

Stabilization of the extra dimension size in RS model by bulk Higgs field

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An extension of the Standard Model is considered, which is built on the basis of the Randall-Sundrum model with two branes. The metric of the background solution is not flat, which allows to solve the hierarchy problem of the gravitational interaction. In the case of unstabilized interbrane distance the model predicts the existence of the “strongly” coupled massless scalar mode, the radion, which contradicts the experimental data. In the present work the stabilization of the extra dimension size is achieved with the help of the five-dimensional Higgs field, which plays the role of the Goldberger-Wise field. The stabilization makes the radion massive, and all the fermion fields, which are assumed to be localized on the TeV brane, get their masses due to the interaction with the boundary value of the Higgs field. The gauge invariance of the theory demands that the electroweak gauge fields also live in the bulk. The equations of motion for the background field configurations are obtained, the second variation Lagrangian for the field fluctuations against a background solution is derived and the equations of motion for them are obtained. The interactions of the bulk Higgs field with the multidimensional gauge and fermion fields are studied and possible values of the model parameters are estimated.

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