

The Probable Fate of the Standard Model

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Extrapolating the Standard Model to high scales using the renormalisation group, three possibilities arise, depending on the mass of the Higgs boson: if the Higgs mass is large enough the Higgs self-coupling may blow up, entailing some new non-perturbative dynamics; if the Higgs mass is small the effective potential of the Standard Model may reveal an instability; or the Standard Model may survive all the way to the Planck scale for an intermediate range of Higgs masses. We evaluate the relative likelihoods of these three possibilities, on the basis of a global fit to the Standard Model made using the Gfitter package. This uses the information about the Higgs mass available directly from Higgs searches at LEP and now the Tevatron, and indirectly from precision electroweak data. We find that the 'blow-up' scenario is disfavoured at the 99% confidence level (96% without the Tevatron exclusion), whereas the 'metastable' and 'survival' scenarios both remain quite plausible. A future measurement of the mass of the Higgs boson could determine the fate of the Standard Model.

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