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Probing Quantum Gravity through the Radio and Gamma Regimes

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What is the fate of a collapsing star? One possibility is that they evaporate due to Hawking radiation. The problem with this decay channel is that this perturbative phenomenon takes place on time scales far too large to be of astrophysical concern. We consider the exciting and exotic proposal of Planck stars put forth by Carlo Rovelli and others which posits new ways of probing quantum gravity using radio and gamma astronomy. It also provides an alternative end point for black holes. A Planck star is the end result of a collapsing star that forms a black hole but does not ever reach the singularity at r = 0. Instead the matter that had collapsed into the black hole is released in an explosion as the black hole quantum tunnels to a white hole. This tunneling process is similar to that which triggers nuclear decay. These Planck stars are modelled using primordial black holes, at least those of interest to us, since they will be exploding today. Larger black holes will only be exploding at times larger than the Hubble time. We study two primordial black hole models and compare whether, given certain assumptions about the spectrum of an exploding black hole, these models might lead to reasonable observations in the radio and gamma regime. We then discuss whether the proposal by Rovelli, that these signals may correspond to fast radio and gamma ray bursts, is plausible.

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