

# Feedback from CMS on EFT truncation, validity and uncertainties

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- general **agreement** with conclusions of **input scheme note**  
→ minor textual follow-ups in the [gdoc](#)
- dedicated CMS EFT forum last Thursday to discuss recommendations on truncation, validity and uncertainties
  - trying to summarize discussion and open points here

- general comment:
  - suggest to better distinguish between recommendations for analyses aimed at **EFT reinterpretation/combination** and **systematic uncertainties** for EFT analysis
  - i.e. need to distinguish between systematic uncertainties that should be added to experimental likelihoods a-priori vs. systematics computed a-posteriori on EFT results
  - need to assure **unbiased measurements** (model-independent) and **combinable/re-interpretable with future measurements**
  
- **The SMEFT truncation of interest is then at the level of dimension-six operators.**
  - true for global combinations → dim8 still relevant for several analyses  
→ guidance from Area 1 desirable

- including squared dimension-six dependencies by default and comparing results with those obtained in the linear SMEFT approximation
  - agree to retain difference between linear and quadratic results and publish all numbers, in particular for future combinations now and beyond LHC
  - (statistical) interpretation of the systematic variation remains unclear
  - difference only relevant when WCs not small
    - proper **systematic uncertainty** for **missing higher orders missing** ?
  - some worries expressed when linear term negative and fit non-converging: analysis meaningless?
  - remaining issue: definition of linear/quadratic parameterizations for processes with NWA resonance i.e. when there is a split in production and decay

- **providing experimental results as functions of the maximal energy probed in the data employed, introducing where necessary an upper cut**
  - first CMS analyses already providing energy information
  - suggest to always publish results **probing the full energy range** having future combinations (probes of smaller WC's) in mind
  - far from trivial when combining results, computationally challenging
  - challenging of finding a **good proxy**, e.g. when the probed quantity is to a large extent energy-independent or when combining several observables like in STXS combinations
  - unclear how to **translate/compare energy scales in different processes**
  - **Q<sup>2</sup> cuts in MC** (clipping EFT) , e.g. typically used in EFT based DM searches
    - nice feature: can be applied to EFT interpretations of differential/fiducial measurements still after the analysis is public
    - still challenging to relate cuts across different processes affected by the same operator
    - provide table with possible cuts per process and analysis beforehand

- **using squared dimension-six contributions, which can readily be computed with existing tools, as proxies for missing dimension-eight terms at order  $1/\Lambda^4$** 
  - general concern: while this provides an estimate of uncertainty it seems less optimal for (future) global analyses
  - **adds info on dim-8 uncertainties** (not just dim-6 linear vs. quadratic), nevertheless it's also a non-perfect dim-8 proxy as it uses dim-6 kinematics: **quadratic terms are not necessarily representative of  $A_{SM} A_8$  contributions**
  - why not extending to estimate **MHO using geo-smeft** (wherever possible)?

BACK-UP