

Triple Higgs couplings in the 2HDM at future e^+e^- colliders

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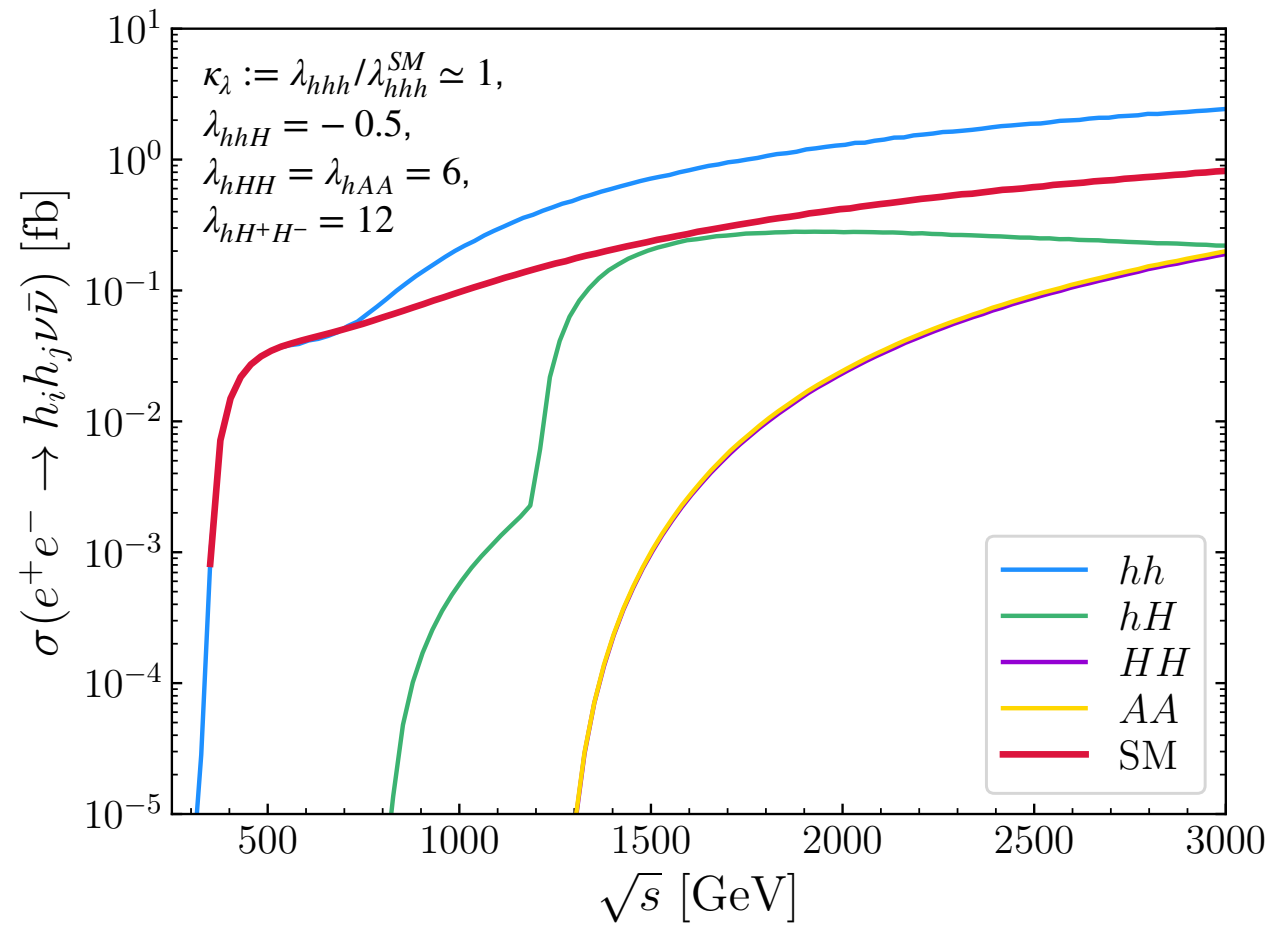
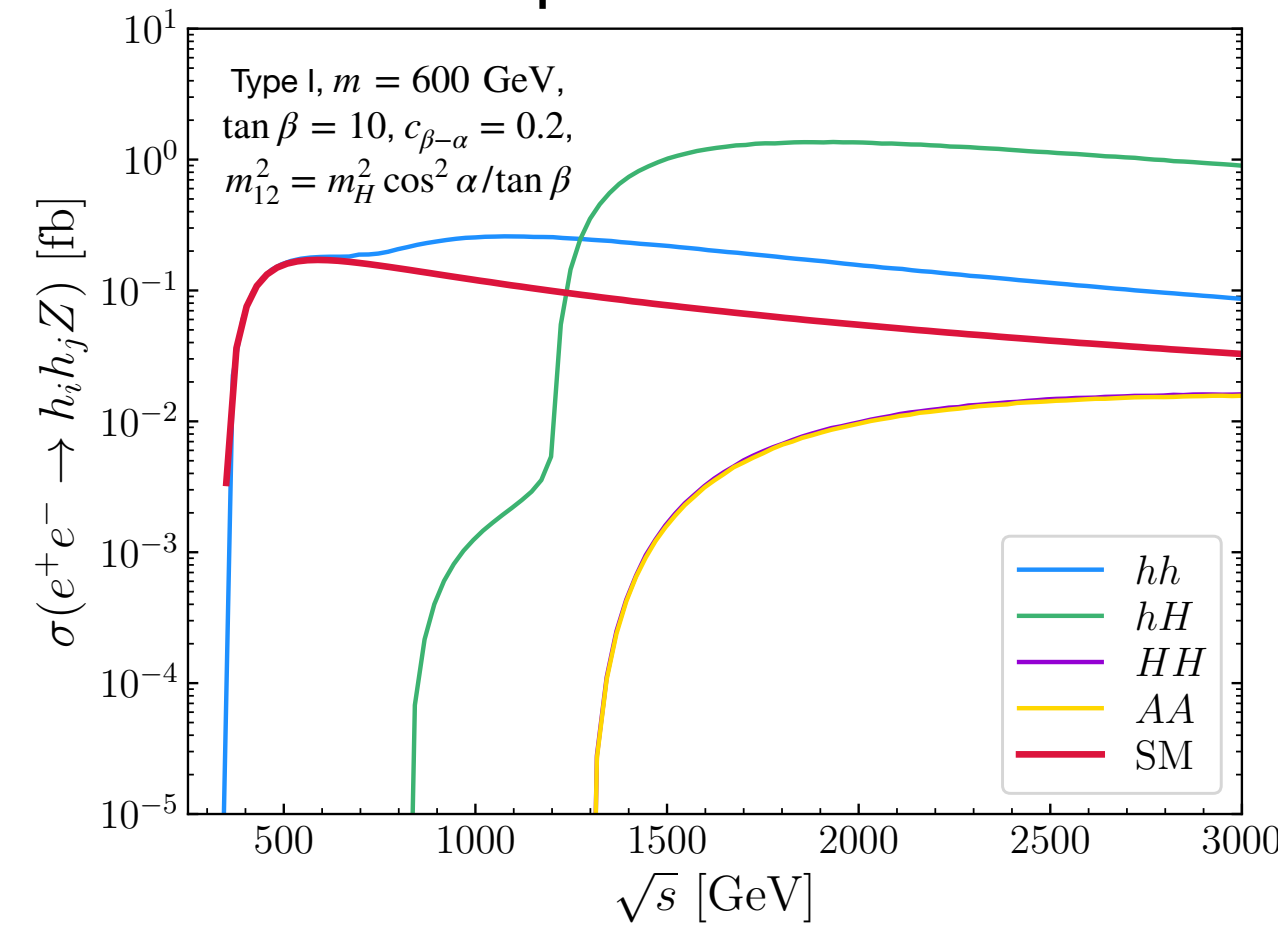
Aim of the work:

Triple Higgs couplings can be large in the 2HDM (yet allowed by constraints) (*Eur.Phys.J.C* 80 (2020) 9, 884, [arXiv2005.10576])

Can we find sensitivity to those couplings in the double Higgs boson production: $e^+e^- \rightarrow h_i h_j Z$ and $e^+e^- \rightarrow h_i h_j \nu \bar{\nu}$??

Center-of-mass energy dependence:

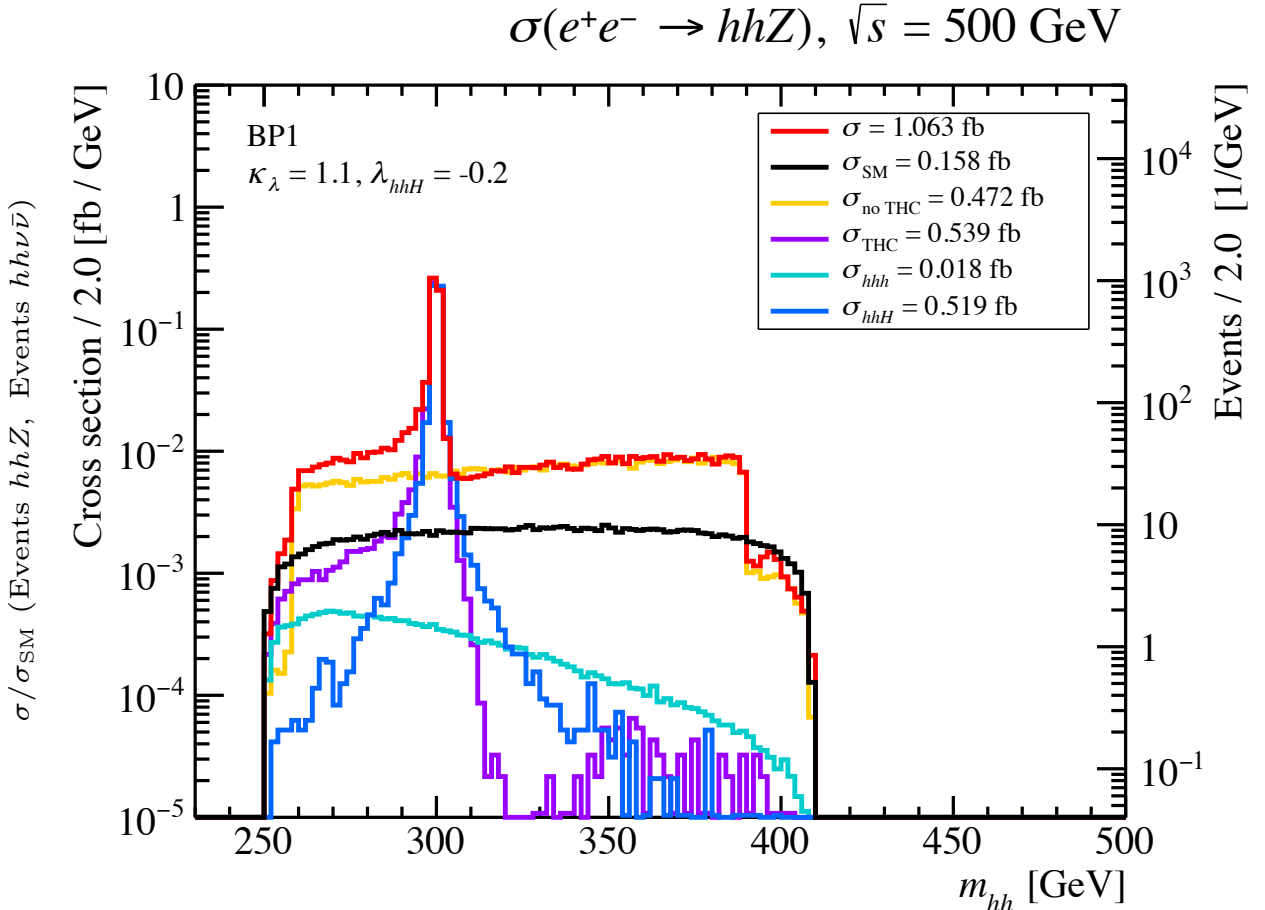
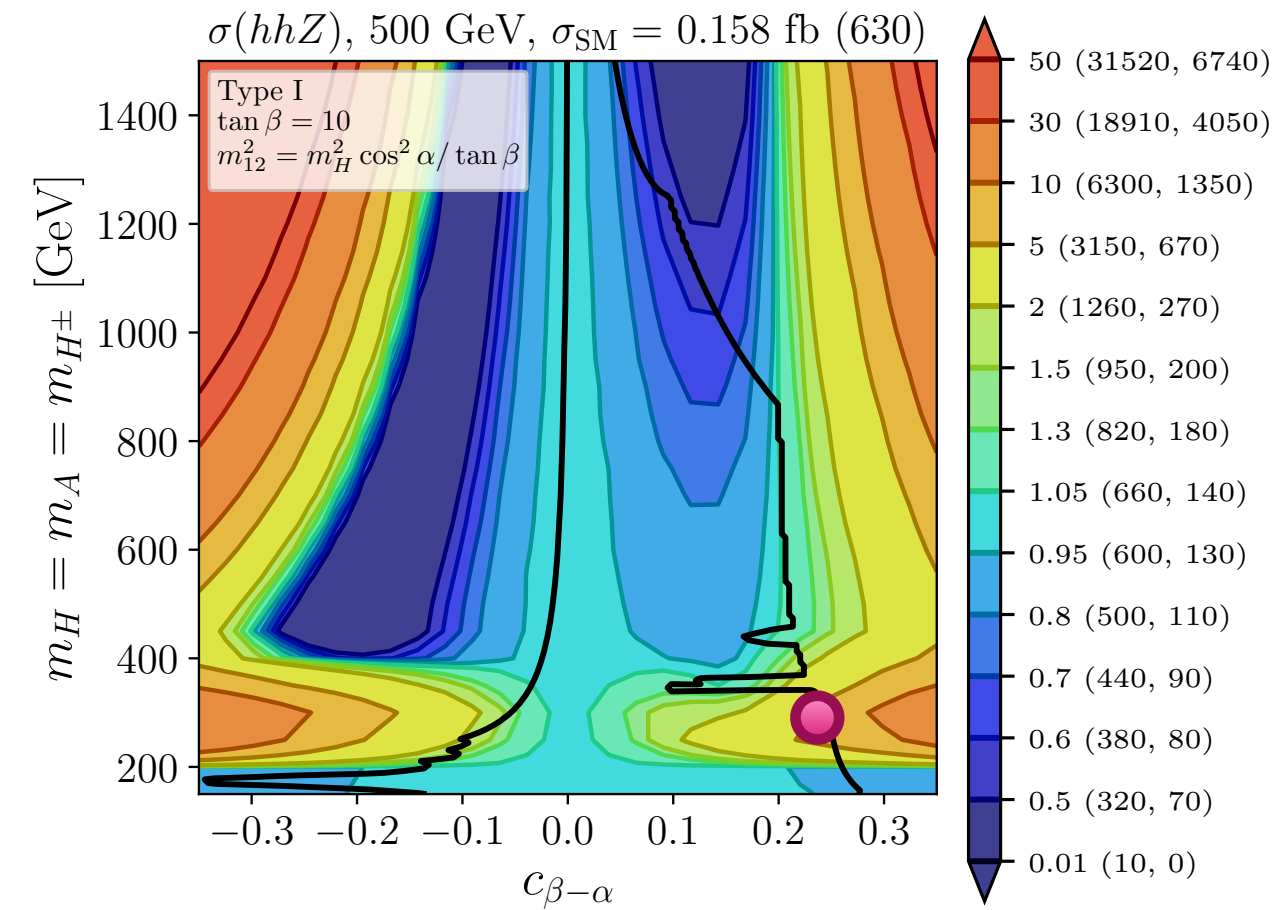
Benchmark point:



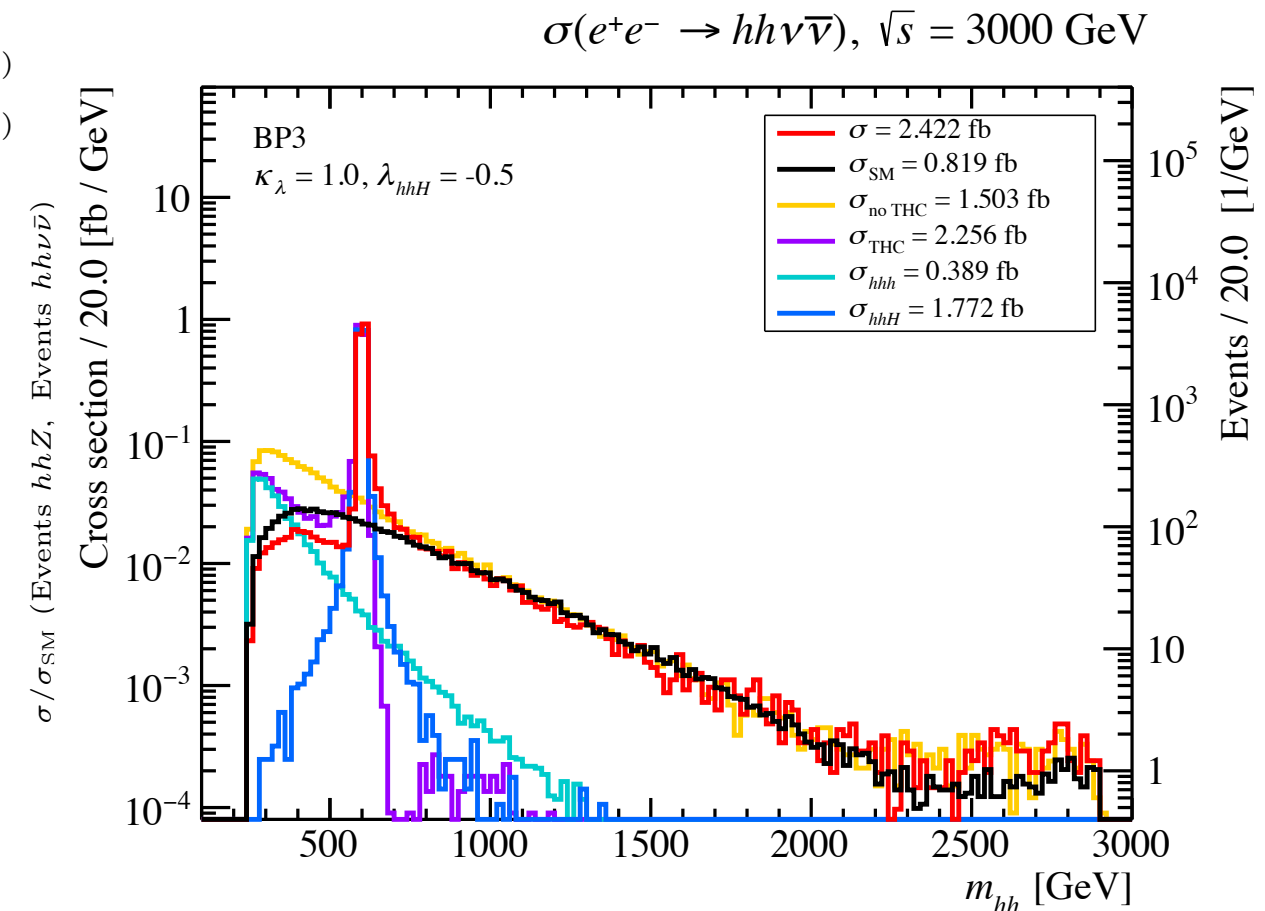
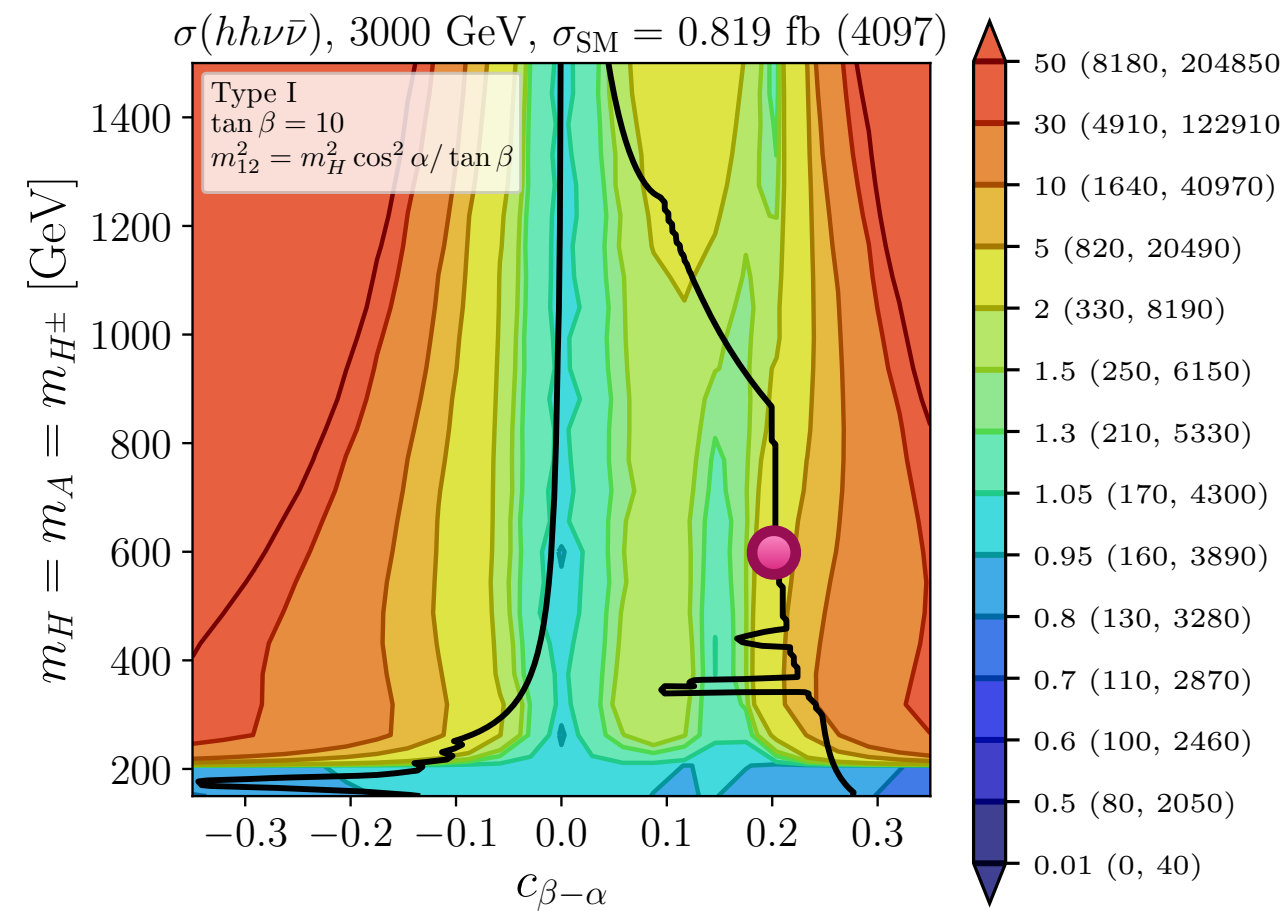
BSM contributions in hh production:

- | | | | |
|---|--|---|---|
| <p>1) Deviations from λ_{hhh}^{SM} i.e. $\kappa_\lambda \neq 1$</p> | <p>2) H mediated diagrams:
 $e^+e^- \rightarrow HZ \rightarrow hhZ$
 $e^+e^- \rightarrow H\nu\bar{\nu} \rightarrow hh\nu\bar{\nu}$
 (contains λ_{hhH})</p> | <p>3) A mediated diagrams:
 $e^+e^- \rightarrow hA \rightarrow hhZ$
 ($\rightarrow hh\nu\bar{\nu}$)
 (no sensitivity to THC)</p> | <p>4) Different couplings to gauge bosons</p> |
|---|--|---|---|

hhZ at ILC 500 GeV:



$hh\nu\bar{\nu}$ at CLIC 3 TeV:



- Sensitivity to $\kappa_\lambda \rightarrow$ region of low invariant mass of the final hh pair
- Sensitivity to $\lambda_{hhH} \rightarrow H$ resonance: ILC + hhZ can access to λ_{hhH} for lower m_H values but CLIC + $hh\nu\bar{\nu}$ has sensitivity up to higher m_H values
- Sensitivity to the sign of $\lambda_{hhH} \rightarrow$ interference around the mass peak