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(G*) (POS-80) Accelerated detector in a superposed spacetime

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In pursuit of a full-fledged theory of quantum gravity, operational approaches offer insights into quantum-gravitational effects produced by quantum superposition of different spacetimes not diffeomorphic to one another. Recent work applies this approach to superpose cylindrically identified Minkowski spacetimes (i.e. periodic boundary conditions) with different characteristic circumferences, where a two-level detector coupled to a quantum field residing in the spacetime exhibits resonance peaks in response at certain values of the superposed lengths. Here, we extend this analysis to a superposition of cylindrically identified Rindler spacetimes, considering a two-level detector constantly accelerated in the direction orthogonal to the identified length. Similarly to previous work, we find resonance peaks in the detector response at rational ratios of characteristic circumferences, which we observe to be accentuated by the acceleration of the detector. Furthermore, for the first time, we confirm the detailed balance condition, expected from the acceleration due to the Unruh effect, in superposition of spacetimes. The resonant structure of detector response in the presence of event horizons, for the first time observed in 3+1 dimensions, may offer clues to the nature of black hole entropy in the full theory of quantum gravity.

Keyword-1

accelerated detector

Keyword-2

spacetime superposition

Keyword-3

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