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Analysis of vacuum stability in the $\mu\nu$ SSM

We perform an analysis of the vacuum stability of the neutral scalar potential of the μ -from- ν Supersymmetric Standard Model ($\mu\nu$ SSM). As an example scenario, we discuss the alignment without decoupling limit of the $\mu\nu$ SSM, for which we demonstrate that large parts of the parameter space are plagued by unphysical minima deeper than the electroweak minimum. In order to estimate the lifetime of the electroweak minimum, we calculate the transition probabilities for the tunneling process into each unphysical minimum. We find that even though the parameter points are metastable, in many cases the lifetime is longer than the age of the universe. In this case a parameter point can still be regarded as valid, emphasizing the importance of accurately taking into account a calculation of the lifetime of metastable configurations. We also find metastable points that are not sufficiently long lived. Thus, the analyse of the vacuum stability of the $\mu\nu$ SSM has an important impact on the parameter space of the model.

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Collaboration / Activity

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