

Snowmass EF02: LOI Review

MSSM Under Higgs Factories

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2010.xxxxx (H. Li, H. Song, S. Su, WS, J. Yang)

MSSM Higgs sector

SM Higgs mass

$$\mathcal{M}_{\text{Higgs}} = \frac{\sin 2\beta}{2} \begin{pmatrix} \cot \beta M_Z^2 + \tan \beta M_A^2 & -M_Z^2 - M_A^2 \\ -M_Z^2 - M_A^2 & \tan \beta M_Z^2 + \cot \beta M_A^2 \end{pmatrix} + \begin{pmatrix} \Delta_{11} & \Delta_{12} \\ \Delta_{12} & \Delta_{22} \end{pmatrix}$$

$$m_{h,\text{tree}} \leq m_Z = 91.18 \text{ GeV} < 125.09 \pm 0.24 \text{ GeV (LHC Run-I)}$$

Tree-level: mixing angle α



Loop-level: α_{eff} (FeynHiggs)

$$\begin{pmatrix} H \\ h \end{pmatrix} = \begin{pmatrix} \cos \alpha_{eff} & \sin \alpha_{eff} \\ -\sin \alpha_{eff} & \cos \alpha_{eff} \end{pmatrix} \begin{pmatrix} H^d \\ H^u \end{pmatrix}$$



Stop sector

Yukawa and gauge couplings

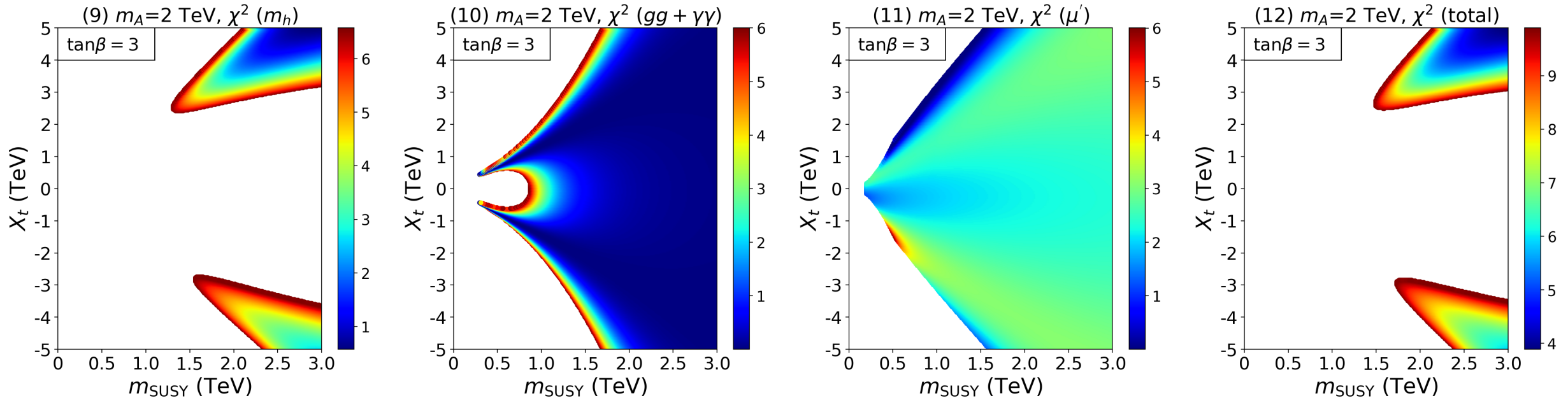
hZZ: $\sin(\beta - \alpha_{eff})$

hbb: $-\sin \alpha_{eff} / \cos \beta \dots$

Global fit method

$$\chi_{total}^2 = \chi_{m_h}^2 + \chi_{\mu}^2 = \frac{(m_h^{\text{MSSM}} - m_h^{\text{obs}})^2}{(\Delta m_h)^2} + \sum_{i=f,V..} \frac{(\mu_i^{\text{MSSM}} - \mu_i^{\text{obs}})^2}{(\Delta \mu_i)^2}.$$

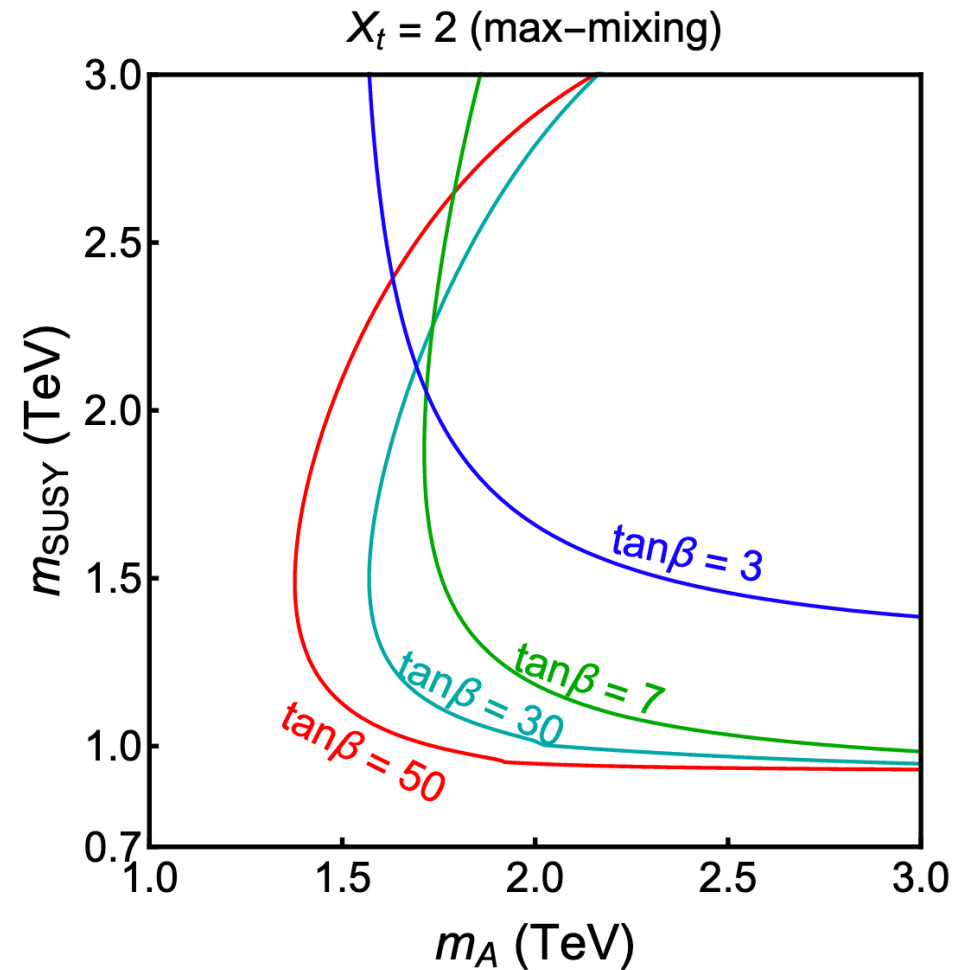
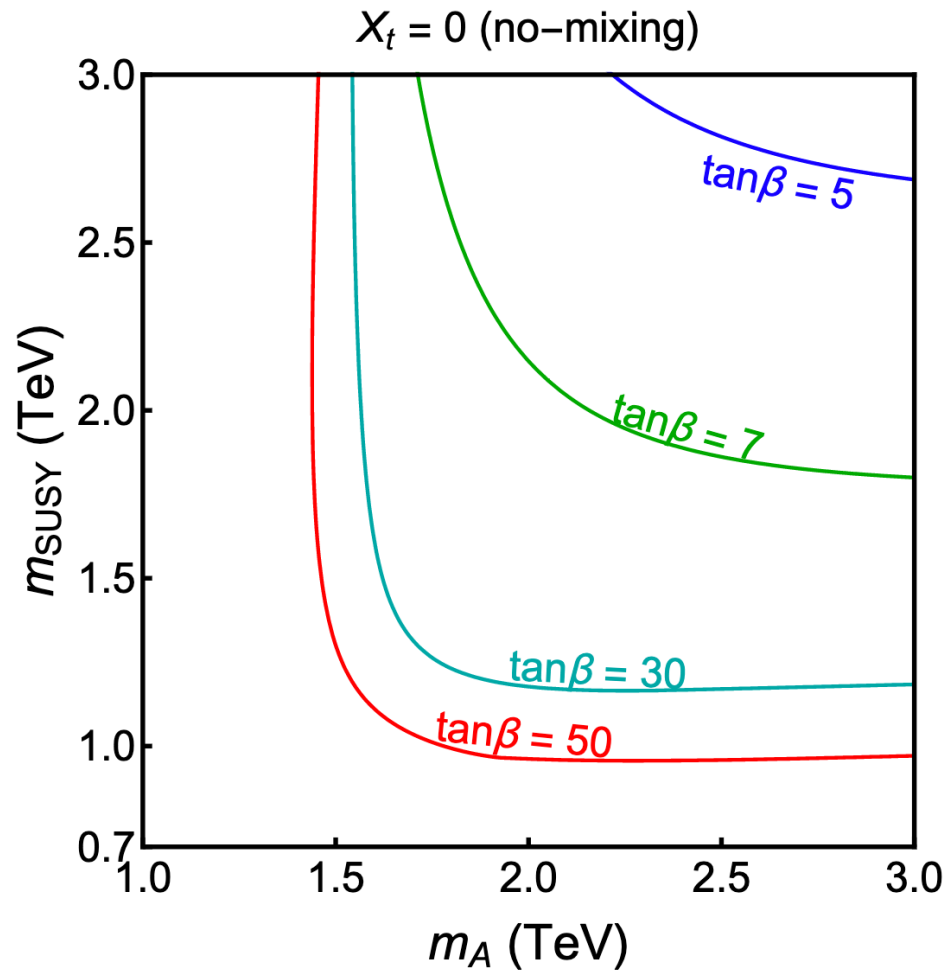
CEPC



$\tan\beta = 3, \mu = 500$ GeV, $m_A = 2000$ GeV

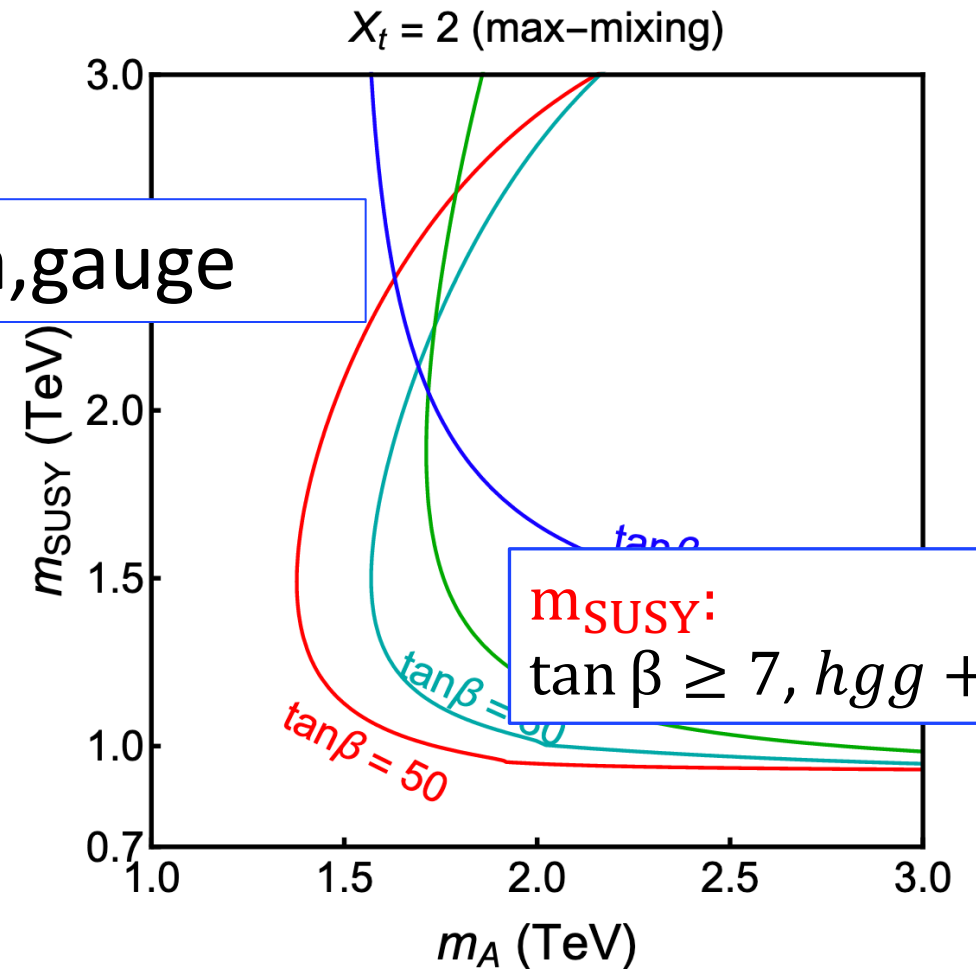
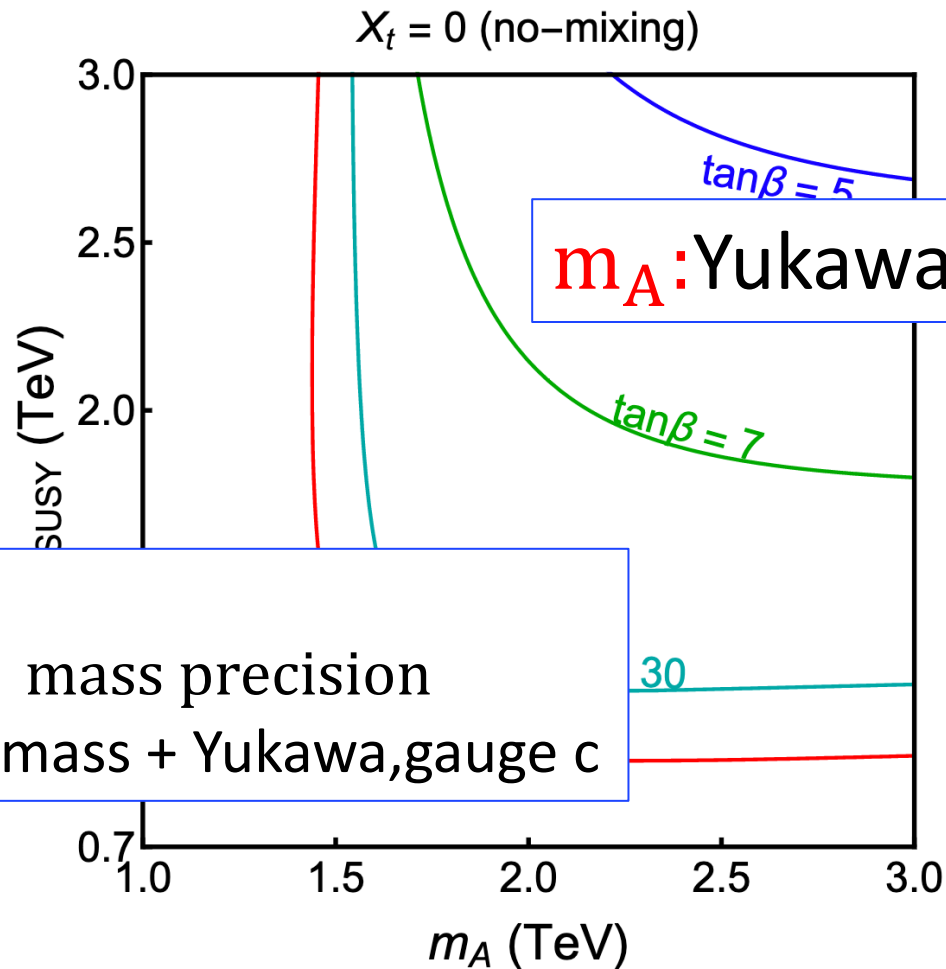
Results: m_A vs m_{SUSY}

CEPC

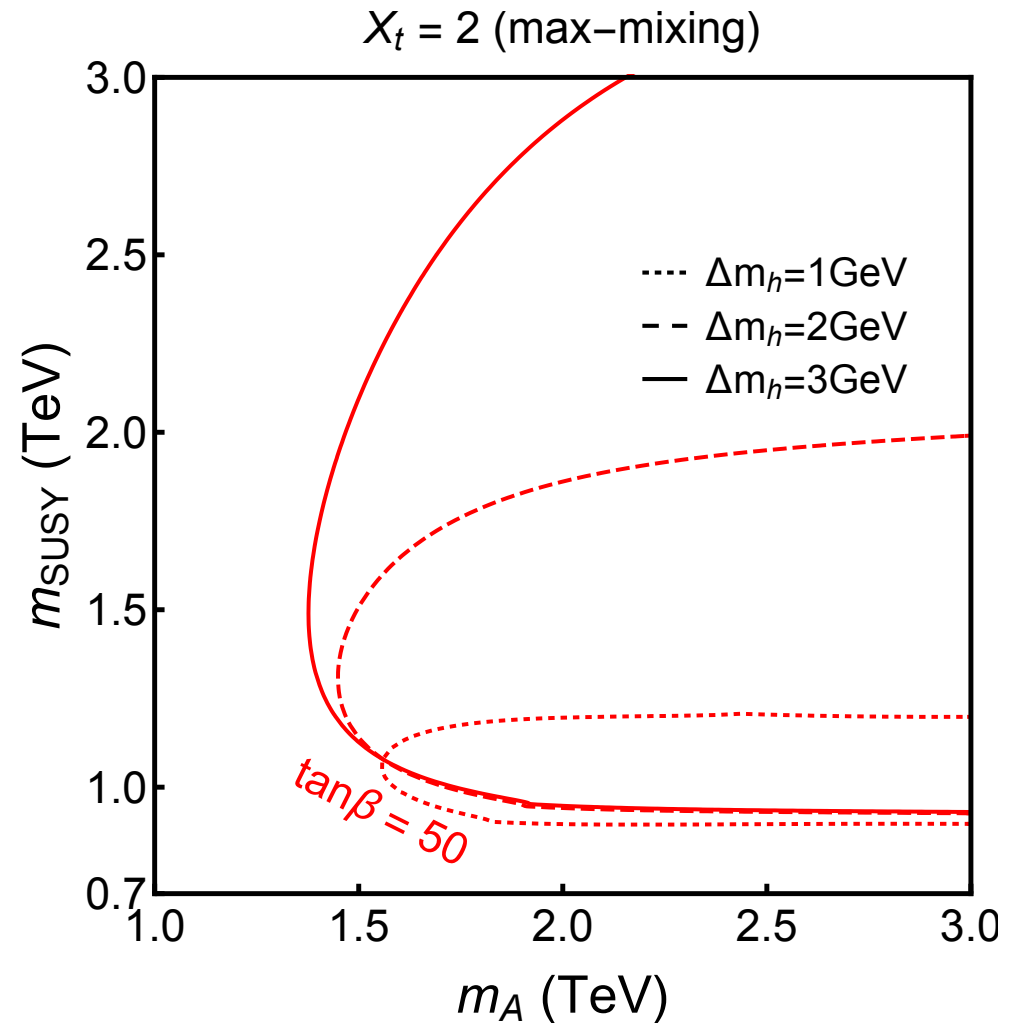
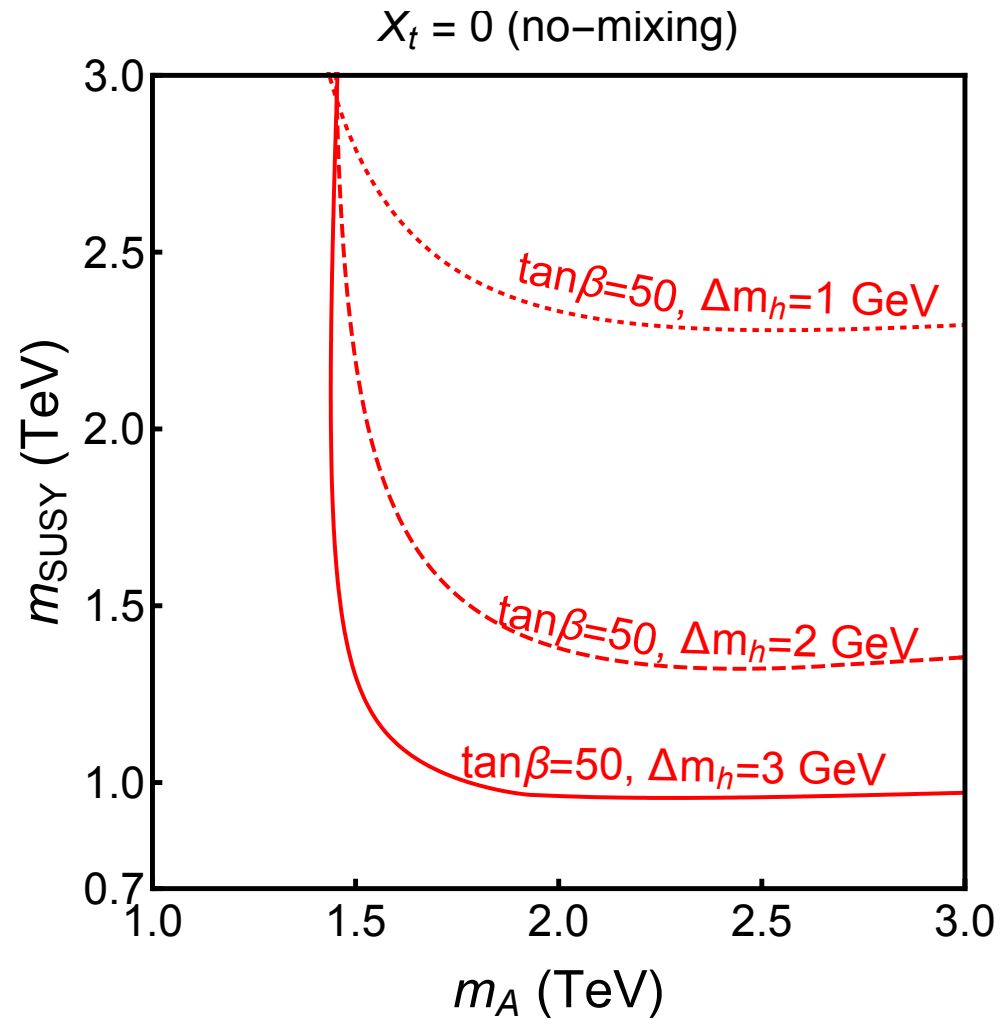


Results: m_A vs m_{SUSY}

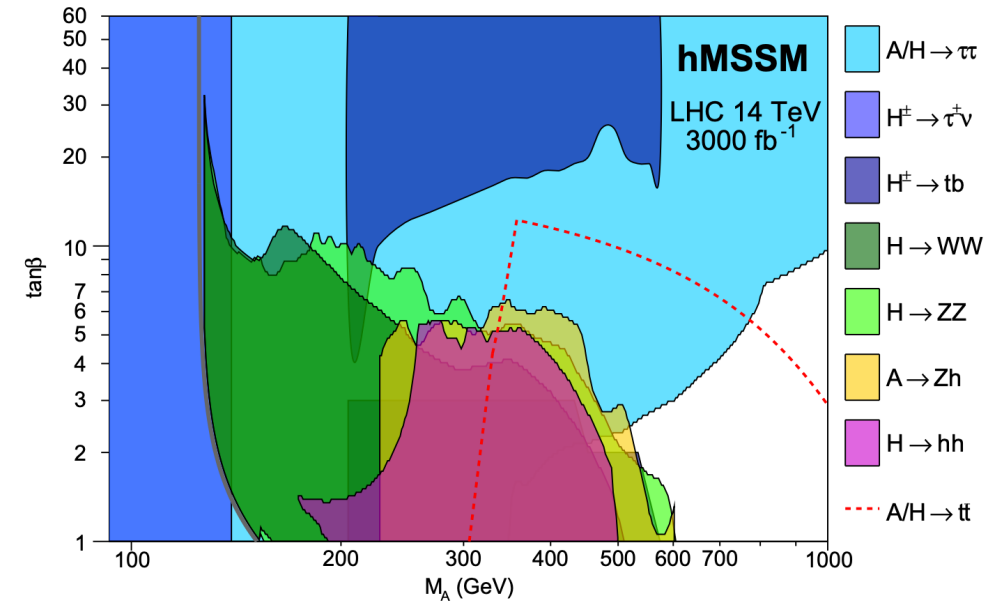
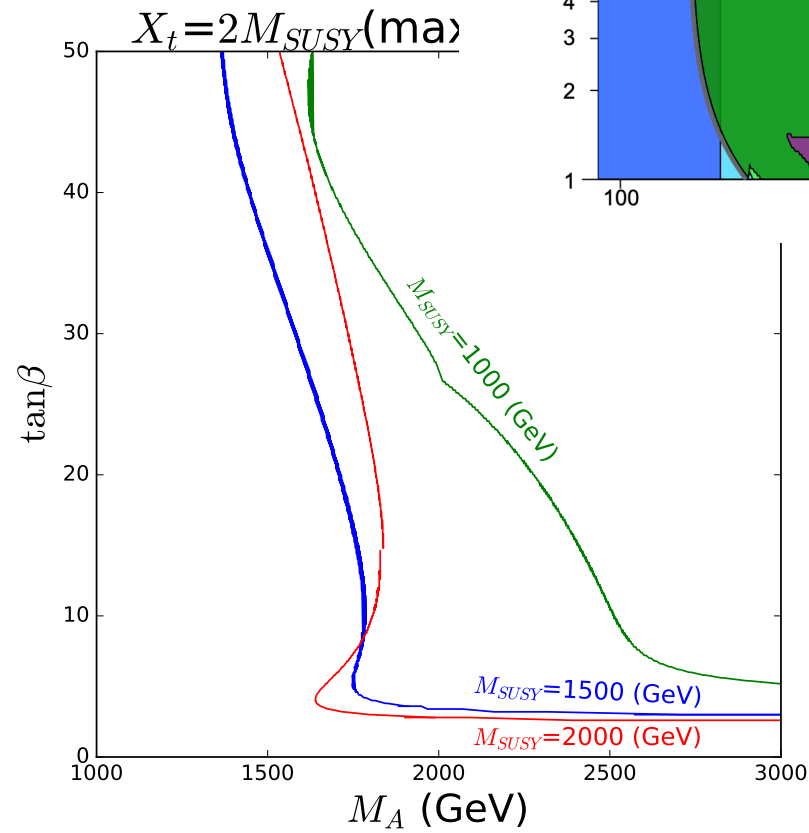
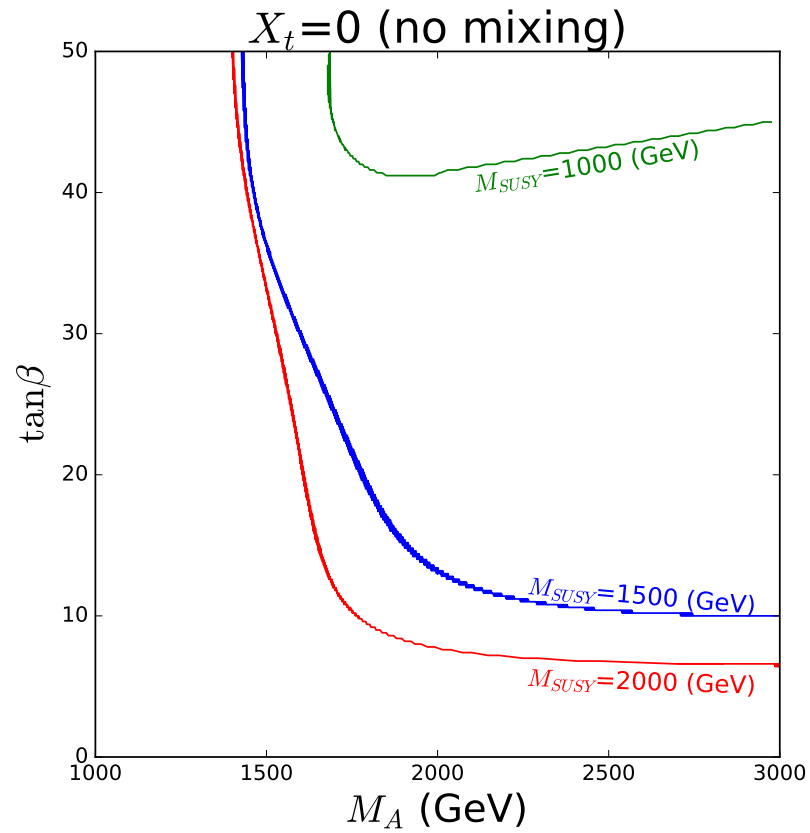
CEPC



Precision of Higgs mass



Results: m_A vs $\tan \beta$



1502.05653, A. Djouadi

For $\tan \beta \leq 20$, complementary with future LHC

Thanks !

Backup

Precision of Higgs mass

