

# BSM Higgs

**G. Carrillo-Montoya for  
Nikolaos Rompotis, Mario Pelliccioni, Ian Low and the WG3**



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## Science Divers for BSM Higgs WG –

Using benchmarks to pursue the following questions:

Is  $h(125)$  a SM or BSM Higgs?

- Inclusive observables: cross-sections, BR, and exotic decay products
- Kinematic distributions in not only decay products of the Higgs, but also in the  $h+X$ ,  $X=1j, 2j, 1h$ , etc.

Does the  $h(125)$  have any partner(s)?

- Based on properties of  $h(125)$ , what can be learned about its partner? Where to search it?
- If a new state was discovered, how to determine it's a partner of the  $h(125)$ ? Does it decay to  $h+X$ ?

## What benchmarks to use?

- Maintain the traditional cohesiveness in MSSM (and 2HDM) benchmarks... under which form?
- Critical time to leave no stone unturned:
  - How to explore theory space outside of MSSM?
  - Adopting a simplified model approach, like for instance, adding a scalar/fermion/vector partner at a time?
  - How to combine traditional benchmark approach with the simplified model approach?

Important to concentrate, from Mario's slides on the exotic searches this morning:

“We do not want in any way to have the role of selecting particular models (it's impossible and counterproductive)  
Yet, we can play the role of a forum to circulate information between theory and experiments, providing documentation, agreeing on conventions, etc.”

## BMS → and overlaps with WG1/2... ?

- NLO and NNLO predictions (both inclusive and exclusive) for BSM benchmarks...  
Traditionally the focus is on SM and MSSM... but high precision cross-sections and differential distributions for a eventual broader (well defined) class of BSM models? → [overlap with WG1](#)
- Pros and cons of characterizing deviations in Higgs couplings using a general framework (EFT) vs benchmarks? are there things that cannot be captured in EFT and vice versa?

Good **transverse communication** is essential

Let's don't forget that we are a Theory–Experimentalist forum...

It includes common tool developments&validation for well defined processes, but goes well beyond that!

# Your feedback is needed...