FlexibleFuture

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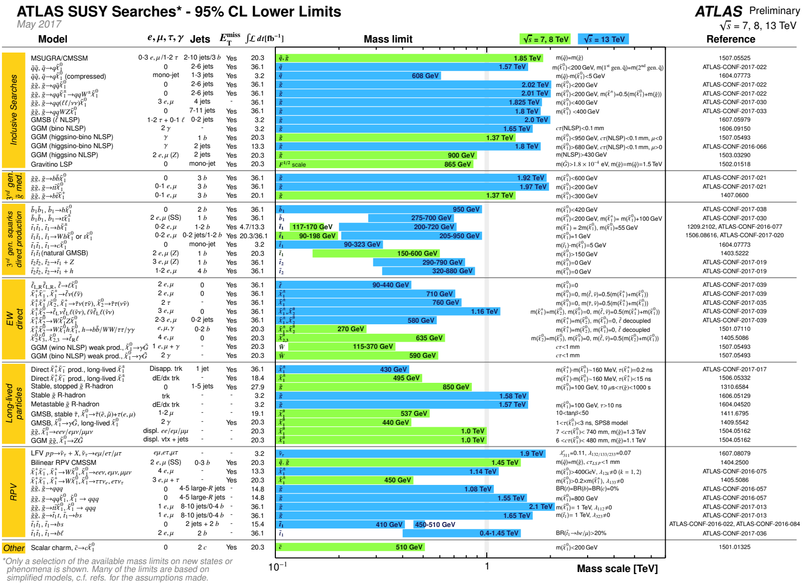
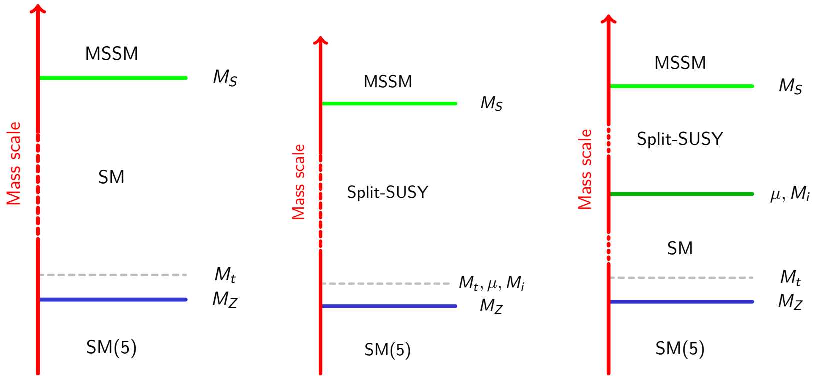
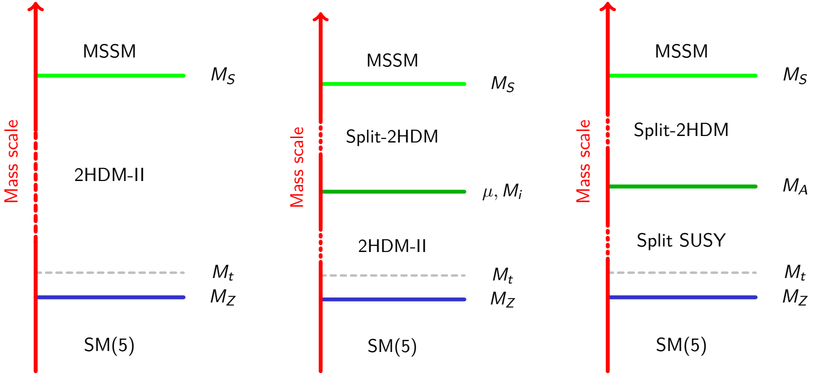
Current limits on SUSY particle masses



EFT towers with low-scale SM



EFT towers with low-scale 2HDM



Requirements for uncertainty estimate

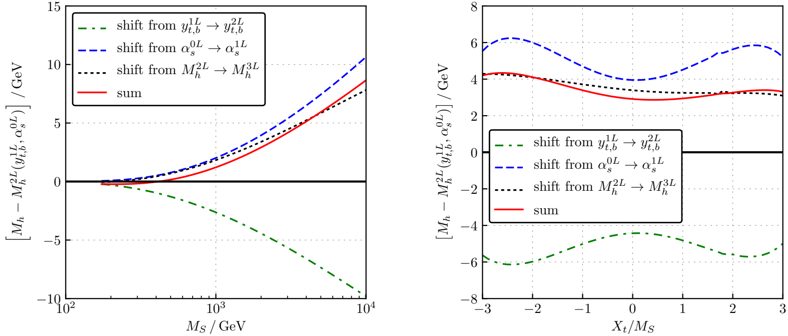
- reasonable
- code specific
- flag specific
- generic (MSSM, NMSSM, THDM, ...)
- $M_S \lesssim 1\,\text{TeV}$: envelope fixed order 3-loop calculation
- $M_S \gtrsim 1\,\text{TeV}$: envelope EFT 2-loop calculation

Debatable ways to calculate ΔM_h

fixed order	1L	2L	3L
Q_{pole}	$[M_S/2, 2M_S]$	$[M_S/2, 2M_S]$	$[M_S/2, 2M_S]$
$y_t(M_Z)$	0L vs. 1L	1L vs. 2L	2L vs. 3L
$\alpha_s(M_Z)$	0L vs. 1L	1L vs. 2L	2L vs. 3L
EFT/mixed	$\Delta\lambda^{0L}$	$\Delta\lambda^{1L}$	$\Delta\lambda^{2L}$
Q_{match}	$[M_S/2, 2M_S]$	$[M_S/2, 2M_S]$	$[M_S/2, 2M_S]$
$\lambda(M_S)$	0 vs. $\frac{v^2}{M_S^2}$	0 vs. $\frac{v^2}{M_S^2}$	0 vs. $\frac{v^2}{M_S^2}$
EFT/mixed	ΔM_h^{1L}, β^{1L}	ΔM_h^{2L}, β^{2L}	ΔM_h^{3L}, β^{3L}
Q_{pole}	$[M_t/2, 2M_t]$	$[M_t/2, 2M_t]$	$[M_t/2, 2M_t]$
$y_t(M_Z)$	0L vs. 1L	1L vs. 2L	2L vs. 3L
$\alpha_s(M_Z)$	0L vs. 1L	1L vs. 2L	2L vs. 3L

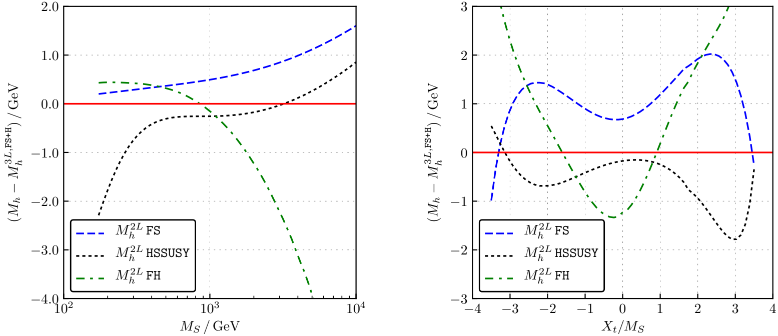
M_h in the MSSM at fixed loop order

Large cancellations:



$\tan\beta = 5$, $X_t = 0$, $M_S = 2\,\text{TeV}$

M_h in the MSSM at fixed loop order



$\tan\beta = 5$, $X_t = 0$, $M_S = 2\,\text{TeV}$