QUANTUM GRAVITY BLACK HOLES AS DARK MATTER

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Abstract

The persistent challenge in quantum gravity research has been the scarcity of experimentally detectable signals. Here, we show a new observational pathway to probe quantum gravity effects. Contrary to previous claims, the quantum decay of de Sitter space into black hole spacetimes can be significant even after inflation and observable on galactic scales. Using the instanton formalism within the no-boundary proposal for a class of quantum-gravity-improved black hole metrics, we show that de Sitter space decay could result in the production of 10^{60} stable Planck-size black hole remnants within the current Hubble horizon, explaining dark matter. Critically, our analysis provides a novel quantum gravitational mechanism for the direct transformation of dark energy into dark matter, suggesting a fundamental link between these enigmatic cosmic components.