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Unveiling the Quantum Nature of Black Holes: A First Proof of Hawking Radiation through Gamma-Ray Observations

In this study, we investigate the potential to observe, for the first time, Hawking radiation from asteroid-mass black hole morsels, hypothesized to form during catastrophic astrophysical events such as binary black hole mergers. The black hole morsels, ejected during the merger, may account for the unobserved merger mass and are predicted to emit a characteristic gamma-ray signal spanning the GeV to above the TeV energy range. The time delay between this radiation and the associated gravitational wave signals could provide insight into the mass distribution of the ejected morsels. The predicted Hawking radiation falls within the sensitivity range of current space- and ground-based gamma-ray instruments. We analyze the Fermi-LAT data from the binary black hole merger event GW170814 to search for such signals. Additionally, we assess the detectability of this phenomenon with both existing and future telescopes and explore its implications for fundamental physics.

Collaboration(s)

The Fermi-LAT Collaboration

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