

Double Higgs production at future e^+e^- colliders in the 2HDM

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Based on arXiv:2005.10576 (to appear soon in EPJC)
 Exploration of 2HDM (type I, II) with large triple Higgs couplings, consistent with theo./exp. constraints

Proposed benchmark point: 2HDM type I

Input:

Output:

$$m_h = 125 \text{ GeV}$$

$$\kappa_\lambda := \lambda_{hhh}/\lambda_{hhh}^{SM} \simeq 1$$

$$m_H = m_A = m_{H^\pm} = 600 \text{ GeV}$$

$$\lambda_{hhH} = -0.5$$

$$\tan \beta = 10$$

$$\lambda_{hHH} = \lambda_{hAA} = 6$$

$$\cos(\beta - \alpha) = 0.2$$

$$\lambda_{hH^+H^-} = 12$$

$$m_{12}^2 = m_H^2 \cos^2 \alpha / \tan \beta \simeq 36000 \text{ GeV}^2$$

$\kappa_\lambda \sim 1$ (due to cancelations), far from alignment limit, large

$\lambda_{hHH}, \lambda_{hAA}$ and $\lambda_{hH^+H^-}$

- hhZ and $hh\nu\bar{\nu}$:

$\sqrt{s} < 800 \text{ GeV}$: very close to SM

$\sqrt{s} > 1 \text{ TeV}$: factor of 2 larger than the SM due to contributions of extended Higgs sector

- hHZ :

Order of magnitude larger than SM above 1250 GeV

- $hH\nu\bar{\nu}$:

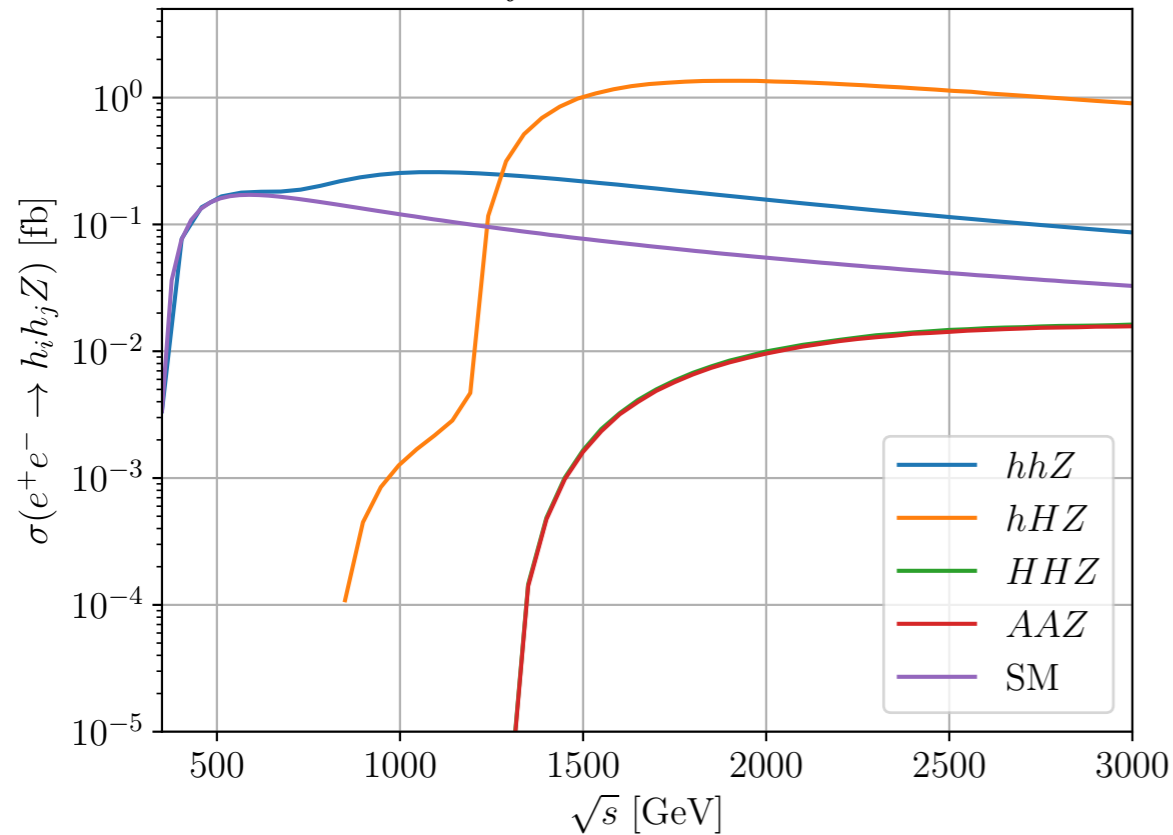
Similar cross section to SM at 1.5 TeV

Cross section $\sim 0.2 \text{ fb}$ accesible at CLIC3TeV

- $HH\nu\bar{\nu}$ and $AA\nu\bar{\nu}$:

Cross sections $\sim 0.2 \text{ fb}$ accesible at CLIC3TeV

$h_i h_j Z$ channel



$h_i h_j \nu\bar{\nu}$ channel

