

# The THDMa and possible $e^+e^-$ signatures

## - Summary -

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based on arXiv: 2105.06231/ 2106.02962

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Higgs 2021  
19. October '21

**setup: 2 Higgs Doublet Model** (Type II), + **pseudoscalar**  
 $a$  (mixing with  $A$ ), + **dark matter candidate**  $\chi$  (fermionic)

- **DM couples to additional field in gauge-eigenstates**

⇒ promoted by LHC Dark Matter Working group in Phys.Dark Univ. 27 (2020) 100351

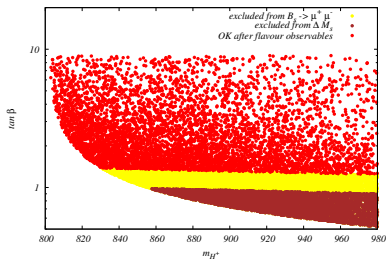
original literature: S. Ipek ea, [Phys. Rev. D90 (2014), no. 5 055021]; J. M. No, [Phys. Rev. D93 (2016), no. 3 031701]; D. Goncalves ea, [Phys. Rev. D95 (2017)]; M. Bauer ea, [JHEP 05 (2017) 138]; P. Tunney ea, [Phys. Rev. D96 (2017)]

⇒ **highly scrutinized by LHC experiments**

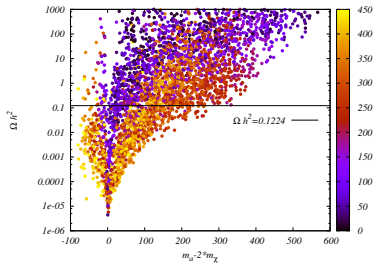
**Interesting at  $e^+e^-$  colliders ??**

# Example for constraints: B-physics, dark matter

... many constraints applied...

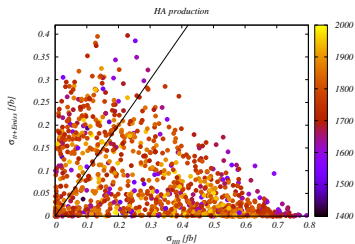


Constraints from B-physics:  
 $B \rightarrow X_S \gamma, B_S \rightarrow \mu^+ \mu^-, \Delta M_S$



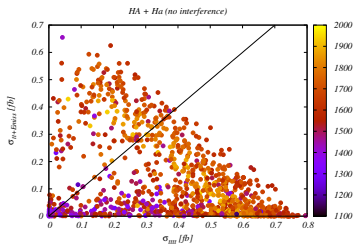
Dark matter relic density

# Can the $\cancel{E}$ channel ever be dominant ?



$t\bar{t}\bar{t}\bar{t}$  and  $t\bar{t} + \cancel{E}$  final states

[color coding  $m_A + m_H$ ]



...including  $Ha$  channel

[color coding  $0.5 \times (m_a + m_A) + m_H$ ]

bottom line: **can find regions where  $t\bar{t} + \cancel{E}$  dominates**