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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

PRISMA+ Colloquium

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Lorentz-Raum 05-127, Staudingerweg 7

Prof. Fred Jegerlehner
Berlin

The Higgs-Boson as Inflaton

The Higgs has been discovered to have a very peculiar mass value, which, depending on some technical details in calculating MSbar parameters in terms of physical ones, allows the Standard Model to work up to the Planck scale. This requires the Higgs potential to remain stable. If so, it turns out that the bare Higgs mass square changes sign at some value below the Planck scale. Assuming that the SM is a low energy effective theory of some cutoff system residing at the Planck scale, the bare parameters are the ones relevant at very high energies as they existed in the early universe after the Big Bang. The change of sign of the bare Higgs mass square triggers the Higgs mechanism. The broken phase characterized by a non-vanishing Higgs vacuum expectation value is realized below the Higgs transition temperature, while in the very early universe the SM is in the symmetric phase, characterized by a large quadratically cutoff-enhanced mass term, which helps to trigger inflation. In fact there is also a large calculable aquatically enhanced positive cosmological constant, which gives additional support for the Higgs to be the Inflaton. Detailed calculations show that Higgs inflation actually works and agree with patterns known from CMB data. The cosmological constant surprisingly also reveals a zero close to the Higgs transition point. At the zeros the quadratically and aquatically enhanced contributions vanish and renormalized parameters of the broken phase match with the bare parameters relevant in the high energy phase of inflation and which grow power like as the energy increases. Consequences of such a scenario for Baryogenesis are briefly mentioned.

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