

Many light Higgs bosons in the NMSSM

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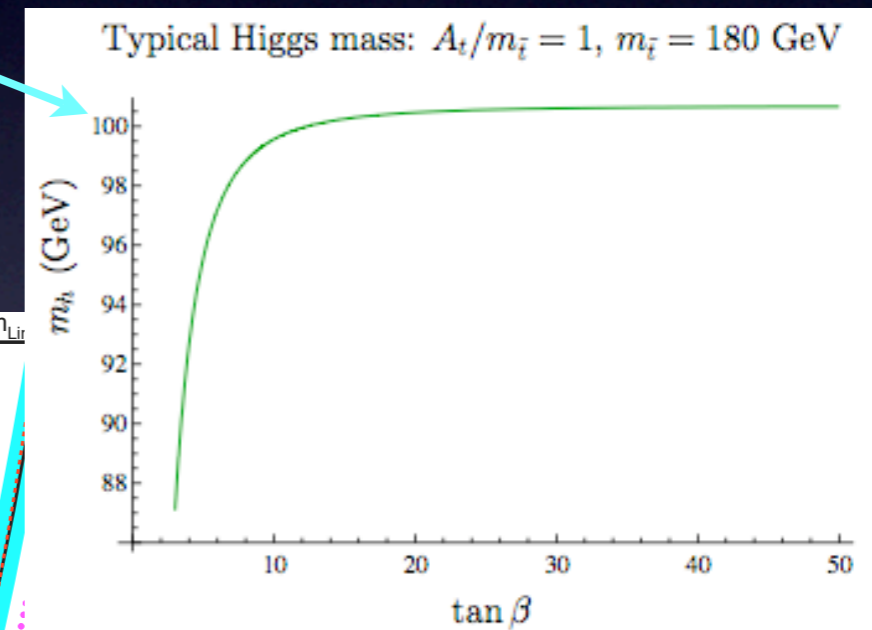
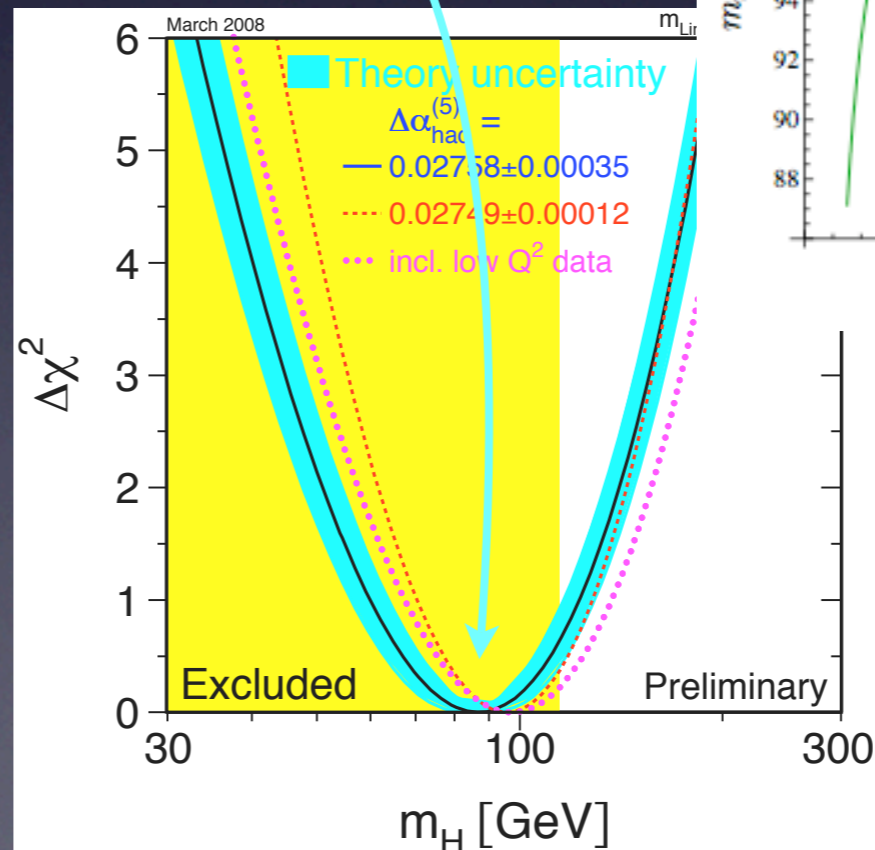
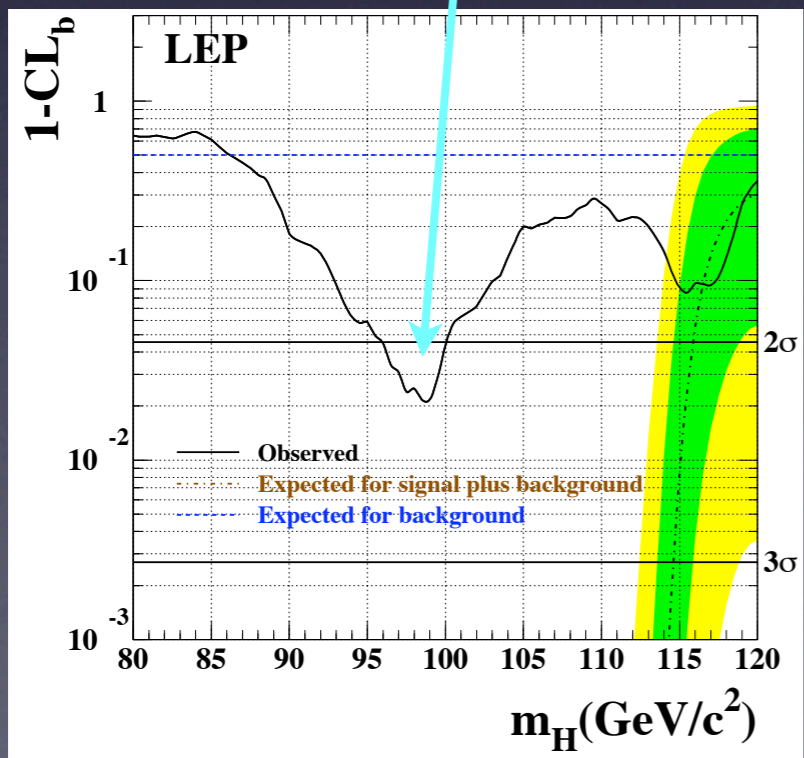
R.D., [arXiv:0806.0847 \[hep-ph\]](#), [arXiv:0807.2135 \[hep-ph\]](#)

R.D. and J. Gunion, [arXiv:0811.3537 \[hep-ph\]](#)

related to a series of papers with J. Gunion

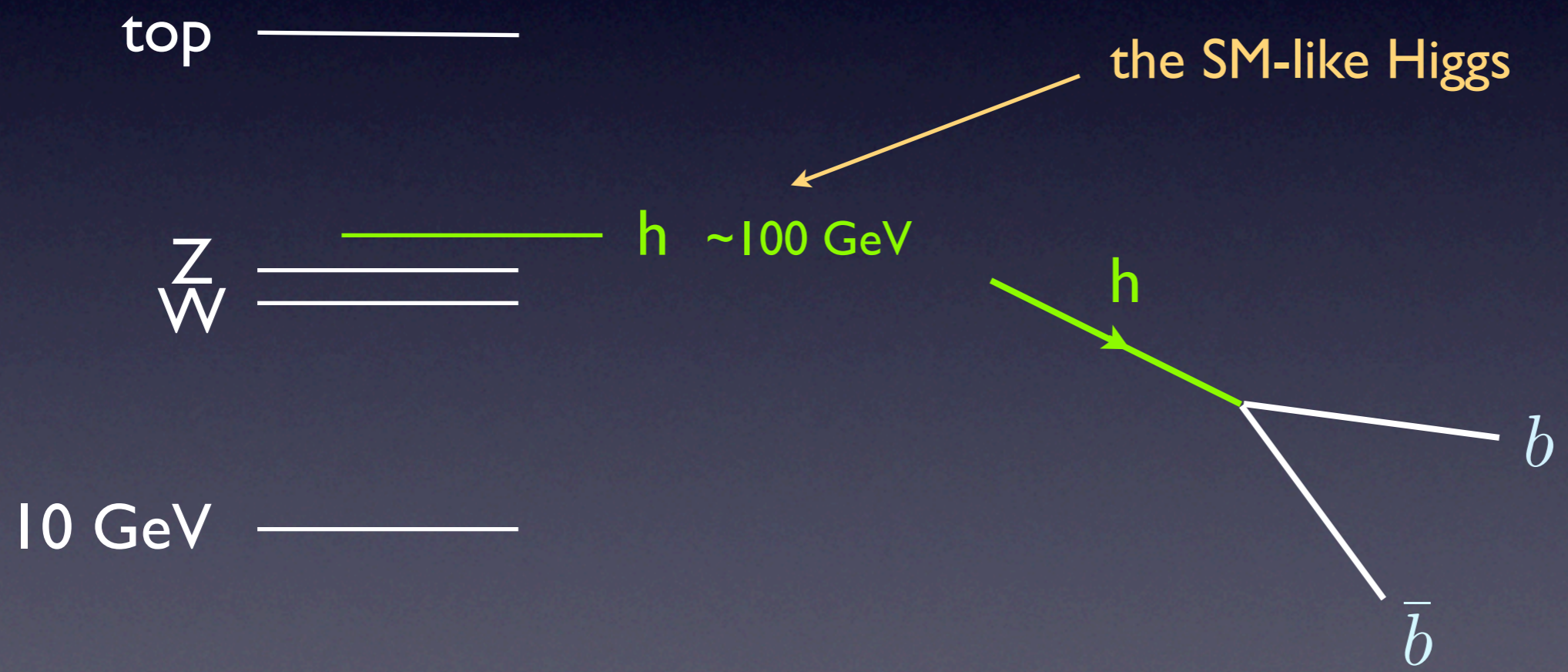
Motivation for modified Higgs decays:

- ◆ arise in many models beyond the SM
- ◆ allow the SM-like Higgs significantly below LEP limits
 - wanted by generic SUSY/natural EWSB
 - preferred by precision EW data
 - indicated by LEP data



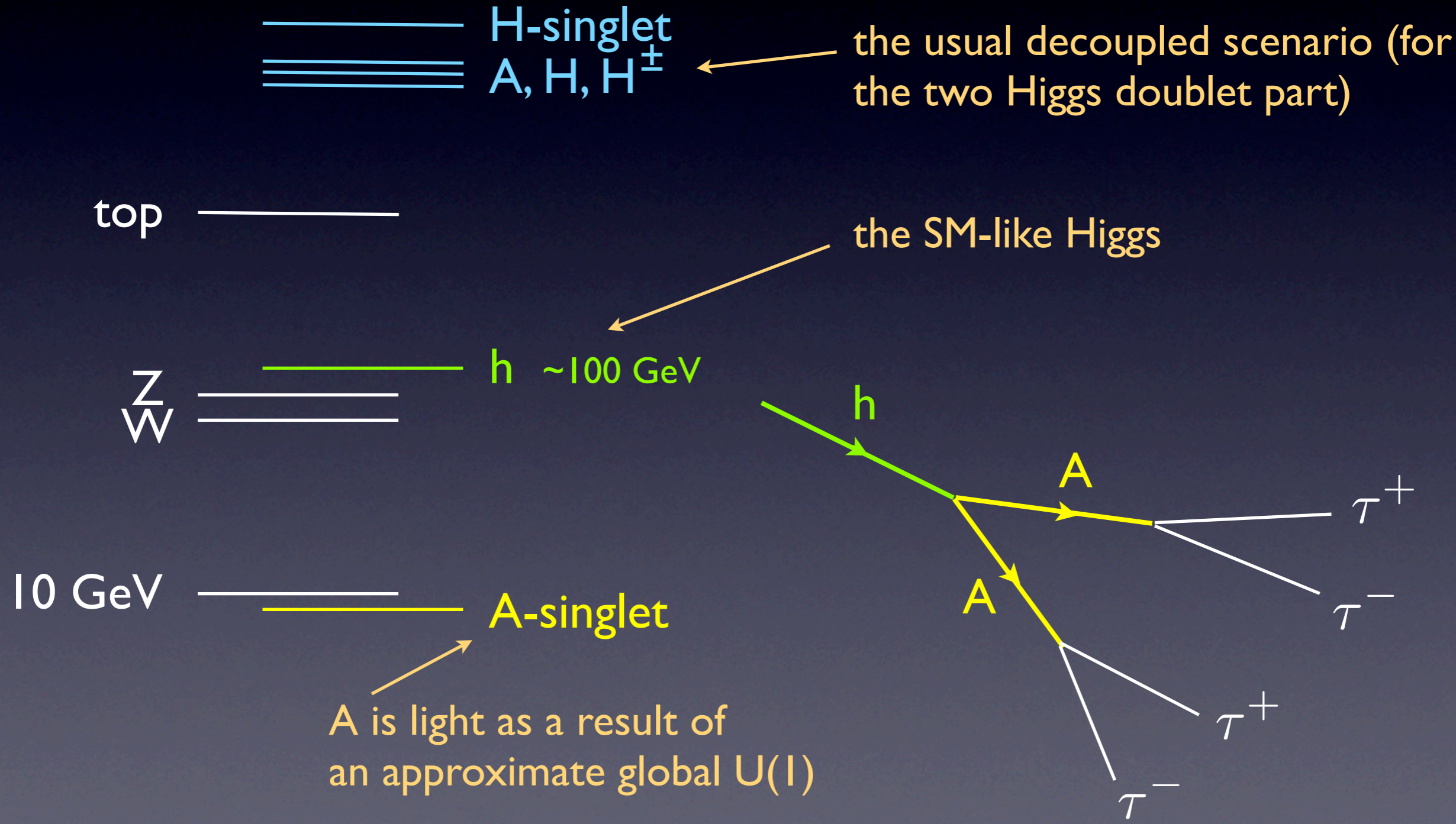
(N)MSSM - the usual story (decoupling limit)

==== H,A-singlets
==== A, H, H[±]



NMSSM with a light singlet CP odd Higgs

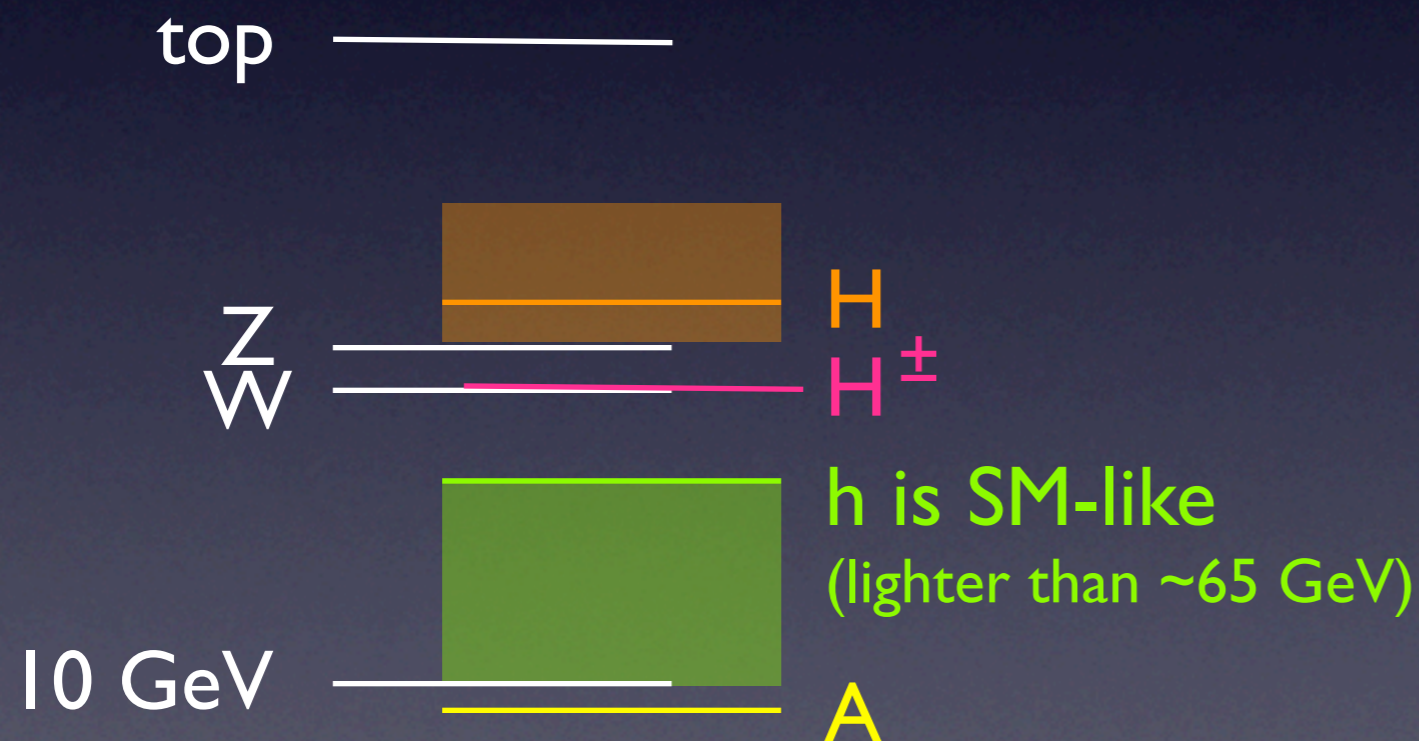
R.D. and J. Gunion (2005)



Models with an MSSM-like light CP odd Higgs

R.D., arXiv:0806.0847 [hep-ph]

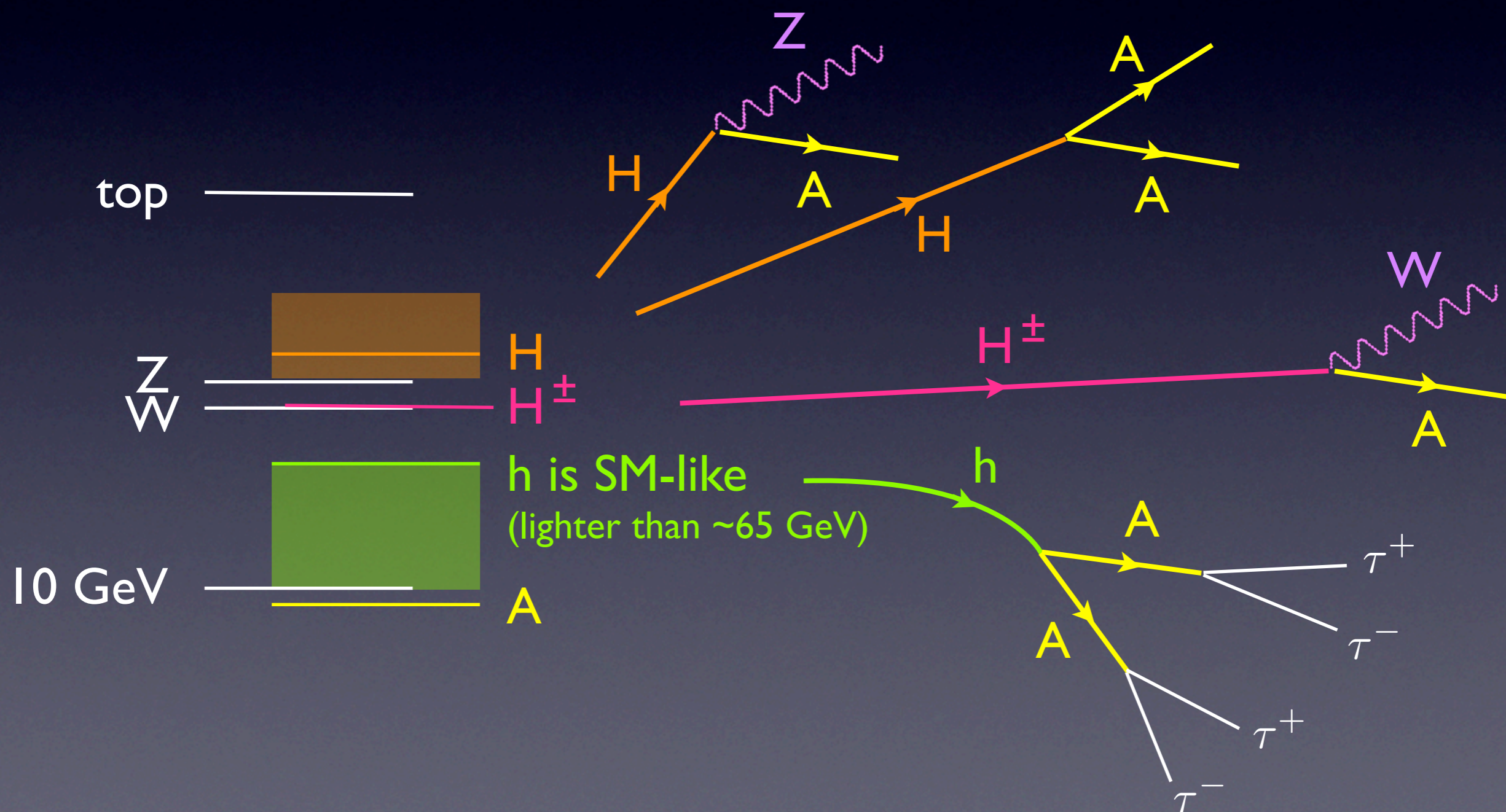
MSSM with $\tan \beta \lesssim 2.5$:



Models with an MSSM-like light CP odd Higgs

R.D., arXiv:0806.0847 [hep-ph]

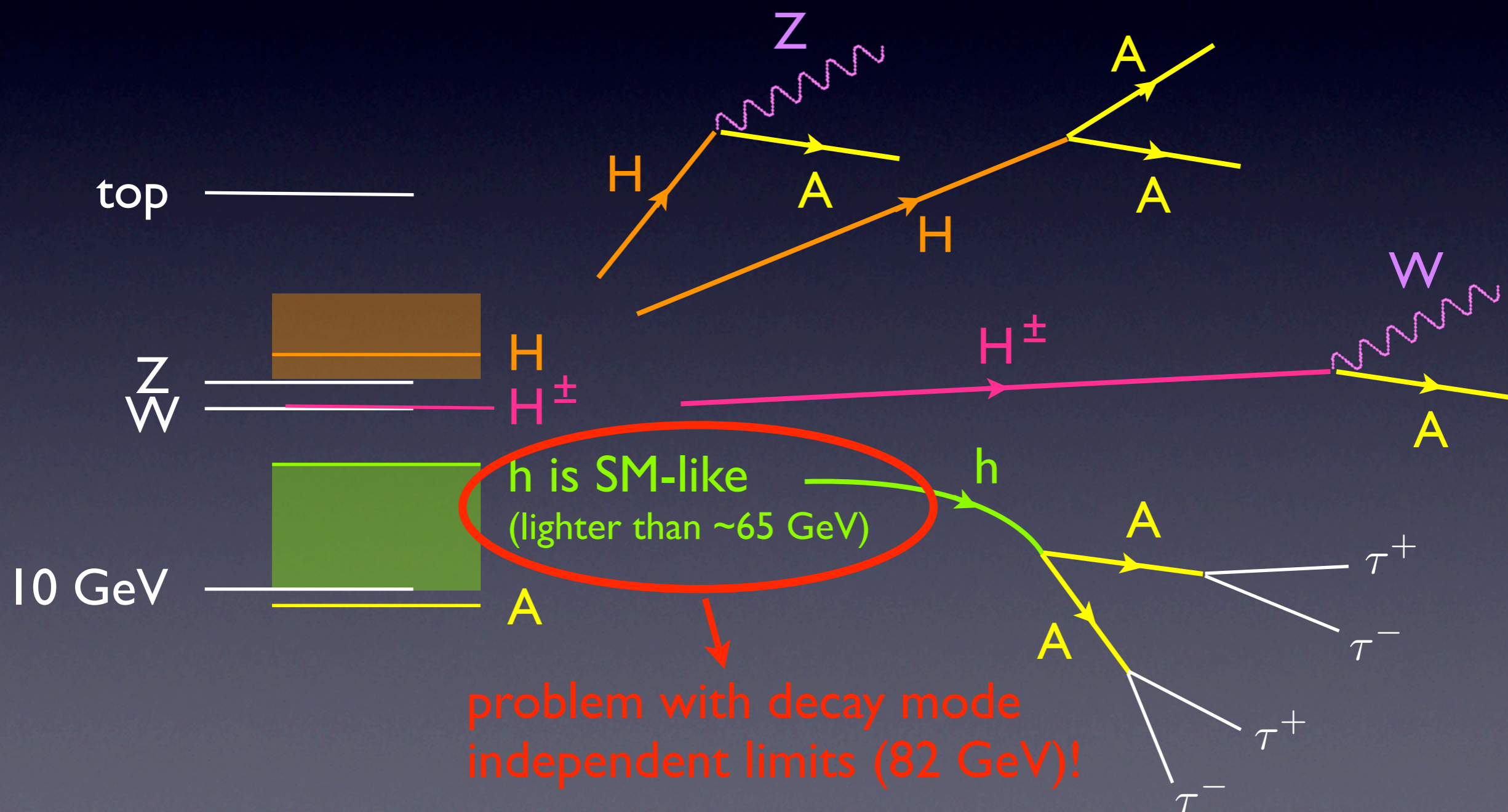
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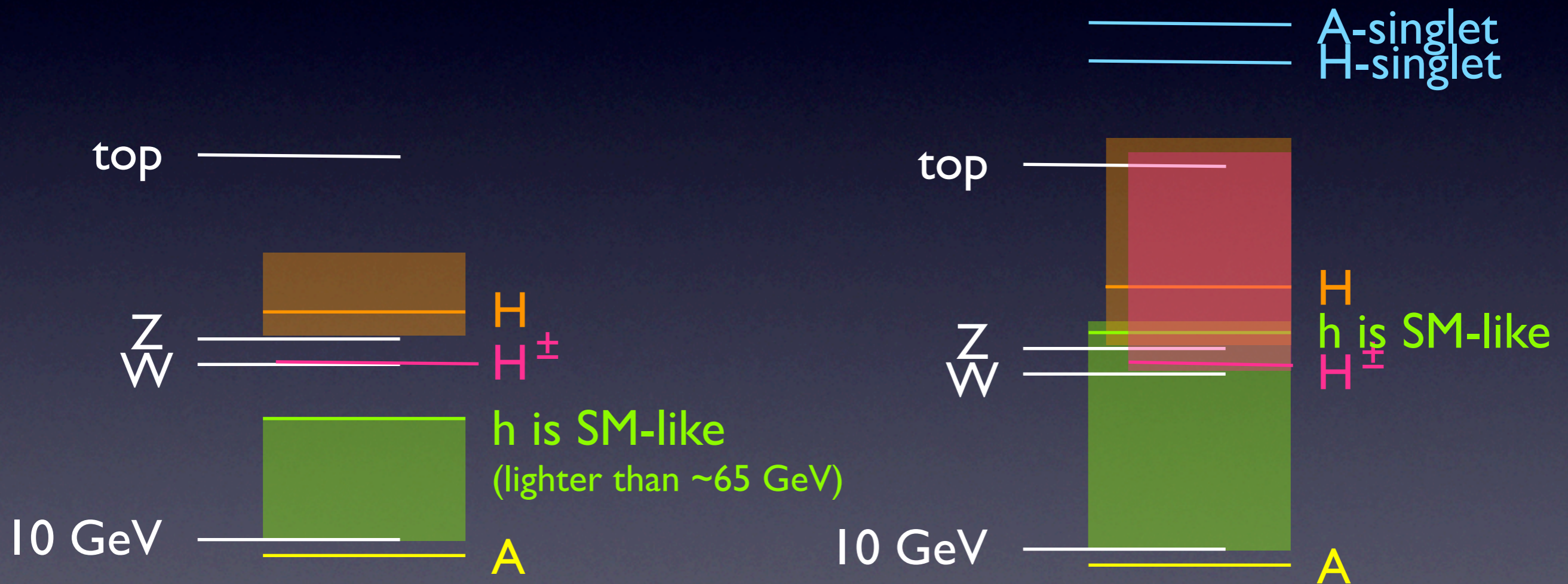


Models with an MSSM-like light CP odd Higgs

R.D., arXiv:0806.0847 [hep-ph], R.D. and J. Gunion, arXiv:0811.3537 [hep-ph]

MSSM with $\tan \beta \lesssim 2.5$:

NMSSM with $\tan \beta \lesssim 2.5$:



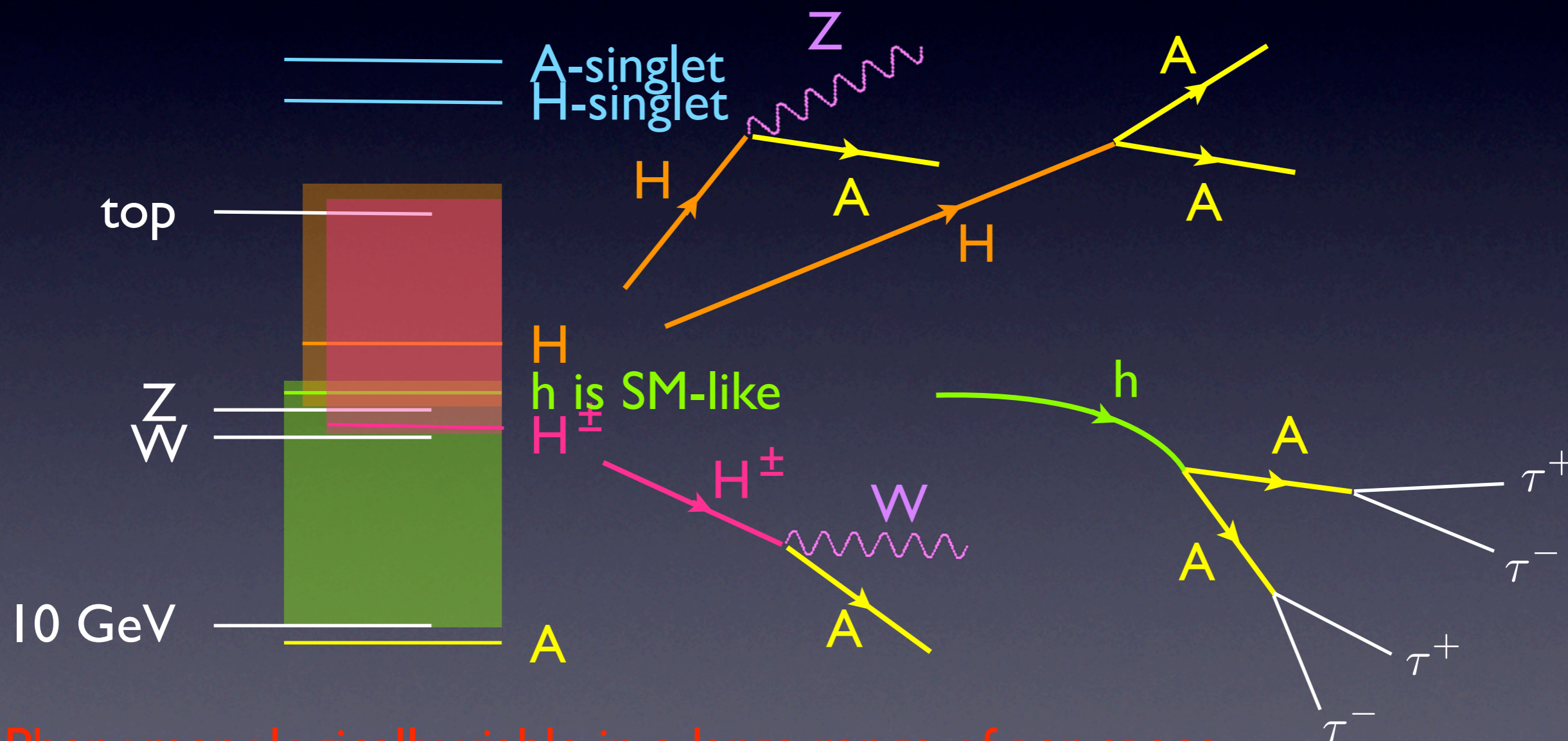
NMSSM provides an additional contribution to the mass of the SM-like Higgs: $m_h^2 \simeq \dots + \lambda^2 v^2 \sin^2 2\beta + \dots$

$W \supset \lambda S H_u H_d$

Models with an MSSM-like light CP odd Higgs

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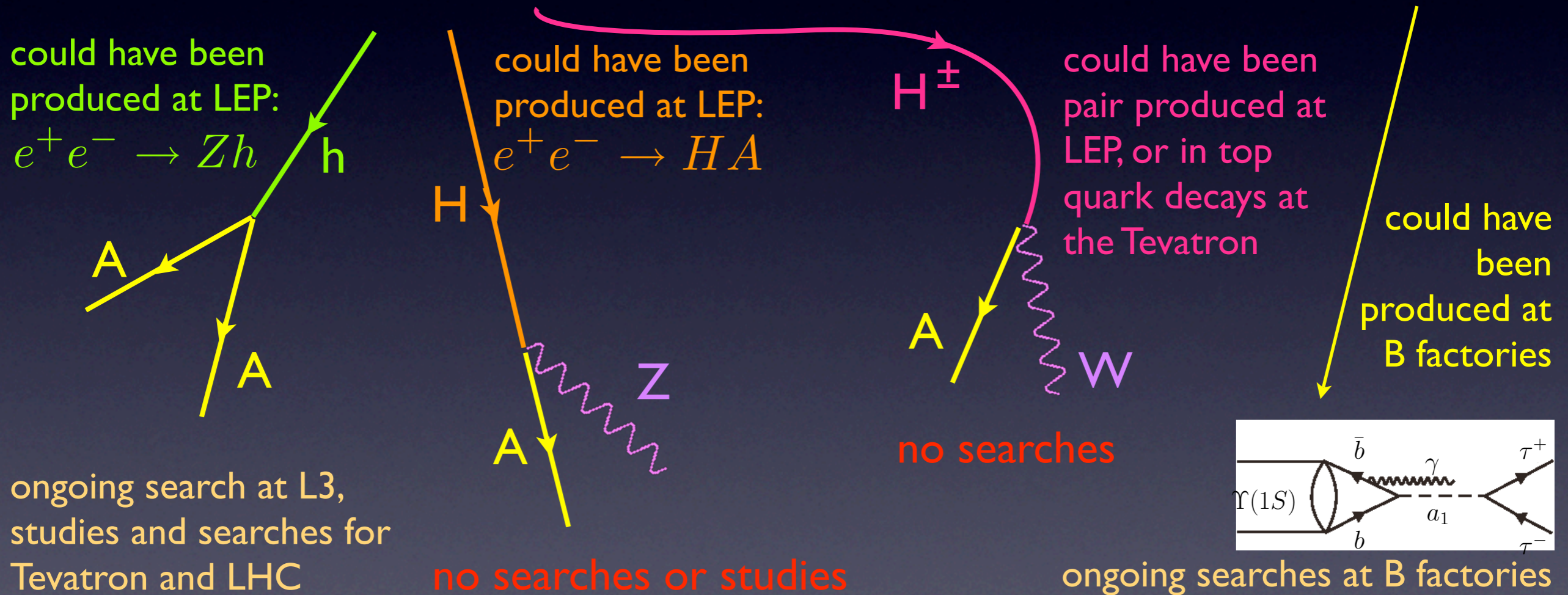
NMSSM with $\tan \beta \lesssim 2.5$:



Phenomenologically viable in a large range of par. space
(no need for heavy SUSY), all Higgses produced already at LEP!

If the light CP-odd Higgs is doublet like:

- ◆ all the Higgses (from two Higgs doublets) would be fairly light
- ◆ all the Higgses: h, H, H^\pm would decay through the CP odd Higgs: A



- ◆ the extra singlet is not necessary

the scenario can be viable in many other models!