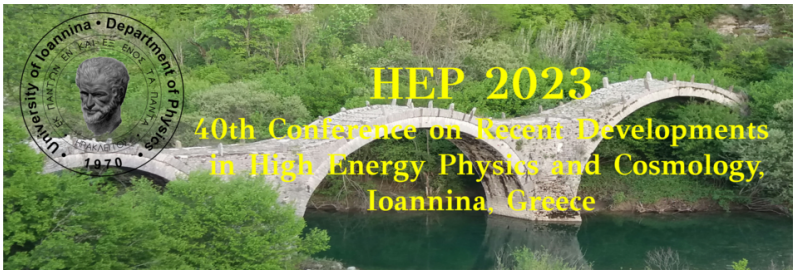

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Ending inflation with a bang: Higgs vacuum decay in $R + R^2$ gravity

Wednesday 5 April 2023 17:20 (20 minutes)

According to the current experimental data, the Higgs vacuum appears to be metastable due to the development of a second lower ground state in its potential. Consequently, vacuum decay would induce the nucleation of true vacuum bubbles with catastrophic consequences for our Universe and therefore we are motivated to study possible stabilising mechanisms in the early universe. In our latest investigation (2207.00696), we studied the electroweak metastability in the context of the observationally favoured model of Starobinsky inflation. Following the motivation and techniques from our first study (2011.037633), we obtained constraints on the Higgs curvature coupling ξ, while embedding the SM on the modified gravity scenario $R + R^2$, which introduces Starobinsky inflation naturally. This had significant repercussions for the effective Higgs potential in the form of additional negative terms that destabilize the false vacuum. Another important aspect lay in the definition for the end of inflation, as bubble nucleation is most prominent during its very last moments. Our results dictated that these stronger lower ξ-bounds are very sensitive to the final moments of inflation, where spacetime deviates increasingly from de Sitter.

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