

Killing the cMSSM softly

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We investigate the constrained Minimal Supersymmetric Standard Model (cMSSM) in the light of constraining experimental and observational data from precision measurements, astrophysics, direct supersymmetry searches at the LHC and measurements of the properties of the Higgs boson, by means of a global fit using the program Fittino. As in previous studies, we find rather poor agreement of the best fit point with the global data. We also investigate the stability of the electro-weak vacuum in the preferred region of parameter space around the best fit point. We find that the vacuum is metastable, with a lifetime significantly longer than the age of the Universe. For the first time in a global fit of supersymmetry, we employ a consistent methodology to evaluate the goodness-of-fit of the cMSSM in a frequentist approach by deriving p-values from large sets of toy experiments. We analyse analytically and quantitatively the impact of the choice of the observable set on the p-value, and in particular its dilution when confronting the model with a large number of barely constraining measurements. Finally, for the preferred sets of observables, we obtain p-values for the cMSSM below 10%, i.e. we exclude the cMSSM as a model at the 90% confidence level.

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