

Whispers from the Dark Universe - Particles & Fields in the Gravitational Wave Era

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WHISPERS FROM THE DARK UNIVERSE – PARTICLES & FIELDS IN THE GRAVITATIONAL WAVE ERA

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Gravitational waves and baby black holes from super-slow first-order phase transition

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Recently, cosmological first-order phase transition (FOPT) that slowly takes place has attracted much attention. On one hand, it predicts larger amplitude of stochastic gravitational wave background (SGWB), which is actually in a nice agreement with the recent PTAs result. On the other hand, inhomogeneity during FOPT may lead to the formation of primordial black holes (PBHs). In our study, we consider possibly the slowest realization of the cosmological FOPT, where the FOPT is catalyzed by the seed PBHs with sparse distribution. We found that this scenario predicts collision of large bubbles sourcing SGWB detectable with future observations. At the same time, rare patches inflate into causally disconnected baby universes causally disconnected. These are seen as black holes from the universe in the true vacuum and can reproduce the dark matter abundance. We also discuss the constraints and observational prospects of this scenario.

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