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J. G. Rosa: Determining the spin of light primordial black holes with Hawking radiation

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We propose a method to determine the mass and spin of primordial black holes (PBHs) in the mass range 5 × 10ˆ7 − 10ˆ12 kg (Hawking temperatures ∼ 10 MeV −200 GeV), based on measuring the energy of specific features in the photon Hawking emission spectrum, including both primary and secondary components. This is motivated by scenarios where PBHs in this mass range spin up as they evaporate, namely the string axiverse, where dimensionless spin parameters a ˜ 0.1 − 0.5 can be achieved through the Hawking emission of hundreds or even thousands of light axion-like particles. Measuring the present PBH mass-spin distribution may thus be an important probe of physics beyond the Standard Model. Since the proposed method relies on the energy of the photons emitted by a given PBH, rather than on the associated flux, it is independent of the PBH-Earth distance and, as a byproduct, can also be used to infer the latter.

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