

SusHi

= Susy Higgs production Xsecs

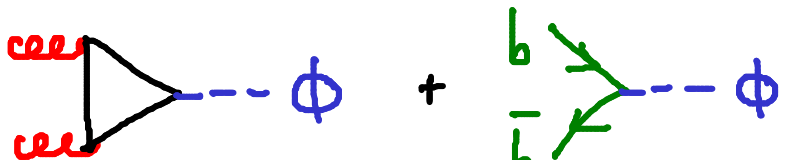
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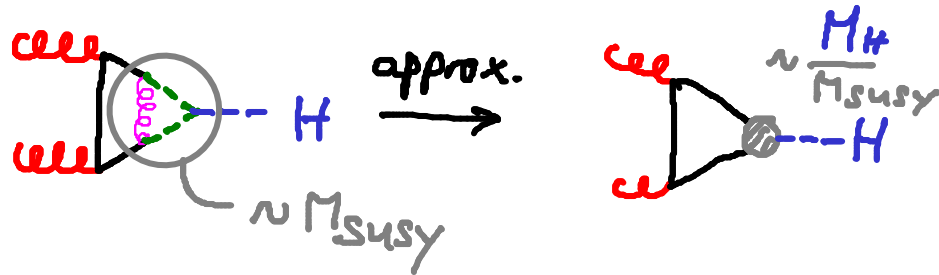
<http://susHi.hepforge.org> , arXiv:1212.3249

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Purpose

-  in MSSM $\phi \in \{h, H, A\}$
including higher orders

- all NLO QCD corrections available!
(as long as $M_H \lesssim M_{\text{susy}} \sim 1 \text{ TeV}$)



- but: nowhere combined consistently
- MSSM very sensitive to issues of renormalization (cf. M_h^{susy})
→ need tool to play with

2HDM

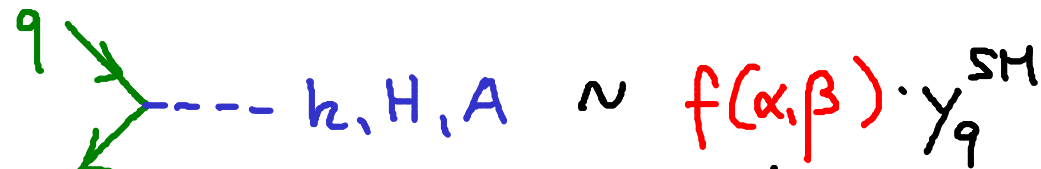
- Higgs sector $\hat{=}$ generalized MSSM:

MSSM: $M_A, \tan\beta$

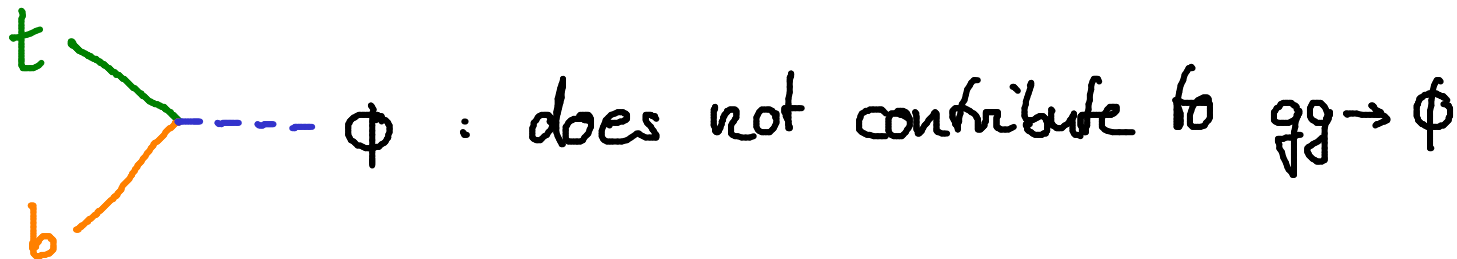
2HDM: + 5 (7) more parameters, e.g.

$M_{h_1}, M_{H_1}, M_{H^\pm}, \sin(\beta-\alpha), m_{12}^2$
 (λ_6, λ_7)

- 2HDM Yukawa couplings:



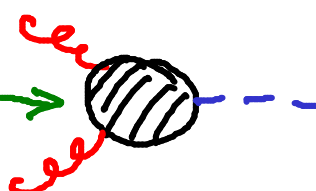
↑ implemented in SusHi



Susy includes:

total inclusive σ for $gg \rightarrow \phi$:

- exact LO $t+b + \left(\begin{smallmatrix} \tilde{t} + \tilde{b} \\ \text{only} \end{smallmatrix} \right)^{\text{MSSM}}$
- exact NLO $t+b$
- NLO $\tilde{t} + \tilde{b}$ for $M_\phi \lesssim 1 \text{ TeV}$
(+ \tilde{g}) MSSM only
- NNLO t (eff. th., i.e. $M_\phi \lesssim 2m_t$; $gg \rightarrow \phi$ NNLO)
- approx. NNLO \tilde{t} (see [hep-ph/0308210]) MSSM only
- Δ_b -corrections (large $\tan\beta$), resummation schemes, scale variation, etc.
MSSM only



differential (p_T, y cuts and distributions):

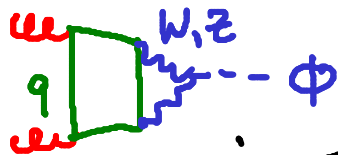
$\mathcal{O}(\alpha_s^3)$, i.e. LO for $p_T \neq 0$

NLO for $p_T = 0$

EW corr's to gluon fusion:

- fully known **only** in SM
- options: use SM EW-factor for MSSM

or use light-quark cont's only

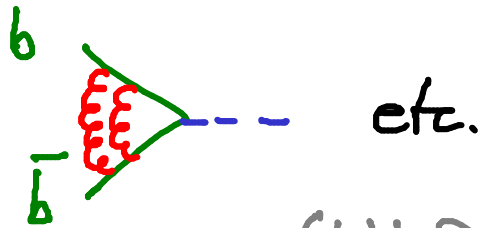


insert SUSY couplings

Susyfi includes:

total inclusive σ_{sec} for $b\bar{b} \rightarrow \phi$:

• through NNLO



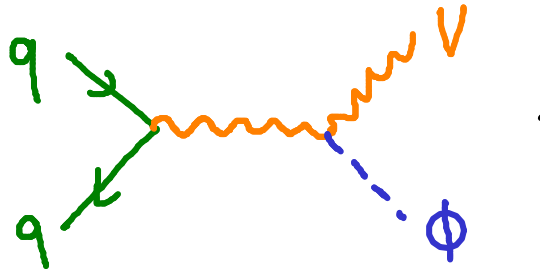
(Δ_b -corrections, Δ_b MSSM only scale variation, etc. (bbh@nnlo))

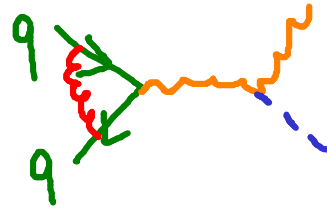
differential (cuts on p_T, γ)

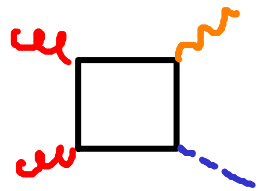
$\mathcal{O}(\alpha_s)$, i.e. LO for $p_T \neq 0$
NLO for $p_T = 0$

- Link to LHAPDF
- easy in- + output
- Link to FeynHiggs ($\rightarrow M_h$)

Remarks on other processes

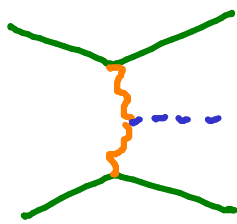
- Higgs-Strahlung:  → rescale SM by 2HDM coupling

dk through NLO QCD: 

NNLO: +  → different couplings, but no interference with other cont's.

→ vhadnlo [Brein, RH, Zirke]

lists these four separately

- VBF:  similar story
→ vbfadnlo [Bolzani, Maltoni, Modi, Zaro]