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Supersymmetry Invariance of Dimensional Reduction Applied to Higgs Boson Mass Calculations

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The Higgs boson mass is an important observable that can be calculated in supersymmetric quantum field theories. Since it is measured with high precision it is valuable to consider higher order contributions in the perturbation theory to this mass. In order to perform such loop calculations one has to regularize the underlying quantum field theory. Even though there are many equivalent regularization schemes it is more convenient to use a scheme which preserves the symmetries of the model at the regularized level. In the work underlying this talk, the aspects of supersymmetry and gauge symmetry which are relevant for the form of the Higgs boson mass are determined. These aspects, represented by Slavnov-Taylor identities, are then investigated in dimensional reduction, a regularization scheme designed to conserve supersymmetry, for a potential breaking. A result of the examination is the symmetry conservation of dimensional reduction in the Minimal Supersymmetric Standard Model up to the three-loop level if the gaugeless limit is considered. Additionally it is shown that the treatment of traces containing $\gamma 5$ in dimensional reduction leads to non-trivial expressions for the breaking at the two-loop level in a general gauge theory.

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