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Primordial Black Holes as laboratories for Physics beyond the standard scenarios

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We use the evaporation of Primordial Black Holes (PBHs) as a laboratory to investigate Physics beyond the Standard Model of particles and to probe the structure of black holes. We show that PBHs develop non-negligible spins through Hawking's emission of a large number of axion-like particles generically present in string theory compactifications, yielding a unique probe of the total number of light scalars in the fundamental theory, independent of how weakly they interact with known matter. We study a regular rotating black hole, described by the Kerr-black-bounce metric, and evaporating under the Hawking emission of a single scalar field. We compared it with a Kerr black hole evaporating under the same conditions and showed how the regularizing parameter affects the evolution of the PBH. We briefly comment on the possibility of investigating the beyond-the-horizon structure of a black hole by exploiting its Hawking emission.

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