Considerations on the Flavor assumptions proposal by the LHC EFT WG

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Flavor assumptions: a top-down approach

Start

Flavor assumption for the UV physics

“Global” fit → Constraints on the Operators

Data

Higgs  Top  EW

DY, dijet, multijet, Flavor
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**"Global" fit → Constraints on the Operators**

**PROS**
- Limit the Nr. of operators, globally
- Optimise the sensitivity on the specific theories that satisfy the assumptions
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"Global" fit $\rightarrow$ Constraints on the Operators

**PROS**
- Limit the Nr. of operators, globally
- Optimise the sensitivity on the specific theories that satisfy the assumptions

**CONS**
- Need to choose (and stick to) a specific flavor assumption
- Realistically, only a few simple choices can be implemented

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We don’t know what New Physics will look like
- It will not be possible to generalise the assumption at a later time
Alternative: bottom-up

Each process in each of these classes typically receives relevant contributions from a few dim-6 operators

1. Assume $M_{NP} \gtrsim 1 \text{ TeV}$ (i.e. assume EFT is valid, neglect dim-8 operators)

2. For each process include contributions from ALL RELEVANT operators (e.g. operators that give a measurable contribution assuming a large but reasonable coefficient, like $C \sim (4\pi)/M_{NP}^2$, or coefficient as big as allowed by other data — flavor, LEP, etc.)

3. Given the data of that process, one obtains a likelihood for the coefficients contributing:

$$L_p(C_i)$$

4. Combine all the likelihoods from all Higgs, EW, Top (etc.) processes

$$L_{SM_{	ext{eff}}}(C_i) = \prod_{P \epsilon \{\text{Higgs, Top, GW, High-PT, flavor}\}} L_p(C_i)$$

UV assumptions can then be implemented (and changed) a posteriori to check specific scenarios.
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Likelihoods from each process are combined into classes of processes

$L_{\text{Higgs}}$, $L_{\text{Top}}$, $L_{Z\rightarrow \mu\nu}$, $L_{W\rightarrow \mu\nu}$, $L_{TGC}$, $L_{DY}$ ...

Which are then combined into a global likelihood

$L_{\text{SM}+\text{FT}}(C_i) = \prod_{p \in \left\{ \text{Higgs, Top, EW} \right\}, \left\{ \text{High PT, Flavor} \right\}} L_p(C_i)$
Doable?

Why not?

It has already been done (with different approaches) for a large class of flavour + Z-pole observables by the Flavio + Wilson + Smelli and HEP-fit projects de Blas et al. 1910.14012; Aebisher, Kumar, Stangl, Straub 1810.08132, 1804.05033, 1810.07698 https://flav-io.github.io/

The extra effort that might be needed to set-up such an approach will be compensated by the greater generality and usefulness of the result.