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論文の内容の要旨

Techniques and phenomenology of radiative corrections from Kaluza-Klein modes in Scherk-Schwarz mechanism

(Scherk-Schwarz機構におけるKaluza-Kleinモードによる 輻射補正のテクニックと現象論)

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Supersymmetry (SUSY) has been attractive to the physicists searching for the physics beyond the standard model. However there is a tension between the Large Hadron Collider (LHC) results and the low scale SUSY scenario. This situation can be accommodated by the Scherk-Schwarz mechanism, that is a SUSY breaking mechanism by the twisted boundary condition in extra dimensional space since it generates the compressed spectrum of the supersymmetric particles. At the tree-level the degeneracy is exact and it is lifted by the radiative corrections.

In this thesis, we calculate the gaugino and sfermion mass corrections in a general setup, 5D SUSY gauge theory compactified over S^1/Z_2 orbifold. It is not trivial that the corrections are small enough to maintain the compressed spectrum, since the 5D gauge theory is not renormalizable. Furthermore there are an infinite number of loop diagrams since the 4D effective Lagrangian has Kaluza-Klein (KK) modes. We regularize the divergence by the KK-regularization scheme and find that the linear and higher divergence don't appear in the mass correction and there remain logarithmic divergence and constant.

We also discuss the compact SUSY model, a realistic application of the Scherk-Schwarz mechanism. Using the results in the general setup, we evaluate the gaugino and the stop mass corrections from the gauge and the Yukawa interactions on the brane. We find that the model has valid phenomenology in certain parameter region of the model.