the Reissner-Nordström spacetime

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The motion of neutral and charged test particles in the Reissner-Nordström spacetime is analysed. Inspired by the recent application of the Biermann-Weierstrass theorem to obtain a general non-radial solution to the geodesic motion in the Schwarzschild spacetime [1], we apply the same method to the Reissner-Nordström spacetime. This approach allows us to describe all types of orbits except for the purely radial ones with a single formula in terms of the Weierstrass elliptic function ⊠. Using the obtained solution, we analyse the qualitative influence of the charge of the black hole on the motion of neutral particles. Similarly, we study the motion of charged test particles.

References

[1] Adam Cieślik and Patryk Mach, Revisiting timelike and null geodesics in the Schwarzschild spacetime: general expressions in terms of Weierstrass elliptic functions, Classical and Quantum Gravity, 39(22):225003, 2022.

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