Abstract

The standard model of the electroweak interactions has been successful to account for all the experimental data so far observed. But the Higgs sector in the standard model is not completely satisfactory. First of all, Higgs particles has not been discovered yet experimentally and it has been argued that the Higgs boson mass suffers from quadratically divergent radiative corrections. Many alternative scenarios for the Higgs sector in the electroweak interactions have been proposed. Among them the gauge-Higgs unification predicts various properties in the Higgs field couplings and gauge field couplings which differ from those in the standard model.

Recently there has been significant progress in the gauge-Higgs unification scenario in which the 4D Higgs field is identified with a part of the extra-dimensional component of gauge fields in higher dimensions. There by the EW symmetry being dynamically broken by the Hosotani mechanism. A realistic gauge-Higgs unification model is constructed in the Randall-Sundrum warped space based on the gauge group $SO(5) \times U(1)$.

In this paper, it is shown that the 4-dimensional effective theory obtained from the model is anomaly free. We take warped factor, only free parameter to determine the gauge couplings, $z_L = (10^{18}\text{GeV})/(1\text{TeV}) = 1.0 \times 10^{15}$, then we can predict as follow. The deviations of the gauge couplings are tiny, less than 1% except for the top quark. The $Zt_L\bar{t}_L$, $Zt_R\bar{t}_R$, $Zb_L\bar{b}_L$ and $Zb_R\bar{b}_R$ couplings deviate from those in the standard model by 7%, 18%, 0.3% and 0.9%, respectively. The violation of the μ-e, τ-e and t-e universality in the charged current interactions is $\mathcal{O}(10^{-8})$, $\mathcal{O}(10^{-6})$ and 2.3%, respectively. These values are not very sensitive on the warp factor and fermion mass and gauge boson mass which are input parameter. Even if we input large warp factor $z_L = 10^{17}$ or other fermion mass within the limits of experimental error, we obtain the value close to the previous results.