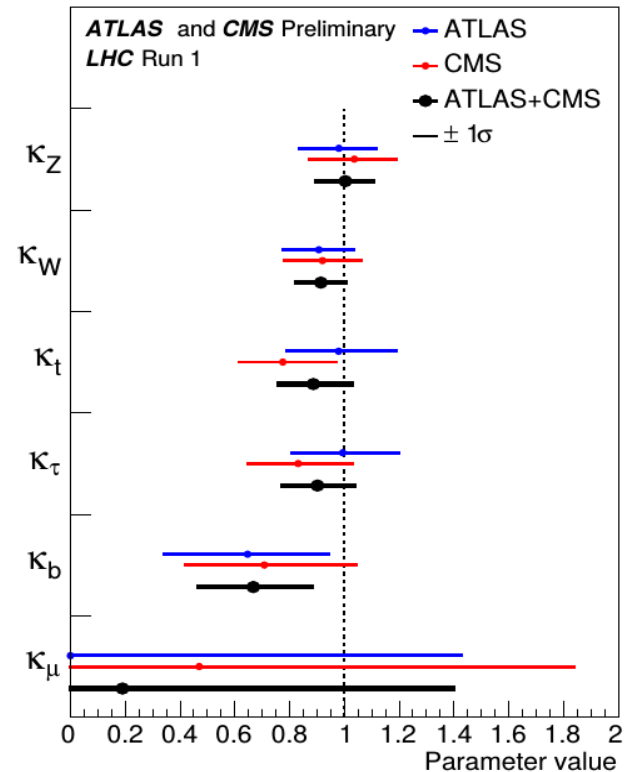
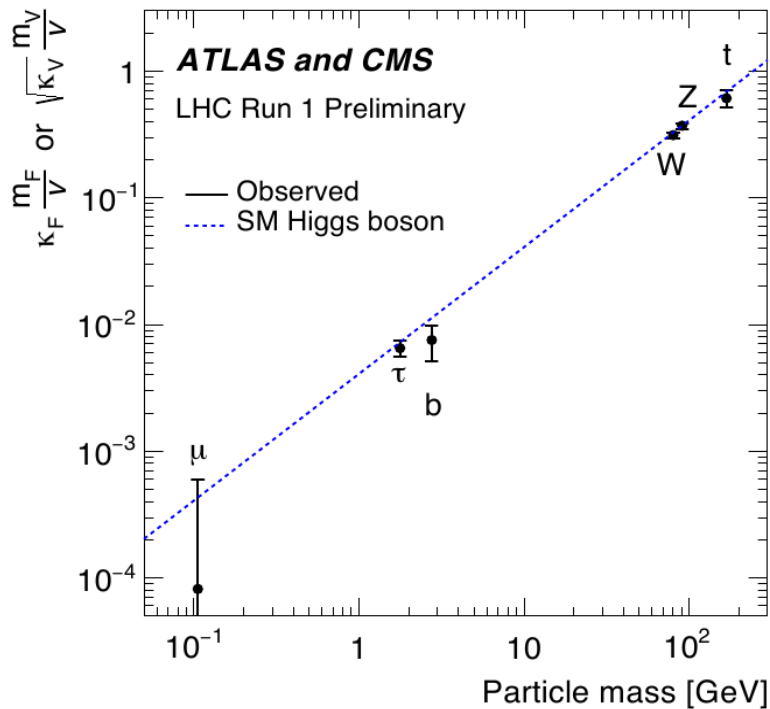


YR4, WG2, and Diff. XS



Chris Hays, Oxford University

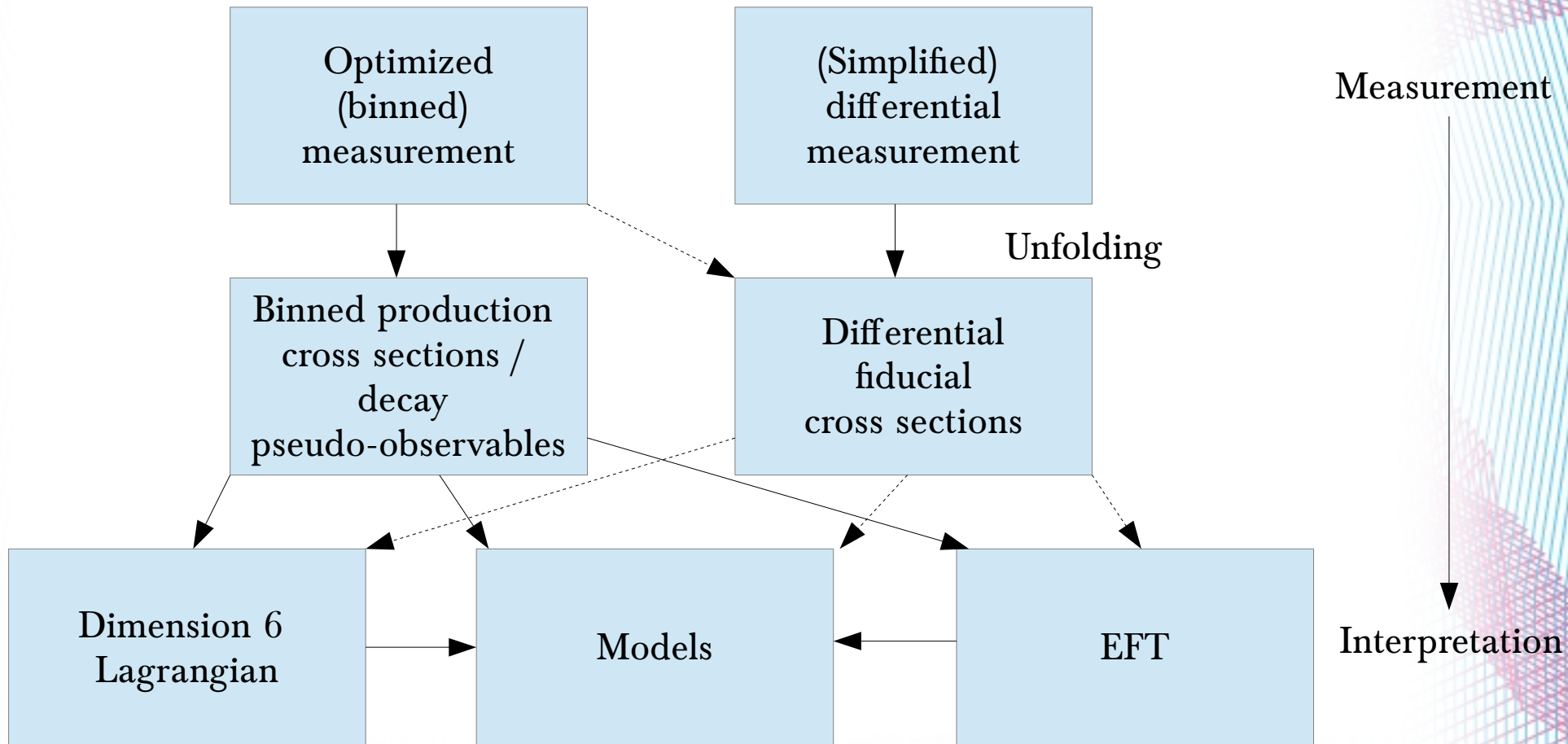
Differential cross section meeting
2 December 2015

Overview

- Measurement and interpretation
- YR4
- Use cases
- Summary

Measurement and interpretation

- The chain from measurement to interpretation:



WG2 sections in YR4

- One chapter introducing the EFT framework

III Effective Field Theory Predictions

III.EFT formalism

1	Warsaw basis
2	Phenomenological effective Lagrangian and its map to Warsaw basis
3	Higgs basis proposal
4	Relations to other popular bases (SILH, HISZ, etc - incl. Rosetta)

(G Isidori,
WG2 Sep
meeting)

III.EFT validity

1	General caveats, contrasting with concrete BSM of WG3
2	Link to WG3 (what would light NP look like)

*The present EFT note
will essentially become
this section of chap. III*

III.EFT application

1	LO EFT tools
1.1	Tools for translations (Rosetta)
1.2	Tools for calculating observables (e.g. EHdecay)
1.3	Tools for simulating events (e.g. Madgraph)
1.4	Tools for comparing with experiments (e.g. Sfitter)
2	NLO EFT results
2.1	NLO EW
2.2	NLO QCD
3	Interpretations in terms of non-linear EFT

(LHCHXSWG-INT-2015-001)

- The purpose of this whole chapter is to provide an EFT “theory reference” (specifying in particular common notations, tools, EFT applicability regimes, etc..)
- No explicit recommendations on data analyses

WG2 sections in YR4

- One chapter on measurements and recommendations

IV Measurements and Observables

IV.1 Introduction

IV.2 Pseudo Observables

- 1 Concept of POs
- 2 Template xsec
 - 2.1 tests how well new physics is covered
- 3 Continuous POs
 - 3.1 soft EW correction
 - 3.2 hopefully also some production stuff

- The purpose of this chapter is to define the general 3-steps strategy for data analysis:

Fiducial Xs → **PO** → **EFT**

(G Isidori, WG2 Sep meeting)

The present temp-Xs/PO note will become this section

- The precise order of sections IV. 2-4 still under discussion (at present this is my favorite order)

IV.3 Recommendation of LO EFT interpretation of LHC Higgs results

- 1 Assumptions
- 2 Scope
- 3 Limitations

Specific recommend. for EFT-based analyses will appear here

IV.4 Fiducial xsec

- 1 Task force
- 2 Tests how well new physics is covered (using the EFT as general example) . . .

Comments on YR4 status

- EFT chapter more advanced than measurement chapter
 - Issues to be worked out with template cross sections and recommendations
 - Not clear where to put subsections on morphing and connecting EFTs to models
- Tangentially affects subsection on differential cross section
 - Potential overlap with template cross sections
 - Consider use cases

Use case: New models

- Many studies connect models to EFT or dim-6 Lagrangian
 - Combined experimental results on template cross sections or differential cross sections can be used to constrain these parameters, or the model parameters directly
 - Experiments can produce EFT/dim-6/model constraints directly according to recommendations
 - Theorists can use combined cross section results to constrain their preferred EFT/model
 - Complementarity of template and differential cross sections
 - Template: production level; most precise measurements
 - Differential: decay level; channel-specific binning

Use case: Standard Model

- Some open issues
 - e.g. resummation scale for b-quark loop (compare predictions to data at low $p_T^{H?}$)
 - template cross sections sensitive to production effects
 - complementary information from finer-binned differential measurements?
 - experiments can compare combined template or differential measurements directly to SM predictions

Summary

- Differential cross section issues primarily measurement-related
 - Aim to maximize data sensitivity for comparison to theory
 - Combine measurements where possible
 - Consider long-term (full Run 2) sensitivity as well as 2016
 - Aim for recommendations that can last
 - Can of course be revisited if necessary
- Valuable to provide example use cases
 - e.g. models where template cross sections are not sufficient
 - CP information?
 - can show model effects on top of distributions
 - could use “straw man” sensitivity estimate