

# Anomalies, Beta Functions and Supersymmetric Unification with Multi-Dimensional Higgs Representations

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## Abstract content

### Summary

In the framework of supersymmetric Grand Unified theories it is possible to extend the minimal Higgs sectors of the models by introducing higher dimension (anomaly free) representations. The addition of complete  $SU(5)$  representations does not alter the unification of gauge couplings neither the unification scale but it can affect the value of the unified Gauge Coupling and the perturbative validity evolution up to the Planck scale. After reviewing the conditions for anomaly cancellations and applying them to study SUSY  $SU(5)$  models, we propose alternative anomaly free combinations of Higgs representations, beyond the usual vector-like choice, and show that their combined  $\beta$  functions are not equivalent, which leads to different scenarios for the perturbative validity of the theory up to the Planck scale.

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