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The most conservative accretion bounds on Primordial Black Holes

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Primordial Black Holes (PBHs) may exist and constitute a portion of the Dark Matter. Their discovery would have profound consequences on fundamental physics and possibly solve some outstanding puzzles in cosmology, such as the existence of high-redshift supermassive black holes.

Baryonic matter would be inevitably attracted towards these objects and form structures such as accretion disks, capable of emitting copious amounts of photons in a wide spectrum of energies. This consideration allowed to set upper limits on the abundance of PBHs by investigating both astronomical and cosmological data. Regarding the former, the requirement not to overshoot the number of observed X-ray sources in the Galactic Ridge region is the key to get the result. Regarding the latter, the accurate measurements of the anisotropies in the Cosmic Microwave Background provide the constraining power needed to exclude the presence of a large fraction of DM in the form of massive PBHs.

However, it is compelling to carefully assess the astrophysical uncertainties involved in these limits. Therefore, we reconsider here both the astronomical and cosmological bounds putting under the spotlight the role of the modeling of accretion physics in first place, together with the uncertainties in the PBH properties (most importantly, their velocity distribution) and the properties of the baryonic gas itself. We aim at assessing the most conservative bound in both contexts that turns out to be compatible with such large uncertainties.

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