



pMSSM scan update: post-processing

Jennet Dickinson

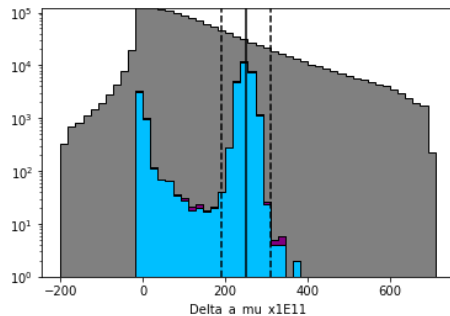
November 3, 2021

Width of Gaussian

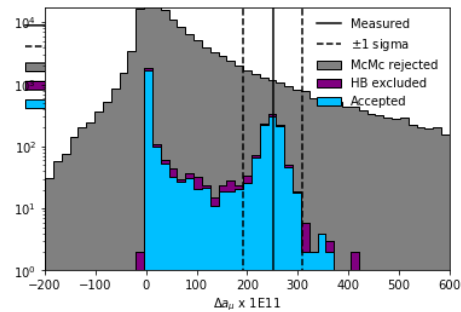
- Studies done with a_μ in the likelihood

Step	Gaus. step width	N(points)	McMC Eff.	Fraction accepted w heaviest slepton < 500 GeV	Fraction accepted w lightest squark > 10 TeV	Fraction accepted w $\Delta(\text{LSP} - \text{gluino}) < 500 \text{ GeV}$	Fraction accepted w $\Delta(\text{LSP} - \text{stop}) < 500 \text{ GeV}$
Log	5%	1624883	1.9%	5.1%	0.45%		
Log	10%	200100	1.6%	5.0%	0.98%		
Log	20%	190799	0.77%	6.5%	2.6%		
Log	30%	162693	0.6%	8.6%	2.8%		
Lin	5%						

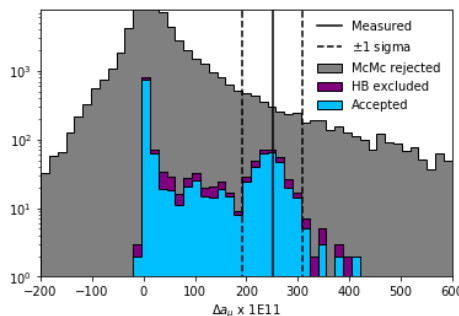
5%



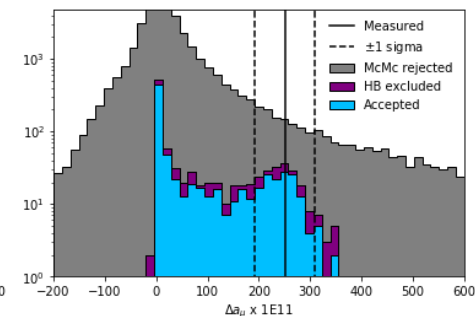
10%






20%



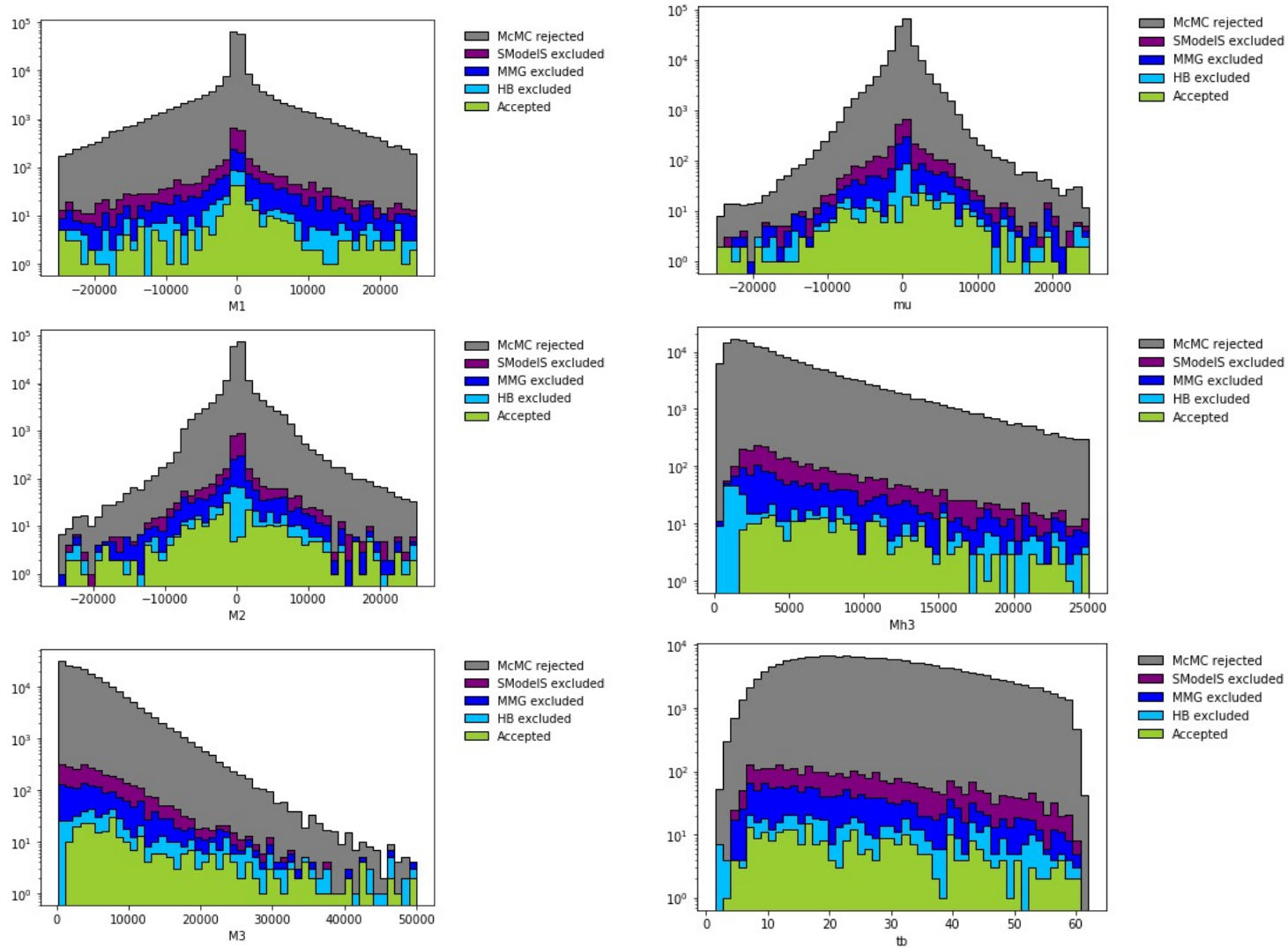
30%



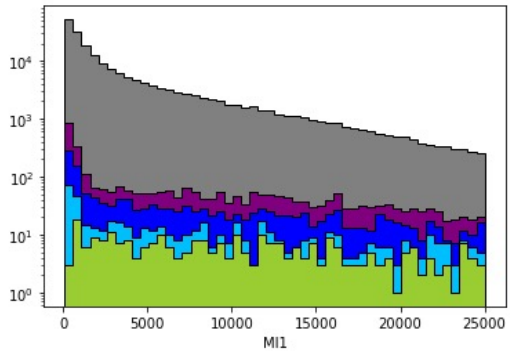
Post-processing

- Ran for test with Gaussian width 0.10
-  MMG exclusion and DM relic density
 - Added: check in McMC if LSP is color particle after calling SPheno
 - This could improve efficiency
 - Added: save neutralino mixing params in post-processing for DM EWino composition
-  SModelS exclusion (thanks Malte!)
-  Parallelized: one point per job – fast!
 - Some intermittent failures on lxplus due to mounting of afs, resubmission is easy

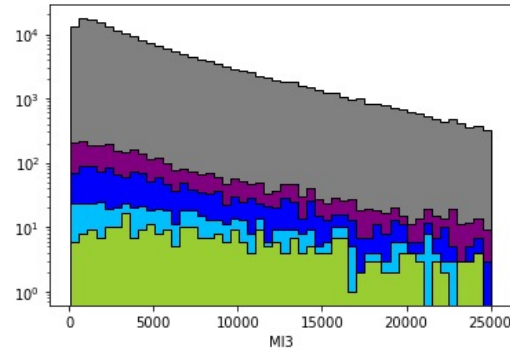
pMSSM params (1)



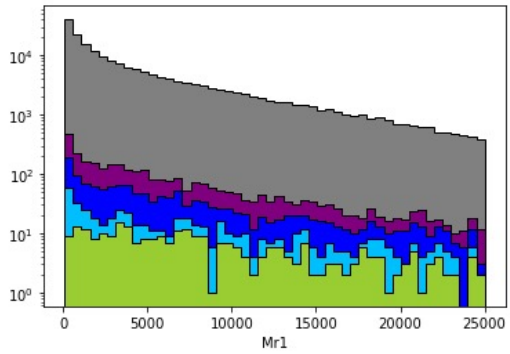
pMSSM params (2)



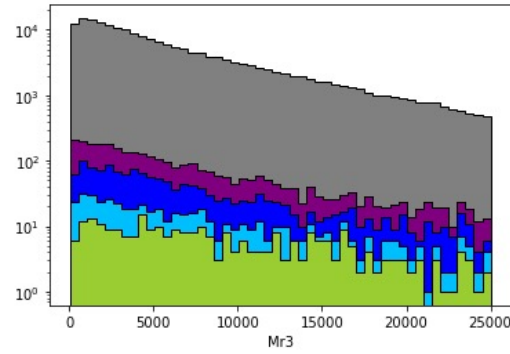
McMC rejected
SModelS excluded
MMG excluded
HB excluded
Accepted



McMC rejected
SModelS excluded
MMG excluded
HB excluded
Accepted

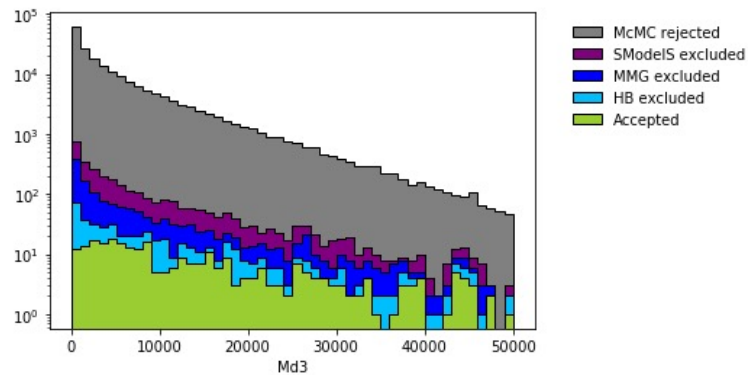
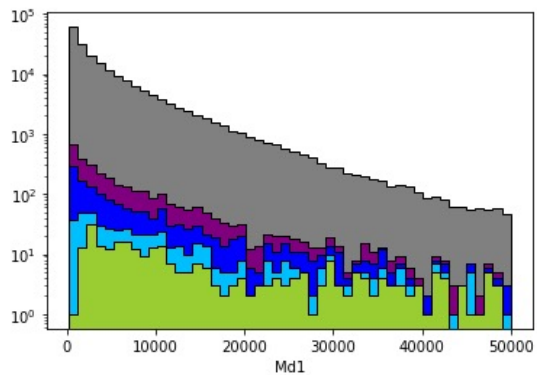
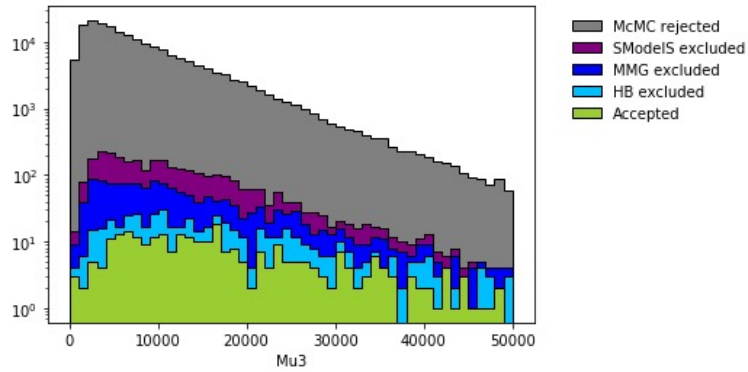
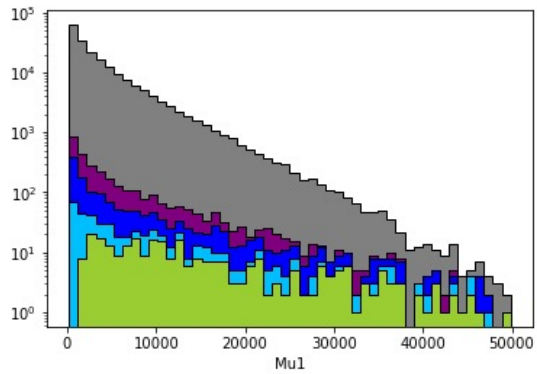
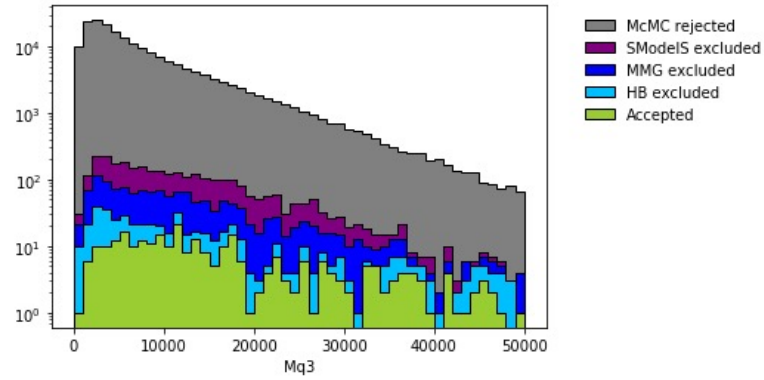
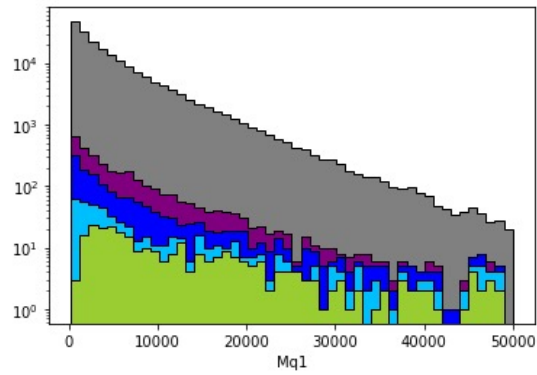


McMC rejected
SModelS excluded
MMG excluded
HB excluded
Accepted

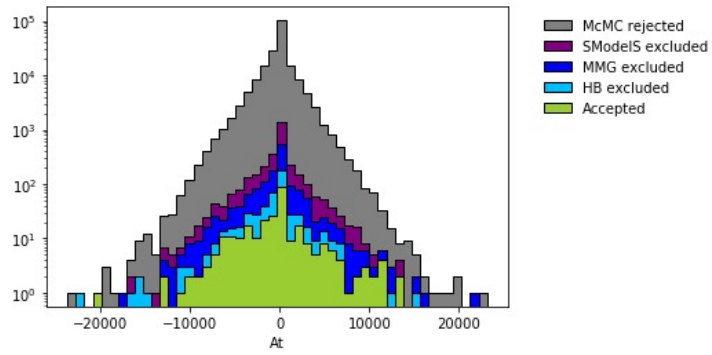
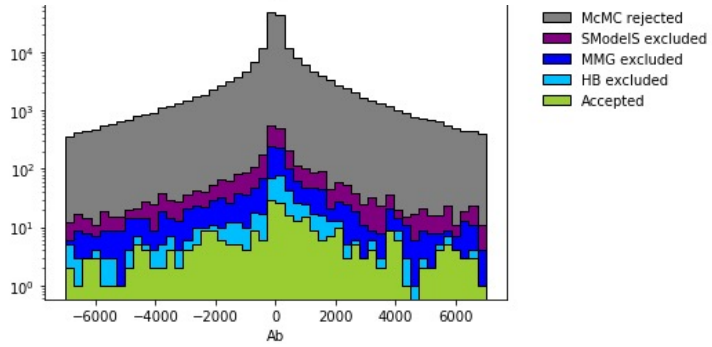
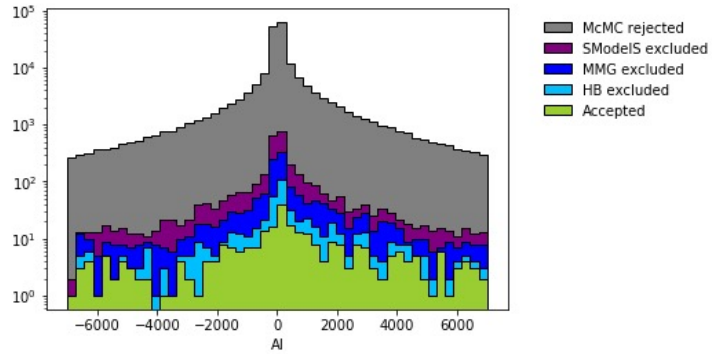


McMC rejected
SModelS excluded
MMG excluded
HB excluded
Accepted

pMSSM params (3)

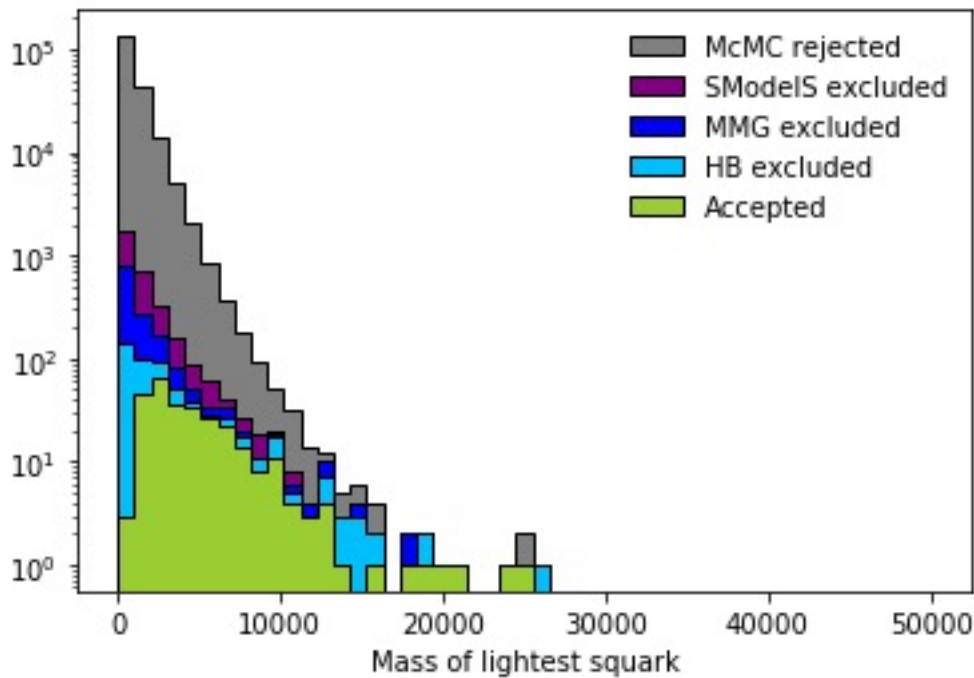


pMSSM params (4)

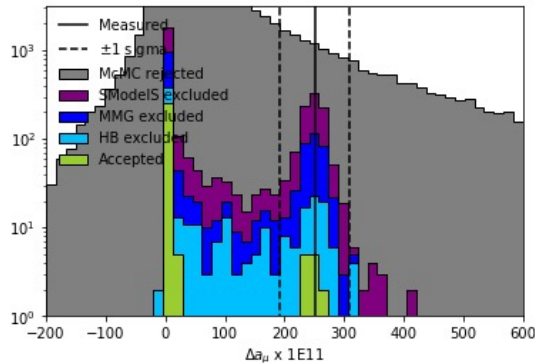
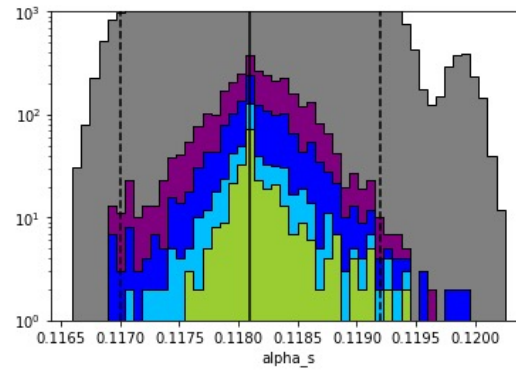
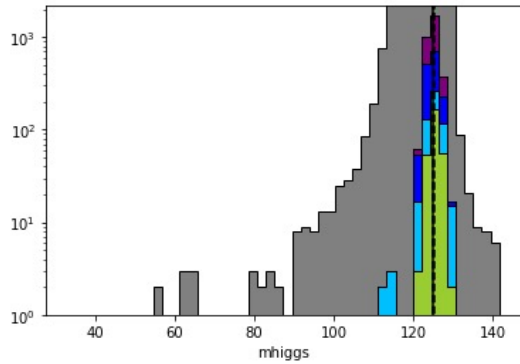
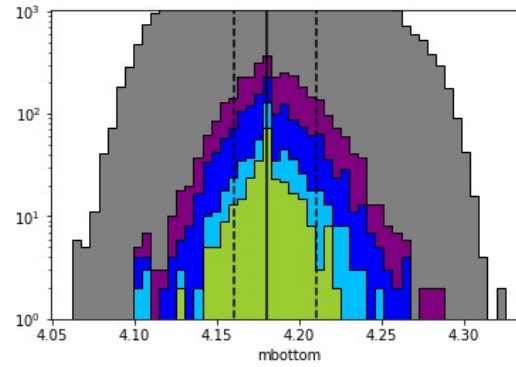
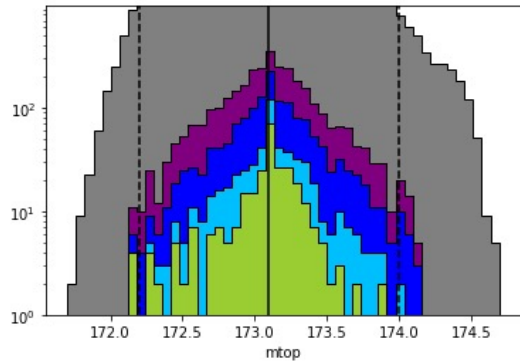


Mass of lightest squark

- Fraction increases after additional exclusions from SModelS and Micromegas
 - 0.98% \rightarrow 6.7% of accepted points > 10 TeV



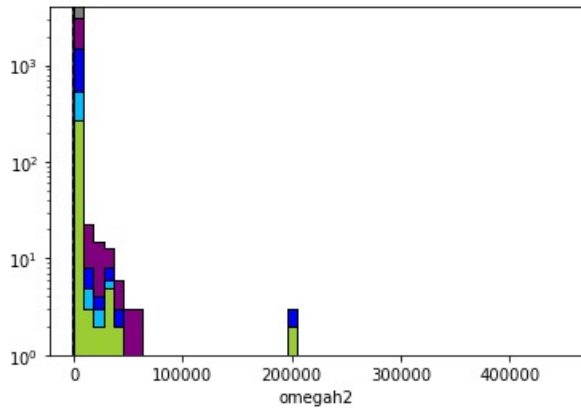
Physics observables



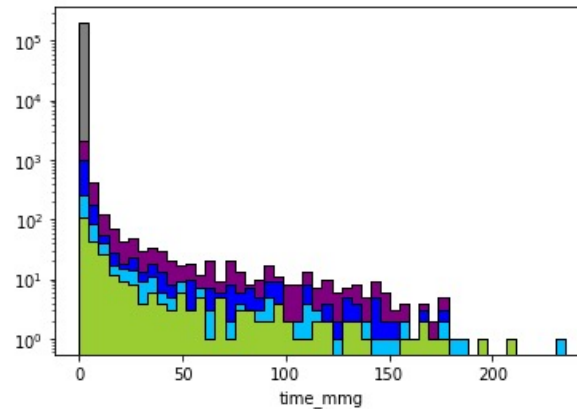
Additional exclusions really hurt the peak at measured a_μ

DM relic density

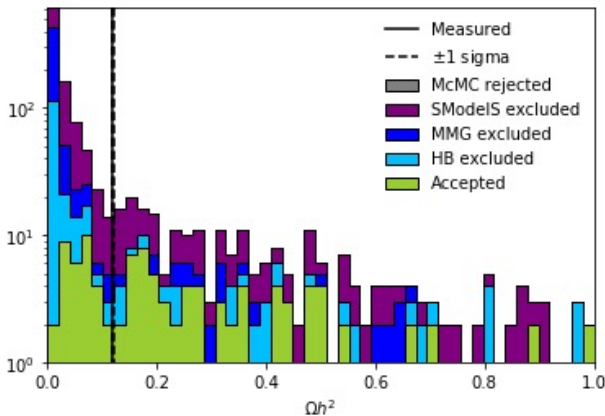
- Huge range of values, can take up to 3 minutes



— Measured
- - - ± 1 sigma
■ McMC rejected
■ SModelS excluded
■ MMG excluded
■ HB excluded
■ Accepted



■ McMC rejected
■ SModelS excluded
■ MMG excluded
■ HB excluded
■ Accepted



— Measured
- - - ± 1 sigma
■ McMC rejected
■ SModelS excluded
■ MMG excluded
■ HB excluded
■ Accepted

Slimming on this variable will kill efficiency. How strict should we be?

Running now

- “Small scans” with SPheno 4.0.5. Same setup with 5 widths
 - Log step 5, 10, 20, 30%, Linear step in squark masses 5%
- Only accept from SPheno if LSP is a neutralino
 - Will improve efficiency
- Saving more DM information
 - LSP mass, LSP composition
- **The plan:** one of these will correspond to the final setup. We can choose based on values in table similar to slide 2
 - If we need more of some area of phase space (e.g. strong sector decoupled), can submit dedicated scan(s) later