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Woes of the "minimal" non-supersymmetric SO(10) GUT

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The "minimal" potentially realistic non-supersymmetric $\mathrm{SO}(10)$ GUT model has a scalar sector consisting of representations $45 + 126 + 10$. The $45 + 126$ part breaks $\mathrm{SO}(10)$ to the Standard Model symmetry, while $126 + 10$ should enable a realistic Yukawa sector. This model is expected to facilitate an unusually robust proton decay prediction, but its analysis is impeded by tachyonic instabilities in the tree-level scalar potential. We shall present the latest developments in the model's analysis: the one-loop effective potential requires in the perturbative regime a breaking pattern through an intermediate $\mathrm{SU}(4) \times \mathrm{SU}(2) \times \mathrm{U}(1)$ stage, but this region of parameter space does not allow for suitable fine-tuning to accommodate a realistic EW-scale Higgs doublet. The model is thus by all indications perturbatively unviable.

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