A Bayesian approach to the Constrained MSSM

We employ a Markov Chain Monte Carlo scanning technique and a Bayesian analysis to perform efficient parameter inference of the CMSSM (Constrained Minimal Supersymmetric Standard Model). The approach allows us to vary simultaneously all the CMSSM parameters and relevant Standard Model (nuisance) parameters, and to properly treat experimental constraints from collider physics and cosmology, fully incorportating all relevant sources of uncertainty. This novel application of Bayesian technology to analysing 'new physics' models leads to much more informative results than the usual fixed-grid scanning method. We delineate probability distributions of the CMSSM parameters, of collider and cosmological observables as well as a dark matter direct detection cross section. The method allows us to derive global properties of the model. In particular, by taking very broad flat priors on the CMSSM parameters, we find that the 68\% posterior probability range for the light, SM-like Higgs mass is between 115.4 GeV and 120.4 GeV. Implications for Higgs searches at the Tevatron, Higgs and superpartner searches at the LHC are also explored. An extension to other SUSY models and multi-parameter frameworks is straightforward.

Summary

This talk will be based on our recent papers:

 Implications for the Constrained MSSM from a new prediction for b to s gamma. Leszek Roszkowski, Roberto Ruiz de Austri, Roberto Trotta . May 2007.
 e-Print: arXiv:0705.2012

2) On the detectability of the CMSSM light Higgs boson at the Tevatron.
Leszek Roszkowski (Sheffield U. & CERN), Roberto Ruiz de Austri (Madrid, Autonoma U.), Roberto Trotta (Oxford U.). Nov 2006. Published in JHEP 0704:084,2007.
e-Print: hep-ph/0611173

3) A Markov chain Monte Carlo analysis of the CMSSM.
Roberto Ruiz de Austri (Madrid, Autonoma U.), Roberto Trotta (Oxford U.), Leszek Roszkowski (Sheffield U.)
. Feb 2006. Published in JHEP 0605:002,2006.
e-Print: hep-ph/0602028

and on some yet unpublished results

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