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Black Hole Metamorphosis on a Quantum Computer

Blackholes are known to be just one among objects of maximal microstate entropy permitted by unitarity, the so-called saturons. Such systems are also known to possess enhanced memory capacity and are subjected to a universal effect of memory burden, which suppresses their decay. Motivated the generic properties of saturons, we attempt a realization of the prototype saturon model on a quantum computer. This affords us the rare opportunity to study and analyze the full dynamics of these fascinating objects. It is also well known that memory burden can be overcome by rewriting stored quantum information from one set of degrees of freedom to another one. However, due to a suppressed rate of rewriting, the evolution becomes extremely slow compared to the initial stage and when pplied to black holes, this predicts a metamorphosis, including a drastic deviation from Hawking evaporation, at the latest after losing half of the mass. We exploit the quantum quench dynamics of the realized model to investigate these cosmological phenomena on a quantum computer. It is hoped that this quantum experiment will shed some light tenuous questions about the fate of a black hole and the possibility of small primordial black holes as viable dark matter candidates.

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