QPOS ANALYSES AND CIRCULAR ORBITS OF CHARGED PARTICLES AROUND MAGNETIZED BLACK HOLES IN BERTOTTI-ROBINSON GEOMETRY

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Abstract

I will present recent results on the motion of charged particles around magnetized black holes in the Bertotti–Robinson spacetime, also known as the electromagnetic universe. This exact electrovacuum solution of the Einstein–Maxwell equations allows us to explore how magnetic and gravitational fields jointly affect particle dynamics near black holes. I will discuss how the electromagnetic universe parameter modifies the effective potential, angular momentum, and the innermost stable circular orbits (ISCOs). Furthermore, I will show that by applying the relativistic precession model to this system, one can describe the observed quasi-periodic oscillations (QPOs) in microquasars and galactic centers. Using Markov Chain Monte Carlo analysis, we have constrained the black hole mass and electromagnetic parameters with observational QPO data from sources such as XTE J1550–564 and Sgr A*. These results indicate that the interplay between magnetic fields and the Bertotti–Robinson geometry can provide new insights into strong-gravity astrophysics and future tests of alternative gravity theories.

This talk is based on [1].

References

[1] A. Shermatov, J. Rayimbaev, B.C. Lütfüoğlu, A. Abdujabbarov, S. Sardor, I. Ibragimov, M. Vapayev, B. Kuyliev, Eur. Phys. J. C **85**, 1017 (2025).