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Shadow Behavior of Extra Dimensional Charged Black Hole In Einstein-Horndeski-Maxwell Theory

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Motivated by string theory and AdS/CFT correspondence, we investigate certain behavior of the shadow geometrical shapes of higher-dimensional charged black hole solution in Einstein-Horndeski-Maxwell theory. We apply the Hamilton-Jacobi method to analyze photon orbits around the black hole and use the formulation of geodesic equations by the Carter approach. The influence of extra dimensions and electric charge on the shadow size of the black hole is analytically calculated. We discover that the size of the shadow of black holes, which depends on their central mass and electric charge, is also determined by the extra dimensions. Interestingly, it turns out that for fixed values of electric charge in Einstein-Horndeski-Maxwell theory, the size of the shadow decreases in higher dimensions except for the cases with dimensions more than 8. We observe that for more values of charge, the shadow radius for $d = 4$ and $d = 11$ approach each other. On the other hand, for fixed dimensions, increasing the electric charge results in decreasing the shadow radius of such charged black holes in Einstein-Horndeski-Maxwell theory. These outcomes may lead to the possibility of testing this Einstein-Horndeski-Maxwell charged black hole solution by using astrophysical observations.

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