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Improved theoretical constraints on BSM models

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BSM models must be confronted with a series of experimental and theoretical constraints. On the theoretical side, it is standard to check the tree-level vacuum stability, the tree-level perturbative unitarity constraints in the limit of large scattering energies, and the cut-off scale using one-loop running with tree-level matching. I will discuss that these constraints can get crucial corrections: (i) loop corrections to the vacuum stability can re-open parameter regions, (ii) 2 to 2 scattering at small energies can lead to much stronger constraints, and (iii) reliable results for the high-scale behaviour of a theory are sometimes just obtained by combining two-loop running and matching. In addition, the check of the perturbative behaviour of the theory can become important. Examples for SM extensions with singlets, doublets and triplets are given.

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