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Where we do not want to go: avoiding charge- or color-breaking vacua

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Coupling scalars to the electroweak-symmetry-breaking sector is a dangerous game, if those scalars are not meant to acquire non-zero VEVs themselves. A prime example of this is the minimal supersymmetric standard model (MSSM), where scalar partners of top quarks and tau leptons couple to the Higgs fields, and parameter points that lead to VEVs for these scalars must be excluded. We present results within the oft-considered “constrained MSSM” showing that it is a very relevant concern, and indicate the kind of parameter combinations that lead to such problems. We also present new public software to address the difficult question of determining the global minimum of a complicated scalar potential, so that theoretical effort is not wasted on invalid parameter points.

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