

# Different Scenarios for WIMPS

Snowmass 2021 EF10 DM@colliders

Disclaimer:

This is just my personal and probably biased view

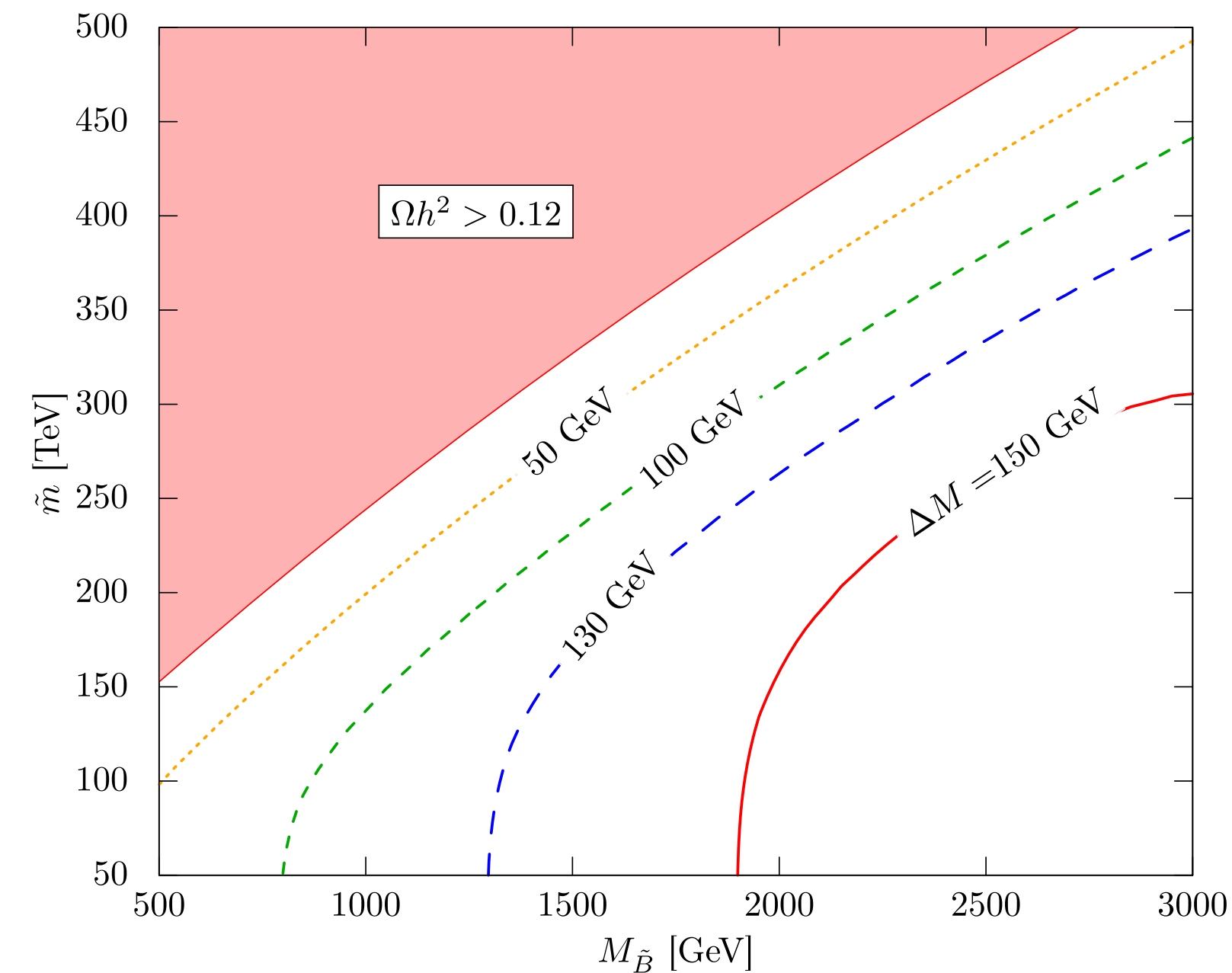
# Electroweakinos as WIMP

- Bino singlet, Higgsino doublet and wino triplet:

$$\mathbf{M}_{\tilde{N}} = \begin{pmatrix} M_1 & 0 & -c_\beta s_W m_Z & s_\beta s_W m_Z \\ 0 & M_2 & c_\beta c_W m_Z & -s_\beta c_W m_Z \\ -c_\beta s_W m_Z & c_\beta c_W m_Z & 0 & -\mu \\ s_\beta s_W m_Z & -s_\beta c_W m_Z & -\mu & 0 \end{pmatrix}$$

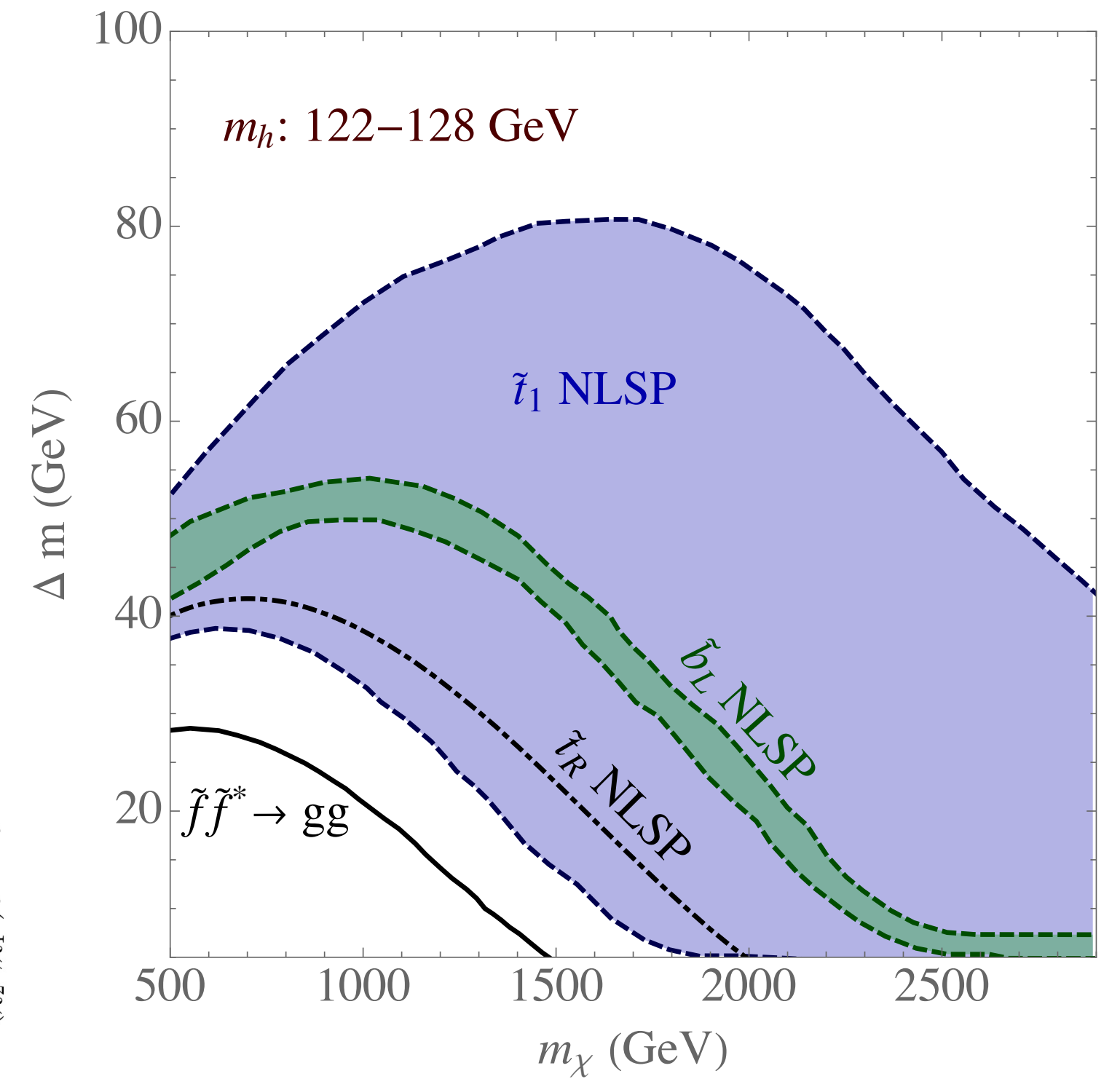
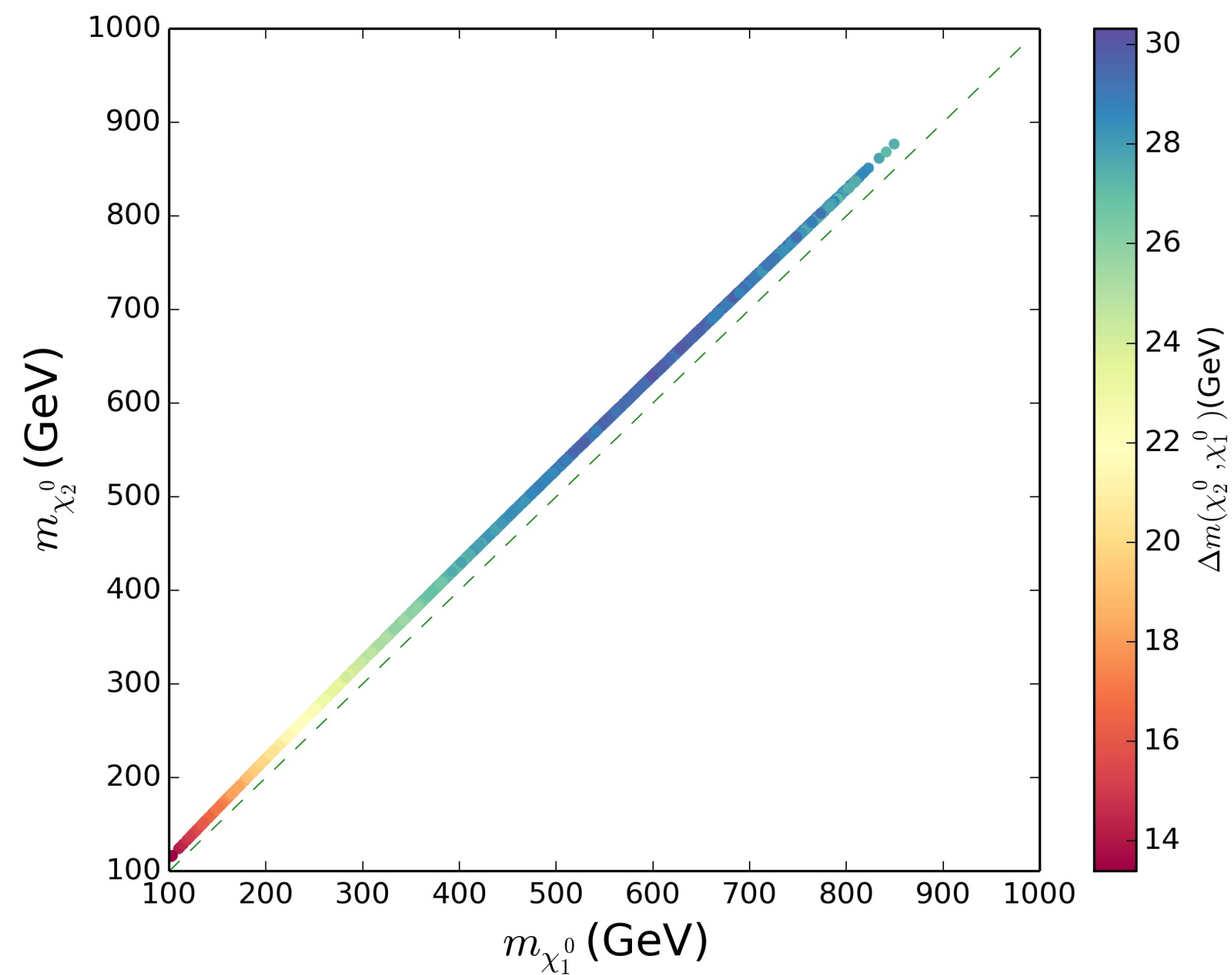
# WIMP in the MSSM (and similar models)

- Pure bino needs co-annihilation



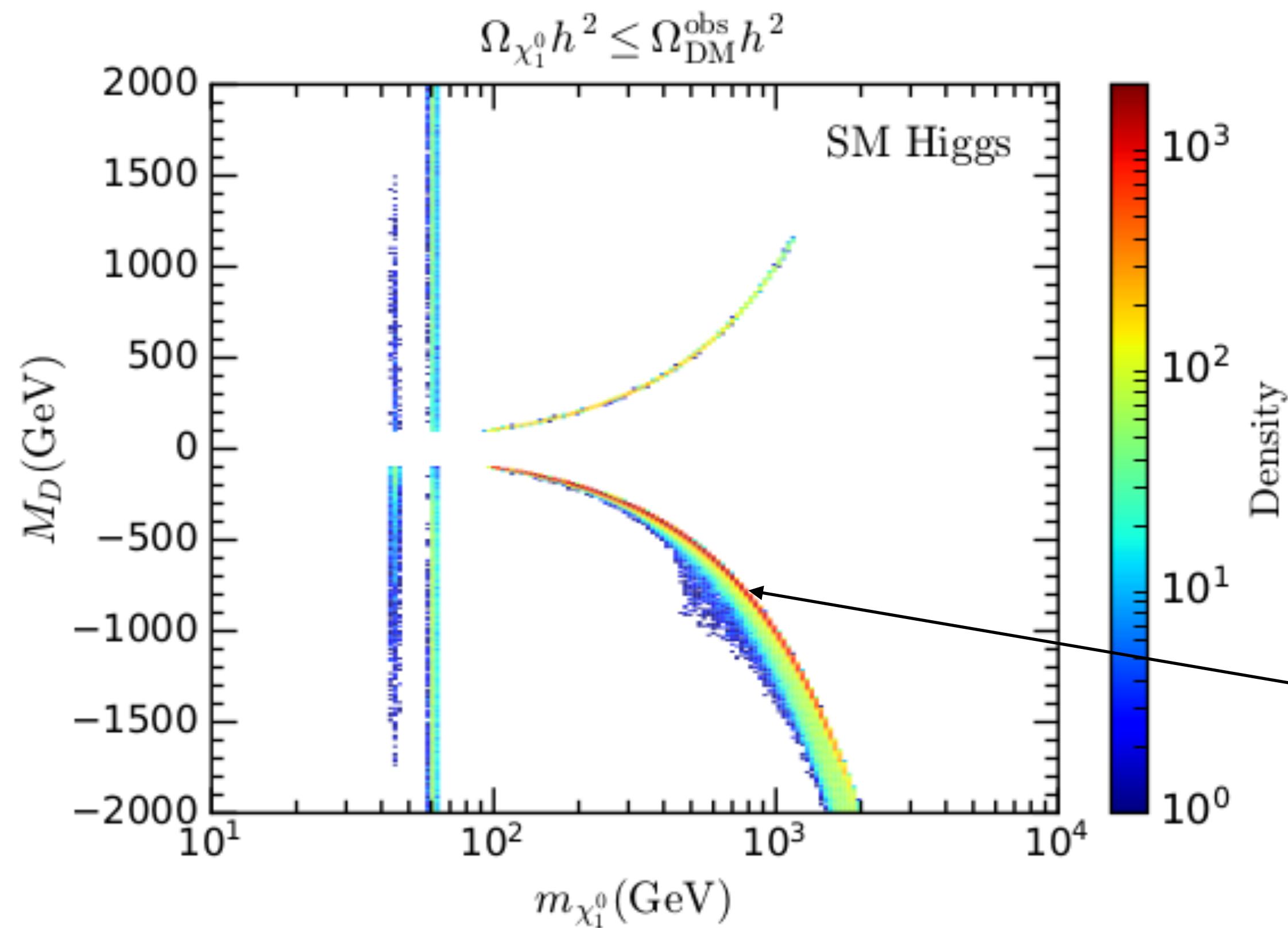
**Gluino** PLB 748 (2015) 24–29

**Wino** arXiv: 1804.05238



**Stop** arXiv: 1706.01911

- ....or funnels
- Admixture of bino with higgsino needs a blind spot because of DD.

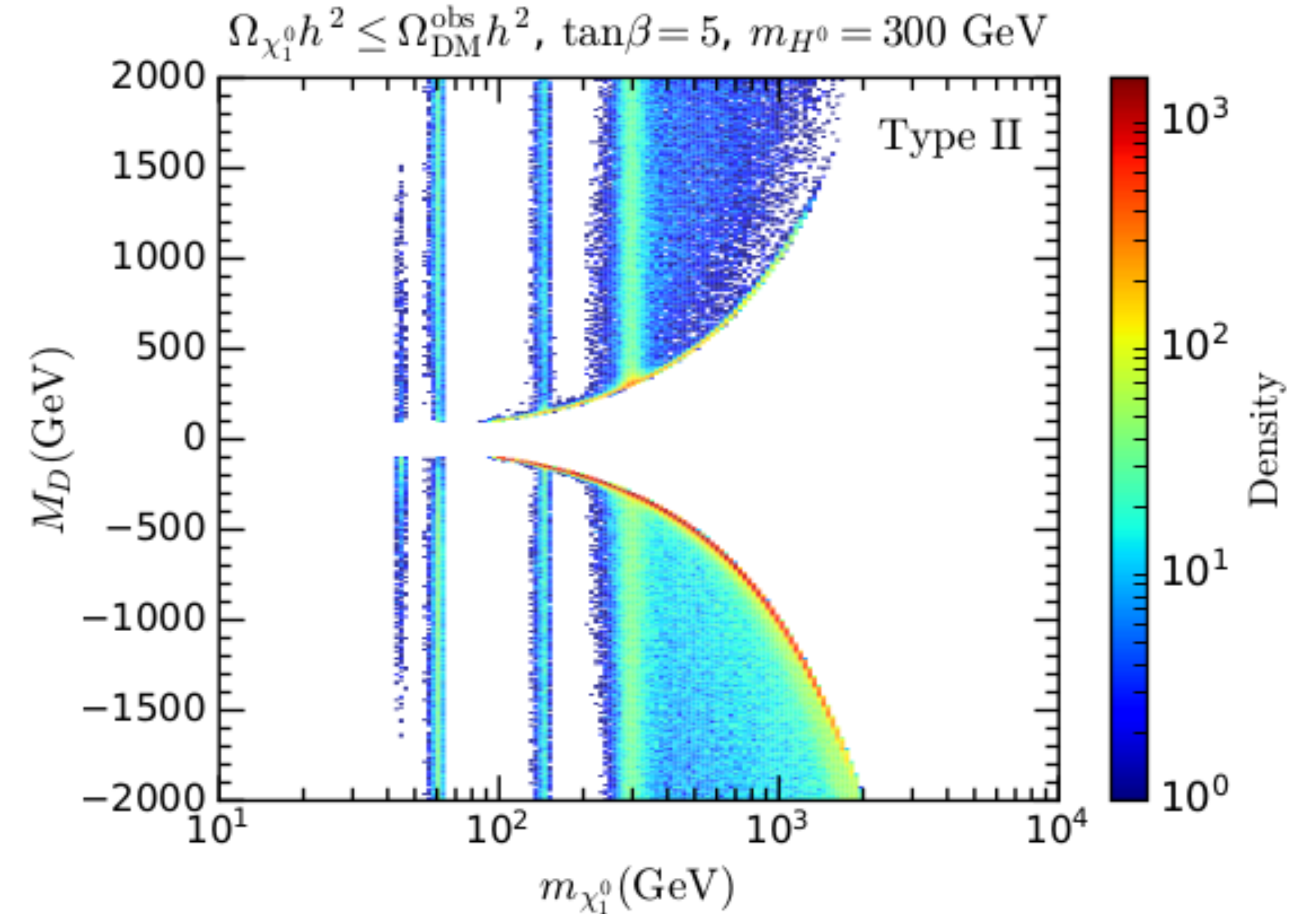
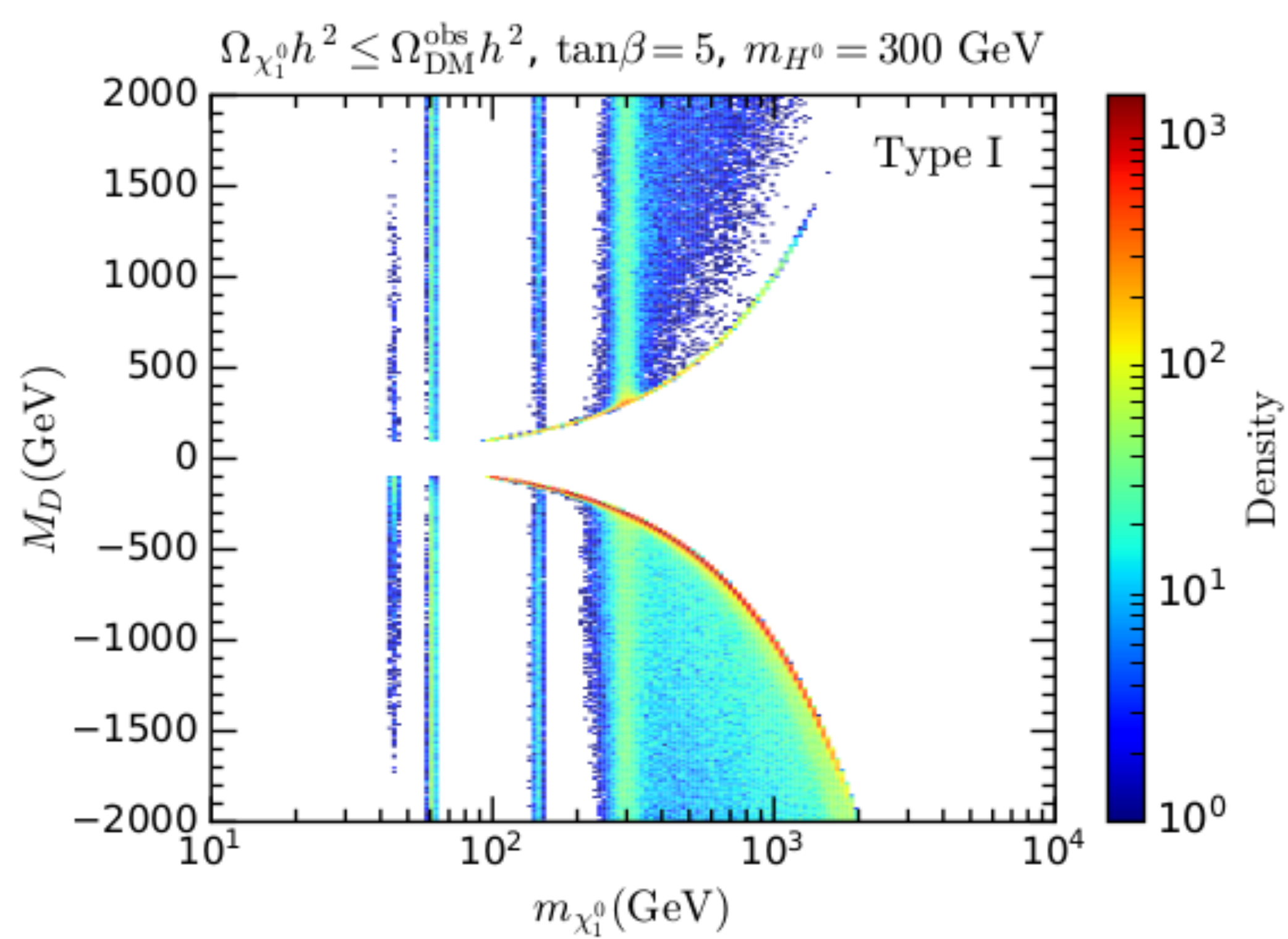


arXiv: 1912.01758

$\Omega = \Omega_{\text{obs}}$



- In a 2HDM with alignment without decoupling the parameter spaces opens:

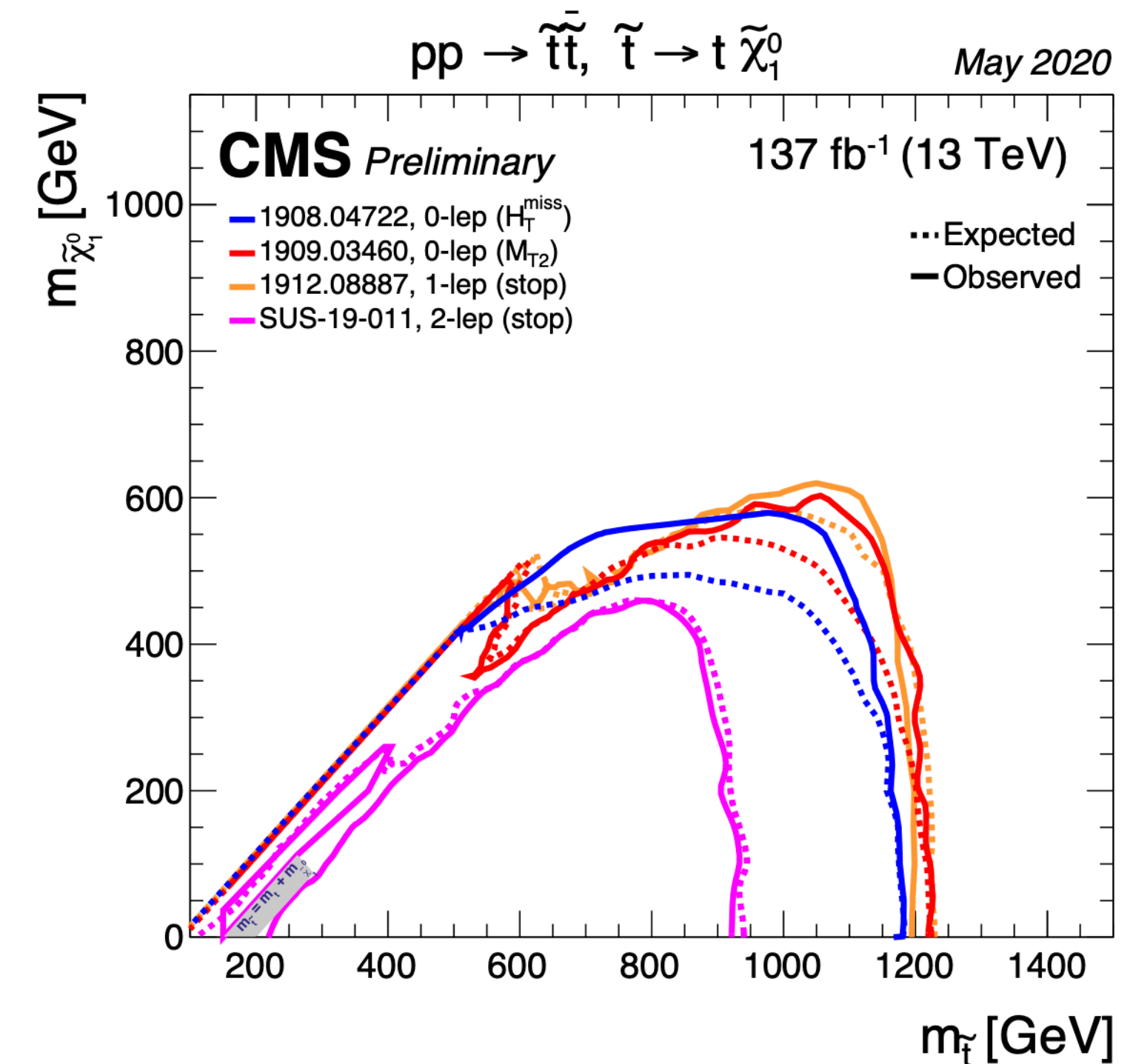
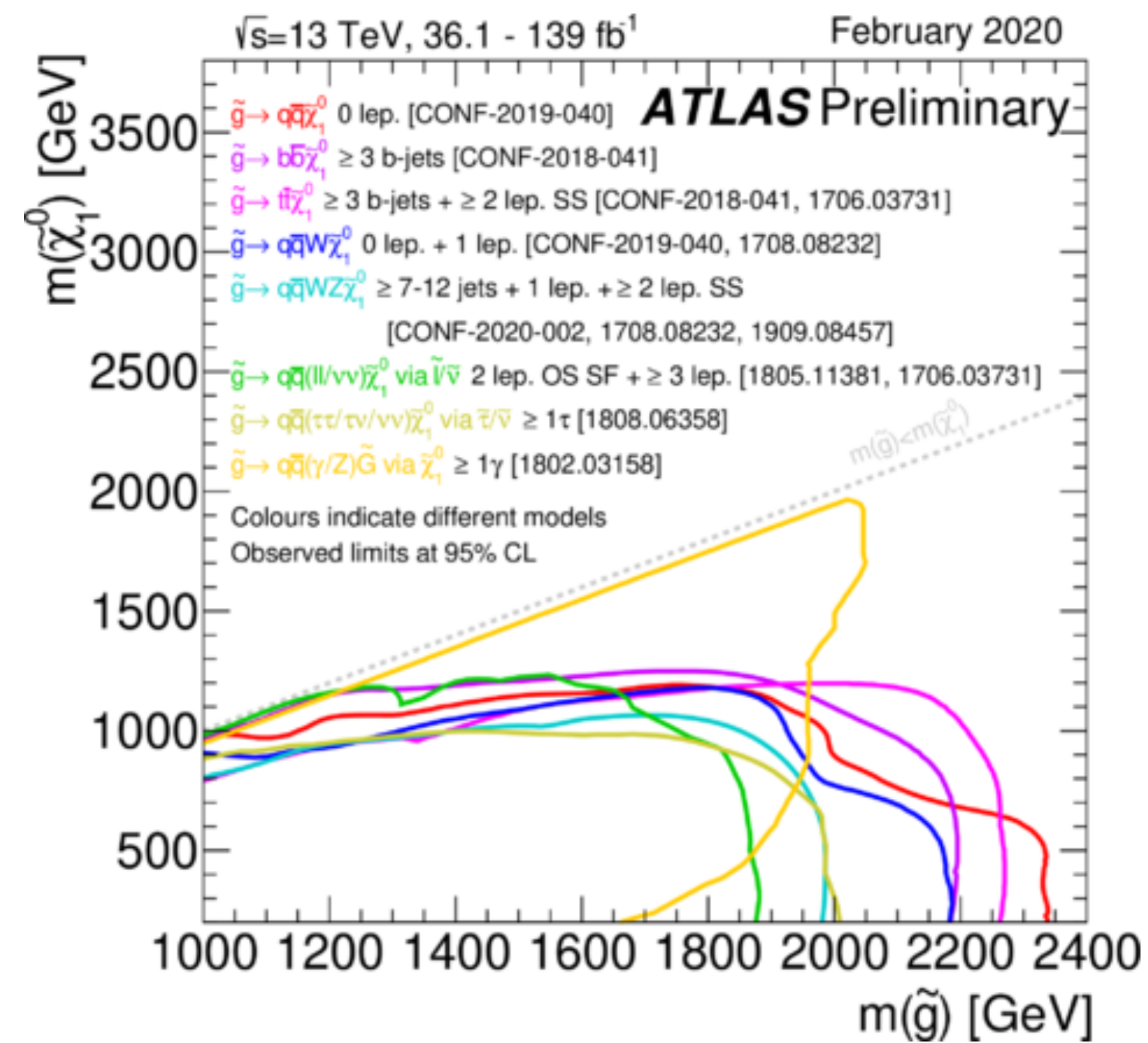


# Pure states

- Pure Higgsino (doublet):  $M=1.1$  TeV
- Scalar doublet:  $M=540$  TeV (possibly ruled out by DD)
- Pure Wino (triplet):  $M=2.9$  TeV (problems with ID)
- Scalar triplet:  $M=2.0$  TeV (problems with the  $\rho$ -parameter)
- Higher representations require always non-renormalizable operator but they may be interesting??

# Search strategies:

- In the case of co-annihilation with colorful partners (gluino or stop) collider searches with not a lot of MET are needed. The region of compressed spectrum is of high interest from the DM point of view



- In the case of the wino collider searches may be more challenging due to the smaller cross-section.



- Monojets vs. standard searches for electroweakinos
- Displaced vertices for “pure states” which charged companions.
- .....