Evaporation of non-rotating black holes in the framework of Modified Gravity: Hawking radiation and its consequences

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We explore gravity in the framework of the modified theory of Einstein's general relativity and how it affects the evaporation of non-rotating black holes. Einstein's gravity theory has been verified by many astrophysical phenomena. However, most of them are in the weak field limit, with the exception of gravitational waves from mergers of compact objects, e.g. black holes. A modified gravity can be proposed such that it asymptotically leads to Einstein's gravity and further Newtonian gravity. However, near black holes, in the regions with strong spacetime curvature, the modified gravity could be significantly deviated from the Einstein's gravity. We explore an f(R)-gravity based modified gravity theory and see how it changes the rate of Hawking radiation. In this work, we are able to show how the modification of gravity affects the tunneling probabilities of particles with different spins. This eventually affects the evaporation time period of black holes. The result may have long standing implications including the consideration of primordial black hole to be the candidate for dark matter.