# $H \to h_{125} h_{125}$ (M. Carena, Z. Liu, M, Riembau, T. Robens, T. Stefaniak)

**Real scalar extension of SM $\Rightarrow$ 2 scalars**

$$m_H = 700 \,\mathrm{GeV}, \; m_h = 125 \,\mathrm{GeV}$$

- LHC production cross section: $14 \,\mathrm{fb} \,@\, 13 \,\mathrm{TeV}$

  [$e^+ e^-$ at 1 TeV ($ZH$): 0.03 fb; $\mu^+ \mu^-$ at 10 TeV (VBF): 7 fb]

- additional input parameters: ration of vevs and mixing angles

  [$\sin \alpha = 0.21$, $\tan \beta \equiv \frac{v}{v_s} = 1.43$]

$\Rightarrow$ **right between exclusion and discovery at HL-LHC**

$\Rightarrow$ **possible to accommodate 1st order EW phase transition**

  higher-masses $\Rightarrow$ lower cross-sections [$800\,\mathrm{GeV}$ : $6\mathrm{fb}/10^{-2}\mathrm{fb}/6\mathrm{fb}$ for LHC/ ee/ $\mu\mu$]

  [ Eur.Phys.J. C75 (2015) 104,Eur.Phys.J. C76 (2016) no.5, 268, Mod.Phys.Lett. A33 (2018) no.10n11,

  1830007, Phys.Rev. D97 (2018) no.9, 095032]