# Searching for Physics BSM at future experiments

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### The Higgs boson at future hadron colliders

arXiv 2004.06122 (JHEP07 (2020) 075) (w/ F. Bishara, P. Englert, C. Grojean, M. Montull, G. Panico) arXiv 20XX.YYYYY (w/ F. Bishara, S. De Curtis, L. Delle Rose, P. Englert, C. Grojean, M. Montull, G. Panico)

- Higgs precision studies are a door towards New Physics.
- Future hadron colliders will offer new possibilities.
- We can do precision measurements with hadron colliders.



#### Assume heavy New Physics $\rightarrow$ use Effective Field Theories (SMEFT).

## The Higgs boson at future colliders

Montecarlo simulation of collider events + simplified analysis.

#### Bounds on Wilson coefficients of the EFT.

$$pp \to W^{\pm}h \to l^{\pm}\nu\,\gamma\gamma$$

arXiv 2004.06122

$$pp \to Z h \to \nu \nu \left( l^+ l^- \right) \gamma \gamma$$



#### Axions, ALPs, EFTs and chiral extensions

arXiv 20WW.ZZZZZ (w/ Q. Bonnefoy, L. Di Luzio, C. Grojean, A. Paul)

- Axions or ALPs are common ingredients in many BSM models.
- There is a huge experimental program starting right now.

**Common lore:** 



We clarify when the implication is broken and find a minimal model where is relevant and study its relation with the origin of the masses of BSM particles.

## **Other projects**

- Scattering amplitudes as a model-independent parametrization of NP. (w/ Q. Bonnefoy, P. Englert, E. Gendy, C. Grojean)
- Model building with one extra (warped) extra dimension: RS, CW/LD. (w/ C. Grojean, O. Matsedonskyi)
- Composite Higgs model building and phenomenology. arXiv: 1904.02560 (JHEP12 (2019) 023) (w/ L. Da Rold)

# Final remarks and paths to explore

- Interface between experiment and theory is increasingly important.
- Astrophysics is becoming very relevant for particle physics.
- What can GW and astrophysical bound tell us about the scalar sector? Higgs, axion, relaxion?

# Thank you for your attention!

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