

Unitarity constraints on large multiplets of arbitrary gauge groups

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We impose partial-wave unitarity on $2 \rightarrow 2$ tree-level scattering processes to derive constraints on the dimensions of large scalar and fermionic multiplets of arbitrary gauge groups. We apply our results to various scalar and fermionic extensions of the Standard Model, and also to the Grand Unified Theories (GUTs) based on the groups $SU(5)$, $SO(10)$, and E_6 . We identify scenarios within the latter two GUTs that violate the unitarity condition —this may require a reevaluation of the validity of perturbation theory in those scenarios.

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