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Observational Characteristics of the Final Stages of Evaporating Primordial Black Holes

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Many early universe theories predict the creation of Primordial Black Holes (PBHs). PBHs could have masses ranging from the Planck mass to 10^5 solar masses or higher depending on the size of the universe at formation. Due to quantum-gravitational effects, a black hole is expected to have a temperature which is inversely proportional to its mass. Hence a sufficiently small black hole will quasithermally radiate particles at an ever-increasing rate as emission lowers its mass and raises its temperature. The final moments of this evaporation phase should be explosive. In this work, we investigate the final few seconds of black hole evaporation using the Standard Model of particle physics and calculate energy dependent PBH burst time profiles in GeV/TeV range. We use HAWC (High Altitude Water Cherenkov) observatory as a case study and calculate PBH burst light curves observed by HAWC. Moreover, we explore PBH burst search methods and potentially unique observational signatures of PBH bursts.

Collaboration

HAWC

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