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Should we still believe in constrained supersymmetry?

Saturday 7 July 2012 18:00 (1 hour)

We calculate Bayes factors to quantify how the feasibility of the constrained minimal supersymmetric model (CMSSM) has changed in the light of a series of observations. This is done in the subjective Bayesian spirit where probability reflects a degree of belief in a proposition and Bayes' theorem tells us how to update it after acquiring new information. Our experimental baseline is the approximate knowledge that was available before LEP, and our comparison model is the Standard Model with a simple dark matter candidate. To quantify the amount by which experiments have altered our relative belief in the CMSSM since the baseline data we compute the Bayes factors that arise from learning in sequence the LEP Higgs constraints, the XENON100 dark matter constraints, the 2011 1 fb^{-1} LHC supersymmetry search results, and the early 2012 LHC Higgs search results. We find that LEP and the LHC strongly shatter our trust in the CMSSM (with M_0 and $M_{1/2}$ below 2 TeV), reducing its posterior odds by a factor of approximately three orders of magnitude. This reduction is largely due to the substantial Occam factors induced by the LEP and LHC Higgs searches and the poor maximum likelihood fit to the LHC Higgs search results.

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