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Emergent particles of a de Sitter universe: Thermal interpretation of the stochastic formalism and beyond

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A thermal interpretation of the stochastic formalism of a slow-rolling scalar field in a de Sitter (dS) universe is given. We construct a correspondence between causal patches in the 3-dimensional space of a dS universe and particles living in an abstract space. By assuming a dual description of scalar fields and classical mechanics in the abstract space, we show that the stochastic evolution of the infrared part of the field is equivalent to the Brownian motion in the abstract space filled with a heat bath of massless particles. The 1st slow-roll condition and the Hubble expansion are also reinterpreted in the abstract space as the speed of light and a transfer of conserved energy, respectively. Inspired by this, we sketch the quantum emergent particles, which may realize the Hubble expansion by an exponential particle production. This gives another meaning of dS entropy as entropy per Hubble volume in the global dS universe.

Mini Symposia (Invited Talks Only)

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