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Transitioning to Memory Burden: Detectable Small Primordial Black Holes as Dark Matter

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Mounting theoretical evidence suggests that the information stored in black holes suppresses their decay rate. This effect of memory burden opens up a new window for small primordial black holes (PBHs) below 10^{15} g as dark matter candidates. In this talk, I show that the smooth transition from semi-classical evaporation to the memory-burdened phase strongly impacts observational bounds on the abundance of small PBHs. The most stringent constraints come from present-day fluxes of astrophysical particles and point towards an early onset of memory burden, after losing only a small fraction of the initial mass. Remarkably, currently-transitioning small PBHs are detectable through high-energetic neutrino events.

Based on:

G. Dvali, M. Zantedeschi, S. Z., *Transitioning to Memory Burden: Detectable Small Primordial Black Holes as Dark Matter*, arXiv:2503.21740.

M. Michel, S. Z., *The Timescales of Quantum Breaking*, Fortsch. Phys. 71 (2023) 2300163, arXiv:2306.09410. Accompanying news article [“Where is the boundary to the quantum world?”\]

G. Dvali, L. Eisemann, M. Michel, S. Z., *Black hole metamorphosis and stabilization by memory burden*, Phys. Rev. D 102 (2020) 103523, arXiv:2006.00011.

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