

Cosmological constant and Dark Dimension scenario

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When the Higgs potential or the vacuum energy are derived in the framework of higher dimensional effective field theories on a multiply connected spacetime with compact dimensions and non-trivial boundary conditions (as in the case of the Scherk-Schwarz SUSY breaking), the usual calculations lead to the conclusion that these quantities are naturally UV-insensitive. By means of a thorough analysis of the assumptions on which these calculations are based, I will show that this paradigm actually misses a crucial source of UV-sensitivity, ultimately connected to the non-trivial topology of the spacetime in these theories. As a consequence, the conclusions on the UV-insensitivity of the Higgs mass, of the Higgs potential, and on the existence of a Dark Dimension, that requires a specific relation between the physical vacuum energy and a Kaluza-Klein scale of order meV , need to be carefully reconsidered.

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