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Title: "Vacuum Inflating Regions and Evolution of Quantum Fluctuations in Inhomogeneous Backgrounds"

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Abstract: Although an inflationary phase can solve some of the issues present in the standard cosmological model, once inflation has started in a certain region it remains to see whether the ambient inhomogeneities affect its development. In particular, the assumption that the inflationary process will effectively smooth out large initial inhomogeneities needs to be checked.

We focus on two ideas related to this context. The first one is a study of the time development of vacuum-bubbles nucleated in ambients with different matter contents. We assume an inflating patch embedded in an external background, with a transition region described by a spherically-symmetric thin-shell. The (in)homogeneous external environments are characterised by FLRW, LTB or Lemâitre geometries, that describe dust or radiation fluids respectively. We show that the evolution of the shell is indeed sensitive to the external content of matter as well as to its spatial distribution.

The second issue deals with the influence of the background on the quantum fields inside the inflating region through the motion of the bubble wall, which plays the role of a moving boundary. We present the analysis of quantum fluctuations of a test scalar field and the computation of its power spectrum for different backgrounds.