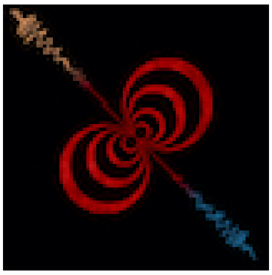

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A. Sanna: Effective models of nonsingular quantum black holes

Monday 19 December 2022 15:45 (15 minutes)

Penrose's singularity theorem proved the utter inevitability of spacetime singularity formation in general relativity during gravitational collapse, where the theory completely loses its predictive powers. It is generally believed that this problem will find a solution in a theory of quantum gravity (QG), whose effects have so far been assumed to act at the Planck length. Instead, this talk explores the possibility that smearing of the singularity may be related to QG effects acting at the event horizon scale. We construct a broad class of non-singular, static and asymptotically-flat black-hole models with a de Sitter core, sourced by an anisotropic fluid which effectively encodes quantum corrections. These corrections are parametrized by a single length-scale l, which represents an effective "quantum hair". Depending on its value, these models interpolate between two-horizon, one-horizon (extremal) or horizonless objects. By analyzing their thermodynamics, we show that models with l ~ R_S (where R_S is the classical Schwarzschild radius) are thermodynamically preferred over those with l ≪ R_S, supporting the relevance of quantum corrections at horizon scales. We argue that these super-Planckian corrections can have phenomenological signatures, potentially observable in the near future.

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