pMSSM test scans

Jennet

June 4, 2021

Git repository

Tag v1.3

- Now running HiggsSignals and HiggsBounds scripts in correct order:
    1. HBSLHAinputblocksfromFHk
    2. HiggsSignals
    3. HiggsBounds
    4. HBwithLHClikelihood_SLHA

Scan setup v1.3

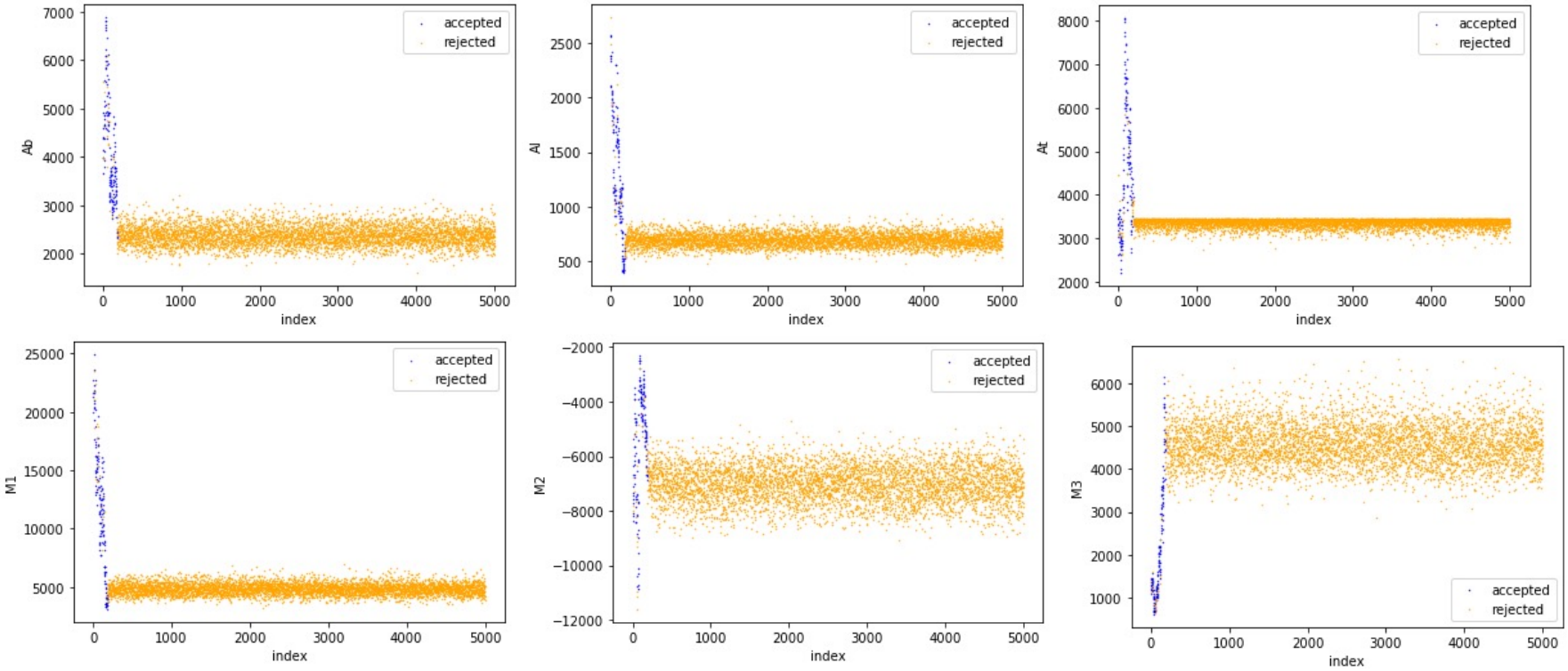
- Log stepping (***width=0.01*** and base=e)
- Likelihood as before(see backup)
  - Uses observables calculated with Superiso, Spheno, FeynHiggs, Higgs Signals, Higgs Bounds
- Parameter ranges as before (see backup)
  - Sign of signed parameters chosen at random

Test scans with v1.3

- Test 0: 100 points. All looks good
- Test 1: 5000 points. All looks good at first, then gets stuck!

Link to all

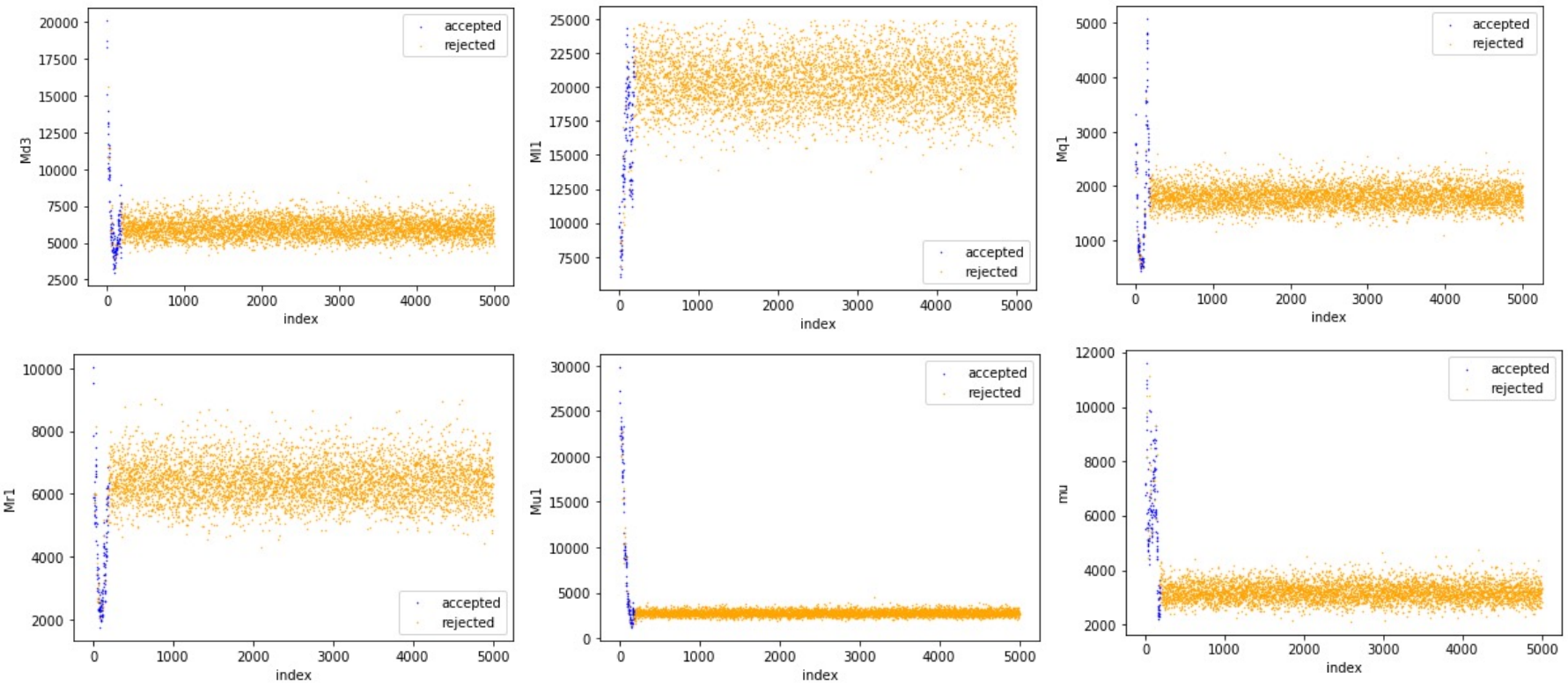
pMSSM params (1)



Blue = accepted
Orange = rejected

Link to all

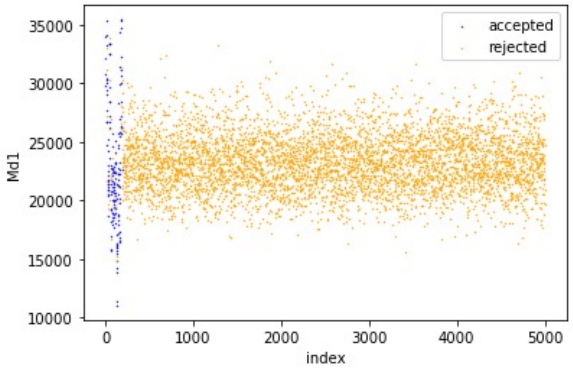
pMSSM params (2)

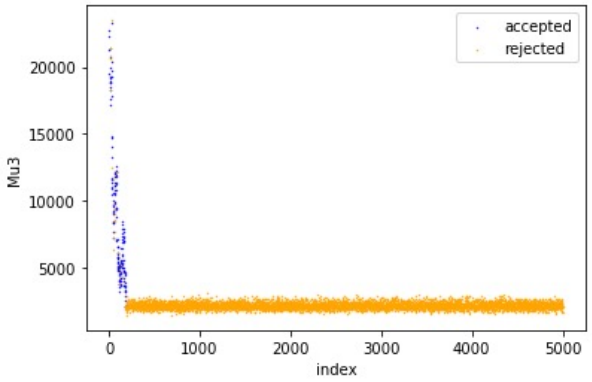


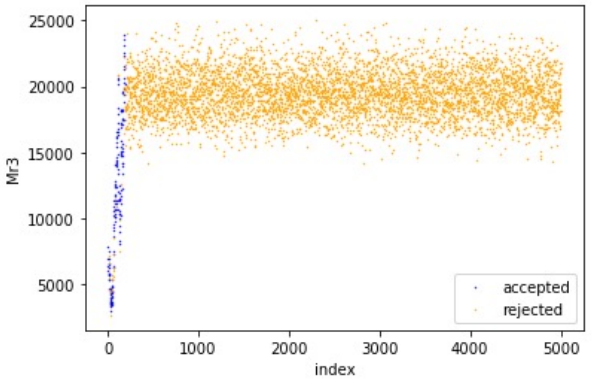
Blue = accepted
Orange = rejected

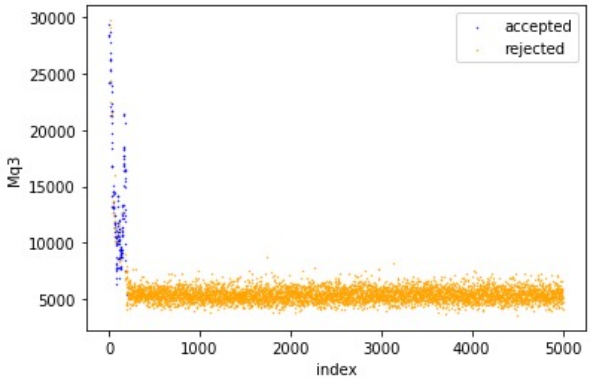
Link to all

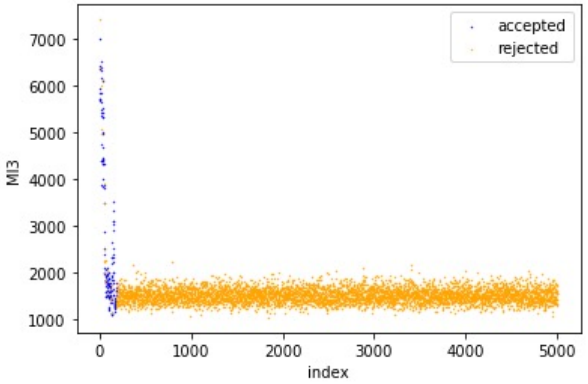
pMSSM params (3)

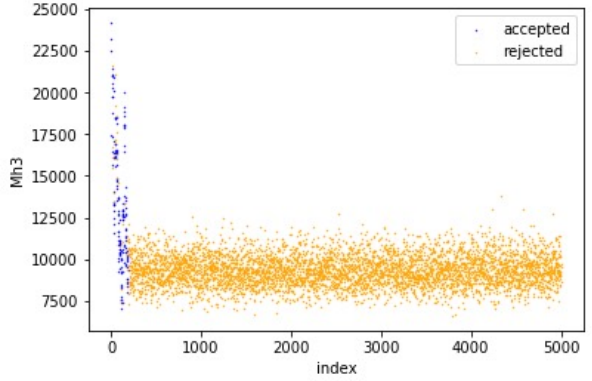


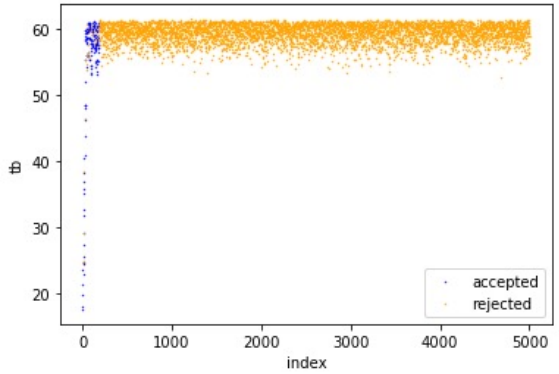








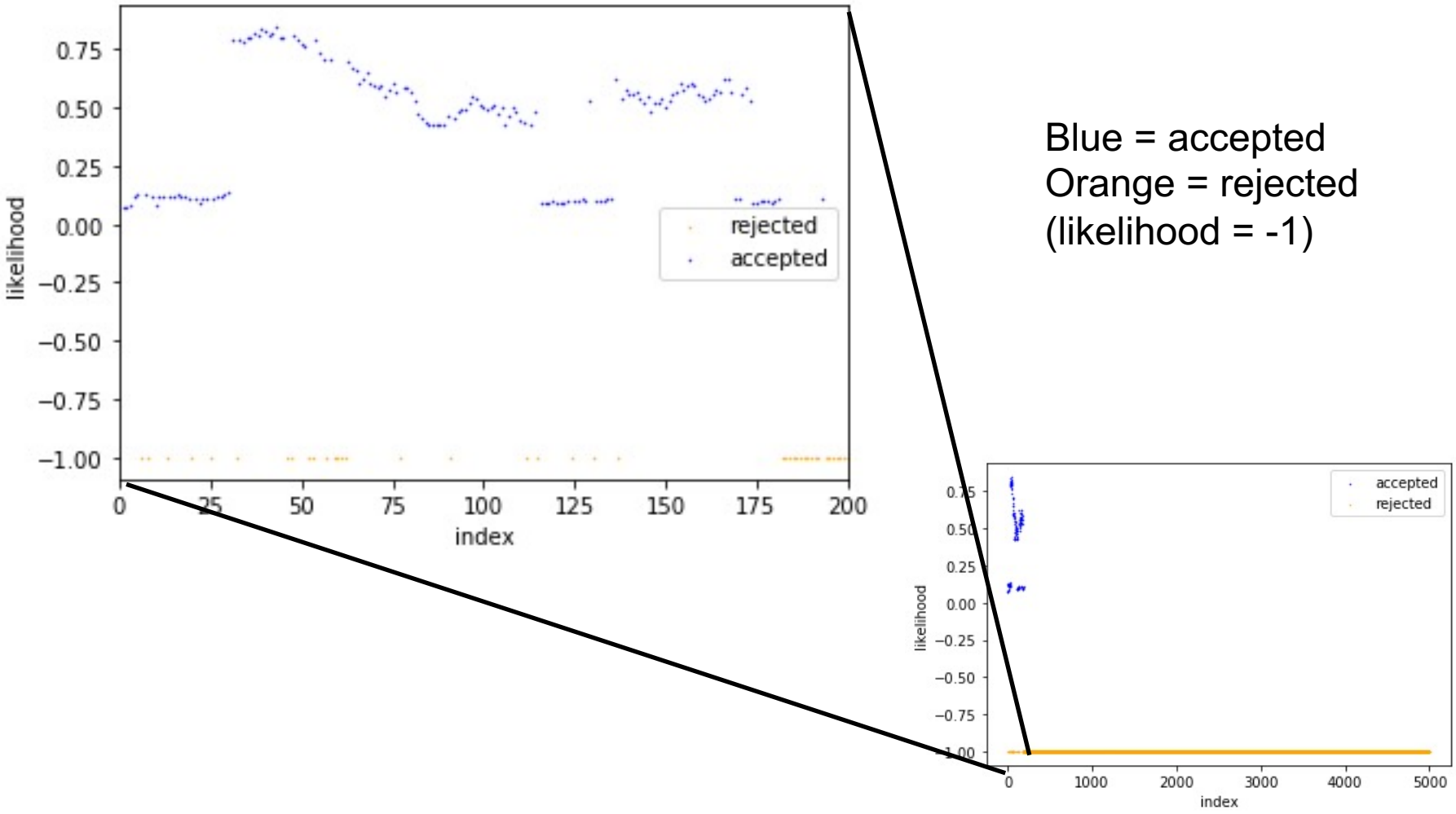




Blue = accepted
Orange = rejected

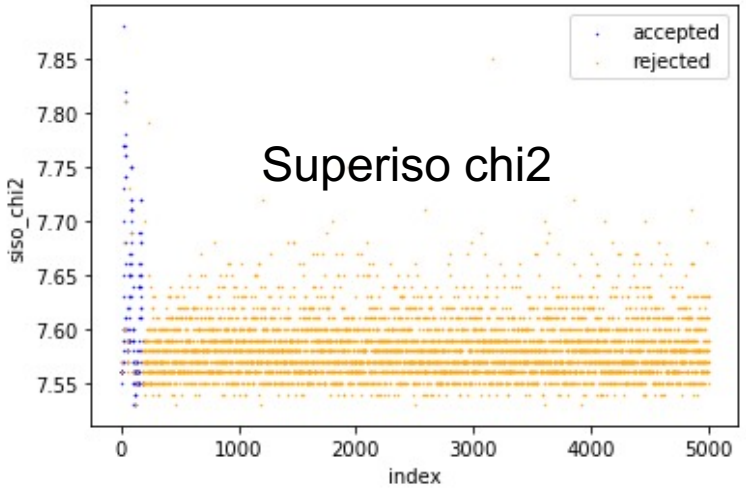
Link to all

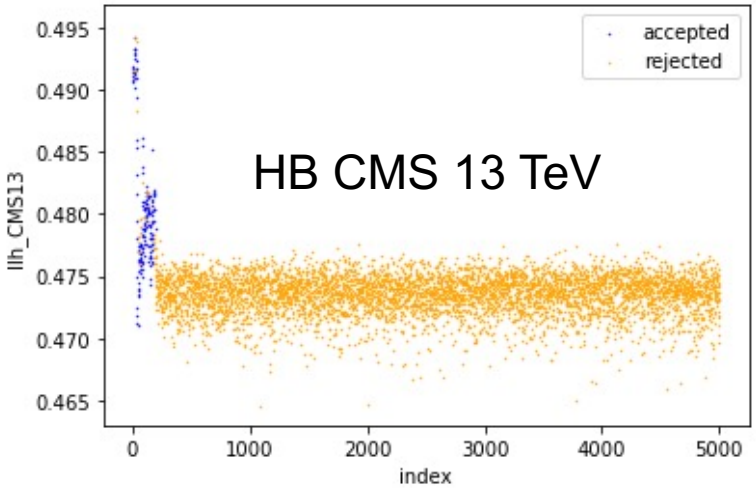
Total likelihood

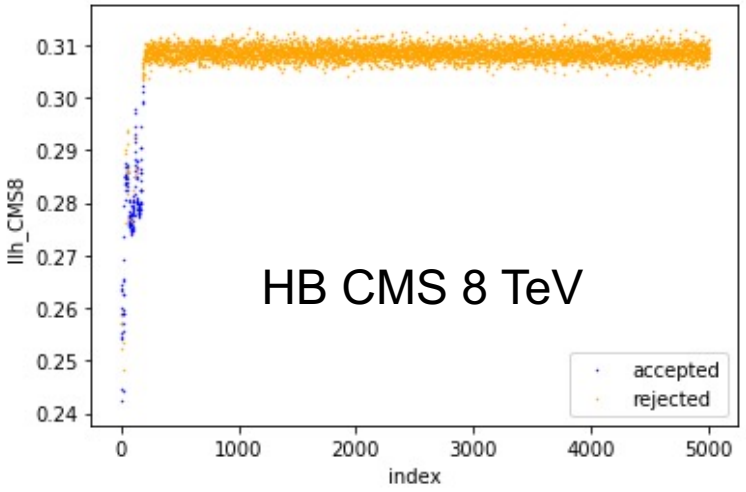


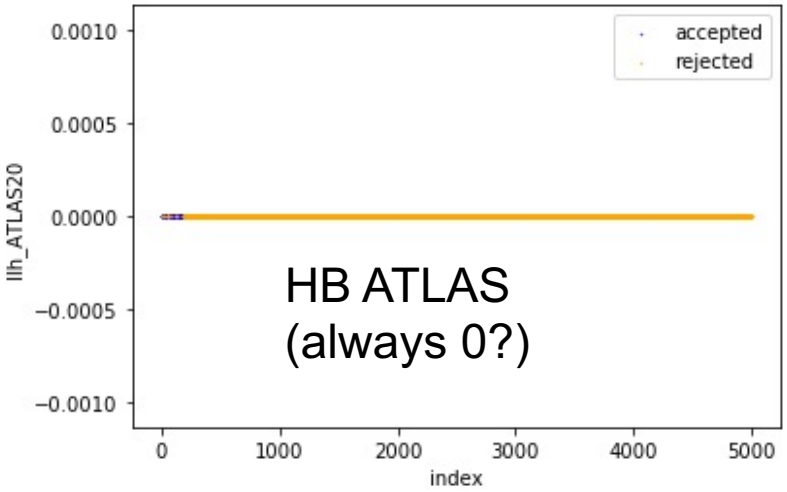
Blue = accepted
Orange = rejected
(likelihood = -1)

Component likelihoods (1)

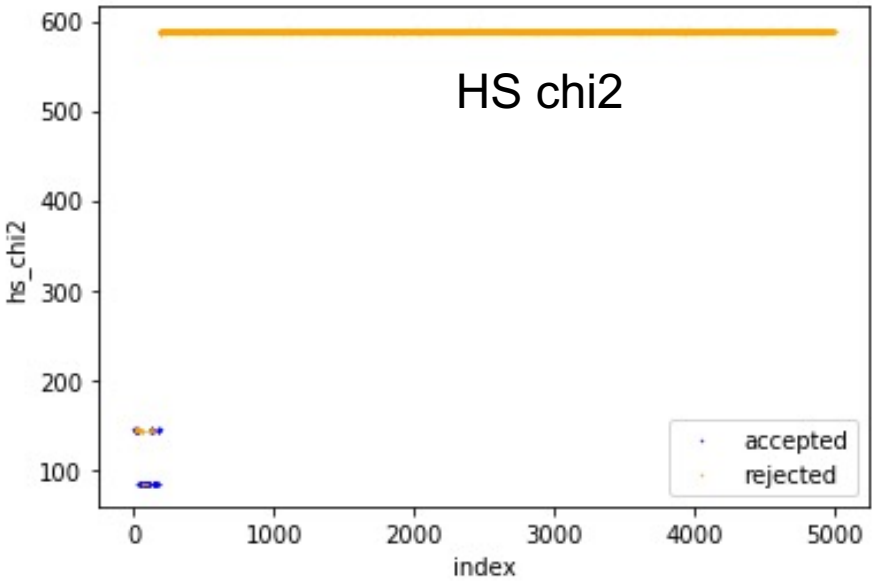


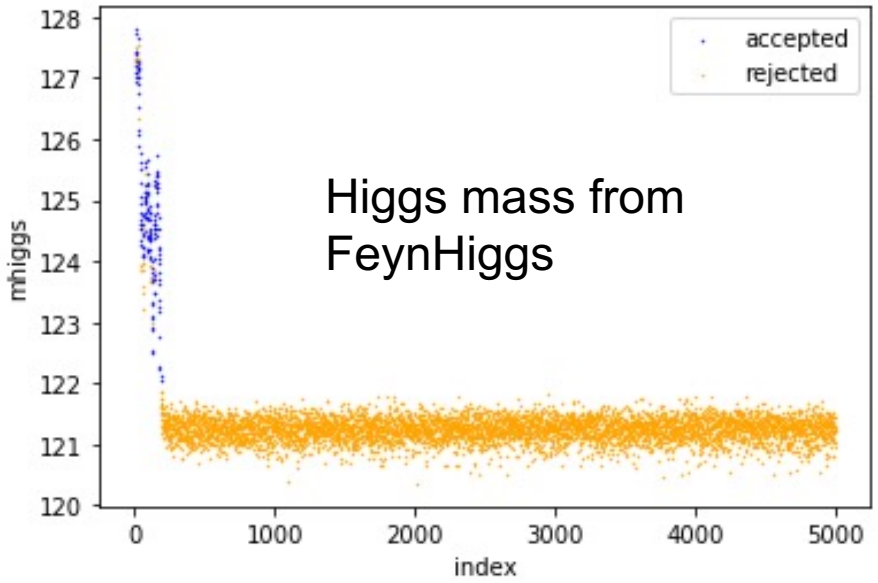






Component likelihood (2)





- Stuck region is clearly disfavored…

Why do we get stuck?

- This doesn't look like a minimum!
  - Clearly disfavored by Higgs measurements
- One idea: run additional small scans trying
  - Linear stepping
  - Larger step size

Additional material

Observables in likelihood

Superiso	SPheno	FeynHiggs	Higgs Signals	Higgs Bounds
$\Delta_0(B\to K\gamma)$	$BR(B^+ \to \tau\nu)$*	m_W	LHC Higgs meas. (includes m_H)	LHC Higgs searches
$BR(b\to s\gamma)$	$BR(D_s\to \tau\nu)$*			
$BR(B_s\to\mu\mu)$	$BR(D_s\to\mu\nu)$*			
$BR(B_d\to\mu\mu)$	$\Delta(\rho)$ *			
$BR(b\to s\mu\mu)$	m_{top}			
$BR(b\to see)$	αS			
$BR(B0\to K^{*0}\gamma)$	m_{bottom}			

* Missing for v1.3

Parameter ranges

Parameter	Minimum	Maximum	Stepping
tan β	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