



pMSSM scan: progress and to-do items

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pMSSM chat

New: scan container

- Since the MCMC code includes so many external packages, made a container where everything is properly compiled
 - Allows users to run and test pMSSM code regardless of where they are setting up
 - The image has been converted to singularity and stored on cvmfs using `unpacked.cern.ch` (to be tested)
- <https://hub.docker.com/repository/docker/jdickins/pmssm-env>
- Feel free to give this a try!
- Still a work in progress: getting this to run on a batch system

New: scan container

- Python 2.7.12 and ROOT 6.12.06
 - Set up root with source root-6.12.06-build/bin/thisroot.sh
- (Unfinalized) version of Malte's McMC code is in directory /pMSSM_McMC
- External packages:

Package	Version	McMC interface?
FeynHiggs	2.16.1	Yes
SPheno	4.0.4	Yes
HiggsBounds	5.9.1	Work in progress
HiggsSignals	2.6.0	Work in progress
Micromegas	5.2.4	Yes, but won't use
GM2Calc	1.7.3	Yes
superiso	4.0	Yes

Observables from external packages

Gaussian at measurement	Using directly a chi2 from software
SPheno: $BR(B^+ \rightarrow \tau\nu)$, $BR(D_s \rightarrow \tau\nu)$, $BR(D_s \rightarrow \mu\nu)$, $\Delta(\rho)$	Superiso: chi2 from $\Delta_0(B \rightarrow K^* \gamma)$, $BR(b \rightarrow s \gamma)$, $BR(B_s \rightarrow \mu\mu)$, $BR(B_d \rightarrow \mu\mu)$, $BR(b \rightarrow s \mu\mu)$, $BR(b \rightarrow s e e)$, $BR(B^0 \rightarrow K^{*0} \gamma)$
FenyHiggs mW	HiggsSignals: chi2 from signal strength observables
GM2Calc $a\mu$ (pending studies)	HiggsBounds: chi2 from one or more searches?
FeynHiggs mH?	HiggsSignals: chi2 from mass observables?

Seeking advice on:

1. Potential redundant usage of mH
2. Chi2 from HiggsBounds

List of to-do items

- Get software running on a batch system
 - Ideally one that will permit long-duration jobs
- Complete HiggsSignals and HiggsBounds interfaces
- Run tests with/without $a\mu$ in the likelihood to see the impact
 - Could be helpful to write code for diagnostics/visualization of scan progress
- Run tests to decide on on a good base for log stepping, and a good width for the step size
- Decide how big the scan should be!
 - e.g. sample N times each from M random starting points

Backup Material

Parameter ranges

- For 100 TeV pp collider, expect sensitivity up to ~ 20 TeV masses. Assume 50 TeV is sufficient for decoupling

Parameter	Minimum	Maximum	Stepping
$\tan \beta$	1	60	Log
M_A	100 GeV	25 TeV	Log
$ \mu $	80 GeV	25 TeV	Log
$ M_1 $	1 GeV	25 TeV	Log
$ M_2 $	70 GeV	25 TeV	Log
M_3	200 GeV	50 TeV	Log
$m_{L123\sim}, m_{e123\sim}$	90 GeV	25 TeV	Log
$m_{Q12\sim}, m_{u12\sim}, m_{d12\sim}$	200 GeV	50 TeV	Log
$m_{Q3\sim}, m_{u3\sim}, m_{d3\sim}$	100 GeV	50 TeV	Log
$ A_b , A_\tau $	1 GeV	7 TeV	Log
$ A_t $	1 GeV	$3\sqrt{(m_{Q3\sim}m_{u3\sim})}$	Log