FeynHiggs: An MSSM Higgs Physics Tool

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Outline

- FeynHiggs: Overview
- Masses and Mixings
- Comparison with another Tool
Higgs Sector in the MSSM

In the Minimal Supersymmetric Standard Model (MSSM):

- **Two Higgs doublets**

  \[ \Rightarrow 5 \text{ Higgs bosons}: \text{at Born level: } \begin{align*}
  &\text{CP-even, neutral: } h^0, H^0 \\
  &\text{CP-odd, neutral: } A^0 \\
  &\text{charged: } H^\pm
  \end{align*} \]

  with **quantum corrections**: \( h^0, H^0, A^0 \) can mix in general

  \[ \Rightarrow h_1, h_2, h_3 \]

- **Masses of the Higgs bosons are not independent:**

  usual input: either \( A^0 \)-mass \( M_{A^0} \) oder \( H^\pm \)-mass \( M_{H^\pm} \) and

  \[ \tan \beta = \frac{v_u}{v_d} \] (ratio of the Higgs vacuum expectation value)

- **Lightest Higgs boson**: theoretical upper mass bound:

  at **Born**: \[ M_{h^0} \leq M_Z = 91 \text{ GeV} \]

  with **quantum corrections**: \[ M_{h_1} \lesssim 135 \text{ GeV} \]
FeynHiggs: Overview

- Higgs mass matrix $\Rightarrow$ masses, mixings
- Higgs production: cross sections
- Constraints
- Higgs couplings
- Higgs decays: (partial) decay widths, branching ratios

FeynHiggs: An MSSM Higgs Physics Tool
Heidi Rzehak
FeynHiggs: Overview

Higgs mass matrix: \( M(p^2) = \begin{pmatrix} M_{h^0}^2 - \hat{\Sigma}_{h^0 h^0}(p^2) & -\hat{\Sigma}_{h^0 h^0}(p^2) & -\hat{\Sigma}_{h^0 A^0}(p^2) \\ -\hat{\Sigma}_{h^0 h^0}(p^2) & M_{h^0}^2 - \hat{\Sigma}_{H^0 h^0}(p^2) & -\hat{\Sigma}_{H^0 A^0}(p^2) \\ -\hat{\Sigma}_{h^0 A^0}(p^2) & -\hat{\Sigma}_{H^0 A^0}(p^2) & M_{A^0}^2 - \hat{\Sigma}_{A^0 A^0}(p^2) \end{pmatrix} \)

- **Real parameters** \( (\hat{\Sigma}_{h^0 A^0}(p^2) = \hat{\Sigma}_{H^0 A^0}(p^2) = 0)\):
  - full one-loop (no NMFV) \([\text{Frank, Hahn, Heinemeyer, Hollik, H.R., Weiglein}]\)
    - Lead. non-min. flavour viol. (NMFV) \([\text{Heinemeyer, Hollik, Merz, Peñaranda}]\)
  - two-loop: \( - \mathcal{O}(\alpha_t \alpha_s) \) \([\text{Degrassi, Slavich, Zwirner}]\)
    - (more compact than original code \([\text{Heinemeyer, Hollik, Weiglein}]\))
    - \( - \mathcal{O}(\alpha_t^2) \) \([\text{Brignole, Degrassi, Slavich, Zwirner}]\)
    - \( - \mathcal{O}(\alpha_b \alpha_s) \) \([\text{Brignole, Degrassi, Slavich, Zwirner}]\)
    - \( - \mathcal{O}(\alpha_b \alpha_t + \alpha_t^2) \) \([\text{Dedes, Degrassi, Slavich}]\)

- **Complex parameters** \( (\hat{\Sigma}_{h^0 A^0}(p^2) \neq 0, \hat{\Sigma}_{H^0 A^0}(p^2) \neq 0)\):
  - full one-loop (no NMFV) \([\text{Frank, Hahn, Heinemeyer, Hollik, H.R., Weiglein}]\)
  - two-loop: \( - \mathcal{O}(\alpha_t \alpha_s) \) \([\text{Heinemeyer, Hollik, H.R., Weiglein}]\)
    - Interpolation of \( \mathcal{O}(\alpha_t^2 + \alpha_b \alpha_t + \alpha_b^2) \) for real parameters
FeynHiggs: Overview

Higgs couplings:

\[ h_i-Z-Z, h_i-W-W, h_i-f-f, h_i-\tilde{f}-\tilde{f}, h_i-\tilde{\chi}_j^0-\tilde{\chi}_k^0, h_i-\tilde{\chi}_j^\pm-\tilde{\chi}_k^\pm, h_i-h_j-Z, h_i-h_j-h_k, \]

\[ h_i-H^+-H^-, H^\pm-f-f, H^\pm-\tilde{f}-\tilde{f}, H^\pm-\tilde{\chi}_j^0-\tilde{\chi}_j^\pm, H^\pm-h_i-W^\pm \]

- tree-level + Higgs mixing effects [Frank, Hahn, Heinemeyer, Hollik, H.R., Weiglein]

- \( h^0-h^0-h^0: + \mathcal{O}(m_t^4)\)-one-loop contributions [Hollik, Peñaranda]

- \( h^0-b-b: + \Delta m_b + \text{SM-QCD corrections} \) [Dabelstein], [Carena, Garcia, Nierste, Garcia, Nierste, Wagner], [Braaten, Leveille], [Sakai], [Inami, Kubota], [Dabelstein, Hollik], [Bardin, Vilensky, Khristova], [Drees, Hikasa], [Chankowski, Pokorski, Rosiek], [Coarasa, Jimenez, Sola], [Gorishnii, Kataev, Larin, Surguladze], [Kataev, Kim], [Surguladze], [Chetyrkin, Kwiatkowski], [Larin, van Ritbergen, Vermaseren]

- full one-loop implementation in progress [Weiglein, Williams], [Hahn]
FeynHiggs: Overview

Higgs decays:

- Partial decay width and branching ratios for:
  \[ h_i \rightarrow f \bar{f}, \gamma\gamma, ZZ^{(*)}, WW^{(*)}, gg, \]
  \[ H^\pm \rightarrow f^{(*)}\bar{f}', h_i W^{\pm*}, \]
  \[ h_j Z^*, h_j h_k, H^+ H^-, \]
  \[ \tilde{f}_j \tilde{f}_k, \tilde{\chi}_j \tilde{\chi}_k, \tilde{\chi}_j^0 \tilde{\chi}_k^0, \]
  \[ \tilde{\chi}_j^\pm \tilde{\chi}_k^\pm, \tilde{\chi}_j \tilde{\chi}_k \]

- couplings as before
- with off-shell effects [Djouadi, Kalinowski, Zerwas]
- NLO contributions [Vicini et al], [Spira, Djouadi, Graudenz, Zerwas]

- Corresponding channels of an SM Higgs with mass \( M_{h_i} \):
  \[ h_i^{SM} \rightarrow f \bar{f}, \gamma\gamma, ZZ^{(*)}, WW^{(*)}, gg \]

- \( t \rightarrow H^+ b, W^+ b \)
  - NLO contributions [Coarasa, Garcia, Guasch, Jimenez, Sola], [Campbell, Ellis, Tramontana], [Körner, Mauser], [Carena, Garcia, Nierste, Wagner]
FeynHiggs: Overview

Higgs production:

- **Cross-sections** (SM total cross-sections multiplied with MSSM effective couplings [Hahn, Heinemeyer, Maltoni, Weiglein, Willenbrock]
  see: http://maltoni.home.cern.ch/maltoni/TeV4LHC/):

  - $gg \to h_i$: full one-loop + SM NNLO QCD [Catani, de Florian, Grazzini, Nason],
    [Aglietti, Bonciani, Degrassi, Vicini]
  - $WW \to h_i, ZZ \to h_i$: eff. coupl. + NLO in QCD with MCFM [Campbell, Ellis]
  - $W \to Wh_i, Z \to Zh_i$: eff. coupl. + NNLO in QCD + NLO in EW
    [Brein, Djouadi, Harlander], [Ciccolini, Dittmaier, Krämer]
  - $b\bar{b} \to b\bar{b}h_i$: eff. coupl. + NNLO in QCD [Harlander, Kilgore]
  - $b\bar{b} \to b\bar{b}h_i$, one $b$ tagged: eff. coupl. + NLO in QCD [Campbell, Ellis, Maltoni, Willenbrock], [Dawson, Jackson, Reina, Wackeroth]
  - $t\bar{t} \to t\bar{t}h_i$: eff. coupl. + NLO in QCD [Beenakker, Dittmaier, Krämer, Plümper, Spira, Zerwas], [Reina, Dawson], [Dawson, Orr, Reina, Wackeroth]
  - $t\bar{t} \to t\bar{t}h_i$: tree-level + Higgs mixing effects [Sherpa], [FeynHiggs]
  - $gb \to tH^-$: NLO-SUSY QCD + $\Delta m_b$-effects [Plehn], [Berger, Han, Jiang, Plehn]
FeynHiggs: Overview

Constraints:

- Precision observables:
  - $\Delta \rho$ at $O(\alpha, \alpha \alpha_s)$, including NMFV effects [Djouadi, Gambino, Heinemeyer, Hollik, Jünger, Weiglein], [Heinemeyer, Hollik, Merz, Peñaaranda]
  
  $M_W, \sin^2 \theta_{\text{eff}}$ via SM formula + $\Delta \rho$ [Awramik, Czakon, Freitas, Weiglein]
  
  $BR(b \to s\gamma)$ including NMFV effects [Hahn, Hollik, Weiglein, Peñaaranda]
  
  $(g_\mu - 2)_{\text{SUSY}}$ including full one- and leading/subleading two-loop SUSY corrections [Moroi], [Degrassi, Giudice], [Heinemeyer, Stöckinger, Weiglein]
  
  EDMs of electron (Th), neutron, Hg [Chang, Keung, Pilaftsis], [Ibrahim, Nath], [Demir, Lebedev, Olive, Pospelov, Ritz], [Olive, Pospelov, Ritz, Santoso]
How to run FeynHiggs?

1. Go to www.feynhiggs.de
2. Download
3. Type `./configure, make all, make install, make clean`:
   - Library `libFH.a` is created
4. Run FeynHiggs
   - In the command line mode
   - Called from a fortran/C++ code
   - Called within a Mathematica program
   - Via the web interface
FeynHiggs: Overview

Higgs mass matrix ⇒ masses, mixings

Higgs production: cross sections

Higgs decays: (partial) decay widths, branching ratios

Higgs couplings

Constraints
Determination of the Higgs masses

Two-point-function: 
\[-i \hat{\Gamma}(p^2) = p^2 - M(p^2)\]

with the matrix:

\[M(p^2) = \begin{pmatrix}
M_{h_0}^{2} & -\hat{\Sigma}_{h_0 h_0}(p^2) & -\hat{\Sigma}_{h_0 H_0}(p^2) & -\hat{\Sigma}_{h_0 A_0}(p^2) \\
-\hat{\Sigma}_{h_0 H_0}(p^2) & M_{H_0}^{2} & -\hat{\Sigma}_{H_0 H_0}(p^2) & -\hat{\Sigma}_{H_0 A_0}(p^2) \\
-\hat{\Sigma}_{h_0 A_0}(p^2) & -\hat{\Sigma}_{H_0 A_0}(p^2) & M_{A_0}^{2} & -\hat{\Sigma}_{A_0 A_0}(p^2) \\
\end{pmatrix}\]

Calculate the zeros of the determinant of \( \hat{\Gamma} \): 
\[\det[p^2 - M(p^2)] = 0\]
or calculate the eigenvalues \( \lambda(p^2) \) of \( M(p^2) \): 
\[\det[\lambda(p^2) - M(p^2)] = 0\]
and solve iteratively:
\[p^2 - \lambda(p^2) = 0\]

\[\Rightarrow \text{complex pole } M_{h_i}^{2} = M_{h_i}^{2} - i M_{h_i} \Gamma_{h_i}\]

with physical mass \( M_{h_i} \) and width \( \Gamma_{h_i} \) and \( M_{h_1} \leq M_{h_2} \leq M_{h_3} \)
\( \varphi X_t \)-dependence:

(small \( M_{H^\pm} \) vs large \( M_{H^\pm} \))

Size of the squark mixing:

\[ X_t := A_t - \mu^* \cot \beta \]

\[ |X_t| = \text{const.} \Rightarrow \text{squark masses const.} \]

\[ |X_t| = 700 \text{ GeV}, \tan \beta = 15 \]

- Higgs mass \( M_{h_1} \) depends on \( \varphi X_t \).
- One-loop corrections are more sensitive to \( \varphi X_t \) for small \( M_{H^\pm} \).
$\varphi X_t$-dependence: 
(small $M_{H^\pm}$ vs large $M_{H^\pm}$)

size of the squark mixing:

$X_t := A_t - \mu^* \cot \beta$

$|X_t| =$ const. $\Rightarrow$ squark masses const.

$|X_t| = 700$ GeV, $\tan \beta = 15$

- Higgs mass $M_{h_1}$ depends on $\varphi X_t$.
- One-loop corrections are more sensitive to $\varphi X_t$ for small $M_{H^\pm}$. 
FeynHiggs: Results

$\varphi X_t$-dependence: (small $M_{H^\pm}$ vs large $M_{H^\pm}$)

size of the squark mixing:

$X_t := A_t - \mu^* \cot \beta$

$|X_t| = \text{const.} \Rightarrow \text{squark masses const.}$

$|X_t| = 700 \text{ GeV}, \tan \beta = 15$

$0 \quad 0.5 \quad 1 \quad 1.5 \quad 2$

$M_{H^\pm} = 150 \text{ GeV} \quad M_{\text{SUSY}} = 0.5\text{TeV}$

$0 \quad 0.5 \quad 1 \quad 1.5 \quad 2$

$M_{H^\pm} = 500 \text{ GeV} \quad M_{\text{SUSY}} = 0.5\text{TeV}$

$O(\alpha) \quad O(\alpha + \alpha_t \alpha_s)$

Bands: Estimate of the size of the corrections of $O(\alpha_b \alpha_s + \alpha_t^2 + \alpha_t \alpha_b + \alpha_b^2)$ [Slavich et al.]
FeynHiggs: Results

\( \varphi_{X_t} \)-dependence:
(small \( M_{H\pm} \) vs large \( M_{H\pm} \))

size of the squark mixing:
\[ X_t := A_t - \mu^* \cot \beta \]
\[ |X_t| = \text{const.} \Rightarrow \text{squark masses const.} \]
\[ |X_t| = 700 \text{ GeV}, \tan \beta = 15 \]

**Bands:** Estimate of the size of the corrections
of \( \mathcal{O}(\alpha_b \alpha_s + \alpha_t^2 + \alpha_t \alpha_b + \alpha_b^2) \) [Slavich et al.]

**Interpolation:** Size of the corrections, known for the MSSM with real parameters: Evaluate for \( \varphi_{X_t} = 0 \) and \( \varphi_{X_t} = \pi \) and interpolate.
Amplitudes with external Higgs bosons

**Mixing** between the Higgs bosons:

\[
(\overline{\text{DR}}/\text{on-shell scheme}) \quad \phi_{\{i,j\}} = H^0, h^0, A^0
\]

Finite wave function normalization factors needed:

\[
\sqrt{\hat{Z}_i (\Gamma_i + \hat{Z}_{ij} \Gamma_j + \hat{Z}_{ik} \Gamma_k)}
\]

- \( \hat{Z}_i \) ensures that residuum is set to 1
- \( \hat{Z}_{ij} \) describes transition \( i \rightarrow j \)

**Definition of mixing matrix** \( \hat{Z} \) (**ZHiggs in FeynHiggs**):

\[
\hat{Z}_{ij} = \sqrt{\hat{Z}_i \hat{Z}_{ij}}, \quad \hat{Z}_{ii} = 1
\]

Vertex with external Higgs boson:

\[
\hat{Z}_{ii} \Gamma_i + \hat{Z}_{ij} \Gamma_j + \hat{Z}_{ik} \Gamma_k
\]
Amplitudes with internal Higgs bosons

Diagrams with internal Higgs bosons enter precision observables (W-mass, ...):

- Calculation with Born states $\phi_i = H^0, h^0, A^0$: no problem
- Calculation with $\phi_i = h_1, h_2, h_3$ ⇒ Inclusion of higher order effects:
  
  One possibility: Use of effective couplings:
  
  Consider $\tilde{Z}_{ij}$ as mixing matrix:
  
  Problem: $\tilde{Z}_{ij}$ is a non-unitary matrix (no rotation matrix)

Further approximations necessary (UHiggs in FeynHiggs):

- Effective potential approach: $\tilde{Z}(\hat{\Sigma}(p^2)) \rightarrow \tilde{Z}(\hat{\Sigma}(0)) = \mathcal{U}$
- On-shell approximation: $\tilde{Z}(\hat{\Sigma}(p^2)) \rightarrow \tilde{Z}(\text{Re}\hat{\Sigma}(p_{\text{OS}}^2)) = R_{\hat{\Sigma}}(p_{\text{OS}}^2 = (M_{i\text{Born}}^2 + M_{j\text{Born}}^2)/2}$
Couplings

One example:

Coupling of two gauge bosons \((V = W, Z)\) and one Higgs boson:

\[
g_{hi} VV = [U_{i1} \cos(\beta - \alpha) + U_{i2} \sin(\beta - \alpha)] g_{HSM} VV
\]

- only CP-even components of the Higgs bosons couple to \(V\)
- all three Higgs bosons can have a CP-even component

standard model coupling
FeynHiggs: Results: $\varphi_{X_t}$-Dependence of Couplings

- Here: $g_{h_iVV}$ is normalized to the standard model coupling.
- $|g_{h_iVV}|^2$ do depend on the phase $\varphi_{X_t}$, $|X_t| = 700$ GeV.
- For $\varphi_{X_t} = 0$, $h_2$ is the CP-odd Higgs boson, for $\varphi_{X_t} = \pi$, it is $h_3$. 

$\varphi_{X_t}$ Dependence of Couplings

$|g_{h_{1,2,3}VV}|^2$

$M_{H^\pm} = 150$ GeV

$|X_t| = 700$ GeV

$\tan \beta = 15$
FeynHiggs and CPsuperH

Two programs: input: MSSM parameters
   output: Higgs masses

Features (not complete):

<table>
<thead>
<tr>
<th>FeynHiggs:</th>
<th>CPsuperH [Lee, Pilaftsis, Carena, Choi, Drees, Ellis, Wagner]:</th>
</tr>
</thead>
<tbody>
<tr>
<td>full one-loop corr.</td>
<td>gaugino/higgsino (leading) log one-loop contr.</td>
</tr>
<tr>
<td>two-loop corr.:</td>
<td>fermionic/sfermionic contr.:</td>
</tr>
<tr>
<td>$\mathcal{O}(\alpha_t \alpha_s)$ complex</td>
<td>up to two-loop (leading) log</td>
</tr>
<tr>
<td>$\mathcal{O}(\alpha_b \alpha_s + \alpha_{{t,b}}^2)$ real</td>
<td>$\mathcal{O}(\alpha_{{t,b}} \alpha_s + \alpha_{{t,b}}^2)$ complex</td>
</tr>
</tbody>
</table>

Input:

| on-shell squark parameters | \(\overline{\text{DR}}\) squark parameters |
### FeynHiggs and CPsuperH: Comparison

<table>
<thead>
<tr>
<th>Input:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>on-shell squark parameters</td>
<td>DR squark parameters</td>
</tr>
<tr>
<td>FeynHiggs</td>
<td>CPsuperH</td>
</tr>
</tbody>
</table>

Transformation from one scheme to another necessary:

Use relation:

\[
X^{\text{DR}} + \delta X^{\text{DR}} = X^{\text{OS}} + \delta X^{\text{OS}}
\]

with \( X = \{A_t, M_L, M_{\tilde{t}_R}\} \): squark soft breaking parameter

\( \delta X^{\text{OS}} \) is then determined by the on-shell counterterms:

\[
\delta X^{\text{OS}} = \delta X^{\text{OS}}(\delta m_{\tilde{t}_1}^{\text{OS}}, \delta m_{\tilde{t}_2}^{\text{OS}}, \delta m_t^{\text{OS}}, \delta \theta_t^{\text{OS}}, \delta \phi_t^{\text{OS}})
\]
FeynHiggs and CPsuperH: Comparison

\( \varphi A_t^{DR} \)-dependence for different \(|A_t^{DR}|\):

- \(|A_t^{DR}| = 1.0 \text{ TeV} \), \( M_{H^\pm} = 300 \text{ GeV} \), \( M_{\{L, \tilde{t}_R\}}^{DR} = 1.0 \text{ TeV} \)
- \(|A_t^{DR}| = 2.5 \text{ TeV} \), \( M_{H^\pm} = 300 \text{ GeV} \), \( M_{\{L, \tilde{t}_R\}}^{DR} = 1.0 \text{ TeV} \)

**Differences:**

- CPsuperH: (leading) log \( \mathcal{O}(\alpha_t^2) \) terms
- FeynHiggs: non-log \( \mathcal{O}(\alpha_t \alpha_s) \) terms
FeynHiggs and CPsuperH: Comparison

$\varphi_{A_t}^{\text{DR}}$-dependence for different $|A_t^{\text{DR}}|$:

\begin{align*}
\varphi_{A_t}^{\text{DR}} & \text{ dependence for different } |A_t^{\text{DR}}|: \\
\begin{array}{c}
|A_t^{\text{DR}}| = 1.0 \text{ TeV} \\
M_{H^\pm} = 300 \text{ GeV} \\
M_{\{L, \tilde{t}_R\}}^{\text{DR}} = 1.0 \text{ TeV}
\end{array}
\end{align*}

\begin{align*}
\varphi_{A_t}^{\text{DR}} & \text{ dependence for different } |A_t^{\text{DR}}|: \\
\begin{array}{c}
|A_t^{\text{DR}}| = 2.5 \text{ TeV} \\
M_{H^\pm} = 300 \text{ GeV} \\
M_{\{L, \tilde{t}_R\}}^{\text{DR}} = 1.0 \text{ TeV}
\end{array}
\end{align*}

Differences:

- CPsuperH:
  (leading) log $O(\alpha_t^2)$ terms

- FeynHiggs: non-log $O(\alpha_t \alpha_s)$ terms

- FeynHiggs: non-log $O(\alpha_t \alpha_s)$ terms
  + interpolation of $O(\alpha_t^2)$ terms

FeynHiggs (up to $O(\alpha_t \alpha_s)$)
FeynHiggs and CPsuperH: Comparison

\[ \varphi A_t^{\overline{\text{DR}}} \text{-dependence for different } |A_t^{\overline{\text{DR}}}| : \]

CPsuperH

FeynHiggs (up to \( \mathcal{O}(\alpha_t \alpha_s) \))

FeynHiggs with Interpolation

Parameter transformation: \( \mathcal{O}(\alpha_s) \mathcal{O}(\alpha_s + \alpha_t) \)

Differences:

CPsuperH:

(leading) log \( \mathcal{O}(\alpha_t^2) \) terms

FeynHiggs: non-log \( \mathcal{O}(\alpha_t \alpha_s) \) terms

FeynHiggs: non-log \( \mathcal{O}(\alpha_t \alpha_s) \) terms + interpolation of \( \mathcal{O}(\alpha_t^2) \) terms
FeynHiggs and CPsuperH: Comparison

$A_{t}^{\overline{\text{DR}}}$-dependence:

Differences:
- CPsuperH: (leading) log $\mathcal{O}(\alpha_t^2)$ terms
- FeynHiggs: non-log $\mathcal{O}(\alpha_t \alpha_s)$ terms

$M_{h^\pm} = 300$ GeV

$M_{L}^{\overline{\text{DR}}} = M_{\tilde{t}_R}^{\overline{\text{DR}}} = 1.0$ TeV

$\varphi_{A_t} = 0$

$\varphi_{A_t} = \pi/2$

$\varphi_{A_t} = \pi$

CPsuperH FeynHiggs (up to $\mathcal{O}(\alpha_t \alpha_s)$)
FeynHiggs and CPsuperH: Comparison

$A_t^{DR}$-dependence:

<table>
<thead>
<tr>
<th>$M_{h^i}$ [GeV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
</tr>
<tr>
<td>115</td>
</tr>
<tr>
<td>120</td>
</tr>
<tr>
<td>125</td>
</tr>
<tr>
<td>130</td>
</tr>
</tbody>
</table>

$M_{h^i} = 300$ GeV

$M_{tL}^{DR} = M_{tR}^{DR} = 1.0$ TeV

$\varphi_{\tilde{A}_t} = 0$

$\varphi_{\tilde{A}_t} = \pi/2$

$\varphi_{\tilde{A}_t} = \pi$

Differences:

CPsuperH: (leading) log $O(\alpha_t^2)$ terms

FeynHiggs: non-log $O(\alpha_t \alpha_s)$ terms

FeynHiggs: non-log $O(\alpha_t \alpha_s)$ terms + interpolation of $O(\alpha_t^2)$ terms
FeynHiggs (www.feynhiggs.de):

- Core: MSSM Higgs masses and mixing calculation:
  - In the real MSSM: up to $O(\alpha_t\alpha_s + \alpha_b\alpha_s + \alpha_t^2 + \alpha_t\alpha_b + \alpha_b^2)$ + including NMFV effects.
  - In the complex MSSM: up to $O(\alpha_t\alpha_s) + \text{interpolation of the } O(\alpha_b\alpha_s + \alpha_t^2 + \alpha_t\alpha_b + \alpha_b^2)$ terms.
- Also: Different Higgs decay rates and Higgs production cross sections are given.
- Further: Constraints as the $W$-mass are calculated.
- Use parameter transformation when comparing to values given by CPsuperH.