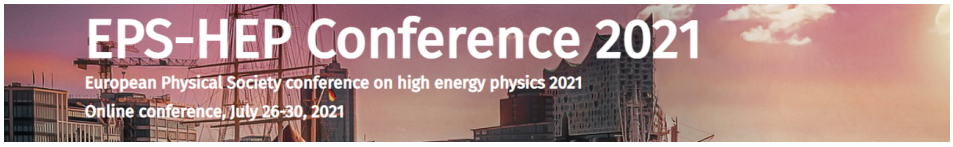

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Cosmological implications of EW vacuum instability: constraints on the Higgs-curvature coupling from inflation

Thursday 29 July 2021 16:50 (20 minutes)

The current experimentally measured parameters of the Standard Model (SM) suggest that our Universe lies in a metastable electroweak vacuum, where the Higgs field is prone to vacuum decay to a lower state with catastrophic consequences. Our measurements dictate that such an event has not taken place yet, despite the many different mechanisms that could have triggered it in our past light-cone. The focus of our work has been to calculate the probability of the false vacuum to decay during the period of inflation and use it to constrain the last unknown renormalisable SM parameter ξ, which couples the Higgs field with space-time curvature. More specifically, we derived lower ξ-bounds from vacuum stability in three inflationary models: quadratic and quartic chaotic inflation, and Starobinsky-like power-law inflation. We also took the time-dependence of the Hubble rate into account both in the geometry of our past light-cone and in the Higgs effective potential, which is approximated with three-loop renormalisation group improvement supplemented with one-loop curvature corrections.

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