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Higgs mass and anomalous Higgs interactions in gauge-Higgs unification

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We discuss the phenomenological implications of gauge-Higgs unification scenario on the Higgs physics. In the scenario, Higgs is a gauge field in higher dimensional space-time to start with.

Thus, the Higgs potential is basically handled by the gauge principle and Higgs mass is related to the weak scale, as in MSSM. As a concrete example, we take 6-dimensional gauge-Higgs unification model, where $M_H = 2M_W$ at the tree level. It is pointed out that the quantum correction to this relation is calculable without suffering from UV-divergence, just as in MSSM.

Also discussed is "anomalous Higgs interactions" in this scenario and related scenario of dimensional deconstruction. In the scenario of gauge-Higgs unification, Higgs may be regarded as a sort of Aharonov-Bohm phase. Thus all observables are expected to be periodic functions of the Higgs field. We argue that this periodicity, together with the breaking of translational invariance along the extra space, leads to Yukawa coupling for lighter quarks, which behaves as a trigonometric function of the Higgs VEV. We thus conclude that in this scenario, Higgs interactions such as Yukawa coupling deviate in general from the predictions of the standard model: "anomalous Higgs interactions".

This talk is based on my recent works published in Phys. Rev. D87(2013)016011 and arXiv:1402.6761[hep-ph].

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