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Exact Solution to the Klein-Gordon Equation on Modified Schwarzschild Black Holes

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In this paper, we solved the Klein-Gordon equation for a light reside in an area influenced by strong gravitational field from massive Black Holes. The gravitational field determined by a modification of Schwarzschild spacetime. The modified Schwarzschild metric was obtained from $f(R)$ theories of gravity, as one of the simplest modifications to General Relativity with constant scalar curvature R_0 . Modified gravity theories have received more attention lately due to combined motivation coming from astrophysics, cosmology and high-energy physics. The solution of Klein-Gordon equation used variable separation method with the complex part of radial symmetry. The numerical methods were presented for the prediction of the solution and compared with nonrelativistic Coulomb type solutions.

Keywords: Klein-Gordon, black holes, $f(R)$ theories of gravity