

Squark and slepton masses as probes of supersymmetric $SO(10)$ unification

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Abstract

We carry out a detailed analysis of the breaking of the grand unified $SO(10)$ to the standard model gauge group in the context of supersymmetric unification. The breaking of $SO(10)$ to the standard model gauge group leads to non-universal supersymmetry breaking scalar masses at the unification scale. We consider the patterns of squark and slepton masses that arise when such a non-universality is present at the unification scale, and show that a set of sum rules for the sfermion masses are independent of the manner in which $SO(10)$ breaks to the standard model, and discuss the reasons for this. We consider the phenomenology arising from such a non-universality, and show that it is unaffected by the symmetry breaking pattern. We discuss the fine tuning problem of the minimal supersymmetric standard model in the context of $SO(10)$ unification. For reasonable values of the parameters, we find that the fine tuning problem can be alleviated by the non-universality as well as the right handed neutrino effects.

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