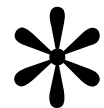


BSM Physics

(informal* discussion)

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informal
adjective

1 *an informal chat*: unofficial, casual, relaxed, easygoing, unceremonious; open, friendly, intimate; simple, unpretentious, easy; informal unstuffy, laid-back, chummy.

ANTONYMS official, formal.

Categorizing NP (I)

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- Models:
 1. Weakly coupled (i.e MSSM) vs strongly coupled (i.e MCHM5).
 2. Simplified models (plainer version of a complete model).
 3. EFT: judicious parameterization of our ignorance.

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- Models:
 1. Weakly coupled (i.e MSSM) vs strongly coupled (i.e MCHM5).
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- Issues:
 - Easier to report results in 2, 3 than 1.
 - Blurry lines between:
 - 1 and 2 : Nomenclature. # new particles > 2, 3, ... ?
 - 1 and 3 : Adopt EFT for Λ [TeV] = 1, 2, 5, 10, 100, 10^{16} ?
 - 1, 2. Benchmarking (last slide!). Choice of “representative” models?
 - 3. Choice of parameterization (wait for Florian’s talk!)

Categorizing NP (II)

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- Effects:
 1. Anomalous couplings (hhh, hhhh, hff, hVV, hhff, hhVV, VVVV, etc)
 2. New particles in loops (triangles vs boxes)
 3. New resonances (i.e: H, S, rho, ...)
 4. hh from chain decays ($n_2 > n_1$ h?)
 5. h/ hh exotic decays ($h > n_1 n_1?$ $h h > n_1 n_1?$)

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 5. h/ hh exotic decays ($h > n_1 n_1$? $h h > n_1 n_1$?)
- Issues:
 - 1: Parameterization: SB realization (L vs NL). Gauge invariance?
 - 2: Some may affect h production (i.e: tth coupling!)
 - 2, 3: Catalog by spin, color rep, ... ? Width: free? f(mass)?
 - 4, 5: Will h always dominate over hh?

Benchmarks for BSM HH Studies?

- LHC HXSWG seeks input. **Strawman proposal:**
 - 1.) Higgs singlet
 - Fix mixing angle to largest allowed by precision EW
 - Free parameters: $M_H, \Gamma(H \rightarrow hh), BR(h \rightarrow \text{invisible})$
 - 2.) Non-resonant 2HDM
 - Small $\tan \beta$, $M_H < 2m_h$
 - Free parameters: $M_H, \cos \alpha, M_A, M_{H^\pm}, \tan \beta, m_{12}^2$
 - 3.) Enhanced b, τ 2HDM
 - Large $\tan \beta$
 - 4.) EFT following Higgs Cross section working group
 - Neglect b 's, assume no CP or flavor /violation
 - Free parameters: $c_{gg}, \delta y_t, y_t^{(2)}, \delta \lambda_3$

[Dawson, Englert, Gouzevitch, Salerno, Slawinska]